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A new *Hasemania* Ellis from the upper rio Paraná basin, with the redescription of *Hasemania crenuchoides* Zarske & Géry (Characiformes: Characidae)

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A new *Hasemania* species is described from the headwaters of the rio Uberaba, rio Grande basin, State of Minas Gerais, Brazil. The new species is distinguished from its congeners by a combination of a black, vertically-elongate humeral spot, a single ossification in the position primitively occupied by infraorbitals four and five, four teeth on the inner series of premaxilla, and scales covering the anal-fin base. *Hasemania crenuchoides* is redescribed and its known geographic distribution is extended; it can be differentiated from other species of the genus by the combination of a black vertically-elongate humeral spot, ii,8 dorsal-fin rays, 11-14 branched anal-fin rays, the presence of separate infraorbitals four and five, and the presence of scales covering the anal-fin base. Phylogenetic relationships of *H. crenuchoides* and the new species within *Hasemania* are discussed.

Uma nova espécie de *Hasemania* é descrita para as cabeceiras do rio Uberaba, bacia do rio Grande, estado de Minas Gerais, Brasil. A nova espécie distingue-se de suas congêneres pela combinação de uma mancha umeral preta verticalmente alongada, uma ossificação única na posição primitivamente ocupada pelos infraorbitais quatro e cinco, quatro dentes na série interna do pré-maxilar e escamas cobrindo a base da nadadeira anal. *Hasemania crenuchoides* é redescrita e sua distribuição geográfica conhecida é ampliada; ela pode ser diferenciada das demais espécies do gênero pela combinação de uma mancha umeral preta verticalmente alongada, ii,8 raios na nadadeira dorsal, 11-14 raios ramificados na nadadeira anal, presença de infraorbitais quatro e cinco distintos e presença de escamas cobrindo a base da nadadeira anal. As relações filogenéticas de *H. crenuchoides* e da nova espécie são discutidas dentro de *Hasemania*.

Keywords: Freshwater fish, Headwaters, Rio Grande, Rio Uberaba.

Introduction

Hasemania Ellis is a small genus of the Characidae restricted to the rivers of the Crystaline Brazilian Shield. The genus was proposed by Ellis (1911) to include three species, *H. melanura* Ellis (type species), *H. maxillaris* Ellis and *H. bilineata* Ellis, and differed from all other characids primarily in the absence of the adipose fin. Ellis (1911) further defined the genus by having two rows of premaxillary teeth, few or no teeth along the upper angle of the maxillary, an incomplete lateral line, the caudal fin naked, and a frequently larval pectoral fin in small specimens. *Hasemania* now includes eight species: *H. melanura* and *H. maxillaris*, from the rio Iguaçu basin, *H. nana* (Lütken) from the rio São Francisco basin, *H. hanseni* (Fowler) from Goiás (precise locality unknown), *H. crenuchoides* Zarske & Géry, from the upper rio Paraná basin, *H. nambiquara* Bertaco & Malabarba, from the upper rio Tapajós basin, *H. piatan* Zanata & Serra, from the rio de Contas basin, and *H. kalunga* Bertaco & Carvalho, from the upper rio Tocantins.

Hasemania crenuchoides was until recently only known from its type specimens, and these specimens exhibit a very clear brown staining, without any spot in the body or fins. Zarske & Géry (1999), in the original description of this species, mentioned the specimens preserved for more than thirty years, having a uniform yellowish to olive green coloration, without spots. Recently, Langeani *et al*. (2007), cited this species from headwaters of the rio Uberaba, rio Grande basin, State of Minas Gerais. Numerous other specimens were subsequently collected in the córrego Paranoazinho, rio Paranaíba drainage, near the type locality of the species; these specimens showing a conspicuous color pattern, including a black humeral spot.

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The analysis of this material revealed that the specimens from the rio Paranaíba basin are indeed *H. crenuchoides*, whereas samples from the rio Grande basin represents a new species, which is described herein together with a redescription of *H. crenuchoides*.

Material and Methods

Counts and measurements follow Fink & Weitzman (1974). Vertebrae, branchiostegal rays, gill-rakers, total dentary teeth counts and teeth cusp numbers were taken from cleared and stained specimens (c&s) prepared according to Taylor & Van Dyke (1985). All measurements were taken point-to-point with an electronic caliper on the left side of specimens. Standard length (SL) is presented in mm, and the other measurements are expressed as percentages of the SL, except for subunits of head which are presented as percentages of the head length (HL). Vertebral count includes the Weberian apparatus as four elements and the fused PU1+U1 as a single element. Meristic data are presented in the description and are followed by the frequency for each count in parenthesis. An asterisk indicates counts of the holotype. Larger specimens were dissected to observe the gonads for sex determination.

