

Three new species of *Australoheros* from southeastern Brazil, with taxonomic notes on *Chromys oblonga*, *Heros autochton* and *H. jenynsii* (Teleostei: Labroidei: Cichlidae)

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> Abstract

Three new species of *Australoheros* are described from the São Francisco, Paraná and Paraíba do Sul river basins, southeastern Brazil. *Australoheros mattosi* sp. n., from the rio São Francisco basin, by having anal-fin base squamation beginning at the third anal-fin spine; *A. montanus* sp. n., from the rio Paquequer drainage, by having a complete red bar on the posterior margin of the caudal fin; and, *A. tavaresi* sp. n., from the rio Tietê drainage, by having prognathous mouth. Three currently listed synonyms of *Australoheros facetus* are discussed: *Chromys oblonga* is considered a *nomen dubium*. The type specimens of *Heros autochton* (lectotype herein designated) indicate that the species does not belong to the genus *Australoheros*. Finally, the status of *H. jenynsii* as synonym of *A. facetus* is confirmed.

> Resumo

Três novas espécies de *Australoheros* são descritas das bacias dos rios São Francisco, Paraná e Paraíba do Sul, sudeste do Brasil. *Australoheros mattosi* sp. n., da bacia do rio São Francisco, por possuir início da escamação da base da nadadeira anal no terceiro espinho da nadadeira anal; *A. montanus* sp. n., da drenagem do rio Paquequer, por possuir uma barra vermelha completa na margem posterior da nadadeira caudal; e, *A. tavaresi* sp. n., da drenagem do alto rio Tietê, por possuir boca prognata. Três nomes atualmente listados como sinônimos de *Australoheros facetus* são discutidos: *Chromys oblonga* é considerado *nomen dubium*. O exame da série tipo de *Heros autochton* (lectótipo aqui designado) indica que ela não pertence ao gênero *Australoheros*; e o status de *H. jenynsii* como sinônimo de *A. facetus* é confirmado.

> Key words

Biodiversity, Cichlinae, coastal basins, fishes, Heroini, Neotropical cichlids, systematics, taxonomy.

Introduction

Australoheros RÍCAN & KULLANDER, 2006 was recently erected to include three species: *Cichlasoma facetum* JENYNS, 1842, *C. tembe* CASCIOTTA, GÓMEZ & TORESANI, 1995 and *C. scitulus* RÍCAN & KULLANDER, 2003, all from the Paraná-Paraguay-Uruguay river system, in northeastern Argentina, southern Brazil and Uruguay (CASCIOTTA *et al.*, 1995; 2006; OTTONI, 2010; OTTONI & COSTA, 2008; OTTONI & CHEFFE, 2009; OTTONI *et al.*, 2008; RÍCAN & KULLANDER, 2006 and RÍCAN & KULLANDER, 2008). Subsequently, several species

have been described, currently the genus comprising 24 valid species, making *Australoheros* one of the Cichlinae genera with the highest species diversity. At the present, besides occurring in the Paraná-Paraguay-Uruguay river system of southern Brazil, Uruguay and northeastern Argentina, species of *Australoheros* are also recorded to several coastal basins between Bahia, northeastern Brazil, and northeastern Argentina, and to the São Francisco and upper Paraná drainages, of Brazil (OTTONI, 2010; OTTONI & COSTA, 2008; RÍCAN

