

## REGULAR PAPER

# A new species of *Hyphessobrycon* Durbin (Characiformes: Characidae) from the western Amazon basin in Colombia and Peru

Carlos Arturo García-Alzate<sup>1,2</sup>  | Flavio Lima<sup>3</sup> | Donald Charles Taphorn<sup>4</sup> | Jose Ivan Mojica<sup>5</sup> | Alexander Urbano-Bonilla<sup>6</sup> | Tulio Franco Teixeira<sup>7,8</sup>

<sup>1</sup>Universidad del Atlántico, Programa de Biología, Ciudadela Universitaria, Barranquilla, Colombia

<sup>2</sup>Corporación Universitaria Autónoma del Cauca, Facultad de Ciencias Ambientales y Desarrollo Sostenible, Popayan, Colombia

<sup>3</sup>Museu de Zoologia da Universidade Estadual de Campinas "Adão José Cardoso", Campinas, Brazil

<sup>4</sup>Research Associate, Ichthyology, Royal Ontario Museum, Belleville, Illinois

<sup>5</sup>Universidad Nacional de Colombia, Facultad de Ciencias, Instituto de Ciencias Naturales, Bogotá, Colombia

<sup>6</sup>Departamento de Biología, Laboratorio de Ictiología, Facultad de Ciencias, Pontificia Universidad Javeriana, Bogotá, Colombia

<sup>7</sup>Programa de Pós-Graduação em Biologia de Vertebrados, Pontificia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil

<sup>8</sup>Museu de Ciências Naturais da PUC Minas, Av. Dom José Gaspar, 290, 30535-901, Coração Eucarístico, Belo Horizonte, Minas Gerais, Brazil

## Correspondence

Carlos Arturo García-Alzate, Universidad del Atlántico, Ciudadela Universitaria, Barranquilla 081001, Colombia.  
Email: carlogarciaa@mail.uniatlantico.edu.co

## Funding information

Andes Amazon Fund; FAPESP; Universidad del Atlántico

## Abstract

*Hyphessobrycon chiribiquete* n. sp. is described from the Río Caquetá drainage in Colombia and the Río Ucayali drainage in Peru, western Amazon. The new species is diagnosed from its congeners by having the following combination of characters: a conspicuous narrow midlateral stripe, starting on the sides of the body behind the opercle near the lateral line; lateral stripe overlapped anteriorly with a vertically elongated humeral blotch; inner premaxillary teeth pentacuspoid; margin of anal fin falcate in mature males.

## KEYWORDS

*Hyphessobrycon agulha*, neotropical diversity, Río Caquetá drainage, Río Ucayali drainage, Serranía de Chiribiquete

## 1 | INTRODUCTION

*Hyphessobrycon* is one of the most species-rich genera of Characidae, with 159 species currently considered as valid (Faria *et al.*, 2018; Ohara *et al.*, 2019; Teixeira *et al.*, 2020) distributed from southern Mexico (Miller *et al.*, 2006) to the Río de La Plata in Argentina (Menni, 2004). The genus was described by Durbin (in Eigenmann, 1908) as "a *Hemigrammus* with naked caudal" fin. Further diagnostic characters

were presented by Eigenmann (1917: 50–51) in the most comprehensive revision on the genus so far. It is nowadays consensual that *Hyphessobrycon*, as are several other species-rich genera within Characidae (*e.g.*, *Astyanax*, *Hasemanina*, *Hemigrammus*, *Moenkhausia*) is polyphyletic, as corroborated by phylogenetic analyses based on both molecular and morphological data (Javonillo *et al.*, 2010; Mirande, 2010, 2019; Ohara, Mirande & Lima, 2017; Oliveira *et al.*, 2011). Despite that, the traditional definition of the genus of

Eigenmann (1917) is still used in taxonomic studies, mainly for practical reasons. Nevertheless, some species groups have been proposed within this genus, based primarily on similarities of colour pattern, shape of body and fins, and secondary sexual characters (Ingenito *et al.*, 2013; Lima *et al.*, 2014; Moreira & Lima, 2017; Ohara & Lima, 2015; Pastana & Ohara, 2016; Weitzman & Palmer, 1997).

In 2004, one of the authors (FCTL) joined a survey of the fishes from terra firme streams from the Jenaro Herrera area in the Río Ucajali, Peru, when several specimens of a distinctive *Hyphessobrycon* species were collected. Subsequent surveys of fish collections (namely MZUSP, MUSM, ANSP, MHNG and NRM) revealed a few additional specimens of the species. Recently (2016–2019), two of the other authors (JIM and AUB) collected several specimens of a *Hyphessobrycon* species from tributaries of the middle Río Caquetá basin in the Serranía de Chiribiquete, Colombia, that on subsequent examination proved to be conspecific with the specimens from Peru. The aim of the present contribution is to describe this species.

## 2 | MATERIALS AND METHODS

The sampled fishes were anaesthetized by immersion in a eugenol solution before being fixed and preserved. They were collected during the expeditions for the nomination of the Serranía de Chiribiquete National Park as a world heritage site of UNESCO, under authorization # 20172000005311 issued by the subdirector's office of management of protected areas of the National Natural Parks of Colombia and permission to collect biological diversity for scientific research resolution # 0778 7 July 2017. Morphometric and meristic data were taken following Fink and Weitzman (1974) and Menezes and Weitzman (1990), except for counts of the horizontal scale rows below the lateral line, which were counted to the pelvic-fin origin. In the description, the frequency of each count is given in parenthesis after the respective count. An asterisk indicates counts of the holotype. Morphometric data were expressed as percentages of standard length ( $L_S$ ), except subunits of the head, which were expressed in percentages of head length. Counts of supraneurals, vertebrae, procurrent caudal-fin rays, unbranched anal-fin rays, branchiostegal rays, gill-rakers, dentary teeth and teeth cusps were taken from cleared and stained specimens (CS), prepared according to Taylor and van Dyke (1985). Vertebrae of the Weberian apparatus were counted as four elements, and the fused PU1 + U1 counted as a single element. Institutional acronyms follow Sabaj (2019).

## 3 | RESULTS

### 3.1 | *Hyphessobrycon chiribiquete* new species

*Hyphessobrycon* sp. "Schwarzstreifen-Rotschwanz": Hoffmann & Hoffmann, 2012: 35 (photo; comparison with *Hyphessobrycon agulha*).

