

## Two new species of the banjo catfish *Bunocephalus* Kner (Siluriformes: Aspredinidae) from the upper and middle rio São Francisco basins, Brazil

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Two new species of banjo catfish of the genus *Bunocephalus* are described from the upper and middle rio São Francisco basins of Brazil. *Bunocephalus hartti* is distinguished from all its congeners by the absence of serrations along the anterior margin of pectoral-fin spine in adults (*vs.* presence of serrations along the anterior margin of the spine). *Bunocephalus minerim* can be diagnosed from all congeners, except *B. larai*, by the absence of an epiphyseal bar between the paired frontals (*vs.* presence of the epiphyseal bar at least in adults). *Bunocephalus minerim* is distinguished from *B. larai* and other congeners, except *B. chamaizelus*, by having nine principal caudal-fin rays (*vs.* 10 principal caudal-fin rays).

Duas novas espécies de peixe-banjo do gênero *Bunocephalus* são descritas para as bacias do alto e médio rio São Francisco no Brasil. *Bunocephalus hartti* difere das demais espécies do gênero pela ausência de ganchos ao longo da margem anterior do espinho da nadadeira peitoral em adultos (*vs.* presença de ganchos ao longo da margem anterior do espinho). *Bunocephalus minerim* pode ser distinguido dos demais congêneres, exceto *B. larai*, pela ausência da barra epifiseana entre os frontais (*vs.* presença da barra epifiseana ao menos nos adultos). *Bunocephalus minerim* pode ser distinguida de *B. larai* e outras congêneres, exceto *B. chamaizelus*, pela presença de nove raios principais na nadadeira caudal (*vs.* 10 raios caudais principais).

**Keywords:** Biodiversity, Endemism, Neotropical, Systematics, Taxonomy.

### Introduction

*Bunocephalus* Kner, 1855 belongs to Aspredinidae, a group of Siluriformes known as banjo catfishes, recognized by their distinctively depressed head and body, followed by a slender caudal peduncle, resembling a banjo (Myers, 1960; Friel, 2003). As currently recognized, the *Bunocephalus* contains 11 valid species, distributed through most tropical river systems in South America, such as the Orinoco, Amazon, Paraná-Paraguay and rivers in the northwestern slope of the Andes (Friel, 2003; Cardoso, 2010; Eschmeyer, 2014). *Bunocephalus* species are benthic, usually found within leaf litter or buried in the substrate of slow-flowing backwaters of creeks and rivers (Leal *et al.*, 2011). The species of *Bunocephalus* appear to be generalized

omnivores, feeding on terrestrial insects, larvae of aquatic insects, small fishes, leaves and flowers (Mérigoux & Ponton, 1998; Melo *et al.*, 2004). *Bunocephalus* species are of no commercial interest for food, but several of them appear regularly in the ornamental fish trade (Friel, 2003).

In an attempt to improve aspredinid classification, some species previously included in *Bunocephalus* (*e.g.*, Friel, 2003; Ferraris, 2007) were placed in a new genus, *Pseudobunocephalus* Friel, 2008. However, hitherto there is not an unambiguous diagnosis for *Bunocephalus*, and there is no evidence that the remaining species still included in this genus do form a monophyletic group. Therefore, species that are included and were recently described in *Bunocephalus* lack the synapomorphic characters of other genera of Aspredinidae (Friel, 1994; Cardoso, 2010).

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Furthermore, the genus *Amaralia* Fowler, 1954 may be closely related to some species of *Bunocephalus* (Friel, 1994) and at this moment the monophyly of the genus is uncertain. There is also a debate as to whether the type species of *Bunocephalus* designated by Kner (1855) is *Silurus verrucosus* Walbaum, 1792 or *Bunocephalus hypsiurus* Kner, 1855 (Ferraris, 1991; 2007; Friel, 2003 *contra* Mees, 1988; 1996). Final resolution of these issues may only be possible following future taxonomical changes as result of phylogenetic analyses within the group, an ongoing research being performed by the authors.

The rio São Francisco basin has about 181 species of freshwater fishes with a high level of endemism, about 60% (106 spp.) of the total number of species (Albert *et al.*, 2011). The first record of a banjo catfish from rio São Francisco basin was made by Mees (1989) who tentatively identified a single specimen from a tributary of the rio das Velhas as *B. larai*. As indicated by several authors (Alves & Pompeu, 2001, 2005; Barbosa & Soares, 2009) the known populations of *Bunocephalus* in the São Francisco basin represent two undescribed species. Here we describe these two new species as endemics of the upper and middle portions of the rio São Francisco basin and we comment about their diagnostic characters.

#### Material and Methods

Measurements were taken point to point with a digital caliper. Measurements are expressed as percent of the standard length (SL), except subunits of head, expressed as percent of the head length (HL). The measurements follow those proposed by Friel (1994) and Cardoso (2010), except for cleithral process length, which was taken from the anterior margin of the cleithrum on its lateral portion to the posterior tip of the cleithral process. Vertebral counts include all preural vertebrae, including the five vertebrae modified into the Weberian Apparatus, plus the PU1+U1 and U2 elements on the caudal skeleton counted as a single vertebrae, according to Lundberg & Baskin, (1969) and de Pinna & Ng (2004). Cleared and stained specimens (c&s) were prepared according to the method described by Taylor & Van Dyke (1985). Sex was determined by direct inspection of gonads on dissected specimens. Anatomical illustrations were made under a stereomicroscope using a camera lucida. Drawings were digitized and edited using Adobe Photoshop CC and Adobe Illustrator CC. Photos of pectoral-fin spines were taken using an AxioCam ERc5s camera attached to a Zeiss Stemi 2000 C stereomicroscope. Osteological descriptions focused on aspects and characters used in previous phylogenetic studies of the family Aspredinidae (Friel, 1994; de Pinna, 1996; Cardoso, 2008). Osteological terminology follows de Pinna (1996), except for the lacrimal, here treated as antorbital. Institutional abbreviations follow Sabaj Pérez (2014). Pictures were taken in a photo-tank following the techniques described by Sabaj Pérez (2009) with a Nikon D90 and a Nikon D7100 digital SLR.

## Results

### *Bunocephalus hartti*, new species

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Fig. 1, Table 1

*Bunocephalus larai* non Ihering, 1930. -Mees, 1989: 238 [doubtfully referred]. -Friel, 2003: 263 [referred as undescribed].

*Bunocephalus* sp. n. -Alves & Pompeu, 2001: 185 [listed].

*Bunocephalus* sp. N. 1. -Alves & Pompeu, 2005: 597 [listed as undescribed].

*Bunocephalus* sp. A. -Barbosa & Soares, 2009: 162 [listed].

**Holotype.** MZUSP 62745, 54.8 mm SL, Brazil, Minas Gerais, Presidente Juscelino, rio Cipó at Fazenda Duas Barras, 18°41'04"S 43°59'18"W, 1 Jul 2000, C. B. M. Alves & P. S. Pompeu.

