

Hyphessobrycon nicolasi (Teleostei: Characidae) a new species from the Uruguay River basin in the Mesopotamian Region, Argentina

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Hyphessobrycon nicolasi is described from the Uruguay River basin in the Mesopotamian Region, Entre Ríos, Argentina. The new species can be distinguished from all congeners by the presence of a well-defined oblique and marginal black stripe on each lobe of the caudal fin. Other characters defining *H. nicolasi* are the possession of 1-3 teeth with 3-10 cusps on maxilla; outer premaxillary row with 2-3 small teeth, with 5 or 7 cusps; iv-vi, 27-36 anal-fin rays; 33-36 scales on the longitudinal series; two vertical dark spots on the humeral region; dorsal and anal fins dappled in black and base of caudal fin bearing conspicuous black spot; and the presence of bony hooks on the rays of dorsal, anal and caudal fins of the mature males.

Hyphessobrycon nicolasi é descrito da bacia do rio Uruguai, na Região Mesopotâmica, Entre Ríos, Argentina. A nova espécie pode ser distinguida de suas congêneres pela presença de uma faixa oblíqua preta bem definida na margem de cada lóbo da nadadeira caudal. Outros caracteres que definem *H. nicolasi* são a presença de 1-3 dentes com 3-10 cúspides no maxilar, fileira externa do pré-maxilar com 2-3 dentes pequenos, com 5 ou 7 cúspides; iv-vi, 27-36 raios na nadadeira anal; 33-36 escamas na série longitudinal; duas manchas verticais pretas na região umeral; nadadeiras dorsal e anal manchadas de negro e base da nadadeira caudal com uma mancha negra conspícua; e pela presença de ganchos ósseos nos raios das nadadeiras dorsal, anal e caudal nos machos maduros.

Key words: Ostariophysi, Neotropical fish, Biodiversity, Endemism.

Introduction

The genus *Hyphessobrycon* Durbin includes more than 100 valid species, occurring from Mexico and Central America to the Mar Chiquita Lagoon in Buenos Aires, Argentina and reaching its highest richness in the Amazon basin (Lima *et al.*, 2003; Miquelarena & López, 2006; Bertaco *et al.*, 2007). Authors that have recently addressed the systematics of the genus are unanimous in pointing out that the group is not well defined and its monophyly is yet uncertain (*e.g.*, Bertaco & Carvalho, 2005; Bertaco & Malabarba, 2005; Carvalho & Bertaco, 2006; Bertaco *et al.*, 2007).

During field trips to tributaries of the Uruguay River in Entre Ríos province, Argentina, the authors collected a new species of *Hyphessobrycon* that presents unique characters among the members of the genus.

Material and Methods

Measurements to the nearest 0.01 mm were made using a digital caliper following Fink & Weitzman (1974). Teeth, lateral line perforated scales, gill rakers, infraorbitals, procurrent caudal-fin rays and vertebral counts were made on 13

specimens (9 females and 4 males) cleared and stained (c&s) for bone and cartilage following the protocol by Taylor & van Dyke (1985). Vertebral counts include the four vertebrae of the Weberian apparatus and the terminal centrum was counted as one vertebra. Gill raker count was made on the upper and lower branches of the first branchial arch (epibranchial/ceratobranchial, hypobranchial).

All measurements are expressed as percentage of standard length (SL), except for head measurements, which are expressed as percentage of head length (HL). For all counts, frequencies are given in parentheses and an asterisk indicates the holotype. Institutional abbreviations follow Ferraris (2007).

Hyphessobrycon nicolasi, new species

Figs. 1-3

Holotype. ILPLA 1808, 49.1 mm SL, female, Argentina, Entre Ríos Province, Colón Department, El Pelado stream, 32°19'S 58°14'W, Nov 2005, A. Miquelarena, H. López, L. Protogino, E. Etcheverry.

Paratypes. Same data as holotype: ILPLA 1809, 20, 33.7-49.7 mm SL; ILPLA 1810, 6 c&s, 36.6-43.9 mm SL; MLP 9746, 9, 41.7-51.4 mm SL (2, 44.4-46.2 mm SL). Same locality as holotype, Oct 2004, A. Miquelarena, H. López, R. Menni, L. Protogino: ILPLA 1811,

8, 37.5–43.6 mm SL; ILPLA 1812, 7 c&s, 34.1–44.7 mm SL.