*Hyphessobrycon* sp. 1: Mojica *et al.*, 2017: 168 (listed, Colombia, Serranía de Chiribiquete, River Tunia basin).



**FIGURE 1** *H. chiribiquete*, ICN-MHN 21678, holotype, 29.9 mm  $L_S$ , male, small stream tributary of the Río Tunia, Apaporis-Jurupá River drainage, Chiribiquete National Natural Park, Colombia

*Hyphessobrycon* sp. nov.: Urbano-Bonilla *et al.*, 2019: 139 (listed, Colombia, River Yari basin); de Souza *et al.*, 2019: 392: *Hyphessobrycon* sp. nov. (listed, Colombia: Bajo Caguán-Caquetá).

### 3.2 | Holotype

ICN-MHN 21678, 29.9 mm  $L_S$ , male, Colombia, Departamento del Caquetá, small stream tributary of the Río Tunia, Apaporis-Japurá-Amazon River basin, Serranía de Chiribiquete, Chiribiquete National Natural Park; 01°29'23.3"N, 72°52'35.1"W; 246 m a.s.l.; J.I Mojica, 20 February 2017 (Figure 1).

### 3.3 | Paratypes

Colombia, Departamento Caquetá, Amazon River basin, Río Caquetá drainage ICN-MHN 21764, (47 specimens, 13.9–36.5 mm  $L_S$ ), CZUT-IC 18708, (two specimens, 33.7–35.4 mm  $L_S$ ), IAvH-P 16114, (two specimens, 30.8–31.1 mm  $L_S$ ), UARC-IC 797, (three specimens CS, 29.4–31.9 mm  $L_S$ ), UARC-IC 798, (three specimens, 27.8–29.5 mm  $L_S$ ), collected with holotype. MPUJ-P 12179, (14 females, 27.4–35.5 mm  $L_S$ , 17 males, 24.6–30.7 mm  $L_S$ ), San Vicente del Caguán, Ciudad Yari, small terra firme streams, Río Yari drainage, Serranía de Chiribiquete, Chiribiquete National Natural Park, 0°47'28.7"N, 74°04'26.2"W; 245 m a.s.l.; A. Urbano-Bonilla 15 March 2017. ICN-MHN 19729 (six specimens, 32.4–39.8 mm  $L_S$ ), small stream, tributary of Río Yari; 0°44'29.6"N, 72°44'58.2"W; 211 m a.s.l.; June 2016. ICN-MHN 19730 (six specimens, 18.9–39.9 mm  $L_S$ ), small stream, tributary of Río Yari system; 0°44'48.6"N, 72°44'58.2"W; 210 m a.s.l.; J.I Mojica, June 2016. Departamento Putumayo, MPUJ 13789 (one female, 33.6 mm  $L_S$ ), Puerto Leguizamo, small stream (Caño on trail 3 at 5700 m) tributary of the Río Caquetá, 0°14'48.2"N, 74°18'52.3"W; 164 m a.s.l.; J.A Maldonado-Ocampo *et al.*, 8 April 2018. MPUJ 13790 (one female, 34.9 mm  $L_S$ , two males, 28.94–29.60  $L_S$ ), Puerto Leguizamo, small stream (Caño on trail 3 at 1050 m) tributary of the Río Caquetá, 0°14'52.8"N, 74°18'40.3"W; 164 m a.s.l.; J.A Maldonado-Ocampo *et al.* 9 April 2018. MPUJ 13791 (one female, 36.1 mm  $L_S$ ), Puerto Leguizamo, Caño Alejandrina, tributary of the Río Caquetá, 0°0'4.2"N,

74°38'46.7"W; 179 m a.s.l.; J.A. Maldonado-Ocampo *et al.*, 21 April 2018. MPUJ 14057 (two females, 29.75–34.54 mm  $L_S$ , four males, 28.1–32.26 mm  $L_S$ ), Solano, small stream (Caño trocha 3 in the 1600 m), tributary of the Río Caquetá, 00°20'9.8"N, 74°45'29.3"W; J.A. Maldonado-Ocampo *et al.*, 18 April 2018. MPUJ 14360 (five males, 32.6–36.16 mm  $L_S$ ), Natural National Park Serranía de Chiribiquete, Puerta de Jerusalén stream, originates from a Tepuy, and drains directly to the Río Mesay, tributary of the Río Yari, 00°04'38.6"N, 72°30'36.3"W; 135 m a.s.l.; A. Urbano-Bonilla, J. Patarroyo, H. Fantoi & J.M Pokai-Kadani, 2 April 2019. MPUJ 14361, (one male, 29.3 mm  $L_S$ , one female, 34.0 mm  $L_S$ ), Serranía de Chiribiquete Natural National Park, Chorro Jurujurú, tributary of the Río Mesay, tributary of the Río Yari, 00°06'46.9"N, 72°36'48.73"W; 183 m a.s.l.; A. Urbano-Bonilla, J. Patarroyo, H. Fantoi & J.M Pokai-Kadani, 11 April 2019. MPUJ 14362 (one male, 28.2 mm  $L_S$ ), Natural National Park Serranía de Chiribiquete, Caño Chive, Río Cuñare, tributary of the Río Yari, 00°19'00.9"N, 72°28'57.4"W; 144 m a.s.l.; A. Urbano-Bonilla, J. Patarroyo, H. Fantoi & J.M Pokai-Kadani, 18 April 2019.

