

***Australoheros mattsosi* Ottoni, 2012 (Teleostei: Cichlidae): live coloration, population differences, and new data on adult external anatomy**

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Resumo

***Australoheros mattsosi* Ottoni, 2012 (Teleostei: Cichlidae): coloração em vida, diferenças populacionais e novos dados da anatomia externa em adultos.** Espécimes recentemente coletados de *Australoheros mattsosi* em cursos d'água próximos à localidade-tipo (drenagem do rio das Velhas, incluindo alto rio Cipó, Minas Gerais, Brasil) revelaram novos dados da coloração de adultos vivos (marcas iridescentes na base das nadadeiras dorsal e anal e coloração avermelhada a hialina-acinzentada na margem distal da nadadeira caudal), variações populacionais (perfil dorsal da cabeça e coloração de fundo da cabeça) e ontogenéticas (variação na posição da narina, perfil ventral da cabeça, escamas nas bochechas e nas nadadeiras anal e dorsal, mancha na margem posterior do opérculo e coloração de fundo em álcool) da morfologia externa e novos dados morfométricos (distância pélvico-peitoral, posição do olho em relação à horizontal ao nível da sínfise e 5^o ceratobranquial) de indivíduos adultos.

Palavras-chave: Dados morfométricos; Heroini; Morfologia; Ontogenia; Sistemática

Abstract

Recently collected specimens of *Australoheros mattsosi* in water courses around locality type (Das Velhas River drainage, including Upper Cipó River, Minas Gerais, Brazil) revealed new data on the adult live coloration (iridescent markings on the base of the dorsal and anal fins and reddish to grayish hyaline coloration on the distal margin of the caudal-fin), population (dorsal head profile and head ground coloration) and ontogenetic variations (variation in the nostril position, head ventral profile, scales on the cheek and the anal and dorsal fins, spot on the posterior margin of the operculum, and ground coloration in alcohol) on the external morphology and new morphometric data (pelvic-pectoral distance, eye position in relation to the horizontal axis at the symphysis and the 5th ceratobranchial levels) on adult individuals.

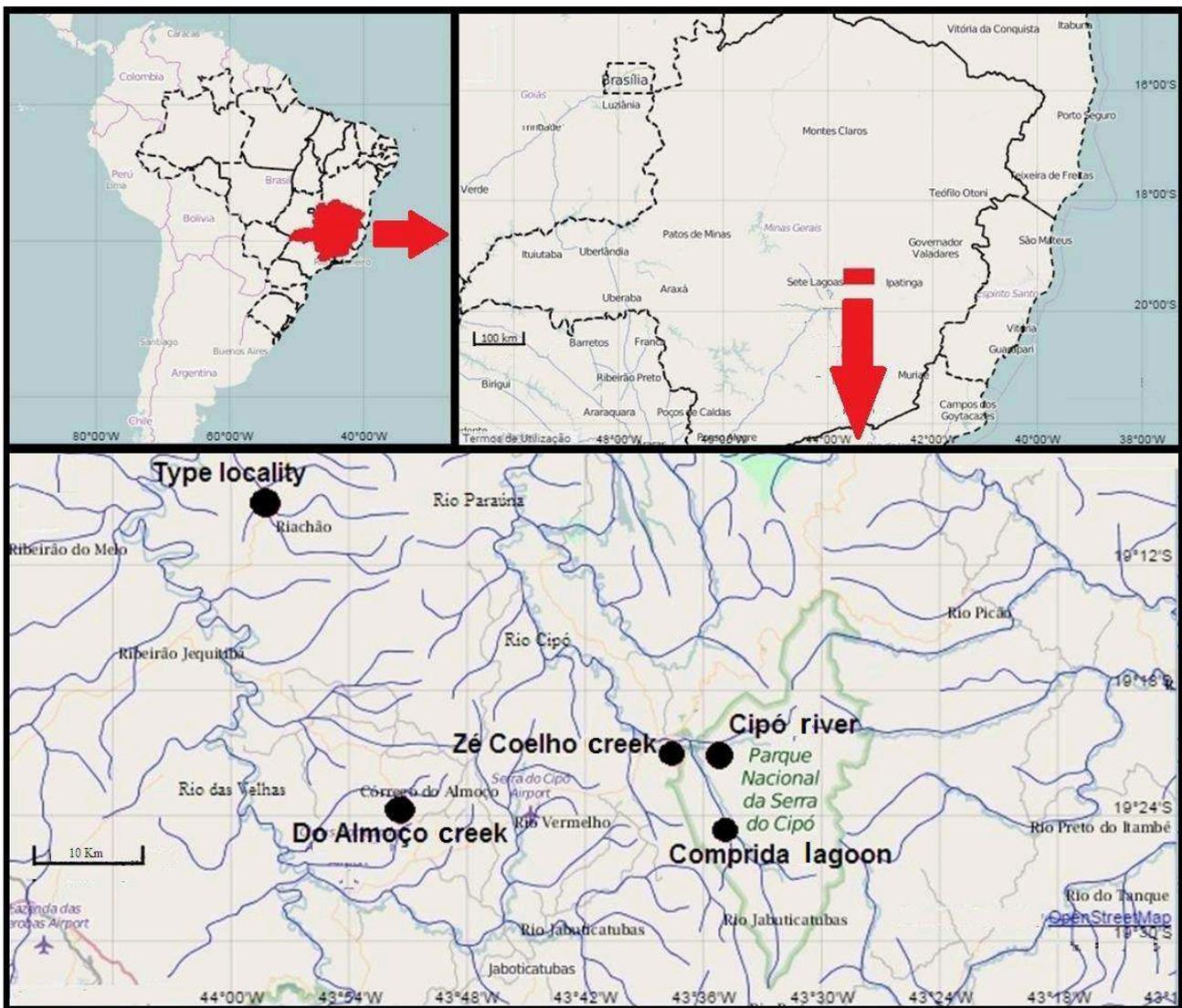
Key words: Heroini; Morphology; Morphometric data; Ontogenetic variation; Systematics