Diagnosis. *Hyphessobrycon nicolasi* can be distinguished from congeners by the presence of a well-defined, oblique and marginal black stripe on each lobe of the caudal fin. In addition, the following combination of characters permits the differentiation of the species: maxilla with 1–3 teeth, bearing 3–10 cusps; outer premaxillary row with 2–3 small teeth, bearing 5 or 7 cusps; iv–v, 27–36 anal-fin rays; 33–36 scales on the longitudinal series; two vertically elongated dark humeral spots; black caudal spot rounded or fan-shaped; dorsal and anal fins with the first rays dappled in black; and presence of minute bony hooks on the dorsal, anal and caudal fins of the mature males.

Description. Morphometric data are shown in Table 1. Body compressed and rhomboidal, greatest body depth at dorsal-fin origin. Predorsal body profile convex, slightly concave at level of supraoccipital process. Body profile slightly straight between dorsal-fin origin and adipose-fin origin. Ventral profile almost symmetrical with dorsal counterpart. Dorsal and ventral margins of caudal peduncle straight or slightly concave. Caudal peduncle relatively high. Head short. Snout short. Eye relatively large. Frontals broad at interorbital area, its width slightly less than or equal to eye diameter. Mouth terminal. Maxilla short not reaching anterior edge of orbit.

Dorsal-fin origin almost equidistant from tip of snout and base of caudal-fin rays. Tip of pectoral fin not surpassing pelvic-fin origin. Pelvic-fin tip not surpassing the anal-fin origin. Presence of bony hooks on rays of dorsal, anal and caudal fins of mature males. Dorsal-fin rays ii,8 (5), i,9 (2), ii,9* (30), or iii,9 (6). In the latter specimens, first unbranched ray very small and only visible in cleared and stained specimens. Posterior margin of dorsal fin rounded, last unbranched ray and first two branched rays longest. Adipose fin well developed. Pectoral-fin rays i,10 (19), i,11* (17), or i,12 (5). Pelvic-fin rays i,6 in all specimens. Pelvic fin with axillary scale.

Anal-fin rays iv,27 (5), v,27 (2), vi,27 (1), iv,28 (6), v,28 (6), iv,29 (7), v,29 (2), iv,30 (5), v,30* (6), iv,31 (2), iv,35 (1), or iv,36 (1). Anal-fin origin aligned to vertical through base of third to sixth dorsal-fin ray, except in one female (37.4 mm SL) with anal and dorsal fin origins aligned. Posterior end of pelvic fin falling short of anal fin by 1–2 scales. Caudal fin forked, lobes rounded, and similar in size. Principal caudal-fin rays i,16,i (1), i,17,i (9), or i,18,i (1). Dorsal procurent rays 9 (5), 10 (3), 11 (2), or 12 (1). Ventral procurent rays 7 (2), 8 (6), or 9 (3).

Scales cycloid. Lateral line incomplete, perforated scales 6 (2), 7 (4), or 8* (5). Longitudinal scale series 33 (1), 34 (12), 35* (14), or 36 (4). Scales row between dorsal-fin and anal-fin origins 15* (13), 16 (9), 17 (7), or 18 (2). Predorsal scales 12* (20), 13 (8), or 14 (3) arranged in irregular series. Single row of scales covering base of anteriormost anal-fin rays. Infraorbital bones 6 (11). Distal margin of third infraorbital not reaching sensory canal of preopercle. Supraneurals 5 (1), 6 (11), or 8 (1). Total vertebrae 32 (1), 34 (6), 35 (4), or 36 (2). Gill-rakers 7/15 (2), or 8/18 (2).

Maxilla short and somewhat expanded (Fig. 2a), with 1–3 teeth (typically 2*), each one with 3–10 cusps (usually 7). Premaxilla with two tooth rows. Outer row with 2–3 teeth (typically 3), with 5 or 7 cusps. Inner row with 4 or 5 (typically 5), with 6–11 cusps; teeth broadened distally and overlapping on its borders (Fig. 2b). Three or 4 anteriormost dentary teeth larger, with 7–11 cusps, followed by medium sized tooth with 7–8 cusps, and 2–3 smaller teeth with 5–6 cusps or conical in shape (Fig. 2c).