Examined specimens are deposited in the collections of the Departamento de Zoologia e Botânica da UNESP de São José do Rio Preto, São José Rio Preto (DZSJRP); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP), Museum d'Histoire Naturelle, Genève (MHNG); Academy of Natural Sciences of Drexel University, Philadelphia (ANSP); Field Museum of Natural History, Chicago (FMNH); and Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP).

Results

Hasemania uberaba, new species

urn:lsid:zoobank.org:act:5515B222-B4F3-4858-AB31-903B44F7F508

Figs. 1-3

Hasemania crenuchoides non Zarske & Géry, 1999: Langeani *et al*., 2007 (119: fig. 1; 119 and 120: rio Grande basin; 121: morphometrics and meristics comparisons with *H. crenuchoides* holotype (MZUSP 52723) and two paratypes (MHNG 2594.044).

Hasemania melanura non Ellis, 1911: Uieda *et al*., 1987 (rio Claro, rio Paranaíba basin; 101: fig. 2A; 102: reference; 107: tab. IV and 108: tab. V, stomach contents).

Holotype. DZSJRP 18781, male, 70 mm SL, Brazil, Minas Gerais, Ponte Alta, Serra do Grotão, road BR 262, headwaters of rio Uberaba, córrego São Pedro, rio Grande basin, upper rio Paraná, 1020 m a.s.l., 19º40'59"S 47º40'09"W, 15 Feb 2013, D. C. Ribeiro.

Paratypes. DZSJRP 8730, 133 (4 c&s), 29.6-62.4 mm SL, 30.9-43.8 mm SL, same locality as holotype, 8 Sep 2006, F. Langeani, J. P. Serra-Sanches, F. R. Carvalho, H. F. Chaves, C. P. Ferreira & F. O. Martins. DZSJRP 15803, 66, 14.2-52.4 mm SL, same locality as holotype, 11 Mar 2012, F. Langeani, F. O. Martins & F. R. Carvalho. DZSJRP 19239, 5, 33.9-54.1 mm SL, collected with the holotype.

Diagnosis. *Hasemania uberaba* is distinguished from congeners by having a black, vertically-elongate humeral spot (*vs*. spot absent except for *H. crenuchoides, H. kalunga*, *H. nambiquara*, and *H. piatan*), a single ossification in the position primitively occupied by infraorbitals four and five (*vs*. infraorbitals four and five separate, except in *H. kalunga* and *H. piatan*), 4 inner row premaxillary teeth (*vs*. 5 except in *H. nana*, *H. melanura*, and *H. piatan*), and scales covering the anal-fin base (*vs*. scales absent except in *H. crenuchoides*, *H. hanseni*, *H. maxillaris*, *H. melanura*, *H. nambiquara*, and *H. nana*). *Hasemania uberaba* can be also distinguished from *H. kalunga* and *H. piatan* by having 14-18 circumpeduncular scales (*vs*. 10-12); from *H. hanseni*, *H. maxillaris*, and *H. nambiquara* by having 10-15 branched anal-fin rays (*vs.* 16-19); from *H. hanseni*, *H. melanura*, and *H. nana* by having 6-10 scales covering the anal-fin base (*vs*. 2-5), and from *H. maxillaris* and *H. nambiquara* by having 7-8 branched dorsal-fin rays (*vs*. 9). Additionally, *H. uberaba* differs from *H. melanura* by having maxillary teeth (*vs*. absent); from *H. maxillaris* by having, 6-7 branched pelvic-fin rays (*vs*. 5), from *H. nambiquara* by the absence of a broad black band in the midlateral line, from the humeral region to the caudal-fin (*vs*. presence of such band). Finally, most specimens of *H. uberaba* have 18 principal caudal-fin rays (*vs*. 19 in most other species except *H. piatan*).