& KULLANDER, 2006 and RÍCAN & KULLANDER, 2008). RÍCAN & KULLANDER (2008) tentatively divided *Australoheros* into four species groups restricted to the Paraná-Paraguay-Uruguay river system on the basis of morphological and molecular data: the *A. scitulus* group, including *A. scitulus* and *A. charrua* RÍCAN & KULLANDER, 2008; the *A. forquilha* group, including *A. forquilha* RÍCAN & KULLANDER, 2008 and *A. tembe*; the *A. facetus* group, including *A. facetus* and *A. guarani* RÍCAN & KULLANDER, 2008; and the *A. kaaygua* group, including *A. kaaygua* CASCIOTTA *et al.*, 2006 and *A. minuano* RÍCAN & KULLANDER, 2008. Next, *A. taura* OTTONI & CHEFFE, 2009 was described from the Laguna dos Patos system, being proposed by the authors to be include in the *A. scitulus* group, based on morphological evidence only (OTTONI & CHEFFE, 2009), *H. acaroides*, also from the Laguna dos Patos system, was re-described as a valid species of *Australoheros* by SCHINDLER *et al.* (2010), and *A. angiru* RÍCAN *et al.*, 2011 and *A. ykeregua* RÍCAN *et al.*, 2011 were described from the Uruguay and Iguaçú river drainages (RÍCAN *et al.*, 2011). A fifth species group was proposed by OTTONI (2010) to include species from southeastern and eastern Brazil, herein termed *A. austrani* group: *A. austrani* OTTONI & COSTA, 2008, *A. barbosae* OTTONI & COSTA, 2008, *A. capixaba* OTTONI, 2010, *A. ipatinguensis* OTTONI & COSTA, 2008, *A. macacuensis* OTTONI & COSTA, 2008, *A. macaensis* OTTONI & COSTA, 2008, *A. muriae* OTTONI & COSTA, 2008, *A. paraibae* OTTONI & COSTA, 2008, *A. perdi* OTTONI *et al.*, 2011, *A. robustus* OTTONI & COSTA, 2008, *A. ribeirae* OTTONI *et al.*, 2008, and *A. saquarema* OTTONI & COSTA, 2008. The latter species group is diagnosed mainly by vertebrae counts, and by several other character states (OTTONI, 2010). Three new species of the *A. austrani* species group are herein described.

Materials and methods

The material is deposited in: **CIMC**, divisão de Fauna, Grupo Especial de Estudo e Proteção do Ambiente Aquático do Rio Grande do Sul, Rio Grande do Sul, Brasil; **MCP**, Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Pontifícia Universidade Católica do Rio Grande do Sul, Rio Grande do Sul, Brasil; **MNRJ**, Museu Nacional do Rio de Janeiro, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brasil; **MTDF**, Museum für Tierkunde Dresden Fish Collection, Dresden, Germany; **MZUSP**, Museu de Zoologia, Universidade de São Paulo, São Paulo, Brasil; **NHMUK V**, Natural History Museum U.K. Vertebrates, London, England; **UFRJ**, Instituto de Biologia, Universidade Federal

do Rio de Janeiro, Rio de Janeiro, Brasil; and **ZMB**, Museum für Naturkunde – Leibniz-Institut für Evolutions- und Biodiversitätsforschung an der Humboldt-Universität zu, Berlin, Germany.

The morphometric and meristic characters are made according to OTTONI *et al.* (2011). The osteological material was prepared following the methodology proposed by TAYLOR & VAN DYKE (1985), and the nomenclature of osteological characters follows COSTA (2006). Bars are grouped in head and trunk bars, numbered from the caudal-fin to the snout, as well as, spots (KULLANDER, 1983). SL means standard length, HL head length and C&S, cleared and stained. In descriptions and tables, the number of specimens exhibiting a character state is presented in parentheses. For species delimitation I adopted here the population aggregation analysis (DAVIS & NIXON, 1992), a character-based method in which species are delimited by a unique combination of stable morphological character states occurring in one or more populations. Comparison with *A. tembe*, *A. charrua*, *A. kaaygua* and *A. guarani* have been based in the following literature: CASCIOTTA *et al.* (1995; 2006) and RÍCAN & KULLANDER (2006; 2008).

Comparative material

Comparative material is listed in OTTONI (2010), OTTONI & CHEFFE (2009), OTTONI & COSTA (2008), OTTONI *et al.* (2008), OTTONI *et al.* (2011) and SCHINDLER *et al.* (2010). Additional comparative material is: *Heros autochthon*: **NHMUK V 1961776**, 1; **NHMUK V 1961772**, 1; **NHMUK V 1961773**, 1; Brazil; and **NHMUK V1961774**, 1; Brazil; Lord Stuart, without information about the date of collection.

Results

Australoheros mattsosi new species

Fig. 1

Holotype. **UFRJ 0752**, 80.4 mm SL; Brazil: Minas Gerais state: tributary of the rio das Velhas, between Santana do Pirapama and Jequitibá, rio São Francisco basin; W. COSTA *et al.*, 14 Mar. 1991.