Color in alcohol. Dorsal and dorsolateral portions of head and body light brown. Dense concentration of chromatophores along dorsal profile, more conspicuous from end of dorsal fin to dorsal procurent rays. Scales above lateral longitudinal stripe darkened by higher concentration of small chromatophores. Infraorbital and opercular areas with scattered, dark chromatophores. Two dark blotches above and below the eye's pupil, which are reddish in living

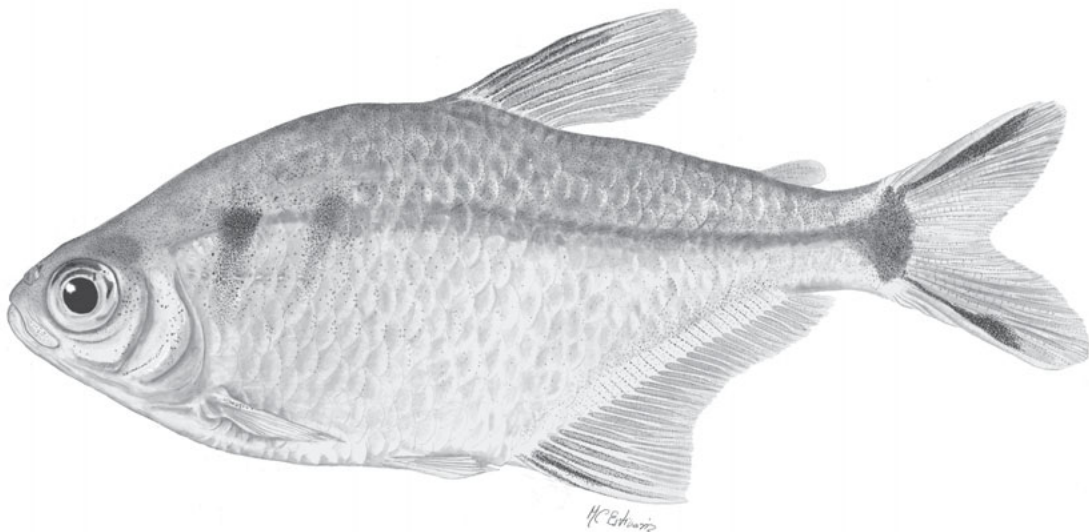


Fig. 1. *Hyphessobrycon nicolasi*, ILPLA 1808, holotype, female, 49.1 mm SL. El Pelado stream, Uruguay River basin.

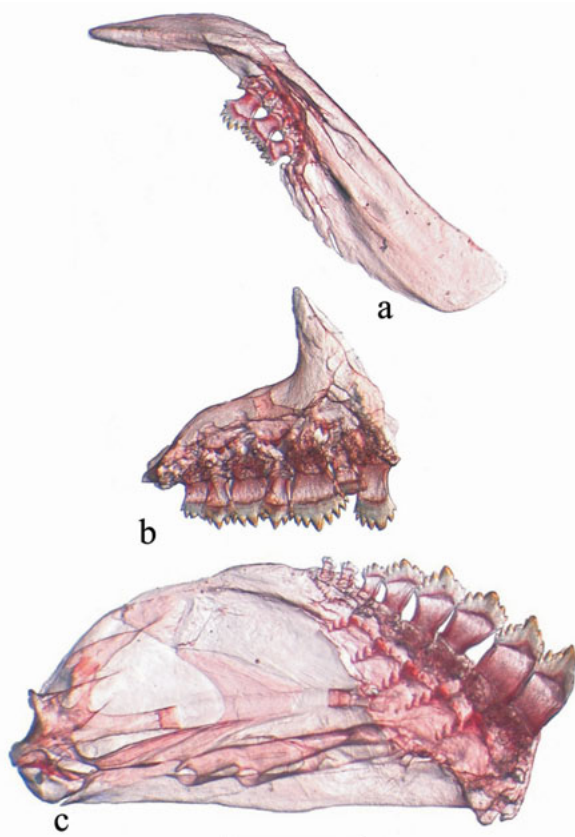


Fig. 2. *Hyphessobrycon nicolasi*, ILPLA 1812, paratype, male, 44.7 mm SL: (a) left maxilla, external view; (b) right premaxilla, external view; (c) right dentary, external view. Scale bar = 1 mm.

individuals.