Introduction

Australoheros (ŘÍČAN; KULLANDER, 2006) was erected to include a monophyletic assemblage of beautifully colored species and the live color pattern may be useful to discern between species (e.g. OTTONI, 2013; OTTONI et al., 2014; OTTONI; SCHINDLER, 2014, among others). *Australoheros mattsosi* Ottoni, 2012 was described (9 specimens, 43.0-106.3 mm SL) from Das Velhas River and Paraopeba River; adult data and live color pattern are not well known currently. Therefore, collections were

made at two sites around the type locality in order to obtain new data on this species. The population of Do Almoço Creek is about 110 km upstream through Das Velhas River from type locality population. The other sampled population is at the PNSC and Zé Coelho Creek, just at the entrance of the Serra do Cipó Brazilian National Park (PNSC), about 470 km from type locality population through water flow, out of which 280 km through the Cipó River. The distance between each sampled populations is about 580 km (Figure 1). Further specimens with the usually accepted standard body size are available

FIGURE 1: Map indicating the sampled areas (PNSC and Do Almoço Creek) and type locality (at the border between the municipalities of Jequitibá and Santana de Pirapama – rounded spots). The PNSC encompasses both Cipó River and Comprida Lagoon and Zé Coelho Creek, located just at the PNSC entrance. Each spot may represent more than one sampling site.



Source: <http://www.mapas.cnpm.embrapa.br/somabrasil/webgis>.

not only for providing data on adult live coloration, but also on ontogenetic and geographic variation as for external morphology and additional data on adult morphometric variation, as well as revealing population differences. About 60.0 mm SL or larger was the standard chosen for describing species by several authors (e.g. ŘÍČAN et al., 2011; ŘÍČAN; KULLANDER, 2008), thus it was applied to this study for comparative analysis purposes.

Material and Methods

Specimens were collected under authorization 30302-2 SISBIO, granted to Mauro Luís Triques and Gilmar Ferreira do Carmo, fixed in 10% formalin, and kept in 70% alcohol by using the acronyms DZUFMG (Departamento de Zoologia da Universidade Federal de Minas Gerais – Belo Horizonte) and UFRJ (Universidade Federal do Rio de Janeiro – Rio de Janeiro). Point-to-point measurements were taken through a digital caliper (estimating to the nearest tenth of a millimeter), resorting to a stereomicroscope when needed. The anterior snout tip was measured from the immovable point just behind the movable upper symphysis, for the sake of accuracy, because many specimens are fixed in formalin with their upper jaw anteriorly projected, generating an error when moved back to the resting position. Measurements from one fin to another were taken from one fin origin to the other fin origin. Fin bases were measured from their origin to their terminus. Otherwise, measurements were taken according to Kullander (1986). Counts were expressed according to Říčan et al. (2011, p. 2-3); caudal vertebrae encompasses the hypural complex and they were counted from the first vertebra with hemal spine, just as in Goodrich (1930, p. 33-37), Weitzman (1974: 38), and Romer and Parsons (1977, p. 167). When needed, cycloid and ctenoid scales were distinguished by removing posterior skin cover to expose posterior scale rim, on the right side of the specimen, in order to preserve coloration on the left side. Dark bars on the flank were counted from rear to front, as well as the flank spots. Abdominal bars are regarded as those anterior to the anal-fin origin. Clearing and staining (registered

as C&S) were performed according to Taylor and Van Dyke (1985) and dissection followed Weitzman (1974). Sexing was implemented without histological gonad preparation, according to Barbieri et al. (1981a; 1981b).

Specimens from the PSNC were radiographed by using a Compacto 500 VMI command table, regulated for 0.04 seconds at 0.55 kV. The images were processed by using a digital system CR and digitalized through the software VEPRO[®]. The osteological nomenclature follows Říčan et al. (2011) and Ottoni (2012).