Paratypes. Brazil: Minas Gerais state: **UFRJ 7755**, 1 C&S, 72.1 mm SL; collected with holotype. **UFRJ 3227**, 1 C&S, 43.0 mm SL; rio do Piolho, rio Acima municipality, between rio Acima and Nova Lima, tributary of the rio das Velhas; M. PINNA & A. CARVALHO, 18 May 1985. **MCP 16745**, 1, 58.5 mm SL; river on the street BR-040, between Angueretá and Felixlândia (19° 4' 24" S / 44° 39' 15" W); R. REIS *et al.*, 12 Jul. 1993. **MZUSP 47388**, 1, 92.6 mm SL; Jabuticatubas, córrego Julião, street to Jabuticatuba (19° 32' 00" S / 43° 44' 00" W); no information about collectors, 1 Oct. 1997. **MNRJ 21550**, 4, 52.9–106.3 mm SL; Ouro Branco, córrego Ferreira, rio Paraopeba basin, street



Fig. 1. *Australoheros mattosi* sp. n.; UFRJ 0752, 80.4 mm SL, holotype; Brazil: Minas Gerais state: between Santana do Pirapama and Jequitibá municipalities: rio das Velhas basin.

Lobo Leite–Ouro Branco (20° 31' 30" S / 43° 43' 11" W); P. BUCKUP *et al.*, 22 Nov. 2000.

Diagnosis. *Australoheros mattosi* sp. n. is distinguished from species of the *A. facetus*, *A. forquilha*, *A. kaaygua* and *A. scitulus* species groups, and from *A. acaroides*, *A. ykeregua*, *A. angiru* and *A. taura* by having 12 caudal vertebrae (vs. 13–15) and 14 precaudal vertebrae (vs. 12–13); from species of the *A. facetus*, *A. forquilha* and *A. kaaygua* species groups by having three abdominal bars in all stages of life (vs. always four abdominal bars in juveniles, and adults with three bars in about 50% and four in about 50% of all specimens examined); from *A. perdi* by having 26 total vertebrae (vs. 25); from *A. ykeregua* by the absence of dark marks on the suborbital region (vs. presence); from *A. agiru* by having a conspicuous rounded caudal-fin base spot (vs. spot very narrow or absent); from all its congeners of the *A. austrani* species group by having anal-fin base squamation beginning at the third anal-fin spine (vs. anal-fin base squamation beginning at the sixth anal-fin spine); from *A. austrani*, *A. barbosa*, *A. ipatinguensis*, *A. macaensis*, *A. macacuensis*, *A. muriae*, *A. paraibae*, *A. robustus*, *A. saquarema* and *A. montanus* sp. n. by having fewer proximal radials on anal-fin base (12 in *A. mattosi* sp. n. vs. 13 in *A. ipatinguensis*, *A. macacuensis*, *A. robustus* and *A. montanus* sp. n.; 13–14 in *A. austrani*, *A. barbosa*, *A. macaensis*, *A. muriae* and *A. paraibae*; and 14–15 in *A. saquarema*); from *A. tavaresi* sp. n. by having mouth isognathous (vs. prognathous); and from *A. ribeirae* by having last dorsal-fin spine shorter (last dorsal-fin spine length 13.2–15.4% SL vs. 16.0–16.8% SL).

Description. Morphometric data are summarized in Table 1, meristic data in Table 2. Body elongated and

laterally compressed. Dorsal profile slightly convex from snout to caudal peduncle origin. Dorsal-fin base slightly curved, progressively descending from origin to end. Ventral profile slightly curved from snout to caudal peduncle origin. Caudal peduncle approximately straight ventrally and dorsally. Head profile between tip of snout and orbit slightly curved. Nostrils in the middle between the tip of snout and anterior margin of orbit. Opercle not serrated. Mouth terminal, distal tip of maxilla not reaching vertical tangent to anterior margin of orbit. Lower lip fold covering distal portion of upper lip. Mouth isognathous.

Trunk and caudal peduncle covered with ctenoid scales. Chest scales cycloids. Sides of head (opercle, preopercle, subopercle and interopercle) covered with cycloid scales. Three rows of scales on cheek. Scales on head and chest not distinctly smaller than scales on flank. Two scales between lateral lines.