Two dark humeral spots, vertically elongated and narrower ventrally. First spot located over third to fourth lateral-line scales and extending over 3-4 horizontal scale rows above

and 1-2 horizontal scale rows below lateral-line perforated scales. Second humeral spot, usually well developed, separated from anterior spot by three less pigmented scales. Posterior to latter spot, sparse melanophores form a well defined narrow midlateral stripe (one scale high); stripe more conspicuous upon caudal peduncle and broader at caudal-fin base and connected to, a dark rounded or fan-shaped spot somewhat expanding over caudal-fin rays. Pectoral and pelvic fins translucent, with few melanophores on rays. Dorsal fin usually with first seven rays black. Proximal half of first anal-fin rays black. Caudal fin with two oblique black stripes on dorsal and ventral margins of each lobe. These stripes variably developed, reaching tips of fin lobes in some specimens. Snout, lips, and maxilla with scattered dark chromatophores. Ventral body light brown. Scales above the base of anal fin with dark chromatophores. Interradial membrane of paired and unpaired fins with small dark chromatophores, distributed along borders of the rays (Fig. 1).

Color in life. Ground color in life iridescent with yellow and turquoise hues. Iris with two reddish blotches above and below, the upper one with a dark lower edge. Dorsal fin yellow with first seven rays black. Generally, first two unbranched rays and first two branched rays more heavily pigmented. On remaining rays, dark pigmentation only reaching proximal third of ray length. Anal fin reddish yellow with anterior third intense red and proximal half of first rays black. Pectoral fin translucent with yellow hues and pelvic fin reddish yellow. Adipose fin yellowish. Caudal fin red with tips of lobes and middle caudal rays yellow; two oblique black stripes of variable length. Stripe on upper lobe of caudal fin involving upper marginal and first branched principal rays; stripe on lower lobe involving last branched and lower marginal principal rays. Two dark humeral spots vertically elongated and a rounded or fan-shaped dark spot on caudal-fin base (Fig. 3).



Fig. 3. *Hyphessobrycon nicolasi*, MLP 9746, paratype, 51.4 mm SL. El Pelado stream, Uruguay River basin. Photographed in life.

Table 1. Morphometric data of holotype and paratypes (n) of *Hyphessobrycon nicolasi* from the El Pelado stream, Uruguay River basin.

	Holotype	n	Range	Mean
Standard length (mm)	49.1	30	33.7-49.7	43.2
Percents of standard length				
Head length	23.8	30	20.9-26.1	23.2
Body depth	43.6	30	42.3-49.6	45.7
Snout to dorsal-fin origin	52.1	30	48.0-55.2	51.5
Snout to pectoral-fin origin	24.2	30	21.8-28.1	25.0
Snout to pelvic-fin origin	42.2	29	37.1-46.5	42.1
Snout to anal-fin origin	55.8	30	52.3-59.2	55.1
Caudal peduncle length	10.0	30	7.8-11.7	9.9
Caudal peduncle depth	11.0	30	10.9-14.5	12.0
Dorsal-fin base length	12.2	30	12.1-18.4	14.3
Longest dorsal-fin ray	23.2	30	23.5-35.2	27.3
Pectoral-fin length	17.1	29	16.0-23.0	18.2
Pelvic-fin length	13.8	30	12.3-19.3	14.3
Anal-fin base length	40.5	30	35.5-45.2	41.4
Percents of head length				
Horizontal eye diameter	39.3	30	36.4-47.0	41.8
Snout length	16.2	30	15.4-21.7	18.5
Interorbital width	35.9	30	33.6-46.7	40.0
Upper jaw length	40.2	30	35.3-45.5	39.8

Small dark chromatophores scattered over body and often on rays of all fins. Upper and lower lips with fine dark dotting.

Sexual dimorphism. Males with minute and blunt bony hooks on dorsal, anal and caudal fins. Dorsal fin with one or two bony hooks at the distal end branched 6th or 7th rays. Bony hooks especially numerous on anal fin, with one bony hook in each ray segment, distributed from last unbranched ray to usually, the 26th branched ray. In one male specimen (39.7 mm SL) bony hooks on anal and dorsal fins only. In specimens larger than 40 mm SL hooks also on central principal rays of caudal fin. Morphology of anal fin similar for both sexes, somewhat more concave in females.

Distribution. *Hyphessobrycon nicolasi* is known from the type locality El Pelado stream, tributary of Uruguay River in the vicinity of the city of Colón, Entre Ríos Province, Argentina (Fig. 4).