### 3.4 | Non type specimens

Peru, Departamento Loreto, Requena, Amazon River basin, Río Ucayali drainage: MCP 54164 (three females, 41.6–42.8 mm  $L_S$ , four males, 38.5–39.1 mm  $L_S$ ); MUSM 66972 (five females, 33.3–44.1 mm  $L_S$ , four males, 33.5–37.8 mm  $L_S$ , one CS, 34.1 mm  $L_S$ ); UF 242745 (four females, 32.9–41.0 mm  $L_S$ , three males, 36.0–37.9 mm  $L_S$ ); ZUEC 17116 (three females, 39.7–43.5 mm  $L_S$ , four males, 32.2–38.5 mm  $L_S$ ), quebrada 14 km E of Jenaro Herrera, road to Colonia Angamos, 4°55'17"S, 73°33'15"W; H. Ortega, R.E. Reis, W.G.R. Crampton, F.C.T. Lima & J.A. Oliveira, 10 January 2004. MUSM 66973 (two specimens, one female, 38.1 mm  $L_S$ , one male, 36.6 mm  $L_S$ ), Quebrada Sapuenillo, c. 7 km from Jenaro Herrera, road to Colonia Angamos, 4°54'25"S, 73°36'44"W; H. Ortega, R.E. Reis, W.G.R. Crampton, F.C.T. Lima & J.A. Oliveira, 13 January 2004. UF 242744 (one specimen, sex undetermined, 36.0 mm  $L_S$ ), Quebrada Salomé Caño, c. 9 km from Jenaro Herrera, road to Colonia Angamos, 4°54'21"S, 73°35'36"W; H. Ortega, R.E. Reis, W.G.R. Crampton, F.C.T. Lima & J.A. Oliveira, 13 January 2004. MUSM 41334 (one specimen, 37.7 mm  $L_S$ ), Jenaro Herrera, CCII, quebrada 5 km from IIAP; P. de Rham & F. Chang, 17 February 1992. MHNG 1579.058–059 (two specimens, 26.5–28.9 mm  $L_S$ ), Jenaro Herrera, "ruisseau Tupaes B", P. de Rham, 19 October 1977. MHNG 1576.42–43 (two specimens, 25.8–28.4 mm  $L_S$ ), Jenaro Herrera, "marigots des Tupacs"; P. de Rham, 18 October 1977. NRM 70351 (two specimens, 25.7–31.9 mm  $L_S$ ); MHNG 2772.054 (one specimen, 39.3 mm  $L_S$ ), Jenaro Herrera, Quebrada Carahuayte, 18 km on road Jenaro Herrera, Colonia Angamos, S.O. Kullander *et al.*, 29 July 1983. ANSP 165016 (one specimen, 47.6 mm  $L_S$ ), small stream near Jenaro Herrera, P. Fromm *et al.*, 23 August 1989. MZUSP 26349 (three specimens, 32.8–38.5 mm  $L_S$ ), Quebrada Copal, 15 km from Jenaro Herrera on road to Colonia Angamos, 4°56'22"S, 73°30'25"W; H. Ortega, 23 September 1979. Colombia, Departamento Amazonas: IAvH-P 22107 (two specimens, 27.3–31.1 mm  $L_S$ ); ZUEC 17025 (two specimens, 27.2–28.5 mm  $L_S$ , one specimen CS, 27.2 mm  $L_S$ ), Río Apapóris, Raudal de Jirijirimo, c. 0°2'35"S, 70°56'53"W;

H. Bleher, September 2017. Peru, Río Ucayali drainage: MUSM 41335 (two specimens, 29.7–30.2 mm  $L_S$ ); Departamento Loreto, Jenaro Herrera, CCII, quebrada at 14.5 km; P. de Rham & F. Chang, 18 February 1992. MZUSP 100938 (two specimens, 22.2–27.2 mm  $L_S$ ), Departamento Ucayali, Pucallpa, Bosque Nacional Alexander Von Humboldt, c. 8°49'S, 75°12'W; P. de Rham, 23 June 1979.

### 3.5 | Diagnosis

*Hyphessobrycon chiribiquete* differs from all congeners, with the exception of *H. cachimbensis* Travassos 1964, *H. cyanotaenia* Zarske & Géry 2006, *H. fernandesi* Fernández-Yépez 1972, *H. melanostichos* Carvalho & Bertaco 2006, *H. nigricinctus* Zarske & Géry 2004, *H. paucilepis* García-Alzate, Román-Valencia & Taphorn 2008, *H. petricolus* Ohara, Lima & Barros 2017, *H. piranga* Camelier, Dagosta & Marinho 2018, *H. psittacus* Dagosta, Marinho, Camelier & Lima 2016, *H. scholzei* Ahl 1937, *H. sovichthys* Schultz 1944, *H. stegemanni* Géry 1961, *H. taphorni* García-Alzate, Román-Valencia & Ortega 2013, *H. tuyensis* García-Alzate, Román-Valencia & Taphorn 2008 and *H. vilmae* Géry 1966, by the presence of a well-defined, narrow dark midlateral stripe on the body extending onto the middle caudal-fin rays (vs. absence of a well-defined midlateral stripe, or midlateral dark stripe becoming blurred towards caudal peduncle, usually not reaching it). *H. chiribiquete* differs from all the aforementioned species, with the exception of *H. cachimbensis*, *H. cyanotaenia*, *H. melanostichos* and *H. nigricinctus*, by having a humeral blotch that overlaps the anterior portion of the midlateral stripe (vs. humeral blotch absent). It is distinguished from *H. cyanotaenia*, *H. nigricinctus*, *H. melanostichos* and *H. petricolus* by a thinner midlateral stripe clearly decreasing in width towards the caudal peduncle, covering one or less than one scale along most of its length (vs. midlateral stripe wider, with a constant width, covering more than one scale along its entire length) and from *H. cachimbensis* by having inner premaxillary teeth with fewer cusps (up to five cusps vs. seven or more). *H. chiribiquete* further distinguishes from *H. cyanotaenia* and *H. melanostichos* by the midlateral dark stripe starting on the sides of the body, posterior to the opercle (vs. midlateral dark stripe starting behind eye). It can be additionally distinguished from *H. cyanotaenia* by the distal margin of the anal fin of mature males and females distinctly falcate, with the last unbranched and anteriormost two branched rays longer than the remaining rays (vs. distal margin of the anal fin of males and females slightly convex to straight), by the number of longitudinal row of scales from lateral line to dorsal-fin origin (5–6 vs. 4–5), and by having 19–21 branched anal-fin rays (vs. 13–16). *H. chiribiquete* can be additionally distinguished from *H. petricolus* by midlateral stripe overlapping humeral blotch except for the ventral portion (vs. midlateral stripe overlapping humeral blotch except dorsal and ventral portions).