Data on external anatomy and live coloration are described on the basis of specimens from the PNSC, Zé Coelho Creek, just outside the PNSC and Do Almoço Creek, and population differences were determined by comparing data from the original description to those from other populations. Data on ontogenetic variation are included in the description of material from the PNSC. Osteological data considers only material from the PNSC.

A total of 270 photographs were taken, out of which 92 portray 6 adult specimens, 2 of them from Do Almoço Creek and 4 from the PNSC and Zé Coelho Creek.

A list of the material under study is provided in Appendix 1. A total of 102 specimens were analyzed; 102 underwent ontogenetic evaluation; 5 were cleared and stained (C&S); 8 were radiographed; 19 larger than 59 mm SL were characterized in terms of morphometric, meristic, and qualitative external morphology (1 was also C&S and 4 were radiographed). Quantitative data are displayed in Tables 1 and 2.

Results

Description

Morphometric and meristic data are presented in Tables 1 and 2. Body moderately elongated and compressed. Dorsal head profile very slightly convex to origin of dorsal-fin in small juveniles, and it progressively turns into a straight oblique backward directed snout profile to vertical through middle of eye diameter, then a slight (juveniles) to strong (males

larger than 63.0 mm SL, females larger than 62.3 mm SL) hump emerges to dorsal-fin. On dorsal-fin base, profile nearly straight slightly downward oblique from 2nd to last spine (since 39.0 mm SL ahead), then convex to end of dorsal base. Caudal-peduncle dorsal profile straight and slightly downward directed. Ventral profile of head nearly straight and downward directed backward in small juveniles to very slightly convex in large specimens, then slightly convex to insertion of caudal-peduncle in very small juveniles, in large specimens being convex to pelvic-fin origin, then slightly concave to anus, then nearly straight under spiny region of anal-fin base, then convex under rayed region of anal-fin base, then straight and obliquely upward directed under caudal-peduncle. Dorsal region of head and body rounded in large specimens, but in small juveniles it is slightly folded in mid-line just in front of dorsal-fin origin. Ventral region rounded at all ages. Mouth terminal; skin fold of lower lip covering corresponding portion of upper lip on the mouth corner, encircling the maxillary laterally towards its medial region, then forming the deep depression along maxillary length, feature regarded to upper jaw protraction. Maxillary posterior border encircled by a deep groove of thick skin. Both upper and lower oral teeth of similar sizes, in two series, caniniform, single cuspidate, slightly curved inward, hyaline, with reddish tip. Outer teeth row increasing in size towards symphysis. Eye above horizontal by upper jaw symphysis in specimens larger than 51.0 mm SL and below this line in juveniles. Single nostril on each side of snout, in the middle of distance from symphysis and anterior eye margin (closer to the latter in specimens larger than 51.0 mm SL). Opercle not serrated.

Body scales ctenoid, except those adjacent to dorsal-fin base and some of the smallest scales adjacent to anal-fin base. Opercle and preopercle scales cycloid. One to four series of scales on cheek (absent

in specimens smaller than 21.0 mm SL). Head and chest scales a little smaller than on flanks. Trunk and caudal-peduncle with ctenoid scales. Dorsal-fin base with single series of scales originating from 10th spine to 1st ray (absent in specimens smaller than 22.0 mm SL). Second series of scales on membrane of dorsal-fin originating from last spine to 4th ray (absent from specimens smaller than 27.0 mm SL). Anal-fin base with single series of scales originating from 4th spine to 1st ray (absent in specimens smaller than 22.6 mm SL). Second series of scales on dorsal-fin membrane originating from 1st to 4th ray (absent from specimens smaller than 27.0 mm SL).

Dorsal-fin origin on vertical through posterior bony rim of opercle; distal margin slightly convex, with long filament at the posterior end, formed by rays 3-5, reaching vertical through the anterior third of caudal-fin in small specimens and posterior caudal-fin margin in specimens larger than 55.0 mm SL. Anal-fin origin on vertical just anterior margin of 4th flank dark bar; distal margin slightly convex, with long filament at the posterior end, formed by rays 3-4, reaching half to $\frac{3}{4}$ anal-fin length in larger specimens and anterior third in small specimens. Caudal-fin moderately long with rounded distal margin, its anterior 5th to 3rd area with ctenoid small scales (absent in the smallest specimens). Pectoral-fin origin on vertical just behind 2nd to 3rd dorsal-fin spine in adults; posterior margin convex, reaching vertical close to base of 1st anal-fin spine (coincident to anterior margin of 4th flank dark bar); its base smaller than its distance to pelvic-fin origin (base length 58.3-94.7% of distance between paired fin bases). Pelvic-fin origin on vertical through pectoral-fin base terminus; posterior margin slightly concave, its first two rays prolonged as a filament reaching the 3rd spine to the 1st ray of anal-fin (coincident to flank dark bars 2-3) in large specimens (in specimens smaller than 15.0 mm SL, the filament do not reach the anal-fin origin).