Habitat notes. At the type locality, El Pelado stream has clear water and rocky/sandy bottom, with irregularly distributed small stones, cobbles and boulders. The stream has shallower sectors with fast-running water up to 60 cm deep, and deeper portions with around 2 m depth and abundant submerged vegetation (Fig. 5). Species collected with *H. nicolasi* were *Apareiodon affinis*, *Australoheros scitulus*, *Cnesterodon decemmaculatus*, *Corydoras paleatus*, *Crenicichla lepidota*, *Cyphocharax spilotos*, *C. voga*, *Characidium rachovii*, *C. tenue*, *Charax stenopterus*, *Cheirodon interruptus*, *Diapomota terofali*, *Heptapterus mustelinus*, *Hypostomus commersoni*, *Loricariichthys anus*, *Macropsobrycon uruguayanae*, *Oligosarcus jenynsii*, *Pseudocorynopoma doriae*, and *Rineloricaria isaaci*.

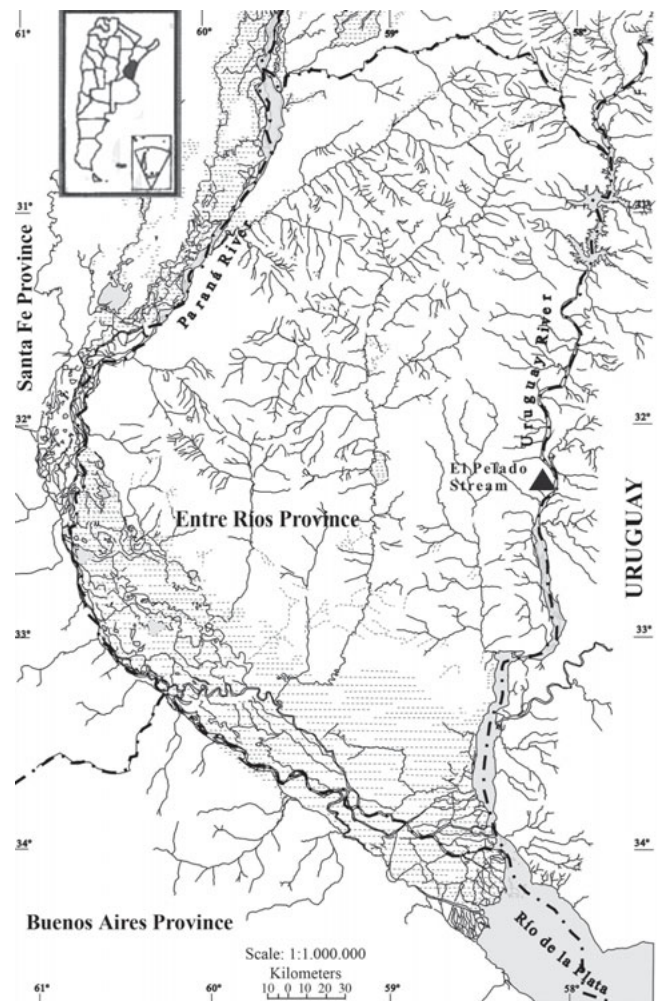


Fig. 4. Type locality of *Hyphessobrycon nicolasi* (triangle).



Fig. 5. El Pelado stream, 32°19'S 58°14'W, Entre Ríos, Argentina, type locality of *Hyphessobrycon nicolasi*.

Etymology. This species is dedicated to Nicolás Bonelli, whose affection and company we have enjoyed for the last few years.

Discussion

Within characids *Hyphessobrycon* is diagnosed by the combined possession of incomplete lateral line, naked caudal fin, presence of adipose fin, two series of premaxillary teeth (the inner row with 5 or more teeth), and second infraorbital not contacting the preopercle inferiorly (Eigenmann, 1917; Géry, 1977). We assign the new species to *Hyphessobrycon* in accordance to that diagnosis of the genus.

The presence of oblique black stripes on the caudal-fin lobes of *H. nicolasi* is a unique character, not described before for any known species of the genus. Among characids the presence of dark symmetric blotches on the caudal fin has been mentioned for *Brittanichthys axelrodi* Géry, *Hemigrammus rhodostomus* Ahl, *H. bleheri* Géry & Mahnert, *Knodus geryi* Lima, Britski & Machado, *Moenkhausia dichroua* (Kner), *M. intermedia* Eigenmann, *M. bonita* Benine, Castro & Sabino, *Microschemobrycon elongatus* Géry, *M. casiquiare* Böhlke, and *Petitella georgiae* Géry & Boutière (Géry, 1965; Lima *et al.*, 2004). In these species the distribution of blotches corresponds to four patterns: apical in *M. dichroua*, *M. intermedia* and *M. bonita* (Benine *et al.*, 2004); medial in *H. rhodostomus*, *H. bleheri* and *P. georgiae* (Géry & Mahnert, 1986); basal in *K. geryi*, *M. elongatus* and *M. casiquiare* (Bohlke, 1953; Géry, 1973; Lima *et al.*, 2004) and marginal in *B. axelrodi* and *H. nicolasi*. The arrangement of the stripes on the main caudal-fin rays described by Géry (1965) for *B. axelrodi* is similar to the condition of *H. nicolasi*, however, we found no other characters that would indicate further similarity between these taxa.