**Paratypes.** All from Minas Gerais, Brazil, rio São Francisco basin: CAS 53522, 1, 57.7 mm SL, creek tributary to rio das Velhas ca. 35 miles north of Belo Horizonte, 2 Feb 1941, T. D. White and others. MCP 45236, 1, 39.9 mm SL, Augusto de Lima municipality, rio Curimataí, tributary to rio das Velhas, 17°59'32"S 44°10'47"W, 9 Jul 2009, C. G. Leal & D. C. de Carvalho. MCP 48280, 1 c&s, 21.5 mm SL, Iguatama municipality, ribeirão São Miguel, tributary to rio São Francisco, 20°12'04"S 45°39'12"W, 26 Sep 2003, B. P. Nogueira and others. MNRJ 31385, 4 (1c&s), 37.2-42.6 mm SL, Piumhi municipality, mouth of rio Piumhi, 20°20'31"S 45°59'03"W, 28 Feb 2007, P. L. Gallo, L. H. Silva, D. L. Z. Kantek & W. A. M. Perez. MZUSP 39443, 1, 45.5 mm SL, rio Formoso, tributary to rio São Francisco, 8 Feb 1988, Y. Sato. MZUSP 39480, 1, 40.0 mm SL, rio São Francisco at mouth of rio Formoso, approx. 17°26'S 44°57'W, 8-10 Feb 1988, Y. Sato. MZUSP 64227, 3, 36.0-44.7 mm SL, Juatuba municipality, rio Paraopeba between Juatuba and Betim, approx. 19°56'S 44°18'W, 6 Nov 2000, C. B. M. Alves.

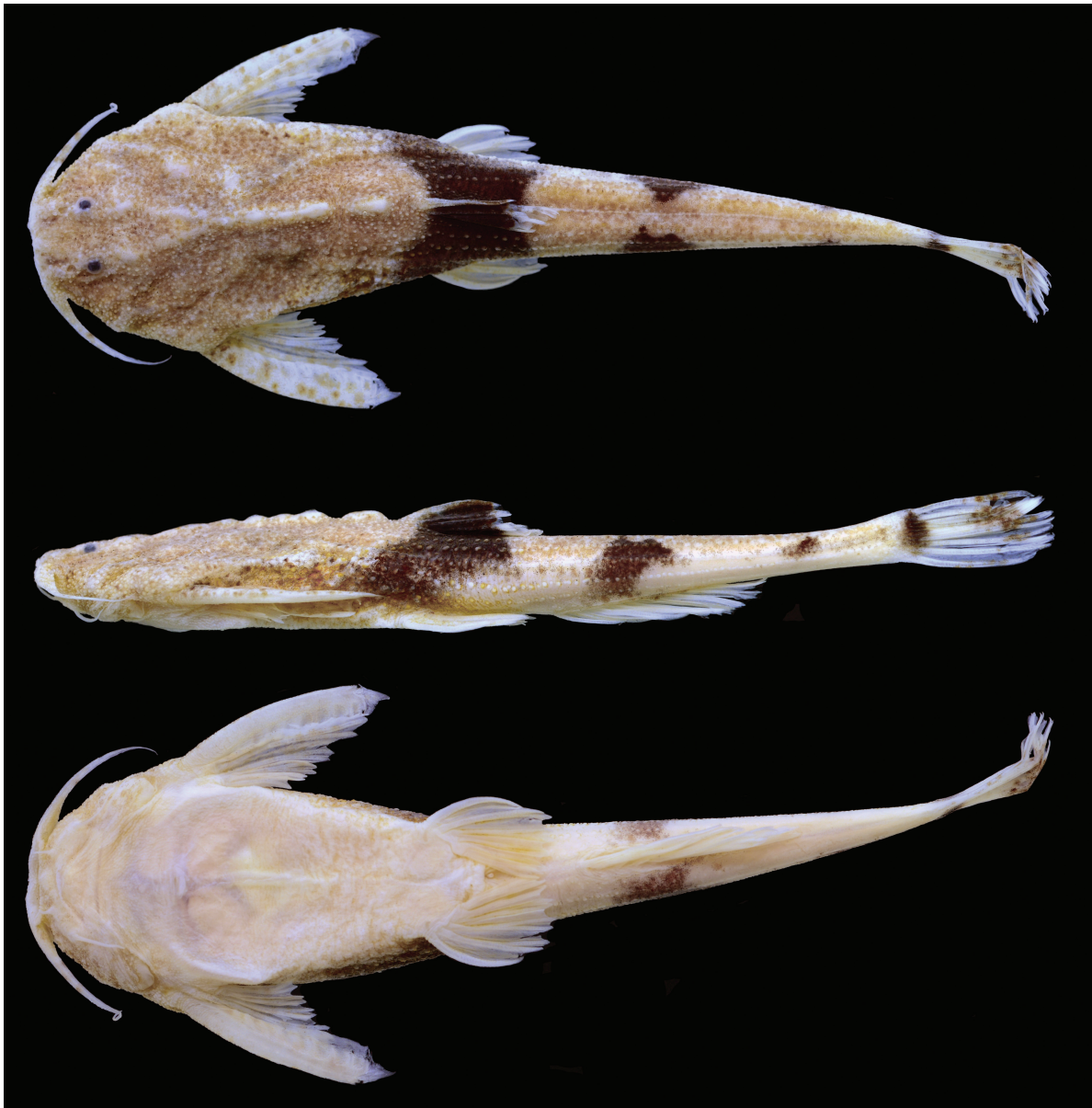
**Diagnosis.** *Bunocephalus hartti* is distinguished from all congeners by the absence of serrations along the anterior margin of the pectoral-fin spine in adults (Fig. 2a; *vs.* presence of serrations along the anterior margin in adults, Fig. 2c). *Bunocephalus hartti* can be further distinguished from most congeners, except for *B. verrucosus*, by having the last dorsal-fin ray completely or almost completely adnate to the dorsum (*vs.* dorsal-fin ray completely free or with less than half extension connected to the dorsum).

**Description.** Morphometric data summarized in Table 1. Maximum body size moderate to small compared to congeners (maximum observed size 57.7 mm SL). Dorsal, left lateral and ventral views of body in Fig. 1. Head and body depressed, lateral profile ascending from tip of

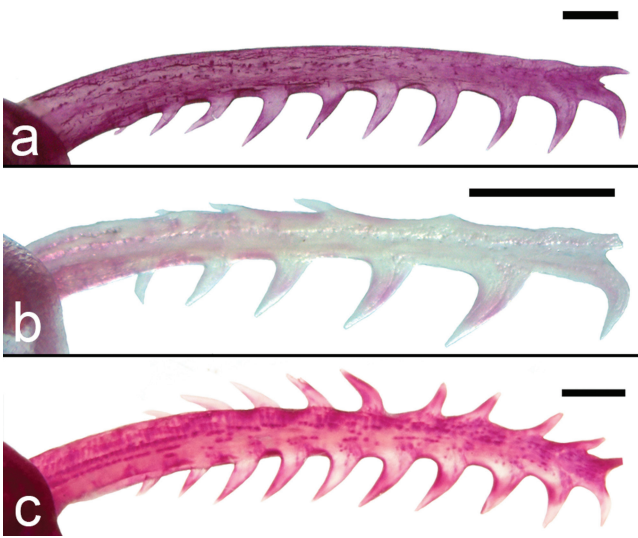
snout to dorsal-fin origin, with bony skull ornamentations in between. Posterodorsal profile of body straight and descending from dorsal-fin origin to near base of caudal fin, becoming slightly convex anterior to caudal-fin base. Ventral body profile convex from mouth to insertion of pelvic fin; concave from this point to anal-fin origin, straight and ascending from anal-fin origin to base of caudal fin, slightly concave at caudal-fin base. Caudal peduncle slender, somewhat rounded in cross section, but flattened dorsally and ventrally, shallowest at midpoint between end of anal fin and caudal-fin origin.

Skull ornamentation weakly developed. Eye small and positioned dorsolaterally. Skin covering eye dense and pale. Anterior nostril located terminally at tip of snout, associated with fleshy tube projecting beyond upper lip.

Posterior nostril without flap, opening anteromedially near eye. Mouth subterminal, upper lip more prominent relative to lower lip. All barbels simple, unbranched; maxillary barbel reaching or slightly surpassing insertion of pectoral-fin spine, posterolateral mental barbel twice as long as anteromedial one. Opercular opening reduced to small valvular slit located just anterior and medially to insertion of pectoral-fin spine. Axial slit pore present, dorsoventrally inclined underneath posterior cleithral process. Adult males with digitiform testes. Integument covered with large unculiferous tubercles, forming series of aligned longitudinal rows on posterior portion of body. Large and well-defined rows of tubercles on caudal peduncle, one on middorsum, and three on lateral of body. Other rows poorly defined.