Dorsal-fin origin at level of posterior margin of opercle. Dorsal fin rounded, pointed on posterior region. Tip of dorsal fin reaching vertical through end of caudal fin. Dorsal-fin squamation beginning at 12th. dorsal-fin spine. Anal fin rounded anteriorly, pointed posteriorly. Tip of anal fin reaching vertical through end of caudal fin. Anal fin squamation beginning at 3th. anal-fin spine. Caudal fin long with distal margin convex. Caudal fin with ctenoid scales, smaller than scales of flank, covering about 25 % of fin. Pectoral fin rounded, reaching vertical through first anal-fin spine or trunk bar 4 anterior margin. Pectoral-fin base on vertical through third spine of dorsal fin. Pelvic fin pointed. Pelvic-fin base on vertical through third or fourth spine of dorsal fin. Tip of pelvic fin reaching vertical through second spine of anal fin.

Jaw teeth caniniform, slightly curved, directed to inside of mouth. Teeth hyaline, red at tip. Outer row

teeth increasing in size symphysiad, anterior teeth of upper jaw anterior longest, anterior teeth of lower jaw subequal. Ceratobranchial 5 partly sutured medially and relatively robust, with 8 (2) teeth along midline and 24 (2) teeth along posterior margin. Posterior teeth often more compressed laterally. Posterior and medial teeth larger than lateral and anterior teeth. Posterior teeth unicuspid, curved forward. Large laterally compressed teeth bicuspid, with second cusp raising anteriorly shelf. Ectopterygoid wide (OTTONI & COSTA, 2008; Fig. 3 B). Arm of epibranchial 1 long and epibranchial 2 with two short processes (OTTONI & COSTA, 2008; Fig. 4 A and 4 D). Microbranchiospines present only on external side of ceratobranchial 4.

Coloration in alcohol (Fig. 1). Side of body light brown with seven trunk dark brown bars (bars 1–5 continuous, 6–7 interrupted above longitudinal stripe) between caudal peduncle and posterior margin of opercle. Trunk bars 2–4 dorsally inclined posteriorly. Trunk bar 5 unforked dorsally and connected to trunk bar 6, above upper lateral line. Trunk bar 6 interrupted between longitudinal stripe and upper lateral line. Trunk bar 7 forked dorsally and interrupted above longitudinal stripe. Arms of trunk bars 7 with the same width (Fig. 2). Trunk bar 1 with an arch form. Three dark spots; first spot on caudal-fin peduncle rounded and visible, through lower lateral line; second one on junction between longitudinal stripe and trunk bar 4; third spot on posterior margin of opercle and longitudinal stripe. Interrupted brown longitudinal stripe from trunk bar 1 to preopercle, lighter and inconspicuous between trunk bars 1–4, darker between trunk bar 4 and head bar 1.

Side of head with three brown bars, all continuous; head bar 1 on post-orbital region, close to eye, head bars 2–3 on supra-orbital zone, between eyes; head bar 2 on posterior orbital margin touching head bar 1 just above preopercle; head bar 3 curved and directed to snout. Head darker than trunk, especially on dorsal part between head bars 2–3.

Dorsal fin light brown, slightly invaded by dark brown trunk bars. Anal fin color pattern similar to dorsal fin. Caudal fin light brown, darker near caudal peduncle. Pectoral fin light brown, pelvic fin just darker.

Distribution. Rio Paraopeba and rio das Velhas drainages, rio São Francisco basin, Minas Gerais state, southeastern Brazil (Fig. 2).

Etymology. The name *mattosi*, in honor to the zoologist and friend JOSÉ LEONARDO DE OLIVEIRA MATTOS.

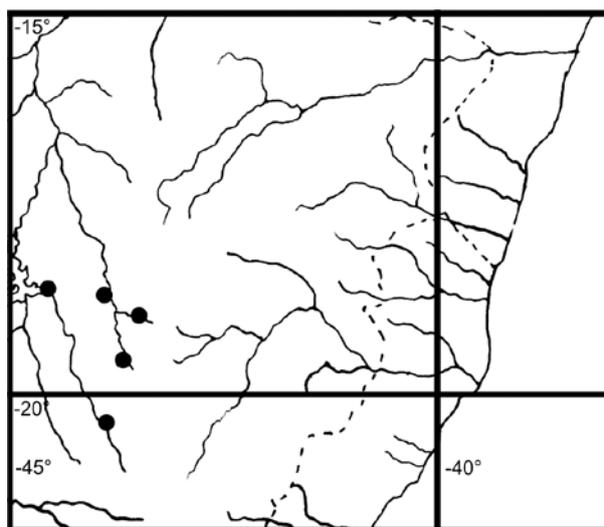


Fig. 2. Distribution map of: ●, *Australoheros mattosi* sp. n.