### 3.6 | Description

Morphometric data for holotype and paratypes are shown in Table 1. Body compressed. Greatest body depth at vertical through dorsal-fin

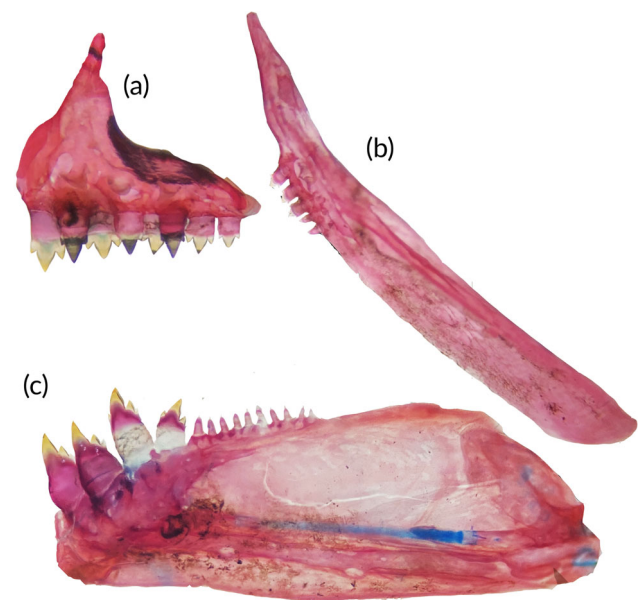
		Holotype	n	Range	Mean	S.D.
Standard length(mm)	M	29.9	17	29.5–38.3	33.9	
	F		35	28.4–47.6	34.7	
Percentage of standard length						
Depth at dorsal-fin origin	M	31.1	17	26.8–33.8	31.2	2.3
	F		35	25.2–38.2	32.6	3.9
Snout to dorsal-fin origin		50.5	53	45.3–52.3	49.7	1.3
Snout to pelvic-fin insertion		46.1	53	44.5–52.4	48.1	1.9
Snout to anal-fin origin		61.2	53	61.2–68.8	64.7	1.8
Dorsal-fin height		29.1	51	25.2–32.9	29.0	1.8
Pectoral-fin length		20.4	53	13.4–26.1	21.2	2.6
Pelvic-fin length		19.4	53	15.4–23.9	23.1	2.2
Anal-fin base length		25.7	33	25.2–29.8	26.9	1.0
Caudal peduncle depth		10.7	53	6.9–11.2	9.6	0.8
Caudal peduncle length		9.7	53	9.4–15.4	13.2	1.3
Head length		28.1	53	24.7–31.3	27.3	1.7
Percentage of head length						
Horizontal eye diameter		38.1	53	34.2–44.8	39.8	2.1
Snout length		20.2	53	20.2–30.5	26.0	2.6
Least interorbital width		59.5	53	28.7–39.5	32.3	2.6
Upper jaw length		44.0	53	40.7–52.7	47.9	3.1

Note. n, number of analysed specimens; M, males; F, females.

origin. Dorsal profile of head slightly convex from tip of snout to nostrils and slightly concave to straight from nostrils to supraoccipital process. Predorsal profile convex; dorsal-fin base straight and posteroventrally inclined; straight to slightly convex from dorsal-fin terminus to adipose-fin origin; straight to slightly concave from that point to anteriormost dorsal procurrent caudal-fin ray. Ventral profile convex from anterior tip of lower jaw to anal-fin origin. Anal-fin base straight and posterodorsally inclined. Ventral profile of caudal peduncle slightly concave.

Mouth terminal. Posterior tip of maxilla reaching beyond vertical through anterior border of pupil. Premaxillary teeth in two rows: outer row with two (1), three\* (40) or four (12) uni- to tricuspid teeth; inner row with four (1), five\* (51) or six (1) tri- to pentacuspid teeth. Maxilla with one (3), two (10), three (21), four\* (17) or five (2) uni-to tricuspid teeth. Dentary with 11 (15), 12 (1), 13 (1) or 14 (36) teeth; four anteriormost teeth larger, tri- to pentacuspid; abrupt decrease in size laterally to fourth tooth, fifth tooth with three cusps; followed by two (15), three (1), four (1) or five\* (36) teeth with one cusp (Figure 2). First gill arch with two (4) or three (1) gill-rakers on hypobranchial, nine (3) or 10 (2) on ceratobranchial, one (5) on cartilage between ceratobranchial and epibranchial, and seven (1) or eight (3) on epibranchial. Branchiostegal rays four (2), three rays attaching to anterior ceratohyal, and one ray to posterior ceratohyal.

Scales cycloid, with three to seven *radii* diverging from focus to posterior portion of scale; *circuli* well marked. Lateral line incompletely pored, with eight (5), nine (16), 10\* (20), 11 (9) or 13 (1) perforated scales. Horizontal scale row, including perforated scales, with 31 (1),



**FIGURE 2** Upper and lower jaws (a) premaxilla, (b) maxilla and (c) dentary of *H. chiribiquete*, UARC-IC 797, paratype. Scale bar 1 mm

32\* (3), 33 (15), 34 (5), 35 (17) or 36 (1) scales. Horizontal scale rows between lateral line and dorsal-fin origin five (40) or six\* (13). Scales rows between lateral line series and pelvic-fin insertion three\*(20) or four (33). Predorsal scales nine (3), 10\* (32) or 11 (14). Single row of five (9), six (11) or seven\* (30) scales on base of anteriormost anal-fin

rays. Circumpeduncular scales 11 (1) or 12\* (27). Axillar scale present. Caudal fin with scales basally along most of fin, extending posteriorly to basal third of both dorsal and ventral lobes.

