

New *Hyphessobrycon* from the upper rio Pardo drainage in eastern Brazil (Teleostei: Characiformes: Characidae)

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A new species of characid, *Hyphessobrycon vinaceus*, is described from the upper rio Pardo, Minas Gerais, Brazil. The new species is distinguished from all other *Hyphessobrycon* species by the combination of the following characters: the body red or reddish pigmented in live specimens, an anterior and conspicuous vertically elongate black humeral spot followed by a second faint humeral spot, 5 teeth in the inner series of premaxilla, maxilla with 2-3 pentacuspitate teeth, 15-17 branched anal-fin rays, 4-5 scale rows above and 3-4 scale rows below lateral line, lateral line with 10-26 perforated scales, 32-34 scales in a longitudinal series, and by a smaller head length in relation to standard length (23.9-26.7%).

Uma nova espécie de caracídeo, *Hyphessobrycon vinaceus* é descrita para o alto rio Pardo, Minas Gerais, Brasil. A nova espécie distingue-se das demais espécies de *Hyphessobrycon* pela combinação dos seguintes caracteres: coloração avermelhada do corpo em vida, uma mancha umeral preta e conspícua verticalmente alongada seguida de uma segunda mancha umeral fracamente pigmentada, 5 dentes na série interna do pré-maxilar, 2-3 dentes pentacuspitados no maxilar, 15-17 raios ramificados na nadadeira anal, 4-5 escamas acima e 3-4 escamas abaixo da linha lateral, 10-26 escamas perfuradas na linha lateral, 32-34 escamas em uma série longitudinal e menor comprimento da cabeça em relação ao comprimento padrão (23,9-26,7%).

Key words: *Hyphessobrycon hamatus*, Taxonomy, Fin hooks, Sexual dimorphism.

Introduction

Hyphessobrycon is a speciose genus of the family Characidae including more than 100 valid species (Lima *et al.*, 2003; Bertaco & Carvalho, 2005) distributed from southern Mexico to río de La Plata in Argentina. The genus was proposed by Durbin in Eigenmann (1908:100) as a subgenus of *Hemigrammus* Gill, differing from the latter by the absence of scales on the caudal-fin. *Hyphessobrycon* was revised by Eigenmann (1918, 1921) whose accounts still constitute the single comprehensive review of the then known members of the genus. The recognition of groups of species in the genus is based primarily on similarities of color patterns (Géry, 1961, 1966, 1977). Weitzman & Palmer (1997) hypothesized the existence of a monophyletic group of *Hyphessobrycon* species, based on the coloration pattern and the shape of the dorsal and anal fins of males that they termed the rosy tetra clade. However, those authors did not present a hypothesis

for the resolution of the relationships of the remaining species in *Hyphessobrycon*.

A new species of *Hyphessobrycon* was discovered during a recent collection made by JAD in headwater streams of the upper rio Pardo drainage, that is described below. The rio Pardo is an eastern coastal drainage with its upper and middle portions located in the state of Minas Gerais and its lower stretch in the state of Bahia, within the domain of the Atlantic forest. Fish species recently described from this area are *Simpsonichthys rosaceus* Costa, Nielsen & de Luca, *S. suzarti* Costa (Rivulidae), and *Astyanax pelecus* Bertaco & Lucena (Characidae).

Materials and Methods

Counts were taken as described by Fink & Weitzman (1974) with the exception of the number of scale rows below the lateral line that was counted from the scale row ventral to the

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lateral line to the scale row closest to the pelvic-fin insertion. Counts of vertebrae supraneurals, gill-rakers, teeth and procurent caudal-fin-rays were taken from cleared and stained specimens (c&s) prepared according to the method of Taylor & Van Dyke (1985). Tooth counts were also taken in all type specimens. Counts of the holotype are given first followed in parentheses by the mean and total number of specimens counted. Vertebral counts include the four vertebrae integrated in the Weberian apparatus, and the terminal centrum was counted as one vertebra. Statistical tests of differences between the sexes were performed. Scanning electronic micrographs (SEM) of teeth and jaws were taken from one dissected cleared and stained specimen.