**Fig. 1.** *Bunocephalus hartti*, MZUSP 62745, holotype, 54.8 mm SL, rio Cipó at fazenda Duas Barras, Presidente Juscelino, Minas Gerais, Brazil.

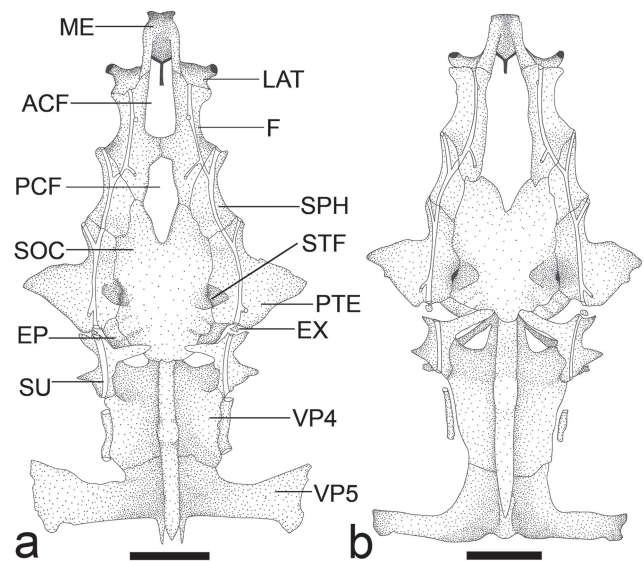


**Fig. 2.** Right pectoral-fin spines of cleared and stained specimens, in dorsal view. a. Adult specimen of *Bunocephalus hartti*, MNRJ 31385, 42.2 mm SL. b. Juvenile specimen of *Bunocephalus hartti*, MCP 48280, 21.5 mm SL. c. Adult specimen of *Bunocephalus minerim*, MCP 28379, paratype, 48.4 mm SL. Scale bar 1 mm.

Osteological description based on two cleared and stained specimens (21.5–42.2 mm SL, see paratype list). Anterior margin of mesethmoid slightly concave, anterolateral projection slightly pronounced (Fig. 3a). Ethmoid cartilage separate from articular facet of palatine. Frontal with lateral projections forming dorsal margin of eye. Frontal posteriorly projected laterally to posterior cranial fontanel and contacting supraoccipital, epiphyseal bar present. Supratemporal fossa present at middle portion of contact between pterotic and supraoccipital bones. Pterotic with laterally expanded and pointed bony shelf. Premaxilla with somewhat rectangular shape, bearing few teeth on its posteromedial margin. Dentary slender, abutting counterpart at medial portion, symphyseal portion slightly expanded, teeth present along anterior half of dorsal margin. Ascending process of Meckel's cartilage present. Coronomeckelian bone present. Hyomandibula associated with preopercle and posterior portion of mandibular laterosensory canal, supraopercle absent. Cartilaginous contact of hyomandibula with neurocranium restricted to sphenotic bone. Anterodorsal process of hyomandibula developed, contacting ventral surface of sphenotic. Opercular condyle of hyomandibula well developed. Metapterygoid present, contacting quadrate and hyomandibula. Endopterygoid present, somewhat triangular in shape, located underneath contact of palatine and lateral ethmoid. Posterior margin of palatine cartilaginous and rounded. Opercle "L" shaped, posterior arm larger than ventral arm. Interopercle present, triangular in shape and firmly attached to ventral arm of opercle. Dorsal hypohyal absent. Anterior ceratohyal with expanded lamina on anteroventral margin, contacting posterior ceratohyal by

means of cartilage and interdigitated suture. Posterior ceratohyal with foramen on midventral portion. Interhyal present. Four branchiostegal rays. Urohyal present, pointed anteriorly, with foramen and well developed lateral wings. First and second pharyngobranchials absent; third and fourth present and ossified. First hypobranchial ossified, second and third cartilaginous. Second and third basibranchial ossified, fourth cartilaginous. Third epibranchial bearing uncinated process. Gill rakers present in all branchial arches, but limited to few on first and second arches. Pharyngeal teeth well developed on upper tooth plate; about two rows of teeth on fifth ceratobranchial limited to its medial margin.

Dorsal lamina of Weberian complex reaching dorsal surface of body, lateral profile of lamina ascending posteriorly with anterior concavity and bony knob at middle portion and elevated crest posteriorly. Parapophysis of fourth vertebra forming broad lamina over swim bladder, contacting parapophysis of fifth vertebrae extensively. Parapophysis of fifth vertebra long, extending to lateral body surface transverse to main body axis. Distal portion of fifth parapophysis expanded. Total vertebrae 35. Vertebra bearing horizontal transverse processes from centrum nine to 31. Hemal spine contacting anal-fin pterygiophores bifid. Four to five pairs of ribs (modally five), on vertebrae six to nine or ten. Abdominal vertebrae foramina (hemal arches) for hemal canal on 6<sup>th</sup> or 7<sup>th</sup> and posteriorly on 10<sup>th</sup> vertebrae.



**Fig. 3.** Dorsal view of neurocranium and Weberian complex. a. *Bunocephalus hartti*, MNRJ 31385, paratype, 42.2 mm SL. b. *Bunocephalus minerim*, MCP 28379, paratype, 43.1 mm SL. ACF anterior cranial fontanel; EX, extrascapula; EP, epioccital; F, frontal; LAT, lateral ethmoid; SPH, sphenotic; SOC, supraoccipital; STF supratemporal fossa; SU, supraclathrum; PCF, posterior cranial fontanel; PTE, pterotic; VP4 parapophysis of fourth vertebra; and VP5 parapophysis of fifth vertebra. Scale bar = 5 mm.

Dorsal fin with five or six rays (modally five), without spinelet. First ray unbranched followed by four or five branched rays. Membrane of last dorsal-fin ray adnate to dorsum. Anterior nuchal plate absent, middle nuchal plate contacting posterior nuchal plate laterally. Posterior nuchal plate not developed laterally, lateral limit not extending beyond contact with middle nuchal plate. Pectoral fin with one rigid spine and five branched soft rays. Pectoral spine curved, feeble serrations present in anterior portion in juveniles, but absent in adults (Figs. 2a,b). Serrations along posterior margin of spine increasing in number with larger body sizes, maximum of 10 serrations on posterior margin. Two ossified plus one cartilaginous pectoral-fin radial. Postcoracoid process of pectoral girdle extending slightly posterior to postcleithral process in lateral view. Pelvic fin with six soft rays, second and third rays longest, not reaching anal-fin origin, first ray unbranched. Posterior

margin of basipterygium jagged. Lateral cartilage of basipterygium extending from its anteriormost portion to contact with last pelvic-fin ray. Anal fin with seven to nine rays (modally eight), first two or three unbranched, third of length of last anal-fin ray extension adnate by membrane to body. Caudal fin with ten principal rays, five associated with upper lobe and five with ventral lobe, posterior margin of caudal fin convex. Lowermost and uppermost caudal-fin rays unbranched, with proximal expansion and slightly shorter than branched middle rays. Caudal fin with two procurrent rays on upper and lower lobes, anterior procurrent ray small, triangular in shape, posterior procurrent ray longer and spine like. Posterior margin of upper hypural plate extending posteriorly further than lower hypural plate (hypurals one and two fused with parhypural). Second ural half-centrum well developed. Adipose fin absent.