Hyphessobrycon nicolasi is similar to *H. meridionalis* Ringuélet, Miquelarena & Menni by its high total anal-fin ray count (31–40 vs. 30–36) and by the morphology and number of teeth with numerous cusps however, it differs from that species by having shorter pectoral fin that does not reach the base of the pelvic fin (vs. surpassing the origin of the pelvic fin) and a different coloration pattern. *Hyphessobrycon pytai* Géry & Mahnert also has a high total anal ray count (32–36) but differs from *H. nicolasi* by the following morphometric characters: smaller eye (35.0–39.0% vs. 36.4–47.0% HL), longer snout (20.0–30.0% vs. 15.4–21.7% HL), longer head (26.0–28.0% vs. 20.9–26.1% SL), and a different coloration pattern.

Other *Hyphessobrycon* species with more than thirty rays in all on the anal fin are *H. bifasciatus* Ellis (29–32), *H. igneus* Miquelarena, Menni, López & Casciotta (29–32), *H. erythrostroma* (Fowler) (31–33), *H. socolofi* Weitzman (31–34), and *H. pyrrhonotus* Burgess (31–32). Besides its color pattern, *H. nicolasi* differs from the first two mentioned species by having higher number of maxillary teeth (1–3, mode 2, vs. 1), and from the remaining species by having multicusp teeth (vs. tricuspid).

The mature males of *H. nicolasi* possess minute bony hooks on the rays of the dorsal, anal and caudal fins. Among *Hyphessobrycon* species the presence of bony hooks on the dorsal-fin rays is known to occur in *H. auca* Almirón, Casciotta, Bechara & Ruiz Díaz, *H. hamatus* Bertaco & Malabarba, *H.*

togoi Miquelarena & López, *H. uruguayensis* (Fowler), and *H. vinaceus* Bertaco, Malabarba & Dergam (Miquelarena & López, 2006; Bertaco *et al.*, 2007).

Hyphessobrycon nicolasi differs from *H. auca* by having higher number of total anal-fin rays (31–40 vs. 24–30), and higher number of maxillary teeth (1–3, mode, 2 vs. 1); from *H. hamatus* by having higher number of branched anal-fin rays (27–36 vs. 16–18), and lower number of perforated scales on the lateral line (6–8 vs. 10–32); from *H. togoi* by having higher number of branched anal-fin ray (27–36 vs. 17–20) and higher number of maxillary teeth (1–3 vs. 1); from *H. uruguayensis* by the number of maxillary teeth (1–3 vs. 6–11), and branched anal-fin rays (27–36 vs. 20–26); from *H. vinaceus* by having higher number of branched anal-fin rays (27–36 vs. 15–17); and lower number of perforated scales on the lateral line (6–8 vs. 10–26).

The presence of minute bony hooks on the dorsal-fin rays also occurs in some species of the “rosy tetra clade” (Weitzman, 1977; Weitzman & Palmer, 1997). *Hyphessobrycon nicolasi* differs from these species (e.g. *H. erythrostroma* and *H. socolofi*) by the number of teeth in the inner row of the premaxilla (4 or 5 vs. 5 to 7) and the absence of the remarkable “rosy tetra clade” color pattern.

According to the ichthyogeographical schemes of Ringuélet (1975) and Arratia *et al.* (1983), the geographical distribution of *H. nicolasi* is within the Paranoplatensean Province and according to López *et al.* (2008) it corresponds to the Great Rivers Province. Within the biogeographical units proposed by Abell *et al.* (2008), this species occurs in the Lower Uruguay ecoregion, along with *H. anisitsi* (Eigenmann), *H. isiri* Almirón, Casciotta & Körber, *H. luetkenii* (Boulenger) and *H. meridionalis*. The analysis of the distribution of *Hyphessobrycon* species shows that most of them occurs in the Paraná and Uruguay Rivers, the Paraná River Delta and the mesopotamic region. The latter has the greater number of species: *H. anisitsi*, *H. elachys* Weitzman, *H. eques* (Steindachner), *H. igneus*, *H. luetkenii*, *H. auca*, *H. meridionalis*, *H. reticulatus* Ellis, *H. wajat* Almirón & Casciotta and *H. isiri*.