Measurements were taken point to point with an electronic caliper on the left side of the specimens. All measurements other than SL are expressed as percentages of SL except for subunits of the head that are recorded as percentages of head length (HL).

The examined specimens are deposited at the California Academy of Sciences, San Francisco (CAS), Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP), and Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP).

Hyphessobrycon vinaceus, new species

Figs. 1 and 2

Holotype. MCP 40916, 56.5 mm SL, male; Brazil, Minas Gerais, São João do Paraíso, rio São João, tributary of the upper rio Pardo, 15°09'50"S 42°09'45"W, 26 Apr 2006, J. A. Dergam & A. A. Oliveira.

Paratypes. MCP 40141, 6 (2 males, 46.7-54.1 mm SL; 1 male c&s 46.7 mm SL; 4 females, 56.1-62.8 mm SL; 1 female c&s 49.6 mm SL), MZUSP 94439, 3 (1 male, 56.3 mm SL; 2 females, 48.3-56.9 mm SL), collected with the holotype; MCP 40915 (3 males, 51.0-54.0 mm SL), same data of the holotype; these specimens were kept in aquarium for one year.

Diagnosis. *Hyphessobrycon vinaceus* is distinguished from all other species of *Hyphessobrycon* except of *H. melanostichos*

Carvalho & Bertaco, *H. notidanos* Carvalho & Bertaco, and the species of the 'rosy tetra clade' Weitzman & Palmer (1997), by the red or reddish pigmented body in live specimens. *Hyphessobrycon vinaceus* differs from the species included in the 'rosy tetra clade' in the number of teeth in the inner row of the premaxilla (4 or 5 vs 7 to 12), and in the number of branched anal-fin rays (15-17 vs 22-29); it differs from *H. melanostichos* by the absence of a conspicuous longitudinal broad black band beginning on the posterior margin of orbit and reaching the tip of middle caudal fin rays; from *H. notidanos* by the lack of an elongated dorsal fin in mature males, in the number of dorsal-fin rays (ii,9 vs iii,8), and number of perforated lateral-line scales (10-26 vs 6-9).

Description. Morphometric data summarized in Table 1. Body compressed and moderately deep; greatest body depth anterior to dorsal-fin origin. Dorsal head profile straight or slightly convex. Dorsal body profile convex from supraoccipital tip to base of last dorsal-fin ray, and straight from that point to adipose-fin origin. Ventral profile of head convex. Ventral profile of body convex from pectoral-fin origin to anal-fin origin. Body profile along anal-fin base straight and posterodorsally slanted. Caudal peduncle elongate, nearly straight to slightly concave along both dorsal and ventral margins.

Snout rounded from margin of upper lip to vertical through anterior nostrils. Mouth terminal. Maxilla extending posteriorly to under middle of orbit, slightly curved, and aligned at approximately 45 degrees angle relative to longitudinal axis of body. Anterodorsal border of maxilla concave, posterodorsal border slightly convex, anteroventral border concave, and posteroventral border convex. Maxilla slightly widened posteriorly.

Premaxilla with two tooth rows; outer row with 2-4, tricuspid or pentacuspoid teeth with central cusp longer; inner row 5 (one with 4) teeth with 5-7 cusps and central cusp longer and broader than other cusps, inner row teeth gradually decreasing in length from first to fourth teeth, last tooth considerably smaller. Two to three maxillary teeth, with 5 cusps, central



Fig. 1. *Hyphessobrycon vinaceus*, MCP 40916, holotype, male, 56.5 mm SL; Brazil, Minas Gerais, São João do Paraíso, rio São João, tributary of upper rio Pardo.

cusps slightly longer. Four or 5 anteriormost dentary teeth larger, with 5-7 cusps, followed by medium sized tooth with 5 cusps, and 5-6 smaller teeth with 1-3 cusps or conical; central cusp in all teeth two to three times longer and broader than remaining cusps. Cusp tips slightly curved posteriorly and lingually (Fig. 2).