**Table 1.** Morphometric data of holotype and paratypes of *Bunocephalus hartti* (n=11 including the holotype) and *Bunocephalus minierim* (n=17 including the holotype). H= holotype; Max = maximum; Min = minimum; SD = standard deviation; and unb = unbranched.

	<i>Bunocephalus hartti</i>					<i>Bunocephalus minierim</i>				
	H	Min	Max	Mean	SD	H	Min	Max	Mean	SD
Standard length	54.8	35.8	54.8	41.75	-	37.9	29.5	45.4	38.2	-
	Percent of standard length									
Head length	22.6	21.9	27.7	24.1	1.92	24.0	22.1	27.3	23.7	1.31
Prepectoral length	20.4	20.4	26.1	23.1	1.58	24.2	21.9	26.0	24.0	1.09
Cleithral width	27.4	26.9	29.2	28.0	0.74	29.8	27.1	31.4	29.7	1.14
Maximum head depth	12.9	12.1	14.6	13.4	0.73	14.7	12.6	15.0	13.8	0.67
Pectoral-spine length	20.2	20.3	25.8	24.1	1.64	24.8	21.0	25.8	23.7	1.53
Distance between coracoid processes	19.9	16.0	23.1	18.5	2.09	21.1	16.6	21.1	19.2	1.31
Coracoid process length	9.8	7.0	9.9	8.7	1.10	10.0	8.8	12.6	11.0	1.06
Distance between cleithral processes	20.9	19.1	21.5	20.1	0.77	22.9	20.6	24.6	22.7	1.12
Cleithral process length	13.8	12.9	15.4	14.1	0.75	15.5	13.0	15.6	14.5	0.69
Predorsal length	43.0	42.3	45.0	43.4	0.77	42.7	40.1	45.8	42.0	1.69
Depth at dorsal-spine insertion	11.7	10.4	13.6	12.1	0.93	14.5	10.4	17.1	14.2	2.02
Dorsal-spine length	12.6	12.4	17.0	14.7	1.44	14.7	14.8	18.2	16.4	1.07
Prepelvic length	43.8	42.0	49.3	45.0	2.26	48.5	40.4	48.5	43.7	2.24
Length of 1st unb. pelvic-fin ray	11.3	11.3	13.7	12.3	0.77	12.9	12.6	15.1	13.8	0.92
Preanal length	60.9	60.6	63.4	62.0	0.95	63.8	56.6	63.9	60.0	2.07
Anal-fin base length	19.1	14.7	19.2	16.3	1.21	21.6	18.1	23.6	20.6	1.56
Caudal-peduncle length	18.8	18.1	24.6	21.9	2.10	18.4	18.1	23.6	20.6	1.56
Caudal-peduncle depth	4.2	3.9	4.7	4.3	0.27	4.7	3.6	5.1	4.4	0.41
Caudal -fin length	15.7	15.7	23.7	20.8	2.24	22.9	21.1	27.3	24.2	1.67
	Percent of head length									
Snout length	29.0	26.5	32.3	29.8	1.49	35.1	26.8	35.2	30.0	2.26
Eye diameter	8.9	7.4	10.4	9.0	0.90	8.7	8.6	12.2	10.4	1.17
Interorbital width	25.0	23.5	30.2	26.9	2.36	31.8	30.2	35.8	33.0	1.52
Maxillary-barbel length	71.7	64.3	94.8	76.0	9.98	87.9	72.0	111.1	93.4	11.36
Distance between anterior nares	16.9	16.7	21.9	18.7	1.90	21.9	17.3	24.7	22.0	1.90
Distance between posterior nares	27.4	24.0	31.3	28.4	2.46	31.8	27.6	34.5	31.9	1.73
Mouth width	33.8	31.1	41.7	36.2	3.33	36.2	32.2	45.3	38.3	3.38

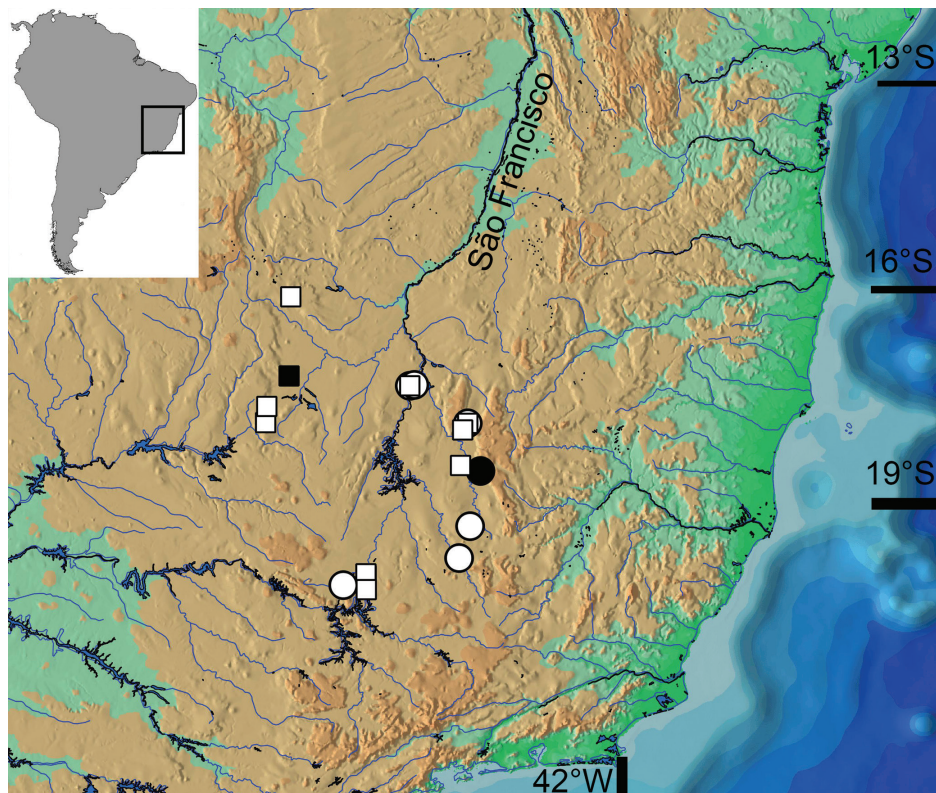
Nasal canal ossified and positioned laterally to mesethmoid, one or two separate tubular ossifications around canal. Antorbital present, with anterior limb pointed, extending anterior to anterior margin of premaxilla. Antorbital mesial limb rounded and associated with laterosensory canal. Infraorbital canal present with three tubular ossifications, canal exiting antorbital, passing below eye margin and entering neurocranium through sphenotic. Mandibular canal interrupted, with two tubular ossifications lateral to posterior portion of dentary, and two tubular ossifications near to contact with preopercle. Extrascapular present. Lateral line not associated with fourth parapophyses, anterior portion running just aside margin of parapophyses. Lateral line complete, extending variably to caudal peduncle, formed by simple tubes, median portion presenting small inconspicuous hooks.

**Color in alcohol.** Head and body light brown dorsally, ventral portions lighter brown to yellowish pale. Four saddles of dark coloration on dorsal surface of body. First dark saddle at level of dorsal fin, second at anal fin vertical, third at middle caudal peduncle and fourth at origin of caudal fin. Second, third and fourth saddles sometimes not connected at middorsal line. Dorsal fin mostly dark brown with light distal margin; pectoral fin whitish cream to hyaline with small light brown spots, pelvic and anal fins mostly hyaline, without conspicuous dark spots. Caudal fin hyaline with dark blotch at proximal portion and scattered black spots on distal third sometimes forming band.

**Distribution.** Known from several tributaries of the upper and middle rio São Francisco basins including the das Velhas, Paraopeba and Formoso rivers in Minas Gerais State, Brazil (Fig. 4).