Description. Morphometric data in Table 1. Body deep and transversely rounded; greatest body depth between tip of supraoccipital spine and dorsal-fin origin. Head moderately deep, rounded anteriorly in lateral profile; eye small. Dorsal profile of head distinctly convex from margin of upper lip to region of vertical through anterior nostril, straight to slightly concave from that point to posterior tip of supraoccipital spine in mature males and immatures, greatly concave in mature females. Dorsal profile of head and body slightly convex from tip of supraoccipital spine to dorsal-fin origin, posteroventrally inclined along dorsal-fin base, straight from terminus of dorsal-fin base to origin of caudal-fin rays. Ventral profile of head and body convex from margin of lower lip to posterior terminus of anal-fin base. Ventral profile of caudal peduncle slightly concave. Infraorbital series incomplete, with only four bones, single ossification in position primitively occupied by infraorbitals four and five and infraorbital 6 absent. Rhinosphenoid cartilaginous.

Jaws equal, mouth terminal. Premaxillary dentition in two rows. Outer row with 3(4) or 4*(28) tricuspid teeth and inner row with 4*(31) or 5 (1) teeth with 3 to 6 cups.

Maxilla with 1(5), 2(17), 3(8), 4(1) or 5*(1) teeth bearing 1 to 6 cusps. Dentary with 4*(32) larger teeth anteriorly with 4 or 5 cusps, followed by 5 to 9 distinctly smaller teeth with 1 to 3 cusps.

Dorsal-fin rays ii,7(1) or ii,8*(32). Distal margin of dorsal fin usually rounded. Anal-fin rays iii-iv,10(1), 11(2), 12(3), 13(14), 14*(9) or 15(4). Pectoral-fin rays i, 10(6), 11*(22) or 12(5). Tip of pectoral fin falling short of vertical through pelvic-fin insertion. Pelvic-fin rays i,6*(27) or 7(4). Caudal fin forked, lobes rounded and of similar size. Principal caudal-fin rays i,8/7,i(2); i,8/8/,i*(43); i,9/8,i(5). Adipose fin absent.

Scales cycloid. Lateral line incomplete. Pored scales 8(3), 9(8), 10(6), 11(1), 12(7), 13(4), 14*(1) or 15(1). Longitudinal scale series including perforated scales 28(2), 29(2), 30(9), 31(5), 32(6), 33(3), 34(3) or 35*(1). Horizontal scale rows between lateral line and dorsal-fin origin 5*(15) or 6(17). Horizontal scale rows between lateral line and pelvic-fin origin 4(23) or 5*(9). Scale sheath along basal portion of anal-fin rays with 6(2), 7(5), 8*(7), 9(7) or 10(3) scales in single series. Scales between tip of supraoccipital process and dorsal-fin origin 10(2), 11(5), 12*(10), 13(1), 14(3), 15(1) or 16(1). Horizontal scale rows around caudal peduncle 14(2), 15(8), 16*(17), 17(1) or 18(1). Scales present only over caudal-fin base. Vertebrae 34(2) or 35(2). First gill arch with 6(2) epibranchial, 8(2) ceratobranquial, 1(2) on cartilage between ceratobranchial and epibranchial, and 2(2) hypobranchial gill-rakers. Supraneurals 5(2) or 6(2).

Color in alcohol. Preserved specimens with dark bodies, chromatophores concentrated mainly dorsally and along posterior margin of scales, resulting in slightly reticulated pattern. Irregular, vertically elongate humeral spot. Longitudinal, mid-lateral stripe extending from vertical midway between head and dorsal-fin origin posteriorly to middle caudal-fin rays. Fins with chromatophores more concentrated along rays than on membranes (Figs. 1-2).

Color in life. Live specimens have conspicuous reticulated color pattern, scales with metallic bluish-purple reflections. Dorsal, anal, and caudal fins, mainly the last one, reddish with dark rays.

Sexual dimorphism. Females with a conspicuous concavity along dorsal profile between vertical passing through the posterior nostril to the posterior portion of the head (Fig. 2). Bony hooks along pelvic and anal-fin rays were not observed in any specimen.

Table 1. Morphometric data for holotype (H) and 32 paratypes of *Hasemania uberaba*. SD = standard deviation. Range includes holotype.