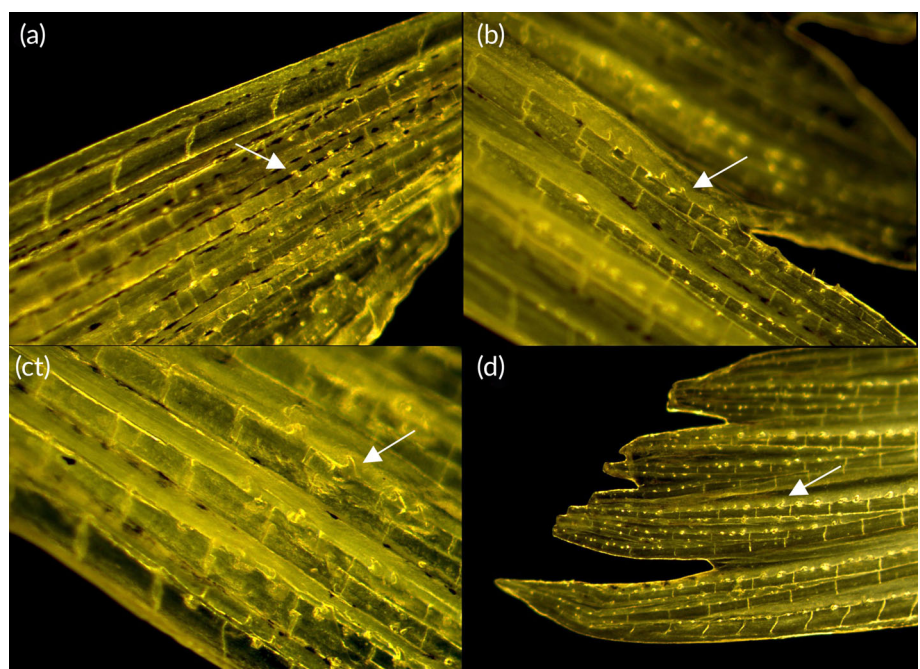
Pectoral-fin rays  $i,11$  (29) or  $12^*$  (24). Distal tip of pectoral fin of mature males surpassing pelvic-fin origin. Distal tip of pectoral fin of mature females reaching or not pelvic-fin origin. Pelvic-fin rays  $i,7^*$  (53). Distal tip of pelvic fin of mature males surpassing anal-fin origin, usually reaching second or third branched ray. Distal tip of pelvic fin of mature females usually not reaching anal-fin origin, reaching last unbranched ray in some specimens. Dorsal-fin rays  $ii,9^*$  (53); first unbranched ray about one-third length of second unbranched ray; second unbranched and first branched rays longest. Dorsal-fin origin slightly anterior to middle of standard length. Anteriormost dorsal-fin pterygiophore inserted posterior to neural spine of 8th (4) or 9th (1) vertebrae. Anteriormost anal-fin pterygiophore inserted posterior to haemal spine of 12th (2), 13th (1), 14th (1) or 16th (1) vertebrae. Anal fin with  $iii-iv$  unbranched rays, and 19 (12),  $20^*$  (23) or 21 (18) branched fin-rays. Anal-fin border profile of both males and females with same general shape; last unbranched ray and first branched ray longest; branched rays gradually decreasing in size from this point to seventh branched ray, forming conspicuous anterior lobe with general concave profile; anal-fin border profile straight from this point to last branched ray. Anal-fin anterior lobe of mature males better developed, forming convex distal profile from last unbranched ray to fourth branched rays due to concentration of tissue on interradial membranes, posteriorly to hooks. Hooks present on anal-, pelvic-, pectoral- and dorsal-fins of mature males (Figure 3). Anal fin with one to three (usually two) hooks per segment of hemitrichia from last unbranched to last branched ray. First five branched rays with hooks present on segments of hemitrichia proximal and distal to first ramification. Remaining branched rays with tiny hooks restricted to

distalmost two or three segments of hemitrichia. Hooks of first six branched rays decreasing in size distally; proximalmost segments of hemitrichia with larger hooks. Hooks increasing in size posteriorly from last unbranched rays to fifth branched ray; fourth or fifth branched ray with larger hooks. Pelvic fin with one to three (usually two) hooks per segments of hemitrichia from unbranched ray to seventh branched ray. Anteriormost four branched rays with nine to 11 hooks on proximalmost and longest ventral segment of hemitrichia. Hooks increasing in size from unbranched ray to second or third branched rays, and decreasing from this point to last branched ray. Pectoral fin with one to two tiny hooks per segment of hemitrichia from first to eighth branched ray. Dorsal fin with one to three tiny hooks from second unbranched ray to last branched ray; hooks restricted to hemitrichia distal to first ramification; only present in populations from Rio Caquetá basin in Colombia.

Adipose fin present. Caudal fin forked, lobes roughly rounded and of similar size. Principal caudal-fin rays  $i,9/8,i$  (53). Dorsal caudal-fin procurrent rays nine (1), 10 (3) or 12 (1), ventral caudal-fin procurrent rays eight (2) or nine (3). Vertebrae 33 (3) or 34 (2). Supraneurals four (2) or five (3).

### 3.7 | Colour in alcohol

Overall body colouration light brown to tan. Head densely pigmented with dark chromatophores dorsally from upper lip to tip of supraoccipital spine. Snout and infraorbitals with scattered dark-brown chromatophores. Opercle with scattered dark-brown chromatophores, more concentrated on dorsal third. Conspicuous dark midlateral stripe on body, extending from slightly behind posterior terminus of dorsal portion of the opercular bone onto middle caudal-fin



**FIGURE 3** *H. chiribiquete*, MPUJ 14360, paratype, 36.1 mm  $L_S$ , partial view of the anterior rays and spines of the (a) dorsal fin, (b) anal fin, (c) pelvic fin and (d) pectoral fin, side and lateral view, in males, right side

rays. Longitudinal stripe width gradually decreasing posteriorly from eighth or ninth scale to just anterior to the caudal-peduncle blotch, covering one or less than one scale. Thin longitudinal line formed by subjacent dark concentration of chromatophores along horizontal septum between epaxial and hypaxial muscles, overlapped by dark midlateral stripe. Single vertical humeral blotch, overlapping with dark longitudinal stripe, only visible through its vertical ventral extension. Ventral extension of the humeral blotch variable, with a lower concentration of chromatophores in some specimens. Humeral blotch extending longitudinally from the second or third to third or fourth lateral-line scales, and vertically from longitudinal stripe to first row of scales below lateral line. Caudal-peduncle blotch present, roughly rhomboidal in shape, coalesced with midlateral stripe. Dorsal midline of body, from tip of supraoccipital process to caudal fin, densely pigmented, forming conspicuous dark-brown band. Scales from middorsal line of predorsal area of body to third row of scales above lateral line with regular concentration of small dark-brown chromatophores on posterior border, forming reticulated pattern. Second row of scales above lateral line with few scattered dark chromatophores, resulting in clear band between reticulated pattern dorsally and longitudinal dark stripe. Scales ventrally to longitudinal dark stripe with randomly scattered chromatophores. Myosepta of hypaxial muscles in area dorsal to anal-fin base with concentration of chromatophores. Anal, dorsal, pelvic and pectoral fins with dark chromatophores uniformly scattered along length of interradiation membranes. Middle-caudal fin rays with dark stripe, continuous with midlateral stripe.