TABLE 1: Morphometric data on *Australoheros mottosi* from the PNSC and Do Almoço Creek, all specimens larger than 59.0 mm SL.

		SL percentage values					
		PNSC (n = 13)	Do Almoço Creek (n = 6)	General range (n = 19)	Standard deviation from the general range	Average general range	Otoni (2012)
1	Head length	34.0-37.1	36.6-38.0	34.0-38.0	1.22	36.0	
2	Head width	21.1-24.6	21.3-23.5	21.1-24.6	0.9	22.9	17.9-20.4
3	Pre-orbital head depth	22.0-26.9	21.6-23.6	21.6-26.9	1.69	23.5	20.8-23.6
4	Snout length	11.4-14.1	12.6-13.4	11.4-14.1	0.84	13.0	12.6-15.2
5	Horizontal eye diameter	8.1-12.6	11.2-12.3	8.1-12.6	1.25	10.8	8.9-12.6
6	Eye depth	14.2-18.6	14.8-16.5	14.2-18.6	1.27	16.2	
7	Upper jaw length	11.6-14.0	11.7-13.4	11.6-14.0	0.69	12.7	10.2-12.1
8	Lower jaw length	11.4-13.1	11.3-13.6	11.3-13.6	0.63	12.2	6.7-9.4
9	Interorbital width	13.5-18.5	12.9-14.8	12.9-18.5	1.55	14.9	14.4-15.9
10	Head depth	31.6-38.3	34.3-37.6	31.6-38.3	1.91	36.0	29.8-34.2
11	Body depth	44.4-52.7	46.5-50.0	44.4-52.7	2.39	47.8	41.5-45.2
12	Pectoral-fin length	29.3-33.8	31.8-34.8	29.3-34.8	1.38	32.4	26.2-30.8
13	Pectoral-fin base length	7.4-8.6	7.6-8.7	7.4-8.7	0.4	7.9	
14	Pectoral-pelvic length	10.6-13.0	10.9-12.6	10.6-13.0	0.65	11.6	
15	Pelvic-fin spine length	16.0-18.8	16.2-20.3	16.0-20.3	1.02	17.3	13.5-18.2
16	Pelvic-fin length	32.1-51.6	36.5-45.7	32.1-51.6	4.5	40.3	28.4-50.0
17	Last dorsal-fin spine length	11.5-18.9	17.4-20.6	11.5-20.6	2.28	16.9	13.2-15.4
18	Last anal-fin spine length	15.0-18.8	18.5-19.7	15.0-19.7	1.47	17.7	13.5-17.3
19	Dorsal-fin base length	55.5-63.7	58.6-62.7	55.5-63.7	2.26	60.4	53.4-58.3
20	Anal-fin base length	26.5-32.1	28.1-30.8	26.5-32.1	1.45	29.3	25.3-29.6
21	Pre-dorsal length	39.6-44.6	42.0-44.6	39.6-44.6	1.32	42.5	41.3-46.7
22	Pre-pelvic length	45.2-47.9	44.6-48.3	44.6-48.3	0.96	46.3	41.4-45.1
23	Caudal-peduncle depth	17.2-20.6	17.7-19.1	17.2-20.6	0.96	18.7	15.0-18.2
24	Caudal-peduncle length	5.0-8.5	5.5-7.1	5.0-8.5	0.83	6.3	7.6-10.8
25	Caudal-fin length	33.5-39.0	32.7-37.4	32.7-39.0	1.76	36.1	28.2-34.2
		Head length percentage values					
1	Head width	60.1-69.2	57.7-64.2	57.7-69.2	3.25	63.6	48.9-55.2
2	Pre-orbital head depth	61.9-76.9	57.8-62.2	57.8-76.9	5.8	65.4	56.7-64.0
3	Snout length	31.8-39.8	33.3-34.7	31.8-39.8	2.58	36.1	32.9-41.4
4	Horizontal eye diameter	23.6-35.2	29.6-32.4	23.6-35.2	3.0	29.8	24.2-32.9
5	Eye depth	39.7-51.8	40.1-43.7	39.7-51.8	3.98	45.0	
6	Upper jaw length	32.6-38.9	31.9-36.4	31.9-38.9	1.92	35.2	28.0-32.7
7	Lower jaw length	32.1-36.9	29.8-35.9	29.8-36.9	1.96	34.0	17.7-25.4
8	Interorbital width	38.1-50.9	34.2-40.2	34.2-50.9	4.8	41.4	37.8-43.0
9	Head depth	92.9-108.8	93.3-99.6	92.9-108.8	5.54	100.0	82.9-99.1
		Pectoral-pelvic length percentage value					
1	Pectoral-fin base length	62.9-72.3	60.5-77.9	60.5-77.9	4.2	68.4	
		Caudal-peduncle depth percentage value					
1	Caudal-peduncle length	27.2-41.2	29.2-39.8	27.2-41.2	4.29	33.5	

TABLE 2: Meristic data on *Australoheros mattsosi* from the PNSC and Do Almoço Creek, all specimens larger than 59.0 mm SL.