	H	Range	Mean	SD
Standard length (mm)	70.0	26.9-70.0	43.3	
Percents of Standard length				
Body depth	34.7	33.5-39.6	36.3	1.5
Head length	31.7	30.1-33.7	31.8	1.0
Predorsal distance	58.6	52.7-61.0	58.0	1.5
Preventral distance	53.9	48.6-55.1	52.7	1.5
Pelvic-anal fin distance	18.4	17.2-22.6	19.5	1.3
Caudal-peduncle depth	13.6	13.5-15.7	14.6	0.6
Caudal-peduncle length	12.0	12.0-18.7	15.2	1.4
Dorsal-fin base length	11.7	10.9-15.9	12.5	1.0
Anal-fin base length	18.4	18.0-21.9	19.9	1.1
Pectoral-fin length	17.4	14.4-20.4	16.5	1.2
Pelvic-fin length	13.9	12.5-16.0	14.3	0.9
Dorsal-fin length	21.4	21.4-28.7	24.7	1.7
Anal-fin length	16.4	15.2-20.2	18.2	1.3
Caudal-fin length	20.6	16.5-22.0	19.2	1.3
Percents of Head length				
Head depth	82.0	82.0-96.5	91.4	3.0
Orbital diameter	21.2	21.2-33.9	28.7	2.5
Snout length	23.9	19.0-26.1	22.5	1.9
Interorbital width	31.5	26.9-34.0	31.0	1.6

Fig. 1. *Hasemania uberaba*, holotype, DZSJRP 18781, male, 70.0 mm SL, Brazil, Minas Gerais State, Ponte Alta, Serra do Grotão, road BR 262, headwaters of rio Uberaba, córrego São Pedro, rio Grande basin, upper rio Paraná basin.

Fig. 2. *Hasemania uberaba*, paratype, recently fixed specimen, DZSJRP 8730, female, 62.4 mm SL, Brazil, Minas Gerais State, Ponte Alta, Serra do Grotão, road BR 262, headwaters of rio Uberaba, córrego São Pedro, rio Grande basin, upper rio Paraná basin.

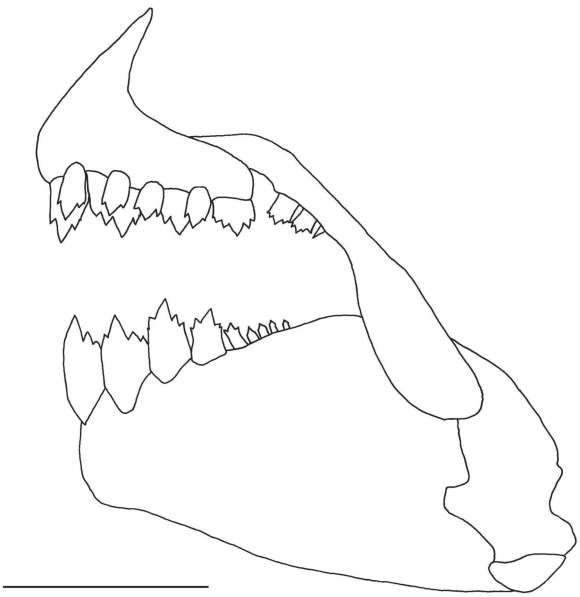

Fig. 3. Jaws of *Hasemania uberaba*, left side, paratype, DZSJRP 8730, 36.8 mm SL. Scale bar = 1.5 mm.

Distribution. *Hasemania uberaba* is only known from its type locality in the headwaters of the rio Uberaba, rio Grande basin, upper rio Paraná basin, Minas Gerais, Brazil (see Carvalho & Langeani, 2013: figs. 4-5).

Ecological notes. Headwaters of the rio Uberaba are a marshland with abundant Cyperacea, Poacea and algae, crystalline water and muddy bottom (Carvalho & Langeani, 2013: fig. 5). *Hasemania uberaba* was captured jointly with a new genus and new species of Crenuchidae, the most abundant species (under analysis), *Hyphessobrycon uaiso* Carvalho & Langeani, and *Rivulus* sp. The larger, less numerous, specimens among *H. uberaba* could be easily seen among the smaller specimens of the other species. They swim in open water or sheltered areas with submerged vegetation. Among the specimens examined for stomach contents, one consumed angiosperms and Chironomidae larvae (Diptera), other angiosperms and Trichoptera, and one mostly Diptera larvae, followed by angiosperms and tecamoebas; Uieda *et al.* (1987: tables IV and V) refer to algae, Ephemeroptera, Odonata, Trichoptera, Diptera, Megaloptera, and organic matter (autochthonous items) and angiosperms, Coleoptera, Trichoptera, and Hymenoptera (allochthonous items) in the stomachs of the specimens of the species they examined (identified therein as *H. melanura*).

Etymology. The species name, *uberaba*, is in reference to the rio Uberaba, where the species is found. A noun in apposition.