### 3.8 | Colour in life

Based on photos of specimens from the Río Caquetá basin (Figure 4) and from a specimen from the Río Ucayali basin. Body greenish-yellow to copper-coloured, laterally with moderate to high concentration of green iridescent erythrophores and melanophores. Predorsal area olive to copper, and preventral area greenish-yellow to light plumbeous, upper margin of eye red and lower margin greenish-black to white. Dorsal area of head greenish-yellow to copper, ventral area greenish-yellow to silvery, with great concentration of melanophores on infraorbitals, preopercle and opercle. Opercle with iridescent green to copper erythrophores. Black lateral stripe from posterior margin of opercle along sides through middle caudal-fin rays. Stripe somewhat



**FIGURE 4** Live colours of *H. chiribiquete*. ICN-MHN 21764, paratype, 28.3 mm  $L_S$ , male

blurred on the area above anal-fin base due to an overlap of silver iridescent green to copper stripe above black stripe from humeral blotch to upper caudal-fin lobe. Caudal-fin lobes with red iridophores at bases of rays. Bases of anal-fin rays with red iridophores that also extend onto posterior sides of body; base of pectoral and pelvic fins greenish-yellow. Adipose fin light greenish-yellow to reddish. Posterior margins of dorsal, pelvic and anal fins whitish.

### 3.9 | Sexual dimorphism

Males and females of *H. chiribiquete* differ in size and body depth at dorsal-fin origin, with females growing larger than males (Table 1), and by the presence of hooks on dorsal, pectoral, pelvic and anal fins of males from Río Caquetá basin (see Description and Figure 5), and on pectoral, pelvic and anal fins of males from the population of the Río Ucayali basin in Peru.

### 3.10 | Distribution

*H. chiribiquete* is currently known from two disjunct areas, from tributaries of the middle Río Caquetá basin, Colombia, and the middle and lower Río Ucayali basin in Peru (Figure 6).

### 3.11 | Ecological notes

*H. chiribiquete* was found in the surroundings of the Serranía de Chiribiquete in small, black or clear water streams; the width of the



**FIGURE 5** *H. chiribiquete*: (a) ZUEC 17116, male, 37.5 mm  $L_S$ , Peru, Loreto, Jenaro Herrera, Río Ucayali basin; (b) ZUEC 17116, female, 42.3 mm  $L_S$ , same locality

**FIGURE 6** Distribution of *H. chiribiquete*: black circles, holotypes; white circles, paratypes; blue circles, nontypes



channel is between 0.5 and 4 m, and the depth between 0.5 m and 2 m. The water temperature varies between 24 and 29°C. The substrates are varied: rock, sand and organic matter. The pH of the water is acidic (4.1–4.9), and the conductivity varies between 5 and 17  $\mu$ S (nutrient poor waters). The new species was found syntopically with *Hyphessobrycon agulha* Fowler 1913, *Hemigrammus luelingi* Géry 1964, *Jupiaba anteroides* (Géry 1965), *J. zonata* (Eigenmann 1908), *Moenkhausia* gr. *oligolepis*, *Pyrrhulina* sp., *Potamoglanis* sp., *Apistogramma* sp. and *Anablepsoides* sp. In the Río Ucayali (Jenaro Herrera) area in Peru, *H. chiribiquete* was always found in terra firme streams, non-floodable forest streams with black water, in some instances (e.g., at Quebrada Carahuayte) syntopically with the similar-looking *Hyphessobrycon agulha*, among other fish species.

### 3.12 | Etymology

The specific epithet refers to the type locality of this species, in the Parque Nacional Natural Serranía de Chiribiquete, and territory of the ancient indigenous Carijonas. It is to be treated as a noun in apposition. Chiribiquete National Natural Park is located in the north-west sector of the Colombian Amazon in the departments of Caquetá and Guaviare. The nearest large town is San Juan de Guaviare. It is the largest national park in Colombia and the largest tropical rainforest national park in the world. It was established on 21 September 1989 and has been expanded twice, first in August 2013 and then in July 2018. The park occupies about 43,000 km<sup>2</sup> (17,000 sq. mi) and includes the Serranía de Chiribiquete highlands and surrounding lowlands, which are covered by rainforest and savannas. (WWF 2018, Website of Parques Nacionales Nacionales de Colombia 2019).

## 4 | DISCUSSION

*H. chiribiquete* has a conspicuous, narrow midlateral stripe, overlapping a relatively conspicuous humeral blotch. *Hyphessobrycon* species having a midlateral stripe were traditionally associated with the *Hyphessobrycon heterorhabdus*-group (García-Alzate et al., 2008; Géry, 1977). However, as discussed by Lima et al., (2014), Dagosta et al., (2016), Moreira & Lima (2017) and Ohara, Lima & Barros (2017), most species that were previously associated with the *Hyphessobrycon heterorhabdus* group actually have one of three distinct colour patterns: (a) species having a midlateral stripe that fades out towards the caudal peduncle; (b) species having a continuous midlateral stripe, without any hint of a humeral blotch; and (c) species having a continuous midlateral stripe, with a humeral blotch overlapping anteriorly with the midlateral stripe. The *Hyphessobrycon heterorhabdus* group was restricted to species having the first colour pattern described by Lima et al. (2014) and Moreira & Lima (2017). *H. chiribiquete* has the third colour pattern, i.e., a continuous midlateral stripe, with a humeral blotch overlapping anteriorly with the midlateral stripe, a pattern which is shared with *H. cachimbensis*, *H. cyanotaenia*, *H. melanostichos*, *H. nigricinctus*, and *H. petricolus*. *H. chiribiquete* can be distinguished from those species by the characters discussed in the Diagnosis section. As discussed by Camelier et al. (2018), although the aforementioned subgroups help in the identification of such a species-rich genus, potential homologies based on coloration pattern need to be evaluated in a phylogenetic framework. The relationships of *H. chiribiquete* among congeners is still undetermined and will probably remain so until a study based on DNA sequences can be performed.

*H. chiribiquete* is sympatric (and syntopic in some localities) with the similar-looking *Hyphessobrycon agulha*, a species widely



**FIGURE 7** Sympatric *Hyphessobrycon* species: (a) *H. chiribiquete* n. sp. MPUJ 14360, paratype 35.8 mm  $L_S$  and (b) *H. agulha* MPUJ 12798, 40.8 mm  $L_S$

distributed in terra firme streams of western and central Amazon basin. *Hyphessobrycon agulha* has a broad, blurred midlateral stripe contrasting with the conspicuous, narrow midlateral stripe in *H. chiribiquete* (see. e.g., Lima et al., 2013: 276–277 and Figure 7).