	PNSC (n = 13)	Do Almoço Creek (n = 6)	General range (n = 19)	Standard deviation from the general range	Average general range	Otoni (2012)
1 Dorsal-fin spines	15-17	15-16	15-17	0.62	16	16-17
2 Dorsal-fin rays	8-10	10-11	8-11	0.84	10	9-10
3 Anal-fin spines	6-8	6-7	6-8	0.5	7	6-8
4 Anal-fin rays	7-9	8-9	7-9	0.56	8	8-9
5 Pelvic-fin spines	1	1	1	0	1	1
6 Pelvic-fin rays	5	5	5	0	5	5
7 Pectoral-fin rays	13-14	13-14	13-14	0.51	14	14
8 Caudal-fin rays	19-23 (2-3+6-8+6-8+3-4)	19-20 (3+6-7+7+3-4)	19-23 (2-3+6-8+6-8+3-4)			21-22 (3+8+8+2-3)
9 Total vertebrae	25-26 (7*)		25-26 (9*)	0.5		26
10 Rib pairs	10-11 (9*)		10-11 (11*)	0.44		11
11 Pre-caudal vertebrae	13 (9*)		13 (9*)	0		14
12 Caudal vertebrae	12-13 (7*)		12-13 (9*)	0.5		12
13 Proximal radials on dorsal-fin base	24-25 (7*)		24-25 (9*)	0.44		24-25
14 Proximal radials on anal-fin base	12-13 (7*)		12-13 (9*)	0.53		12
15 Gill rakers from first branchial arch	(5-7)+(15-17) (3*)		(5-7)+(15-17) (4*)			
16 Scales of upper lateral line series	15-18	16-19	15-19	0.95	17	16-18
17 Scales of lower lateral line series	6-10	7-10	6-10	0.96	8	7-10
18 Scales between lateral lines	2	2	2	0	2	
19 Scales of caudal-peduncle depth	7-9	9	7-9	0.46	9	7
20 Scales of dorsal-fin origin transversal series (L1)	4-5	4	4-5	0.45	4	4
21 Scales of the end of superior lateral line to dorsal-fin series (L2)	2	1-3	1-3	0.33	2	3
22 Scales from anal-fin origin series to upper lateral line	7	7	7		7	8-9
23 Series of longitudinal scales contiguous to lower lateral line series (E0)	24-28	23-26	23-28	1.39	25-26	25-28
24 Series of longitudinal scales (E1)	25-28	25-26	25-28	0.86	25-26	25-29
25 Series of longitudinal scales contiguous to upper lateral line series (E2)	20-22	21-23	20-23	0.71	21	21-23

* Number of specimens examined concerning this feature.

Sexual dimorphism

No sexual dimorphism was found.

Osteological data

Ectopterygoid wide in lateral view, with convex anterior margin, as in Ottoni and Costa (2008). Anterior arm of epibranchial 1 long and epibranchial 2 with tubular ax elongated twice as long its diameter beyond the laminar area in both sides, as in Ottoni and Costa (2008). Micro-branchio-spines observed only on dorso-medio-posterior face of ceratobranchial 4. Ceratobranchial 5 partially sutured, medially and relatively robust, each with 6-7 teeth along medial line and 22-24 teeth on posterior margin; tooth plate 40-60% wider than long; posterior teeth progressively more compressed and slim towards medial line; larger teeth medially and posteriorly on bone, gradually smaller anteriorly and laterally; posterior teeth with posterior cusp frontward directed and with a second cusp arising from the anterior subapical region.

Coloration in alcohol

Head and body ground color brown, clearer in small specimens. Body flank with 7 dark brown bars (clearer in small specimens; a single 47.9 mm SL with 8 bars). Mid-lateral dark brown stripe inconspicuous, above middle flank depth, alongside E0 and E1 series, slightly darker than bars, two scales in width, extending from bar 1 to close to opercle, sharper from bar 4 ahead connecting bar 5-7 at the E1 level (in small specimens, just below upper lateral line and prolonging on head to post-ocular region).

Only bars 6-7 are interrupted, above stripe (in small specimens, interruption may not occur). Presence of 3 abdominal bars over the lifespan (a single specimen, 47.9 mm SL, with 4 bars). Bars 1-4 curved, convexity rearward. Bars 6-7 curved, concavity frontward (in small specimens, bar 6 may be straight). Bar 5 forked, sometimes only dorsally (Y-shaped), sometimes also ventrally (X-shaped), always at the E1 level; anterior and posterior arms having the same width. Small specimens may have bar 6 Y-shaped (Figure 2).