Conservation status. *Hasemania uberaba* until now was only confirmed to occur in the type-locality (area of occupancy AOO less than 10 km2). There is a putative new reference for the species, based on a fish drawing (fig. 2A, Uieda et al., 1987, referred as *Hasemania melanura*), in the rio Claro, rio Paranaíba basin, a locality very near the type-locality; this additional occurrence, however, could not be confirmed because the specimens analyzed by Uieda et al. (1987) were not conserved and all recent efforts to collect the species in the rio Claro were unsuccessful. The small geographic area (one location) harbors a very peculiar kind of habitat (see "Ecological notes" above) and is limited by a paved road (BR 262) and land areas with agriculture. Furthermore, the waters of the rio Uberaba are used by human consumption and since the southeastern Brazil is suffering a long drought (Escobar, 2015), this can contribute to a decay of the water levels in the basin, which now seems to be a serious plausible threat that can drive the species to critically endangered or extinct in a very short time, allowing to its classification as Vulnerable (VU D2) according to the IUCN (2001, 2011). In spite of that, it is now preferable to consider *Hasemania uberaba* as Data Deficient (DD) until more information about its biology and geographical distribution is available, as already pointed out by Carvalho & Langeani (2013) for *Hyphessobrycon uaiso*, a syntopic characid species.

Hasemania crenuchoides Zarske & Géry, 1999

Figs. 4-5

Hasemania crenuchoides Zarske & Géry, 1999 (original description, type locality: corrego Planaltina, oberer rio São Bartolomeu (mündend in den rio Corumba, Nebenfluss des rio Paranaiba, La-Plata system), 1050 m über NN, nahe Planaltina, nordöstl. von Brasilia, Distrito Federal, Bundesstaat Goias, Brasilien, etwa 15°38' südl. Breite und 47°40' westl. Länge); Lima *et al*., 2003 (128: check list for the genus); Bertaco & Malabarba, 2007 (compared to *H. nambiquara*); Langeani *et al*., 2007 (*partim*, 121: holotype (MZUSP 52723) and two paratypes (MHNG 2594.044) morphometrics and meristics comparisons with *Hasemania* specimens from rio Grande (= *Hasemania uberaba*); Bertaco & Carvalho, 2010 (compared to *H. kalunga*); Langeani & Serra, 2010 (733: rhinosphenoid bone comparisons with *Coptobrycon bilineatus*); Zanata & Serra, 2010 (compared to *H. piatan*).

Diagnosis. *Hasemania crenuchoides* is distinguished from its congeners by having a black vertically-elongate humeral spot (*vs*. absent, except from *H. kalunga*, *H. nambiquara*, *H. piatan*, and *H. uberaba*), ii,8 dorsal-fin rays (*vs*. ii,9, except *H. hanseni*, *H. kalunga*, *H. melanura*, *H. nana*, and *H. uberaba*); 11-14 branched anal-fin rays (*vs*. 16-19, except *H. kalunga*, *H. melanura*, *H. nana*, *H. piatan*, and *H. uberaba*), infraorbitals four and five (*vs*. a single ossification in the position occupied by infraorbitals four and five, except *H. hanseni*, *H. maxillaris*, *H. melanura*, *H. nambiquara*, and *H. nana*), and presence of scales covering the anal-fin base (*vs*. absent, except *H. hanseni*, *H. maxillaris*, *H. melanura*, *H. nambiquara*, *H. nana*, and *H. uberaba*). Additionally, *H. crenuchoides* differs from *H. melanura* by having maxillary teeth (*vs*. absent); from *H. nambiquara* by the absence of a broad black band in the midlateral line, from the humeral region to the caudal-fin (*vs*. presence), and from *H. piatan* by possessing 19 principal caudal-fin rays (*vs*. 18).

Description. Morphometric data in Table 2. Body deep and transversely rounded. Greatest body depth between tip of supraoccipital spine and dorsal-fin origin. Head moderately deep and rounded anteriorly in lateral profile; eye small. Dorsal profile of head distinctly convex from margin of upper lip to region of vertical through anterior nostril, nearly straight from that point to tip of supraoccipital spine. Dorsal profile of body slightly convex from tip of supraoccipital spine to dorsal-fin origin, posteroventrally inclined along dorsal-fin base, straight from terminus of dorsal-fin base to origin of caudal-fin rays. Ventral profile of head and body convex from margin of lower lip to anal-fin origin, straight and posterodorsally inclined along anal-fin base, nearly straight in caudal peduncle. Infraorbital series complete. Rhinosphenoid cartilaginous.