The presence of *H. nicolasi* and *Rineloricaria isaaci* Rodríguez & Miquelarena, recently described from El Pelado stream (Rodríguez & Miquelarena, 2008) supports the assertions of Lucena & Kullander (1992) and Miquelarena & López (2004), who characterized the Uruguay River basin as a significant area of endemism.

Comparative material. *Hyphessobrycon auca*: ILPLA 1211, 1, 42.2 mm SL, **Argentina**, Corrientes, Mburucuyá National Park, swamps close to Estancia Santa Teresa. *H. bifasciatus*: ILPLA 147, 4, 27.1–30.2 mm SL, **Brazil**, Rio Grande do Sul, Estação Ecológica do Taim; ILPLA 1587, 2, 28.7–33.7 mm SL; ILPLA 1590, 3, 33.4–39.8 mm SL, Entrada do Ayo. *H. guarani*: MHNG 2366.100, 5, 18.3–26.2 mm SL, paratypes, **Paraguay**, río Alto Paraná à Puerto Bertoni, Depto. Alto Paraná; MHNG 2370.13, 7, 18.0–29.8 mm SL, **Argentina**, Misiones, río Alto Paraná à Puerto Iguazú. *H. igneus*: MLP 8413, 26.6 mm SL, holotype, **Argentina**, Corrientes, pond along Bella Vista-San Roque Road across from School N° 12. *H.*

lietkenii: MLP 8822, 1, 25.2 mm SL, **Argentina**, Formosa, pond along Route 11 to Tte. Gral. J. C. Sánchez; ILPLA 12, 2, 22.8-23.9 mm SL, Corrientes, Arroyo Batel; ILPLA 1589, 3, 39.0-51.7 mm SL, **Brazil**, Rio Grande do Sul, Estação Ecológica do Taim. *H. meridionalis*: MLP 8339, 43.7 mm SL, holotype, **Argentina**, marsh on the road from La Plata to Magdalena; ILPLA 10, 3, 39.4-40.9 mm SL, Berisso, Los Talas; ILPLA 45, 3, 38.5-39.1 mm SL, Zapata creek, outskirts of La Plata; MLP 8407, 2, 31.0-32.0 mm SL, pond along Bella Vista-San Roque Road across from School N° 12. *H. togoi*: ILPLA 1704, 59.0 mm SL, holotype, **Argentina**, Buenos Aires Province, Chascomús lagoon. *H. wajat*: MLP 9321, 27.4 mm SL, holotype, **Argentina**, Corrientes, Brava pond.