Scales cycloid, moderately large. Lateral line incomplete, perforated scales 10-26 (26, mean = 16, n = 12). Longitudinal scale series including lateral-line scales 32-34 (34, mean = 33.1, n = 12). Scale rows between dorsal-fin origin and lateral line 5 (5, one with 4, mean = 4.9, n = 12); scale rows between lateral line and pelvic-fin origin 3-4 (4, mean = 3.6, n = 12). Predorsal scales 11-12, arranged in regular series (11, mean = 11.7, n = 12). Scales rows around caudal peduncle 14 (n = 12). Scale sheath along anal-fin base with 3-5 scales in single series (5, n = 12), extending posteriorly to base of first rays.

Dorsal-fin rays ii,9 (n = 13); first unbranched ray approximately one-half length of second ray. Males with small bony hooks in distal one-third of first to fifth branched rays. Dorsal-fin origin located approximately at middle of SL and posterior to vertical through pelvic-fin origin. Adipose-fin located approximately at vertical through insertion of 13th - 15th branched anal-fin rays. Anal-fin rays iii-iv,15-17 (iii,16, mean = 16.1, n = 13). First unbranched ray usually only apparent in cleared and stained specimens. Anal-fin profile smoothly concave in females and nearly straight in males. Anal-fin origin located posterior to vertical through base of last dorsal-fin ray. Anal-fin rays of males bearing one pair of retrorse bony hooks along posterolateral border of each segment of lepidotrichia, usually along last unbranched ray and fifteen anterior branched rays; hooks more numerous along first through tenth branched rays. Hooks usually located along posteriormost branch and distal 1/2 to 2/3 length of each ray. Pectoral-fin rays i,9-12 (i,9, mean = 11.3, n = 13).

Males with small bony hooks on distal portion of first to fifth branched rays. Pelvic-fin rays i,7 (one with i,6,i, n = 13). Pelvic-fin origin located anterior to vertical through dorsal-fin origin. Pelvic fin of males usually bearing small bony hooks along ventromedial border of second to third branched rays. Caudal-fin forked, with 19 principal rays with small bony hooks at tip of middle caudal-fin rays. Dorsal procurent rays 10, and ventral procurent rays 9 (n = 2).

Precaudal vertebrae 16; caudal vertebrae 16-17; total vertebrae 32-33. Supraneurals 5. Gill-rakers 6/10 (n = 2).

Color in alcohol. Dorsal and dorsolateral portions of head and body dark brown. Infraorbital and opercular areas covered with scattered, dark chromatophores. Scales on lateral and ventral surface of body bordered with dark brown chromatophores forming a reticulate color pattern. Dark anterior humeral spot vertically-elongate, and narrowing ventrally, located over second to fourth lateral-line scales and extending over 4-5 horizontal series of scales including lateral line. Second humeral spot diffuse, located nearly above 7th-8th lateral line scale and at anterior end of midlateral stripe, and extending usually over two horizontal series of scales above lateral line. Faint midlateral body stripe extending from second humeral spot to tip of median caudal-fin rays, gradually wider and more intensely pigmented towards caudal peduncle. Midlateral body stripe slightly wider on caudal peduncle and caudal-fin base forming small spot. Fins with scattered dark chromatophores (Fig. 1). Some specimens examined soon after fixation in formalin with ventrolateral portion of body, and caudal fin base with intensely red-orange or reddish coloration. Males and females with similar color pattern.