Three dark spots observed. Caudal-peduncle spot sharp, ellipsoid, length twice to three times larger than width, vertically elongated and going through the inferior lateral line. Spot on bar 4 less conspicuous in adults and clearly visible in juveniles, at the level of the stripe uniting bars 5-7, between lateral lines. Opercle posterior margin spot conspicuous in adults, less visible in smaller specimens, contiguous to the stripe.

Seventh body bar partially over head, above opercle region. In front of it, above the post-ocular region, a clear area is observed, in front of which the head is uniformly dark brown dorsally, clearing ventrally. Head light brown with one bar uniting the post-ocular region from one side to the other of head and another bar over snout.

FIGURE 2: Lateral view of *Australoheros mottosi*, 107.8 mm SL, male, DZUFMG 130, Comprida Lagoon, PNSC.



Source: Photograph by M. L. Triques.

Dorsal-fin brown, with darker prolongations of flank bars (not visible in specimens smaller than 20.0 mm SL); lighter to hyaline posteriorly, on the rayed region. Anal-fin dark brown, lighter to hyaline posteriorly, on the rayed region. First third of caudal-fin dark brown, then light brown to hyaline on the second third, brown dark on the distal third (totally hyaline in small specimens, after caudal-peduncle spot). Pectoral-fin with hyaline membrane and brown rays. Pelvic-fin dark brown laterally and hyaline medially in small specimens, totally dark brown in large specimens, sometimes with hyaline distal parts.

Do Almoço Creek population

There is no coloration difference in alcohol.

Original description differences

The single apparent difference found was in dorsal profile, from smoothly convex from snout to origin of caudal-peduncle in Ottoni (2012) to roughly straight from 2nd to last dorsal-fin spine insertion. Ottoni (2012) found ground head coloration darker than body ground color while an equally clear ground head and body coloration was found in this study. New data shown herein and absent in the original description consist in the pelvic-pectoral distance, eye position in relation to the horizontal axis at the upper jaw symphysis, and the 5th ceratobranchial tooth plate, as well as ontogenetic variation in the nostril position, ventral body profile, number of scales on the cheek and over anal and dorsal fins, spot on posterior margin of opercle and ground body coloration in alcohol.

Live coloration

Figures 3 to 5 provide a description of specimens from the PNSC and the surrounding area. Ground body and head coloration is yellowish dorsally, brownish-cream to reddish-cream ventrally (varying in the same specimen), and green in a wide lateral middle flank area. Head and body bars and spots black. Small orange spots dorsally on flank may be apparent or not in the same specimen. Seven bars on flank, prolonging through dorsal and anal fins, the 6th and 7th horizontally crossed by a yellow stripe mid-dorsally.

FIGURE 3: Lateral view of *Australoheros mattsosi*, 93.1 mm SL, male, UFRJ 8971, Zé Coelho Creek, in front of the PNSC entrance.



Source: Photograph by G. F. Carmo.

FIGURE 4: Head of *Australoheros mattsosi*, lateral view, 110.9 mm SL, male, DZUFMG 126, Comprida Lagoon, PNSC. Anterior scales partially removed after collection with gillnets.



Source: Photograph by G. F. Carmo.

Head with a black bar uniting eyes posteriorly, a grey interorbital bar, and a light grey bar anteriorly between eyes; presence of a dark horizontal stripe below eye to upper and lower jaw confluence (when mouth is closed), which is variably united with the grey area of head ventrally. Opercle and cheek area may present bluish-green markings; yellow vertical and narrow bar present postero-ventrally to eye. Yellow to brown colored eye iris (varying in the same specimen).

FIGURE 5: Lateral view of *Australoheros mattsosi*, 95.1 mm SL, male, DZUFMG 143, Zé Coelho Creek, in front of the PNSC entrance.



Source: Photograph by G. F. Carmo.

Dorsal-fin ground color yellow; distal margin hyaline to grayish; orange small to dorso-ventrally developed spots may turn into brown in the same specimen. Anal-fin ground color varies between black

and yellow, with black or yellow rays; posterior and/or distal area of fin yellow in some specimens. Anal and dorsal fins with small bluish-green iridescent markings, visible mainly over flank dark bars prolongations on fins. Pelvic-fin black to dark brown with bluish-green small markings. Pectoral-fin yellow. Chest area blackish. Head ventrally varies from yellowish to brownish in larger specimens, it may be grayish in specimens about 60.0 mm SL. Caudal-peduncle spot black, sharp and vertically elongated; bluish-green small markings may be observed over this spot. Caudal-fin ground color yellow, brownish proximally and reddish to grayish hyaline in distal margin; a number of transversal series of orange or brown markings may be discernible or caudal-fin smoothly clearing towards tip.