## 5 | COMPARATIVE MATERIAL EXAMINED

*Hyphessobrycon agulha*: MHNG 1576.36–41 (6, 29.3–43.1 mm  $L_S$ ); NRM 26316 (28, 27.5–42.0 mm  $L_S$ ); MHNG 2481.001 (8, 37.4–41.2 mm  $L_S$ ); NRM 26322 (3, 28.8–37.1 mm  $L_S$ ): Peru, Loreto, Río Ucayali basin. MPUJ 12798 (89 specimens), Colombia, Guaviare, Unilla, El tablazo Creek, El retorno. IAvH-P 8345 (19 specimens), Colombia, Amazonas, Leticia, tributary of Matamata Creek. IAvH-P 8335 (37 specimens), Colombia, Amazonas, Leticia, tributary of Matamata Creek. IAvH-P 8332 (four specimens), Colombia, Amazonas, Leticia, tributary of Matamata Creek. IAvH-P 8333 (52 specimens), Colombia, Amazonas, Leticia, tributary of Purité River. IAvH-P 9025 (85 specimens), Colombia, Amazonas, Leticia, Sufragio in front of Zafire Station. IAvH-P 9046 (14 specimens), Colombia, Amazonas, Leticia, stream, tributary of Calderón River, 45 min north of Zafire Station. IAvH-P 9071 (38 specimens), Colombia, Amazonas, Leticia, tributary of Calderón River, 45 min north of Zafire Station. IAvH-P 9407 (25 specimens), Colombia, Amazonas, Leticia, stream 2, tributary of Purité River 3 h from Salados Varios, Amacayacu National Park. ZUEC 8534 (40 specimens, 17.2–43.3 mm  $L_S$ ): Brazil, Pará, Rio Arapiuns basin. ZUEC 16125 (8, 42.1–48.5 mm  $L_S$ ): Brazil, São Gabriel da Cachoeira, Rio Negro basin. *Hyphessobrycon amapaensis*: ZUEC 16889 (33, 17.2–29.7 mm  $L_S$ ): Brazil, Amapá. *Hyphessobrycon cyanotaenia*: ZUEC 8515 (ten specimens), 24.1–32.9 mm  $L_S$ , Brazil, Mato Grosso, Rio Juruena basin. *Hyphessobrycon eschwartzae*: MUSM 42392,

holotype, Peru, Madre de Dios, Madre de Dios River. AUM 51350 (12 specimens), paratypes, Río Planchón. AUM 51374 (16 specimens), paratypes, Río Buyuyoc. MUSM 22474 (111 specimens), paratypes, collected with holotype. MUSM 3684 (16 specimens) paratypes, Tambopata River, Quebrada 500 m from campsite. MUSM 9771 (26 specimens), paratypes, Madre de Dios River. MUSM 21221 (143 specimens), paratypes, Quebrada at 14 km on road to San Juan, Manuripe Alegría River drainage. MUSM 22893 (30 specimens), paratypes, Quebrada El Planchón. IUQ 3033 (three specimens CS), paratypes, Quebrada at 14 km, road to San Juan, Manuripe Alegría River drainage; ZUEC 11402 (30 specimens, 19.0–29.1 mm  $L_S$ ): Peru, Madre de Dios, Rio Madre de Dios basin. *Hyphessobrycon fernandesi*: MZUSP 105545 (28 specimens), 10.1–22.7 mm  $L_S$ , Venezuela, Falcón, Tucacas. *Hyphessobrycon heterorhabdus*: MCP 41577 (five specimens), 19.5–23.6 mm  $L_S$ , Brazil, Para, Igarapé Açuí. ZUEC 14203 (17 specimens, 19.0–26.8 mm  $L_S$ ); MZUSP 5001 (31 specimens, 20.3–30.3 mm  $L_S$ ): Brazil, Pará, Rio Guamá basin. ZUEC 14211 (90 specimens, 15.9–22.2 mm  $L_S$ ); ZUEC 14202 (97 specimens, 16.8–26.8 mm  $L_S$ ): Brazil, Pará, Rio Marapanim basin. *Hyphessobrycon klausanni*: UARC-IC 539, holotype (23.1 mm  $L_S$ ), male, Colombia, Meta, Mapiiripan County, upper Guaviare River drainage, Caño Claro. UARC-IC 540 (five specimens, 22.1–24.2 mm  $L_S$ ), paratypes, collected with holotype. UARC-IC 541 (two specimens CS, 20.2–22.3 mm  $L_S$ ), paratypes, collected with holotype. UARC-IC 542 (eight specimens, 20.1–23.3 mm  $L_S$ ), paratypes, Mapiiripan county, upper Guaviare River drainage, Caño La División. UARC-IC 543 (two specimens, 25.1–28.4 mm  $L_S$ ), paratypes, El Castillo County, upper Guaviare River drainage, Caño Hondo. UARC-IC 544 (six specimens, 22.1–23.4 mm  $L_S$ ), paratypes, Mapiiripan County, upper Guaviare River drainage, Caño División. MPUJ 7857 (eight specimens, 25.4–31.4 mm  $L_S$ ), paratypes, El Castillo County, Caño Hondo, upper drainage of Guaviare River. *Hyphessobrycon loretoensis*: MUSM 20179 (two specimens), Peru, Loreto, Anazo Creek. MUSM 23172 (four specimens), Peru, Loreto, Platanoyacu River. MUSM 23233 (five specimens, 20.7–30.2 mm  $L_S$ ), Peru, Loreto, Platanoyacu River. ZUEC 8658 (two specimens, 19.1–21.1 mm  $L_S$ ): Peru, Loreto, Río Itaya basin. *Hyphessobrycon melanostichos*: MCP 39808 (five specimens), Brazil, Mato Grosso, Rio Doze de Outubro. ZUEC 8517 (five specimens, 20.4–26.6 mm  $L_S$ ), Brazil, Mato Grosso, Rio Doze de Outubro. *Hyphessobrycon metae*: CAS 61751, holotype, Meta, Río Meta in Barrigona. IAvH-P 3014 (57 specimens), Meta, Puerto Gaitán, Caño Muco. *Hyphessobrycon nigricinctus*: MUSM 26791 (one specimen, 32.0 mm  $L_S$ ), Perú, Cusco, Ilahuala Creek. MUSM 26786 (five specimens), Peru, Cusco, Ilahuala Creek. *Hyphessobrycon oritoensis*: IUQ 1574, holotype, Colombia, Putumayo, Orito, Quebrada La Palma. IUQ 139 (6 specimens), paratypes, collected with the holotype. IUQ 1575 (two specimens CS), paratypes, collected with the holotype. MBUCV-V 33737 (two specimens), paratypes, collected with the holotype. MCNG 55844 (two specimens), paratypes, collected with the holotype. *Hyphessobrycon petricolus*: ZUEC 13040 (two specimens, 32.4–42.7 mm  $L_S$ ), Brazil, Mato Grosso, Rio Roosevelt. *Hyphessobrycon paucilepis*: IUQ 1897, holotype, Venezuela, Lara state, Los Quediches Reservoir, overflow channel. MBUCV-V 23710 (three specimens), paratypes, collected with