**Etymology.** The epithet *hartti* is a patronym honoring Charles Frederick Hartt, a Canadian-American geologist, and first professor of Geology at Cornell University. Hartt worked extensively in Brazil, and a few of his notable accomplishments include the publication of “Geology and physical geography of Brazil” (Hartt, 1870), and serving as the founder and director of the section of geology at the Museu Nacional of Brazil from 1866 to 1867.

**Conservation status.** *Bunocephalus hartti* is known from an Extent of Occurrence (EOO) of approximately 34,000 km<sup>2</sup>, and despite some areas within its range suffer continuing decline in habitat quality because of contamination from the city of Belo Horizonte and also mining and agriculture, there is no evidence of its habitat being severely fragmented or occurring extreme fluctuations in range or number of individuals. Considering that no specific threats to the species were detected, *B. hartti* is categorized as Least Concern (LC) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions subcommittee, 2014).



**Fig. 4.** Distribution map of the new species of *Bunocephalus* in the rio São Francisco basin, Brazil. Circles represent *Bunocephalus hartti* and squares represent *B. minerim*, solid symbols indicate the type-localities.

***Bunocephalus minerim*, new species**

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Figs. 5, 6, Table 1

*Bunocephalus* sp. N. 2. -Alves & Pompeu, 2005: 597 [listed as undescribed].

*Bunocephalus* sp. B. -Barbosa & Soares, 2009: 162 [listed].

*Bunocephalus* sp. -Leal *et al.*, 2011: 148 [ecology]. -de Carvalho *et al.*, 2011: 85 [barcoded].

**Holotype.** MCP 47087, 37.9 mm SL, Brazil, Minas Gerais, Guarda-Mor municipality, córrego Guarda-Mor, near the town of Guarda-Mor on highway BR-364, 17°44'52"S 47°05'40"W, 21 Jan 2012, R. E. Reis, E. H. L. Pereira & P. C. Lehmann A.

**Paratypes.** All from Minas Gerais, Brazil, rio São Francisco basin: ANSP 172080, 1, 24.4 mm SL, Curvelo municipality, rio Picão approx. 20 km NE of Curvelo, 18°36'14"S 44°17'06"W, 11 Jul 1993, S. A. Schaefer and others. MCP 16742, 1, 36.8 mm SL, Curvelo municipality, rio Picão at road from Curvelo to Monjolos, 18°36'14"S 44°17'06"W, 11 Jul 1993, R. E. Reis, E. L. Pereira & S. A. Schaefer. MCP 28378, 1, 45.3 mm SL, Paracatu municipality, stream at highway BR-040 from Paracatu to João Pinheiro, 17°18'15"S 46°46'16"W, 24 Jan 2001, C. A. S. Lucena, J. F. P. Silva, E. L. Pereira & A. R. Cardoso. MCP 28379, 2 c&s, 43.1-48.4 mm SL, Guarda-Mor municipality, córrego Macaúba tributary to rio Claro on road between Coromandel and Guarda-Mor, 17°58'57"S 47°06'41"W, 24 Jan 2001, C. Lucena, J. F. P. Silva, E. H. L. Pereira & A. R. Cardoso. MCP 34665, 3 (1 c&s), 29.8-32.9 mm SL, Iguatama municipality, ribeirão São Miguel tributary to rio São Francisco, 20°12'00"S 45°39'09"W, 26 Sep 2003, B. P. Nogueira. MCP 45156, 10, 36.2-42 mm SL, Augusto de Lima municipality, rio Curimataí, tributary to rio das Velhas, 17°59'34"S 44°10'48"W, 9 Dec 2009, C. G. Leal & D. C. Carvalho. MCP 45242, 23 (2 c&s), 11.2-41.7 mm SL, Augusto de Lima municipality, rio Curimataí, tributary to rio das Velhas, 17°59'34"S 44°10'48"W, 9 Dec 2009, C. G. Leal & D. C. Carvalho. MCP 45759, 1, 42.4 mm SL, Augusto de Lima municipality, rio Curimataí, tributary to rio das Velhas, 17°59'34"S 44°10'48"W, 24 May 2009, F. A. Sampaio, F. Suzuki & R. Couto. MCP 45763, 1, 38.8 mm SL, Augusto de Lima municipality, rio Curimataí, tributary to rio das Velhas, 17°59'34"S 44°10'48"W, 24 May 2009, F. A. Sampaio, F. Suzuki & R. Couto. MNRJ 26500, 3, 30.6-36.6 mm SL, Iguatama municipality, rio São Miguel at Fazenda Doce de Leite, 20°11'59"S 45°39'09"W, 21 Dec 2003, B. P. Nogueira, G. A. Pereira & R. E. S. Hojo. MNRJ 31414, 3, 23.1-37.6 mm SL, Pains municipality, ribeirão Moendas, tributary to rio São Miguel, 20°26'31"S 45°40'00"W, 26 Aug 2007, P. A. Buckup, M. R. Britto & U. Jaramillo. MZUSP 39444, 2, 27.8-30.3 mm SL, rio Formoso, tributary to rio

São Francisco, 8 Feb 1988, Y. Sato. MZUSP 73800, 5, 34.4-42.4 mm SL, Augusto de Lima municipality, rio Curimataí at fazenda Vitória, 18°05'43"S 44°16'15"W, 16 Aug 2001, C. B. M. Alves & P. S. Pompeu. UFRGS 11273, 2, 40-40.9 mm SL, Unai/Palmeirinha municipalities, stream at road between Unai and Palmeirinha, 16°09'22"S 46°44'48"W, 11 Sep 2009, G. Frainer, F. R. Carvalho & V. A. Bertaco. UFRGS 11374, 1, fixed and preserved in ethanol 95%, 42.4 mm SL, Unai/Palmeirinha municipality, stream at road between Unai and Palmeirinha, 16°09'22"S 46°44'48"W, 11 Sep 2009, G. Frainer, F. R. Carvalho & V. A. Bertaco.

**Sequences. Genseq-2 COI:** Published sequences from a barcode study of the fauna of the São Francisco River basin (de Carvalho *et al.*, 2011) identified as *Bunocephalus* sp. are available of paratypes MCP 45156, MCP 45763 and MCP 45759. These correspond to genseq-2 COI following the nomenclature of Chakrabarty *et al.* (2013). GenBank accession numbers for these sequences are: HM405074 and HM405075 for MCP 45156; HM405076 for MCP45763; and HM405077 for MCP45759.

**Diagnosis.** *Bunocephalus minerim* can be diagnosed from all congeners, except *B. larai*, by the absence of an epiphyseal bar between the paired frontals (*vs.* presence of the epiphyseal bar at least in adults). *Bunocephalus minerim* is distinguished from *B. larai* and other congeners, except *B. chamaizelus*, by having 9 principal caudal-fin rays (*vs.* 10 principal caudal-fin rays).

**Description.** Morphometric data summarized in Table 1. Maximum body size small compared to congeners (maximum observed size 48.8 mm SL). Dorsal, left lateral and ventral views of body in Figs. 5-6. Head and body depressed, lateral profile almost straight and ascending from supraoccipital tip to dorsal-fin origin, bony humps at posterior end of Weberian lamina and at middle nuchal plate. Posterodorsal profile of body straight and descending from origin of dorsal fin to caudal-fin base. Ventral body profile convex from mouth to insertion of pelvic fin; concave from this point to anal-fin origin, straight and ascending from anal-fin origin to base of caudal fin, slightly convex at caudal-fin base. Caudal peduncle slender, round in cross section, shallowest at midpoint between end of anal fin and caudal-fin origin.