Do Almoço Creek population differences

Subtle differences were found and regarded as population, instead of species features. Reddish hue

was observed on the anal-fin posterior tip. The reddish hyaline distal area on the caudal-fin is wider and the red hue is more conspicuous. Distal margin of dorsal-fin more hyaline than grayish. Pectoral-fin hyaline with yellow rays. Orange markings on the dorsal-fin tend to be red and they are rather conspicuous.

Ecologic notes

Several recent collections conducted by the authors with gillnets and hand nets in various rivers and creeks without aquatic vegetation revealed scarce specimens, while in lagoons and creeks with dense aquatic vegetation (or marginal vegetation densely inserted in water) the number of *Australoheros mattsosi* specimens is high and they were always collected along with vegetation (Figures 6 to 8). *Australoheros mattsosi* specimens were not collected in sandy and/or pebbly/rocky bottom areas.

FIGURE 6: Do Almoço Creek close to bridge in the MG-323 highway. Land grass immersed in water attracts a large number of *Australoheros mattsosi* specimens and other fish species.



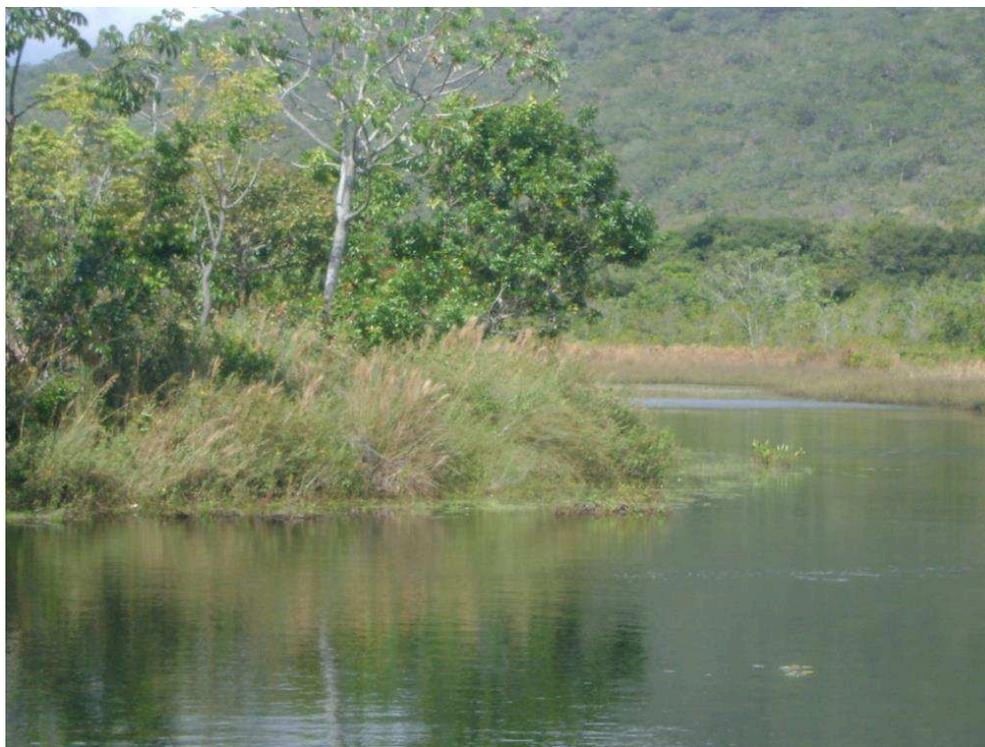
Source: Photograph by G. F. Carmo.

FIGURE 7: Do Almoço Creek upstream from the bridge in the MG-323 highway, at a dammed stretch, with land grass on the margins and water plants.



Source: Photograph by G. F. Carmo.

FIGURE 8: Comprida Lagoon, PNSC.



Source: Photograph by G. F. Carmo.

Discussion

The morphometric data found in this study is not dissonant with the original description. However, in original description the data include information on adults together with a number of specimens smaller than 60.0 mm SL, down to 43.0 mm SL. Considering that most of the previous literature concerning the *Australoheros* taxonomy is rather restricted to specimens about 60.0 mm SL or larger, data shown herein may be more easily compared to the current literature on this genus. For instance, in the original description, head length varies from 16-39% of the SL, while a range from 34-38% was found herein and this rather restrict amplitude may help distinguishing this species from similar ones. It is noteworthy that the difference is often small or even included in the new data. There were also three additional SL proportions and the pectoral-fin base was introduced as a percentage of the pectoral-pelvic length, a new measurement for *Australoheros*.

A single difference in live coloration was perceived in relation to *Australoheros paraibae* (OTTONI; COSTA, 2008): the presence of orange markings dorsally on the flank and dorsal-fin (not described for *A. paraibae*), however, as orange markings often turn into brown markings in the same specimen, this difference must be carefully taken into account.