holotype. IUQ 1898 (one specimen CS), paratype, collected with holotype. MBUCV-V 903 (four specimens CS), paratypes, Los Quediches Reservoir, overflow channel. MBUCV-V 23706 (42 specimens), paratypes, Los Quediches Reservoir, overflow channel. MBUCV-V 6933 (6 specimens), paratypes, Burere, Carora-Cabimas highway. CPUCLA 532 (five specimens), paratypes, Ciénaga de Puricaure Carora, El Venado highway, about 1 km from Puricaure, Quebrada Arriba road. *Hyphessobrycon psittacus*: ZUEC 8516 (10 specimens, 22.1–29.6 mm  $L_S$ ), paratypes, Brazil, Mato Grosso, Rio Papagaio. *Hyphessobrycon stegemanni*: ZUEC 12761 (nine specimens, 17.5–22.7 mm  $L_S$ ), Brazil, Tocantins, Rio Soninho. *Hyphessobrycon taphorni*: MUSM 42391, holotype, Perú, Madre de Dios, Tambopata River. MUSM 22042 (95 specimens), paratypes, collected with holotype. AUM 56757 (two specimens), paratypes, Tambopata River. AUM 56758 (two specimens), paratypes, Tambopata River. MUSM 5562 (60 specimens), paratypes, Sandoval Lake. MUSM 5581 (four specimens), paratypes, Sandoval Lagoon. MUSM 5588 (80 specimens), paratypes, Quebrada 2 km from Sandoval Lagoon. MUSM 9584 (11 specimens), paratypes, Sandoval Lake. MUSM 21703 (15 specimens), paratypes, Tambopata River. MUSM 21824 (58 specimens), paratypes, Tambopata River. MUSM 21994 (272 specimens), paratypes, Tambopata River. IUQ 3032 (two specimens CS), paratypes, Tambopata River. ZUEC 11403 (10 specimens, 18.4–21.7 mm  $L_S$ ), Peru, Madre de Dios, Rio Madre de Dios. *Hyphessobrycon vilmae*: ZUEC 9720 (19 specimens, 11.0–19.7 mm  $L_S$ ); ZUEC 9718 (29 specimens, 9.6–20.2 mm  $L_S$ ), Brazil, Mato Grosso, Rio Aripuanã. MZUSP 61128 (87 specimens, 10.0–25.9 mm  $L_S$ ), Brazil, Mato Grosso, Rio Arinos basin.

We express our gratitude to Julia Miranda, Director of National Natural Parks of Colombia, Ministry of Culture and Colciencias and Colombia Bio Program for the funding of the field trips developed within the framework of the project for the declaration of the PNNSC as biological and historical heritage of humanity (UNESCO), Carlos Castaño (Fundación Herencia Ambiental Caribe) and Gonzalo Andrade (Universidad Nacional de Colombia) managers and coordinators of these expeditions. To Cristian Martínez (Universidad Nacional de Colombia) for his help with the counts and measurements of the specimens deposited in the ICN-MHN. We are grateful for the support of the Biology Program, University of Atlántico (UA), Barranquilla, Colombia. We thank Javier Maldonado-Ocampo (*in memoriam*) and Saúl Prada-Pedrerros (MPUJ), Gustavo Casas Andreu and Hector Espinoza (IBUAM-P), Carlos Alberto Santos De Lucena (MCP), Francisco Provenzano (MBUCV-V), Hernan Ortega and Max Hidalgo (MUSM), Janeth Muñoz Saba and Jaime Aguirre (ICMNH), Mark H. Sabaj and Mariangeles Arce (ANSP), Sven O. Kullander, Bo Delling and Erik Ahlander (NRM), Raphael Covain (MHNG), David Werneke (AUM), Philip Willink (FMNH) and Carlos DoNascimento (IAVH-P) for access to the fish collections in their care. Thanks to John Fong (CAS) and James Maclaine (BMNH) for kindly sending images of type species. AU-B thanks the Fundación para la Conservación y el Desarrollo Sostenible-FCDS (Rodrigo Botero), Field Museum, Chicago (Corine Vriesendorp) and Andes Amazon Fund, who financed the scientific expeditions within the framework of the project Expansion of the Serranía de Chiribiquete National Natural Park, and Rapid Biological and Social Inventories Report 30; to the Fundación Puerto Rastrojo

(Barbara Jeffrey and Patricio von Hildebrand) and to Dirección Territorial Amazonía de Parques Nacionales who financed the Expedición científica en la ventana Mesay en el sector sur del PNN Serranía de Chiribiquete. Special thanks to the friends of the Tunia communities (John E. Valderrama and David Quebrada Quiscue), Chiribiquete (H. Fantoi and JM Pokai-Kadani), and J. Patarroyo for accompaniment AU-B to explore the aquatic systems to the PNN Serranía de Chiribiquete. FCTL is grateful to William G.R. Crampton and James S. Albert for the invitation to participate in an expedition of the Ucamara project (NSF DEB # 0215388) in January 2004, when much of the material from Jenaro Herrera area was collected. FCTL was funded by FAPESP (grants # 2011/51532-7 and 2013/20936-0), and TFT by CNPq-Brazil (grant # 155877/2018-6). To Jorge E. García-Melo (CavFish Project) for Figure 4, in the project Colombia: Bajo Caguán-Caquetá; Rapid Biological and Social Inventories Report 30. Field Museum, Chicago. Thanks to Omar Melo and Mateo Peña, members of MPUJ ichthyology. DCT wishes to thank World Wildlife Foundation Colombia and in particular Saulo Usma for funding trips to Colombian museums to identify specimens.

## CONTRIBUTION SECTION

Authors made equal contributions to this work.

## ORCID

Carlos Arturo García-Alzate  <https://orcid.org/0000-0002-8527-0661>

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**How to cite this article:** García-Alzate CA, Lima F, Taphorn DC, Mojica JI, Urbano-Bonilla A, Teixeira TF. A new species of *Hyphessobrycon* Durbin (Characiformes: Characidae) from the western Amazon basin in Colombia and Peru. *J Fish Biol.* 2020;1–10. <https://doi.org/10.1111/jfb.14319>