Color in life. Color pattern similar to that described for alcohol preserved specimens except as follows. Body dorsal portion

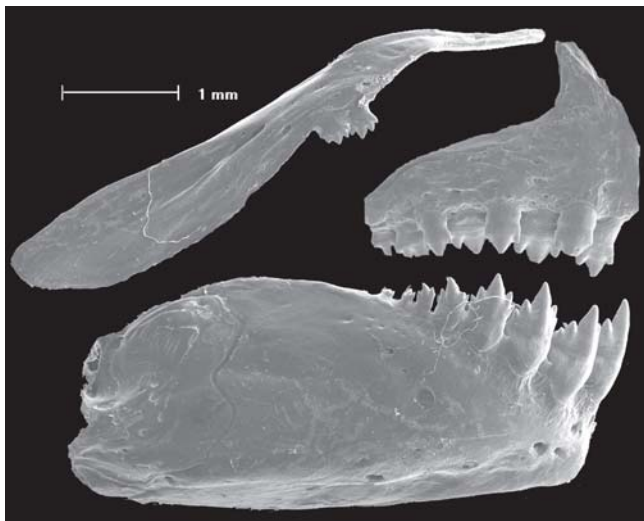


Fig. 2. Scanning electronic micrograph of upper and lower jaws (right side) of *Hyphessobrycon vinaceus*, MCP 40141, paratype, female, 49.6 mm SL.

Table 1. Morphometric data of holotype (MCP 40916) and paratypes (MCP 40141; MZUSP 94439) of *Hyphessobrycon vinaceus* from the upper rio Pardo drainage (n = 10 including the holotype). SD = standard deviation.

	Holotype	Range	Mean	SD
Standard length (mm)	56.5	46.7-62.8	55.0	-
Percents of standard length				
Predorsal distance	50.0	50.0-55.8	52.6	1.55
Prepelvic distance	47.2	46.9-49.9	48.3	1.12
Prepectoral distance	24.6	24.2-26.5	25.4	0.77
Preanal distance	65.2	65.2-69.4	67.0	1.45
Depth at dorsal-fin origin	31.4	30.1-35.8	32.1	1.82
Caudal peduncle depth	12.8	11.4-13.5	12.8	0.60
Caudal peduncle length	16.4	14.9-17.4	15.9	0.74
Anal-fin base	22.8	20.7-25.1	22.2	1.39
Dorsal-fin length	22.9	22.4-24.2	23.2	0.56
Pelvic-fin length	16.2	15.1-17.1	16.3	0.63
Pectoral-fin length	19.7	18.9-21.7	20.0	0.85
Head length	24.1	23.9-26.7	25.2	1.04
Percents of head length				
Snout length	23.8	21.1-25.8	23.8	1.37
Upper jaw length	41.3	39.6-47.2	43.3	2.47
Orbital diameter	27.5	24.2-31.4	27.9	2.05
Interorbital width	34.8	32.1-36.7	34.7	1.21

green to gray brown. Abdomen and opercle portions silvery to brilliant green. Body portion above anal-fin base, and pectoral, pelvic, and anal fins intensely red or reddish pigmented. Dorsal and caudal fins green or yellowish brown. Red or reddish coloration is more evident in freshly preserved specimens in formalin.

Sexual dimorphism. Males of *H. vinaceus* are easily recognized by the presence of bony hooks on all fin rays, observed in males larger than 46.7 mm SL. Males and females also slightly differ in anal-fin shape, which is concave in females and nearly straight in males. One male and female (46.7 and 49.6 mm SL) were dissected before clearing and staining, and only the male had mature gonads. Gill glands were not found on first gill arch in both males and females.

Distribution. *Hyphessobrycon vinaceus* is known only from rio São João, in the headwaters of the rio Pardo drainage, a coastal drainage in eastern Brazil.

Etymology. The specific name *vinaceus* is from Latin and means reddish, and it is in allusion to the body coloration red or reddish observed in live specimens.

Ecological notes. At the type locality, the rio São João is a fast running clear water and shallow river about four to five meters wide, with sandy bottom, and large amount of riparian vegetation. Live specimens of *H. vinaceus* were caught in rapid stretches just below a small waterfall. *Hyphessobrycon vinaceus* was collected syntopically with *Aspidoras cf. alwater* and *Otothyropsis* sp.

Discussion

Hyphessobrycon vinaceus is included in this genus according to the definition, proposed by Durbin in Eigenmann (1908) and further elaborated by Eigenmann (1918): premaxillary teeth in two rows; maxillary teeth absent or reduced in number and restricted to the upper portion of its free margin; lateral line incomplete; adipose fin present and caudal fin naked.