Australoheros montanus new species

Fig. 3

Holotype. MNRJ 32555, 78.9 mm SL; Brazil: Rio de Janeiro state: Carmo, córrego Tanque, tributary of the rio Paraíba do Sul, locality of Passa Três (21° 49' S / 42° 32' W); E. CARAMASCHI & D. MORAES JR., 29 Oct. 1988.

Paratypes. Brazil: Rio de Janeiro state: Carmo municipality: MNRJ 17132, 6 (1 C&S), 20.5–23.9 mm SL; collected with holotype. MNRJ 14691, 2 (1 C&S), 36.2–43.3 mm SL; córrego Monte Alegre, tributary of the rio Paquequer, near córrego Bom Sucesso mouth (21° 58' S / 42° 36' W); E. CARAMASCHI & D. MORAES JR., 06 Aug. 1990. MNRJ 14703, 7 (1 C&S), 19.7–47.4 mm SL; córrego dos Pereiras, tributary of the rio Paquequer (21° 54' S / 42° 36' W); E. CARAMASCHI & D. MORAES JR., 06 Aug. 1990. MNRJ 14756, 5 (1 C&S), 19.4–75.9 mm SL; córrego da Glória, tributary of the rio Paquequer, between córrego Pedra Branca and córrego São José (21° 55' S / 42° 35' W); E. CARAMASCHI & D. MORAES JR., 02 Aug. 1990. MNRJ 14817, 2, 49.1–56.2 mm SL; ribeirão Quilombo, rio Paraíba do Sul basin, near Farm Quinta, between Carmo and Cantagalo (21° 49' S / 42° 27' W); E. CARAMASCHI & D. MORAES JR., 30 Oct. 1988. MCP 43130, 1, 28.3 mm SL; córrego da Glória, tributary of the rio Paquequer, between córrego Pedra Branca and córrego São José (21° 55' S / 42° 35' W); E. CARAMASCHI & D. MORAES JR., 02 Aug. 1990. Cantagalo municipality: MNRJ 14686, 4 (1 C&S); 24.4–79.4 mm SL, ribeirão Quilombo, rio Paraíba do Sul basin, bridge on locality of Amparo (21° 54' S / 42° 29' W); E. CARAMASCHI & D. MORAES JR., 02 Oct. 1990. Sumidouro municipality: UFRJ 7795, 5, 63.7–102.5 mm SL; rio São Francisco, locality of Barra de São Francisco, between Sumidouro and Carmo, street to Eletrofurnas, transversal to RJ-148, near to farm Paquequer (21° 58' 36.64" S / 42° 11' 98" W); F. OTTONI *et al.*, 04 Jun. 2010. Sapucaia municipality: UFRJ 7817, 3, 50.2–55.5 mm SL; bridge on the rio São Francisco, between Nossa Senhora da Aparecida and the street RJ-154 (22° 01' 33" S / 42° 47' 23.93" W, 445 m alt.); F. OTTONI *et al.*, 27 Jul. 2010. UFRJ 7856, 3, 54.0–61.0 mm SL; rio São Francisco, about 1 km before Nossa Senhora da Aparecida (22° 2' 2.80" S / 42° 47' 47.28" W); P. BRAGANÇA & A. KATZ, 12 Aug. 2010.

Table 1. Morphometric data of *Australoheros mottosi* sp. n., *Australoheros montanus* sp.n. and *Australoheros tavaresi* sp.n. H = holotype, R = range and M = mean.