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Literature Cited

- Abell, R., M. L. Thieme, C. Revenga, M. Bryer, M. Kottelat, N. Bogutskaya, B. Coad, N. Mandrak, S. Contreras-Balderas, W. Bussing, M. L. J. Stiassny, P. Skelton, G. R. Allen, P. Unmack, A. Naseka, R. Ng, N. Sindorf, J. Robertson, E. Armijo, J. V. Higgins, T. J. Heibel, E. Wikramanayake, D. Olson, H. L. López, R. E. Reis, J. G. Lundberg, M. Sabaj-Pérez & P. Petry. 2008. Freshwater Ecoregions of the World: biogeographic units for freshwater biodiversity conservation. *BioScience*, 58(5): 403-414.
- Arratia, G., M. B. Peñafort & S. Menu-Marque. 1983. Peces de la región sureste de los Andes y sus probables relaciones biogeográficas actuales. *Deserta*, 7: 48-107.
- Bertaco, V. A. & T. P. Carvalho. 2005. A new characid fish *Hyphessobrycon hexastichos* (Characiformes: Characidae) from Chapada dos Parecis, Mato Grosso, Brazil. *Neotropical Ichthyology*, 3(3): 439-443.
- Bertaco, V. A. & L. R. Malabarba. 2005. A new species of *Hyphessobrycon* (Teleostei: Characidae) from the upper rio Tocantins drainage, with bony hooks on fins. *Neotropical Ichthyology*, 3(1): 83-88.
- Bertaco, V. A., L. R. Malabarba & J. A. Dergam. 2007. New *Hyphessobrycon* from the upper rio Pardo drainage in eastern Brazil (Teleostei: Characiformes: Characidae). *Neotropical Ichthyology*, 5(3): 245-249.
- Carvalho, T. P. & V. A. Bertaco. 2006. Two new species of *Hyphessobrycon* (Teleostei: Characidae) from upper rio Tapajós basin on Chapada dos Parecis, Central Brazil. *Neotropical Ichthyology*, 4(3): 301-308.
- Eigenmann, C. H. 1917. The American Characidae, part. 1. *Memoirs of the Museum of Comparative Zoology*, 43: 1-102.
- Ferraris C. J., Jr. 2007. Checklist of catfishes, recent and fossil (Osteichthyes: Siluriformes), and catalogue of siluriform primary types. *Zootaxa*, 1418: 1-300.
- Fink, W. L. & S. H. Weitzman. 1974. The so-called cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). *Smithsonian Contributions to Zoology*, 172: 1-46.
- Géry, J. 1965. A new genus from Brazil - *Brittanichthys*. *Tropical Fish Hobbyist*, 13(6): 13-24, 61-69.
- Géry, J. 1977. *Characoids of the World*. Neptune City, NJ, T. F. H. Publications, Inc., 672p.
- Lima, F. C. T., H. A. Britski & A. F. Machado. 2004. New *Knodus* (Ostariophysi: Characiformes: Characidae) from the Upper Rio Paraguay Basin, Brazil. *Copeia*, 2004(3): 577-582.
- Lima, F. C. T., L. R. Malabarba, P. A. Buckup, J. F. Pezzi da Silva, R. P. Vari, A. Harold, R. Benine, O. T. Oyakawa, C. S. Pavanelli, N. A. Menezes, C. A. S. Lucena, M. C. S. L. Malabarba, Z. M. S. Lucena, R. E. Reis, F. Langeani, L. Casatti, V. A. Bertaco, C. Moreira. & P. H. F. Lucinda. 2003. Genera *Incertae Sedis* in Characidae. Pp. 106-169. In: Reis, R. E., S. O. Kullander & C. J. Ferraris Jr. (Eds). *Check list of the freshwater fishes of South and Central America*. Porto Alegre, Edipucrs, 729p.
- López, H. L., R. C. Menni, M. Donato & A. M. Miquelarena. 2008. Biogeographical revision of Argentina (Andean and Neotropical Regions): an analysis using freshwater fishes. *Journal of Biogeography*, 35: 1564-1579.
- Lucena, C. A. S. & S. O. Kullander. 1992. The *Crenicichla* (Teleostei: Cichlidae) species of the Uruguay River drainage in Brazil. *Ichthyological Exploration of Freshwaters*, 3(2): 97-160.
- Miquelarena, A. M. & H. L. López. 2004. Considerations on the ichthyofauna of the Uruguay River basin: *Hemiancistrus fuliginosus* Cardoso y Malabarba, 1999 (Loricariidae: Ancistrinae). *Journal of Applied Ichthyology*, 20: 234-237.
- Miquelarena, A. M. & H. L. López. 2006. *Hyphessobrycon togoi*, a new species from the La Plata basin (Teleostei: Characidae) and comments about the distribution of the genus in Argentina. *Revue suisse de Zoologie*, 113(4): 817-828.
- Ringuélet, R. A. 1975. Zoogeografía y ecología de los peces de aguas continentales de la Argentina y consideraciones sobre las áreas ictiológicas de América del Sur. *Ecosur*, 2(3): 1-122.
- Rodríguez, M. S. & A. M. Miquelarena. 2008. *Rineloricaria isaaci* (Loricariidae: Loricariinae), a new species of loricariid catfish from the Uruguay River basin. *Journal of Fish Biology*, 73: 1635-1647.
- Taylor, W. R. & G. C. van Dyke. 1985. Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybium*, 9: 107-119.
- Weitzman, S. H. 1977. *Hyphessobrycon socolofi*, a new species of characid fish (Teleostei: Characidae) from the Rio Negro of Brazil. *Proceedings of the Biological Society of Washington*, 90(2): 326-347.
- Weitzman, S. H. & L. Palmer. 1997. A new species of *Hyphessobrycon* (Teleostei: Characidae) from the Neblina region of Venezuela and Brazil, with comments on the putative "rosy tetra clade". *Ichthyological Exploration of Freshwater*, 7(3): 209-242.

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