Table 2. Morphometric data of holotype (H) (MZUSP 52732), paratypes (MHNG 2594.044) and non-type specimens (DZSJRP 11039 and DZSJRP 14185) of *Hasemania crenuchoides*. SD = standard deviation, N = 38 including the holotype and paratypes.

	H	Paratypes	Range	Mean	SD
Standard length (mm)	63.7	28.0-38.0	28.0-63.7	41.9	
Percents of Standard length					
Body depth	34.4	32.8-36.0	27.8-36.1	31.4	1.7
Head length	29.7	27.9-30.0	26.2-30.0	28.0	0.9
Predorsal distance	56.8	52.6-55.0	50.1-56.8	52.6	1.3
Preventral distance	51.2	48.4-50.0	47.1-51.9	49.5	1.1
Pelvic-anal fin distance	16.5	17.5-18.2	15.3-19.5	17.4	1.0
Caudal-peduncle depth	14.3	12.8-12.9	12.2-14.3	13.3	0.5
Caudal-peduncle length	15.7	17.5-17.6	12.8-18.1	16.2	1.1
Dorsal-fin base length	12.6	9.7-10.0	9.7-15.0	13.1	1.3
Anal-fin base length	18.7	18.9-19.5	17.5-22.7	19.9	1.3
Pectoral-fin length	18.2	18.7-21.1	18.2-22.5	20.3	1.1
Pelvic-fin length	14.1	13.4-14.3	10.1-17.9	15.2	1.4
Dorsal-fin length	21.4	21.3-23.9	21.3-28.6	25.4	1.7
Anal-fin length	16.0	16.8-17.6	16-21.6	19.2	1.4
Caudal-fin length	20.4	18.9-22.5	18.2-24.2	21.1	1.5
Percents of Head length					
Head depth	97.9	85.7-94.3	85.6-97.9	90.3	2.9
Orbital diameter	25.4	32.1	25.4-34.8	31.3	2.0
Snout length	26.5	22.6	20.2-26.5	22.6	1.3
Interorbital width	33.9	32.1-34.0	30.9-35.5	33.2	1.3

Jaws equal, mouth terminal. Premaxillary dentition in two rows. Outer row with 3(4), 4*(25) or 5(1) tricuspid teeth and inner row with 5*(30) irregularly placed teeth with 5 cusps. Maxilla with 1(4), 2*(24), 3(4), or 4(1) tricuspid teeth along anterior dentigerous portion of bone. Dentary with single row of 4*(27) or 5(4) larger teeth with 5 cusps anteriorly followed by 5(2) or 6(2) distinctly smaller ones, with 1 or 3 cusps.

Dorsal-fin rays ii,8*(38). Anal fin short, iii-iv,11(3), 12*(24), 13(9), or 14(2) rays. Caudal fin forked, lobes rounded and similar in size, with some scales covering basal portion of rays. Principal caudal-fin rays i,8/8,i(1); i,9/8,i(33); or i,9/9/i*(1). Pectoral-fin rays i,9(5), 10(16), 11*(16) or 12(1), its tip falling short of pelvic-fin insertion. Pelvic-fin rays i,5(4), 6(32) or 7*(1). Adipose fin absent.

Scales cycloid. Lateral line incomplete. Pored scales: 5(1), 7(1), 9(2), 11(3), 12*(9), 13(7), 14(5), 15(4), 16(4) or 17(2). Longitudinal scale series including perforated scales 20(1), 22(2), 23(5), 24(4), 25(10), 26(7), 27*(5), 28(1), 29(1), 31(1) or 33(1) . Horizontal scale rows between lateral line and dorsal-fin origin 4(1) or 5*(37). Horizontal scale rows between lateral line and pelvic-fin origin 4*(38). Scale sheath along basal portion of anal-fin rays with 4*(6), 5(12), 6(12), 7(5), 8(2) or 9(1) scales in single series. Horizontal scale rows around caudal peduncle 13(3), 14*(34) or 15(1).

Scales between tip of supraoccipital process and dorsal-fin origin 10(6), 11(13), 12(11), 13*(1) or 14(1). Vertebrae 33(2) or 34(2). First gill arch with 6(2) epibranchial, 8(2) ceratobranquial, 1(2) on cartilage between ceratobranchial and epibranchial, and 2(2) hypobranchial gill-rakers.