Skull ornamentations weakly developed, conspicuous bony knobs absent in adult specimens. Eye small and positioned dorsolaterally. Skin covering eye dense and pale. Anterior nostril located terminally at tip of snout, associated with fleshy tube projecting beyond upper lip. Posterior nostril without flap, opening anteromedially near eye. Mouth subterminal, upper lip more prominent relative to lower lip. All barbels simple, unbranched, maxillary barbel slightly surpassing insertion of pectoral-fin spine, posterolateral mental barbel twice as long as anteromedial one. Opercular opening reduced to small valvular slit located just anterior and medially to insertion of pectoral-

fin spine. Axial slit pore present, dorsoventrally inclined underneath posterior cleithral process. Some female specimens with eggs attached to lateral and ventral surface of the body and pectoral, pelvic and anal fins (Fig. 6). Adult males with digitiform testes. Integument covered with

small unculiferous tubercles, those on posterior portion of body larger and forming series of aligned longitudinal rows. Large and well-defined rows of tubercles on caudal peduncle, especially in juveniles, one on middorsum and three on lateral of body. Other rows poorly defined.



**Fig. 5.** *Bunocephalus minerim*, MCP 47087, holotype, 37.9 mm SL, córrego Guarda-Mor near the town of Guarda-Mor on highway BR-364, Minas Gerais, Brazil.





**Fig. 6.** Paratype specimens of *Bunocephalus minierim*. a. Dorsal view of MCP 34665, 31.5 mm SL; showing the saddled pattern of a distinct color morph. b. Left lateral view of a mature female, MCP 45242, 41.4 mm SL, showing the eggs adhered and marks of previously attached eggs on the lateral and ventral portions of body and fins.

Osteological descriptions based on five cleared and stained specimens (32.6–47.6 mm SL). Anterior margin of mesethmoid straight, anterolateral projections absent. Ethmoid cartilage separate from articular facet of palatine. Frontal with lateral projections forming dorsal margin of eye. Frontal posteriorly projected laterally to posterior cranial fontanel and contacting supraoccipital, epiphiseal bar absent. Supratemporal fossa present at middle portion of contact between pterotic and supraoccipital bones. Pterotic with laterally expanded and pointed bony shelf. Premaxilla with somewhat rectangular shape, bearing teeth on its posteromedial margin. Dentary slender, abutting counterpart at medial portion, symphyseal portion slightly expanded, teeth present along most of dorsal margin of dentary. Ascending process of Meckel's cartilage present, contacting main portion of this cartilage. Coronomeckelian

bone present. Hyomandibula associated with preopercle and posterior portion of mandibular laterosensory canal, supraopercle absent. Cartilaginous contact of hyomandibula with neurocranium restricted to sphenotic bone. Anterodorsal process of hyomandibula developed, contacting ventral surface of sphenotic. Metapterygoid present (bilaterally absent in some specimens), small in size and ventrally contacting dorsal margin of quadrate. Endopterygoid present, somewhat squared in shape, located underneath contact of palatine and lateral ethmoid. Posterior margin of palatine cartilaginous and rounded. Opercle "L" shaped, posterior arm larger than ventral arm. Interopercle present, triangular in shape and firmly attached to ventral arm of opercle. Dorsal hypohyal absent. Anterior ceratohyal with expanded lamina on anteroventral margin, contacting posterior ceratohyal by means of cartilage and

interdigitated suture. Posterior ceratohyal with foramen on midventral portion. Interhyal present. Typically five branchiostegal rays (four on one side in few specimens). Urohyal present, pointed anteriorly, without foramen. Lateral wings and dorsal keel of urohyal reduced or absent. First and second pharyngobranchials absent, third present and ossified, fourth present and variably ossified. First hypobranchial ossified, second variably ossified and third cartilaginous. Second basibranchial ossified, third variably ossified. Third epibranchial bearing uncinated process. Gill rakers absent on first and second branchial arches, small and scattered on third and fourth arches. Pharyngeal teeth well developed on upper tooth plate; about two rows of teeth on fifth ceratobranchial.

Dorsal lamina of Weberian complex reaching dorsal surface of body, lateral profile of lamina ascending posteriorly with anterior concavity and bony knob at middle portion (Fig. 3b). Parapophysis of fourth vertebra forming broad lamina over swim bladder presenting hook-shaped process at posterior lateral margin. Parapophysis of fourth vertebra contacting parapophysis of fifth vertebrae extensively. Parapophysis of fifth vertebra long, extending to lateral body surface transverse to main body axis. Distal portion of fifth parapophysis expanded in adult specimens. Total vertebrae 34-37 (modally 34). Vertebrae bearing horizontal transverse processes from 7<sup>th</sup> to penultimate centrum. Hemal spines simple, those contacting anal-fin pterygiophores not bifid. Four pairs of ribs, on vertebrae six to nine. Abdominal vertebrae foramina (hemal arches) for hemal canal on 6<sup>th</sup> or 7<sup>th</sup> and posteriorly on 11<sup>th</sup> vertebrae.

Dorsal fin with four or five rays (modally five), without spinelet. First ray unbranched followed by three or four branched rays. About half length of last dorsal-fin ray adnate to dorsum by membrane. Anterior nuchal plate absent, middle nuchal plate contacting posterior nuchal plate laterally. Posterior nuchal plate not developed laterally, lateral extension passing slightly beyond contact with middle nuchal plate. Pectoral fin with one rigid spine and five branched soft rays, last one variably branched. Pectoral spine curved, bearing recurved serrations along  $\frac{3}{4}$  of its anterior and posterior margins. Serrations increasing in number with larger body sizes, to maximum of 10 serrations on anterior and posterior margin of pectoral spines. A single ossified plus one cartilaginous pectoral-fin radial, one specimen with two ossified and one cartilaginous radial. Postcoracoid process of pectoral girdle extending slightly posterior to postcleithral process in lateral view. Pelvic fin with six soft rays, second and third rays longest, just reaching to anal-fin origin, first ray unbranched. Basipterygium with reniform shape, its posterior margin jagged and not bearing cartilaginous tip in adults. Lateral cartilage of basipterygium extending from anteriormost portion of bone to contact with last pelvic-fin ray. Anal fin with seven to nine rays (modally nine), first three to five unbranched. Caudal fin with nine principal rays, five associated with upper lobe and four

with ventral lobe, posterior margin of caudal fin convex. Lowermost and uppermost principal caudal-fin rays unbranched with proximal expansion and slightly shorter than branched middle rays. Caudal fin with two procurent rays on upper and lower lobes, anterior procurent circular to rectangular in shape, posterior procurent ray longer and spine-like. Posterior margin of upper hypural plate extending posteriorly further than lower hypural plate. Second ural half-centrum well-developed. Adipose fin absent.

Nasal canal ossified positioned laterally to mesethmoid, variably one or two tubular ossifications around canal. Antorbital present, with anterior limb pointed, extending anterior to anterior margin of premaxilla. Antorbital mesial limb rounded and associated with laterosensory canal. Infraorbital canal present with three tubular ossifications, canal exiting antorbital, passing below eye margin and entering neurocranium through sphenotic. Mandibular canal interrupted, with one tubular ossification lateral to posterior portion of dentary, and one or two tubular ossification near to contact with preopercle. Extrascapular present. Lateral line not associated with fourth parapophysis, anterior portion running just ventrally to margin of parapophysis. Lateral line complete; extending variably to caudal peduncle, with simple ossified tubes presenting variably few inconspicuous hooks on anterior portion.