The intensely red or reddish pigmented ventrolateral portion of body and caudal fin base in live specimens of *H. vinaceus* easily distinguish the new species from most *Hyphessobrycon* species. Similarities with *H. melanostichos*, *H. notidanos* and some species of the 'rosy tetra clade' remains only in the presence of reddish pigments but *H. vinaceus* is easily distinguished from those species by the characters listed in the diagnosis.

Mature males of *H. vinaceus* possess bony hooks on rays of all fins. Gonçalves *et al.* (2005) observed a positive correlation between mean gonadosomatic index of maturing and mature males and the number of anal-fin rays bearing hooks in *Aphyocharax anisitsi*, and suggested these hooks develop along with sexual maturation, and once developed are retained by the males. The presence of hooks on fin rays was

proposed as a synapomorphy for a group containing most genera and subfamilies of the Characidae (Malabarba & Weitzman, 2003), but these hooks are usually found only in the anal- and pelvic-fin rays and sometimes in the caudal-fin rays of males, and usually represent a secondary sexual character. However, the occurrence of bony hooks in all fins, including dorsal, caudal, and pectoral fins in males is uncommon in characids. Some recently described species of Tetraodonterinae (*sensu* Géry) also possess bony hooks on rays of all fins in males, *e.g.* *Astyanax ojiara* and *Moenkhausia pankilopteryx*, and in all fins except the caudal fin, *e.g.* *A. elachylepis* and *H. hamatus* (see Bertaco & Lucinda, 2006). Among *Hyphessobrycon* species, the presence of bony hooks on the dorsal-fin rays is known to occur only in *H. socolofi*, *H. erythrostroma* (see Weitzman, 1977), *H. hamatus* and *H. uruguayensis* (Fowler) (*pers. obs.*). *Hyphessobrycon vinaceus* differs from *H. socolofi* and *H. erythrostroma* by number of branched anal-fin rays (15-17 vs 28-30 and 27-29, respectively), and by absence of a black spot on dorsal fin vs the presence of such pigmentation; from *H. hamatus* by head length (23.9-26.7 vs 27.5-32.3% of SL), caudal peduncle length (14.9-17.4 vs 10.0-14.4% of SL), and orbital diameter (24.2-31.4 vs 29.1-33.7% of HL); and from *H. uruguayensis* by maxillary teeth (1-3 vs 6-11), branched anal-fin rays (15-17 vs 20-26), and absence of black longitudinal lines in the lateral body vs presence.

Hyphessobrycon vinaceus possesses dark chromatophores delineating the scale borders over the body, a character found in *H. balbus* Myers, *H. langeanii* Lima & Moreira, *H. boulengeri* (Eigenmann), and *H. hamatus* (see discussion in Bertaco & Malabarba, 2005). *Hyphessobrycon vinaceus* further shares some characters with *H. hamatus* not found in other species of the genus as the larger number of perforated scales, reduced number of anal-fin rays, and presence of bony hooks on all fins, except the caudal fin in *H. hamatus*. The general lack of knowledge of the relationships within *Hyphessobrycon*, however, precludes further inferences on the possible relationships among these species based on these characters.

Comparative material. *Hyphessobrycon balbus*: CAS 60463, 15 paratypes, lagoa Fervedeira, Planaltina, Goiás, Brazil. *Hyphessobrycon boulengeri*: MCP 21685, 11, channel between lagoa Emboaba and Emboabinha, Osório, Rio Grande do Sul, Brazil. *Hyphessobrycon hamatus*: MCP 34000, holotype, 43.1 mm SL, MCP 33930, 10 paratypes, 26.7-44.8 mm SL, tributary of rio Vermelho, rio Tocantins drainage, Mambá, Goiás, Brazil. *Hyphessobrycon uruguayensis*, MCP 36795, 13, arroyo Salsipuedes, río Negro drainage, Tacuarembó, Uruguay.

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