Color in alcohol. Based on recently collected specimens. Preserved specimens with yellowish bodies and dark-brown chromatophores concentrated more dorsally and along posterior margin of scales (mainly in midportion), resulting in slightly reticulated pattern on body; humeral spot irregular, inconspicuous and vertically elongated, mid-lateral stripe extending from slightly behind humeral spot to middle caudal-fin rays. Fins with chromatophores more concentrated along rays than on membranes (Figs. 4-5).

Color in life. Body and head yellowish, more so along ventral portion of head, opercular series and anterior portion of body. Pectoral fin yellowish. Dorsal fin mostly hyaline. Pelvic fin reddish to yellowish. Anal fin red overall but turning yellowish along posteriormost rays. Caudal fin reddish along most superior and inferior rays and yellowish along median ones.

Sexual dimorphism. No secondary sexual characters were observed.

Distribution. *Hasemania crenuchoides* seems to be restricted to the streams from the upper rio Paraná and upper rio Tocantins in the Distrito Federal, Brazil. This is the first reference to the species for the rio Tocantins basin.

Fig. 4. *Hasemania crenuchoides*, all from Brazil, Distrito Federal, rio Paranaíba system, upper rio Paraná basin: (a) holotype, MZUSP 52732, male, 63.7 mm SL, córrego Planaltina, rio São Bartolomeu, rio Corumbá drainage; (b) DZSJRP 11039, female, 57.9 mm SL, córrego Paranoazinho, tributary of rio Sobradinho, rio São Bartolomeu basin. rio Maranhão system, rio Tocantins basin; (c) DZSJRP 14185, female, 64.5 mm SL, ribeirão da Contagem, Contagem Biological Reserve.

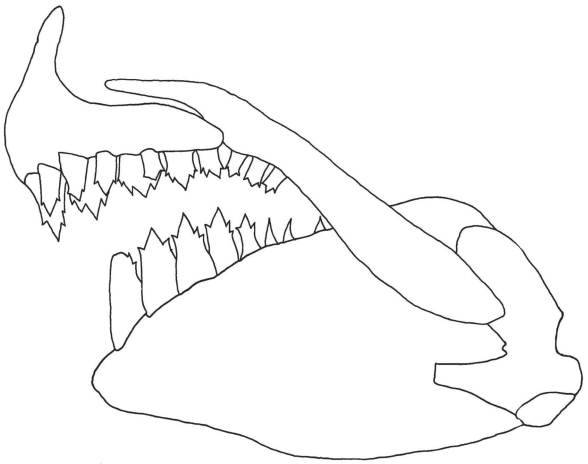

Fig. 5. Jaws of *Hasemania crenuchoides*, left side, DZSJRP 11039, 51.5 mm SL. Scale bar = 2 mm.

Material Examined. Brazil: Distrito Federal: Upper rio Paraná drainage. DZSJRP 11039, 47 (4 c&s, 33.8-50.7 mm SL) 20.3-58.0 mm SL, and DZSJRP 14222, 4, 42.9-52.9 mm SL, córrego Paranoazinho, tributary of rio Sobradinho. MHNG 2594.044, 2 of 5 paratypes, 28.0 and 38.0 mm SL; and MZUSP 52732, 63.7 mm SL, holotype, male, córrego Planaltina. Upper rio Tocantins drainage. DZSJRP 14185, 20, 35.6-78.2 mm SL, ribeirão da Contagem, Contagem Biological Reserve.

Discussion

The relationships of *Hasemania uberaba* and *H. crenuchoides* within the genus remain to be investigated. Nevertheless, the two species are probably closely related to *H. piatan* and *H. kalunga*, by sharing an apparently derived character, the presence of a rhinosphenoid entirely cartilaginous (*vs*. ossified). In the other species of *Hasemania* and small characids the rhinosphenoid is completely ossified, whereas in *H. uberaba*, *H. crenuchoides*, *H. piatan*, and *H. kalunga* a cartilage occurs in the position primitively occupied by the bone. Additionally, *H. uberaba*, *H. kalunga* and *H. piatan* share the presence of a single ossification in the position primitively occupied by infraorbitals four and five. *Hasemania uberaba* and *H. piatan*, in turn, share 18 principal caudal-fin rays (*vs*. 19 in other congeners, and most other characids and characiforms). Zanata & Serra (2010) have already proposed *H. piatan* as probably phylogenetically close to *H. crenuchoides* based in the presence of five infraorbitals and a cartilaginous rhinosphenoid. In spite of that, *H. crenuchoides*, *H. uberaba*, *H. kalunga* and *H. piatan* seem indeed to be closely related based on a combination of cartilaginous rhinosphenoid, larger and deeper bodies, and similar color pattern, with an irregular and vertically elongated humeral spot (*vs*. rhinosphenoid osseous, body shallow and small and humeral spot absent or rounded and horizontally elongated).