**Color in alcohol.** Pigmentation variable with two distinct color morphs of overall dark and light patterns (Figs. 6a-b). Dark morph with dorsal portion of head and body dark brown with three poorly defined and variably present dark saddles, first beneath dorsal fin, second at vertical through middle of anal fin and third at end of caudal peduncle (Fig. 5). Light morph have similar pigmentation pattern but with light brown dorsal surface contrasting with clearly defined dark brown saddles; lateral portion of body with irregularly mottled dark blotches (Fig. 6a). Ventral surface of body overall light brown with dark pigment concentrated in unculiferous tubercles. Pectoral, ventral and anal fins with scattered dark pigment. Dorsal and caudal fins overall dark with light distal portions. Caudal fin sometimes bearing clear patch at proximal portion.

**Distribution.** Known from several tributaries of the upper and middle rio São Francisco basins including the das Velhas, Formoso, Paraopeba and Paracatu rivers in Minas Gerais State, Brazil (Fig. 4).

**Etymology.** The specific epithet, *minerim*, refers to the typically regional manner of pronouncing the Portuguese word “mineirinho”, diminutive of “mineiro”, which refers to a person that comes from the State of Minas Gerais. The name is an allusion to the region where it is found and also to its relative small size in comparison with other species of *Bunocephalus*. A noun in apposition.

**Conservation status.** *Bunocephalus minerim* is known from an Extent of Occurrence (EOO) of approximately 75,000 km<sup>2</sup>, and despite some areas within its range suffer continuing decline in habitat quality because of contamination from the city of Belo Horizonte and also mining and agriculture, there is no evidence of its habitat being severely fragmented or occurring extreme fluctuations in range or number of individuals. Considering that no specific threats to the species were detected, *B. minerim* is categorized as Least Concern (LC) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2014).

### Discussion

The new species described herein in *Bunocephalus* share three apomorphic features proposed by Friel (1994) to a clade composed by *Amaralia* and *Bunocephalus*: middle nuchal plate ornamentation well developed; posterior margin of basipterygium jagged and lateral line ossicles with small hooks, this last feature being variable in *B. minerim*. The new species do not share most of the seven apomorphic features of *Amaralia* (Friel, 1994), except for the presence of four branchiostegal rays and absence of serration on anterior portion of pectoral-fin spine in *B. hartti*. With the limited information at hand, we prefer to include these new species in *Bunocephalus* since reviewing the composition and the monophyly of these two genera are beyond the scope of the present paper.

The two new species of *Bunocephalus* can be diagnosed among other species of the genus by apomorphic characters, which can be related to morphological changes during ontogeny. *Bunocephalus hartti* is unique within the species of the genus by the absence of serrations on the anterior margin of the pectoral-fin spine in adults (Fig. 2a). Feeble serrations are observed in the pectoral-fin spines of juveniles of *Bunocephalus hartti* (Fig. 2b), and during ontogeny these serrations seem to be absorbed by the growth of the anterior portion of the spine. Within Aspredinidae, serrations on the anterior margin of the spine are absent in most hoplomyzontines, *Xyliphius* Eigenmann, 1912, *Amaralia* and seem to have been lost multiple times within the family (Friel, 1994).

Most species of *Bunocephalus* possess the plesiomorphic condition within aspredinids of having an epiphyseal bar between the paired frontals. The only exceptions are *B. larai*, endemic from the upper rio Paraná basin, and the new species herein described *B. minerim*. The presence of the epiphyseal bar can be related to the degree of ontogenetical development of the specimens: a developmental series of *B. verrucosus* (INPA 4395) contains a juvenile specimen (38.4 mm SL) with incomplete medial contact between the frontals, whereas the bar is completely formed in all individuals above 68 mm SL. According to Friel (1994, 2008) the absence of an epiphyseal bar is also observed in some members of the

genus *Pseudobunocephalus* and at least in *Xyliphius lepturus* Orcés, 1962. Therefore the loss of the epiphyseal bar in adults seems to have evolved independently at least three times within aspredinids, perhaps as retention of a juvenile feature. Within *Bunocephalus* the absence of the epiphyseal bar may suggest a close relationship between *B. larai* and *B. minerim*.

An interesting feature observed in *Bunocephalus minerim* is the presence of eggs directly attached to the skin surface of some females (e.g., MCP 45242, MCP 45156, MZUSP 73800 and UFRGS 11273). Such parental care in the form of physical attachment to developing embryos has previously been reported in some aspredinids such as *Pterobunocephalus*, *Platystacus*, *Aspredo*, and *Aspredinichthys* (Friel, 2003). In *Pterobunocephalus*, like in *B. minerim*, the eggs are directly attached to the body, whereas in *Platystacus*, *Aspredo*, and *Aspredinichthys* eggs are attached to fleshy stalks, called cotylephores (Wetzel *et al.*, 1997). Within *Bunocephalus* this feature is rarely observed. From an extensive examination of museum specimens of *Bunocephalus* (Friel, 1994; Cardoso; 2008; lots listed herein) only three other specimens of a *Bunocephalus* cf. *coracoideus* from French Guiana were observed carrying adhesive eggs (CUMV 81970). However, the eggs in these specimens are more superficially attached to body in comparison with *B. minerim*, in which depressions on the skin surface are observed (Fig. 6b).

**Comparative Material Examined.** *Amaralia hypsiura*: **Brazil**: INPA 32338, 3 (1 c&s), 70-79 mm SL, Porto Trombetas, Pará. *Amaralia* sp.: **Paraguay**: UMMZ 207818, 2 (1 c&s), 84-118 mm SL, Río Aquidaban at Paso Horqueta, Concepción. *Bunocephalus aloikae*: **French Guiana**: ZMA 102.229, 62.5 mm SL (holotype of *Bunocephalus amaurus aloikae* Hoedeman, 1961), Rivière Litany near Aloiké village. *Bunocephalus aleuropsis*: **Brazil**: MCP 34142, 2, 36.3-37.4 mm SL, rio São João, Ribeirão Cascalheira, Mato Grosso. MCP 35744, 1, 46.3 mm SL, Bujari, rio Riozinho do Andirá, Bujari, Acre. UNT 2038, 1, 45.3 mm SL, Ipueiras, rio Tocantins, Tocantins. UNT 2039, 1 c&s, 66.8 mm SL, rio Tocantins, Tocantins, Brazil. *Bunocephalus amaurus*: **Guyana**: FMNH 53121, 55.8 mm SL (holotype of *Bunocephalus amaurus* Eigenmann, 1912), Konawaruk. **Suriname**: ZMA 102.228, 70.6 mm SL (holotype of *Bunocephalus amaurus sipaliwini* Hoedeman, 1961), bordering Paru Savannah, Sipaliwini. *Bunocephalus colombianus*: **Colombia**: FMNH 56038, 71.2 mm SL (holotype of *Bunocephalus colombianus* Eigenmann, 1912), Raspadura, Choco. FMNH 56668, 1, 112.7 mm SL (paratype of *Bunocephalus colombianus* Eigenmann, 1912), Raspadura, Choco. CAS 35249, 1, 84.7 mm SL (paratype of *Bunocephalus colombianus* Eigenmann, 1912), rio Quito into rio Atrato, Quibdó, Choco. *Bunocephalus chamaizelus*: **Guyana**: FMNH 53122, 26.7 mm SL (holotype of *Bunocephalus chamaizelus* Eigenmann, 1912), Erukin. FMNH 53123, 1 of 2 35.2 mm SL (paratype of *Bunocephalus chamaizelus* Eigenmann, 1912), Erukin. FMNH 53125, 2, 22.3-28.1 mm SL (paratypes of *Bunocephalus chamaizelus* Eigenmann, 1912), Gluck Island. FMNH 7370, 1, 23.3 mm SL (paratype of *Bunocephalus chamaizelus* Eigenmann, 1912) Tumatumari, lower Potaro River.