Information on live coloration seems to be significant, as it may be enough to distinguish *Australoheros* species from each other in many cases. For instance, *A. muriae* (OTTONI; COSTA, 2008) has one metallic green stripe on the distal margin of the dorsal-fin (OTTONI, 2013), clearly absent in *A. mattsosi* (where a grayish to hyaline stripe is observed). However, as previously pointed out, *A. mattsosi* has a single difference in live coloration that must be carefully taken into account in further studies.

Several photographs of a single living specimen have enabled us the perception of changes in coloration and various photograph backgrounds may help inducing coloration changes, increasing the accuracy of this kind of study.

Dorsal head and body profile was originally described as convex from snout to caudal-peduncle,

also in large specimens (up to 103.6 mm SL). In large specimens recently collected, a hump, progressively larger as body size increases, was observed both in males and females. When a hump is present, the body profile on the dorsal-fin base varies from very slightly convex to almost straight (up to the beginning of the dorsal-fin rays insertion), maybe it is a feature unique to this species, not described for other *Australoheros* species.

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Appendix 1

Material examined in this study:

Material from Do Almoço Creek (19°23'20"S, 43°51'17"W, close to MG-253 Highway, km 25, border between the municipalities of Jaboticatubas and Baldim): DZUFMG 139 (4, 28.2-64.2 mm SL), June 16, 2013, G. F. Carmo and L. M. Araújo; DZUFMG 140 (6, 24.3-69.4 mm SL), May 5, 2013, G. F. Carmo and M. L. Triques; DZUFMG 141 (3, 54.1-69.0 mm SL), June 15, 2013, G. F. Carmo and M. L. Triques; DZUFMG 142 (11, 18.5-64.8 mm SL), August 8, 2013, G. F. Carmo and M. L. Triques.

Material from the PNSC (municipality of Jaboticatubas): DZUFMG 098 (1, 82.9 mm SL), Cipó River, close to the IBAMA office, 19°20'39"S, 43°36'54"W, PNSC, November 25, 2000, UFMG Ichthyology Excursion; DZUFMG 099 (2, 18.2-80.1 mm SL), Mascates Creek, tributary of the Cipó River, 19°21'58"S, 43°35'45"W, UFMG Ichthyology Excursion, without data collection; DZUFMG 104 (1, 79.2 mm SL), Das Pedras Creek, left margin tributary of the Cipó River, close to the IBAMA office, 19°22'33"S, 43°36'17"W, PNSC, November 25, 2000; DZUFMG 105 (10, 25.3-87.1

mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, November 25, 2000, UFMG Ichthyology Excursion; DZUFMG 106 (2, 32.8-41.0 mm SL), lagoon close to Dos Sapos Lagoon, Cipó River, close to the IBAMA office, 19°20'53"S, 43°36'31"W, PNSC, March 10, 2002, UFMG Ichthyology Excursion; DZUFMG 107 (14, 27.0-50.8 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, November 25, 2000, UFMG Ichthyology Excursion; DZUFMG 108 (1 C&S, 78.5 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, March 28, 2002, UFMG Ichthyology Excursion; DZUFMG 118 (1 C&S, 43.9 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, November 25, 2000, UFMG Ichthyology Excursion; DZUFMG 122 (2 C&S, 39.0-48.4 mm SL), lagoon close to Dos Sapos Lagoon, Cipó River, close to the IBAMA office, 19°20'53"S, 43°36'31"W, PNSC, March 10, 2002, UFMG Ichthyology Excursion; DZUFMG 123 (1 C&S, 23.7 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, November 25, 2000, UFMG Ichthyology Excursion; DZUFMG 125 (38, 14.8-68.8 mm SL), Zé Coelho Creek, left margin tributary of the Cipó River, 19°20'59"S, 43°37'58"W, road between MG-010 and the PNSC office, May 23-24, 2012, G. F. Carmo and M. L. Triques; DZUFMG 126 (1, 110.9 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, May 24, 2012, G. F. Carmo and M. L. Triques; DZUFMG 130 (1, 107.8 mm SL), Comprida Lagoon, 19°22'37"S, 43°35'44"W, on the left margin of Mascates Creek, left margin tributary of the Cipó River, PNSC, May 24, 2012, G. F. Carmo and M. L. Triques; DZUFMG 143 (2, 56.3-95.1 mm SL), Zé Coelho Creek, left margin tributary of the Cipó River, 19°20'59"S, 43°37'58"W, road between MG-010 and the PNSC office, April 18, 2015, G. F. Carmo; UFRJ 8971 (3, 38.3-93.1 mm SL), Zé Coelho Creek, left margin tributary of the Cipó River, 19°20'59"S, 43°37'58"W, road between MG-010 and the PNSC office, May 23-24, 2012, G. F. Carmo and M. L. Triques; UFRJ 8970 (3, 29.7-39.3 mm SL), Zé Coelho Creek, left margin tributary of the Cipó River, 19°20'59"S, 43°37'58"W, road between MG-010 and the PNSC office, May 23-24, 2012, G. F. Carmo and M. L. Triques.