The monophyly of *Hasemania* based mainly on the absence of an adipose fin has been questioned by several authors (Böhlke, 1958; Géry, 1972, 1977; Weitzman & Malabarba, 1999; Lima & Gerhard, 2001). As a consequence, Lima & Gerhard (2001) described *Hyphessobrycon negodagua*, a species lacking the adipose fin, and maintain it within *Hyphessobrycon*. Even Ellis (1911), in the same paper in which she proposed *Hasemania*, described another characid fish lacking an adipose fin as *Hyphessobrycon taurocephalus* without further explanation. Despite being allocated to *Hyphessobrycon*, *H. negodagua* and *H. taurocephalus* are traditionally compared with *Hasemania* species due to the absence of adipose fin. *Hasemania crenuchoides* differs from *Hyphessobrycon negodagua* in its color pattern, by having 11-14 branched anal-fin rays (*vs*. 14-17), and the anal-fin base length 15.5-22.7% of SL (*vs*. 25.4-33.2%); from *H. taurocephalus* in its color patterns and by having ii,8 dorsal-fin rays (*vs*. ii,9). *Hasemania uberaba* differs from *H. negodagua* in its color pattern, by having 18 principal caudal-fin rays (*vs*. 19), 6-10 scales in the anal-fin base (*vs*. 3-5), the orbital diameter 21.2-33.9% of HL (*vs*. 39.1-48.4%) and the anal-fin base length 18.0-21.9% of SL (*vs*. 25.4-33.2%); from *H. taurocephalus* by having 18 principal caudal-fin rays (*vs*. 19), eight dorsal-fin rays (*vs*. 9) and the head length 30.1-33.7% of SL (*vs*. 26.3-29.2%).

Furthermore, *Hasemania crenuchoides* and *H. uberaba* lack the synapomorphies used to diagnose other characid groups lacking the adipose fin, *e.g.* a few Cheirodontinae (Malabarba, 1998); a few Xenurobryconini (Weitzman & Fink, 1985); *Nematobrycon* Eigenmann and *Grundulus* Valenciennes (Mirande, 2010); and *Coptobrycon* Géry (Langeani & Serra, 2010).

Comparative Material Examined. Brazil: *Hasemania hanseni*. ANSP 72105, 3, paratypes, 27.7-28.3 mm SL, Goiás. MZUSP 35676, 268, 2 c&s, 21.8-33.0 mm SL, Distrito Federal, córrego Pipiripau. *Hasemania kalunga*. DZSJRP 12339, 12, paratypes, 19.8-38.6 mm SL, 1 c&s, 34.2 mm SL, Goiás, tributary of rio das Almas. *Hasemania maxillaris*. FMNH 54303, holotype, 24.4 mm SL, Paraná, rio Iguaçu. *Hasemania melanura*. FMNH 54385, 39, paratypes, 2 c&s, 18.2-35.4 mm SL, Paraná, rio Iguaçu. *Hasemania nambiquara*: MCP 38038, 2 of 4 paratypes, 1 c&s, 21.6-23.1 mm SL, Mato Grosso, rio Mutum, rio Juruena. *Hasemania nana*. MZUSP 39171, 23, 1 c&s, 19.4-25.5 mm SL, Minas Gerais, ribeirão do Gado, rio São Francisco. MZUSP 39184, 30, 2 c&s, 19.4-23.8 mm SL, Minas Gerais, córrego Gameleira, rio São Francisco. *Hasemania piatan*. MZUSP 104538, holotype, 54.0 mm SL, Bahia, municipality of Piatã (córrego Três Morros, bridge on road between Piatã and Núbia), tributary of rio de Contas. DZSJRP 11933, 20, paratypes, 3 c&s, 23.1-33.5 mm SL, Bahia, municipality of Piatã, córrego Piabas, south of Piabas farm, tributary of rio de Contas. *Hyphessobrycon negodagua*. MZUSP 54589, 20, paratypes, 4 c&s, 21.7-28.8 mm SL, Bahia, Iraquara, fazenda Pratinha, rio Pratinha. *Hyphessobrycon taurocephalus*. FMNH 54390, 23, paratypes, 30.1-42.5 mm SL, Paraná, Serrinha Paraná, rio Iguaçu.

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