ROM 91314, 5 (1c&s), 17.5-30.3 mm SL, Imbaima Creek tributary to Kuribrong River, Potaro-Siparuni. ROM 91386, 4 (1c&s), 18.8-29 mm SL, Creek tributary to upper Kuribrong River, Potaro-Siparuni. *Bunocephalus coracoideus*: **Peru**: ANSP 138984, 2 (1 c&s), 49.2-80.0 mm SL, Río Nanay at vicinity of Iquitos, Loreto. **French Guiana**: CUMV 81970, 4, 81.6-84.5 mm SL, Rivière Sinnamary. **Brazil**: MNHG 255032, 6 of 10, 70.6-84.0 mm SL, Igarapé Cuxiú, near Ourém, Pará. MHNG 2551.015, 1, 82.9 mm SL, rio Tocantins, ca. 3 km of São Félix, Tocantins. *Bunocephalus doriae*: **Brazil**: MCP 13176, 7 (1 c&s), 36.0-50.9 mm SL, rio Uruguai, São Nicolau. MCP 14267, 6 (1 c&s) 61.5-73.2 mm SL, rio Negro on road between Bagé and Aceguá, Bagé, Rio Grande do Sul, *Bunocephalus erondinae*: **Brazil**: MCP 40877, 82.9 mm SL (holotype of *Bunocephalus erondinae* Cardoso, 2010), canal São Gonçalo, Pelotas, Rio Grande do Sul. MCP 40878, 17 (1 c&s), 56.6-76.9 mm SL (paratypes of *Bunocephalus erondinae* Cardoso, 2010). MCP 43519, 2 (1 c&s), 33.5-61.1 mm SL, rio das Antas at mouth, Cotiporã, Rio Grande do Sul. *Bunocephalus knerii*: **Ecuador**: FMNH 99481, 1, 50.7 mm SL, stream tributary to Río Payamino, Capihuara, Napo. NMW 10976, 1 50.7 mm SL (syntype of *Bunocephalus kneri* Steindachner, 1882), Canelos. *Bunocephalus larai*: **Brazil**: MCP 28376, 2, 48.6-53.9 mm SL, rio Paranaíba, córrego tributary of the rio Paranaíba, Rio Paranaíba, Minas Gerais. MCP 28377, 3 (1 c&s), 51.1-55.6 mm SL, ribeirão de Fora on road from Rio Paranaíba to Serra do Salitre, Rio Paranaíba, Minas Gerais. MZUSP 22614, 2, 36.0-37.9 mm SL, rio Paraná in front of Jupia, São Paulo. MZUSP 23092, 7, 26.0-31.3 mm SL, rio Paraná, at Ilha Solteira, São Paulo. *Bunocephalus verrucosus*: **Brazil**: MCP 35743, 5 (2 c&s) 55.8-82.7 mm SL, Igarapé Maninguari on highway BR-364, Bujari, Amazonas. MCP 29811, 1, 98.4 mm SL, lago Tefé near Tefé, Amazonas. INPA 4395, 5 (2 c&s), 27.3-38.8 mm SL, rio Uraricoera, Roraima. **Guyana**: MHNG 2281.52, 1, 92.7 mm SL, affluent du Rupununi, Rupununi, Annai. **Peru**: MHNG 2395.58, 2, 27.1-29.7 mm SL, tributary of Río Ucayali (Pachitea), Ucayali. *Pseudobunocephalus amazonicus*: **Bolivia**: ZMA 109.246, 37 mm SL (holotype of *Dysichthys amazonicus* Mees, 1989), creek near Todos los Santos, Cochabamba. **Brazil**: MCP 35751, 6 of 15 (2 c&s) 23.7-29.3 mm SL, rio Ribeirão in the highway BR-425 ca. 62 km S of highway BR-364, Nova Mamoré, Rondônia. *Pseudobunocephalus bifidus*: **Peru**: CAS 35106, 4, 32.6-42.4 mm SL (paratypes of *Bunocephalus bifidus* Eigenmann, 1942), Yurimaguas creek, Loreto. **Brazil**: MCP 32772, 1 c&s, 31.2 mm SL, rio Iquiri, tributary to rio Ituxi, Amazonas. *Pseudobunocephalus iheringii*: **Argentina** MCP 13377, 7 (1 c&s) 23.3-48.0 mm SL, Arroio Chimiray, 5 km of Azara, tributary to Río Uruguay, Misiones. *Pseudobunocephalus lundbergi*: **Venezuela**: ANSP 168817, 28.4 mm SL, (holotype of *Pseudobunocephalus lundbergi* Friel, 2008), caño Barranca, ca. 1.25 hours downstream from Jubillal (opposite bank) on Río Caura, Bolívar. *Pseudobunocephalus quadriradiatus*: **Peru**: MHNG 21570.21, 31.4 mm SL, (holotype of *Dysichthys quadriradiatus* Mees, 1989), Chinguito [= Cocha Shinguita or Shirguita], Loreto. MHNG 2430018, 4, 27.1-32.1 mm SL, (paratypes of *Dysichthys quadriradiatus* Mees, 1989), NRM 15142, 28 (2 c&s) of 66, 19.0-21.7 mm SL, Río Samiria drainage left bank of stream halfway between Hamburgo and Santa Elena, Peru. *Pseudobunocephalus rugosus*: **Brazil**: MCP 15540, 3 (2

c&s), 19.8-23.9 mm SL, rio Paraguai at Cáceres and outskirts, Mato Grosso. *Pterobunocephalus depressus*: **Ecuador**: ANSP 130606, 1 c&s, Río Conejo at Santa Cecilia, Napo. *Pterobunocephalus dolichurus*: **Brazil**: MCP 35745, 1 c&s, 73.3 mm SL, rio Caeté at highway BR-364, Acre. *Xyliphius lepturus*: **Venezuela**: MCNG 5547, 1 c&s, 107.8 mm SL, Río Bocono, Portuguesa/Barinas.

### Acknowledgements

We are grateful to the following people for loan of specimens and hospitality while visiting museums: M. Sabaj Pérez, K. Luckenbill, J. Lundberg (ANSP), D. Catania (CAS), M. Rogers (FMNH), L. Rapp Py-Daniel (INPA); C. Oliveira and F. Roxo (LBP), Donald Taphorn and Otto Castillo (MCNG), C. Lucena and M. Lucena (MCP), S. Fisch-Müller and R. Covain (MHNG), P. Buckup and M. Britto (MNRJ), M. de Pinna, A. Datovo and O. Oyakawa (MZUSP), S. Kullander (NRM), H. Wellendorf (NMW), H. López-Fernández (ROM), P. Lucinda (UNT). Thanks to C. Leal and D. Carvalho for information on DNA barcoded specimens of *Bunocephalus minirim*. Thanks also to C. B. M. Alves for information regarding these new species. Thanks to C. Lucena for helping with photos of the pectoral-fin spines. We also thank John Lundberg for discussions on catfish morphology. This research was partially supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) (process number 229355/2013-7 to TPC, and processes number 305180/2010-0 and 207038/2013-9 to RER), and Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul - FAPERGS (process number 11/0936-5 to RER). The authors are grateful to the All Catfish Species Inventory (NSF DEB-0315963).

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Submitted October 13, 2014

Accepted June 03, 2015 by Francisco Langeani

Published September 25, 2015

## ERRATA

Page 499, Resumo, line 2, page 500, Results, right column, line 1, page 501, caption of Fig. 1, line 1, page 502, caption of Fig. 2, lines 3 and 4, page 503, heading of Table 1, line 1, page 504, Conservation status, lines 1 and 10, page 504, caption of Fig. 4, line 2, page 509, Discussion, left column, paragraph 2, lines 4 and 8:

**Where read:** *hartii*.

**Should read:** *hartti*.

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All changes are already incorporated in the online PDF and HTML versions of this article available at <http://www.scielo.br/ni>