	H	R n=9	M	H	R n=15	M	H	R n= 11	M
Standard length (mm)	80.4	43.0–106.3	72.2	78.9	36.2–102.5	63.5	46.6	44.0–65.8	54.5
Percentages of SL									
Body depth	42.4	41.5–45.2	43.0	48.5	41.1–48.9	45.0	39.7	39.0–42.2	40.3
Predorsal length	43.5	41.3–46.7	43.3	44.4	42.8–46.0	44.2	42.3	41.6–45.7	43.0
Prepelvic length	42.7	41.4–45.1	43.0	43.9	42.5–45.1	43.8	39.3	39.3–45.1	41.9
Caudal pedicel depth	18.2	15.0–18.2	16.4	16.2	15.0–18.1	16.1	16.5	14.3–17.3	16.4
Caudal pedicel length	10.8	7.6–10.8	9.0	10.4	10.1–11.9	10.6	10.7	9.8–11.6	10.5
Dorsal-fin base length	58.3	53.4–58.3	56.4	57.3	53.8–59.9	57.0	53.6	52.2–58.2	55.4
Anal-fin base length	25.7	25.3–29.6	26.8	26.6	25.6–30.9	27.8	23.6	23.1–29.6	25.3
Pelvic-fin spine length	17.4	13.5–18.2	16.0	16.0	14.6–17.3	15.7	15.9	14.3–17.2	15.6
Pelvic-fi length	38.8	28.4–50.0	36.8	38.8	27.6–56.8	35.2	27.9	26.4–32.3	30.1
Last dorsal-fin spine length	15.4	13.2–15.4	14.5	15.7	12.2–17.1	14.2	15.0	13.5–15.8	14.6
Last anal-fin spine length	17.3	13.5–17.3	14.9	14.8	12.4–17.0	14.6	15.2	14.1–16.4	15.1
Pectoral-fin length	30.7	26.2–30.8	28.7	29.4	26.0–32.7	29.2	27.3	24.7–29.1	26.9
Caudal-fin length	34.2	28.2–34.2	31.7	30.8	29.0–34.4	31.2	30.0	22.5–31.8	29.4
Head length (mm)	29.7	16.4–39.3	26.2	28.2	13.0–37.4	23.4	16.8	16.8–24.0	19.9
Percentages of HL									
Head deth	88.2	82.9–99.1	88.9	92.5	80.7–105.4	90.0	81.0	80.6–94.2	87.0
Orbital diamiter	28.6	24.2–32.9	27.4	28.5	26.2–38.5	31.7	34.5	30.0–34.5	33.2
Snout length	38.7	32.9–41.4	37.6	39.5	30.0–39.5	34.2	32.7	32.7–37.6	34.9
Head width	54.5	48.9–55.2	52.6	57.3	48.6–58.8	53.8	49.4	46.9–54.2	50.3
Interorbital width	40.1	37.8–43.0	40.9	47.0	39.8–47.1	43.8	39.9	39.3–42.9	41.5
Preorbital depth	64.0	56.7–64.0	61.2	64.8	57.3–69.0	62.2	51.2	51.2–60.0	55.9
Upper jaw length	32.7	28.0–32.7	29.8	32.7	28.1–34.2	31.2	29.8	28.4–31.3	29.9
Lower jaw length	24.2	17.7–25.4	22.0	23.1	19.3–25.7	22.4	19.6	19.6–21.7	20.5
Percentages of SL									
Head deth	32.6	29.8–34.2	32.3	33.0	31.2–38.2	33.2	29.2	29.2–34.3	31.8
Orbital diamiter	10.6	8.9–12.6	10.0	10.1	9.6–13.8	11.7	12.4	10.9–13.2	12.1
Snout length	14.3	12.6–15.2	13.7	14.1	11.0–14.1	12.6	11.8	11.8–13.7	12.7
Head width	20.1	17.9–20.4	19.1	20.4	18.9–21.5	19.9	17.8	17.2–19.8	18.3
Interorbital width	14.8	14.4–15.9	14.9	16.7	15.2–17.4	16.2	14.4	14.4–15.7	15.1
Preorbital depth	23.6	20.8–23.6	22.3	23.1	21.0–25.2	23.0	18.5	18.5–21.3	20.4
Upper jaw length	12.1	10.2–12.1	10.8	11.7	10.6–12.5	11.5	10.7	10.4–11.4	10.9
Lower jaw length	9.0	6.7–9.4	8.0	8.2	7.3–9.3	8.3	7.1	7.1–7.8	7.5

Diagnosis. *Australoheros montanus* sp. n. is distinguished from species of the *A. facetus*, *A. forquilha*, *A. kaaygua* and *A. scitulus* species groups, and from *A. acaroides*, *A. ykeregua*, *A. angiru* and *A. taura* by having 12 caudal vertebrae (vs. 13–15) and 14 pre-caudal vertebrae (vs. 12–13); from species of the *A. facetus*, *A. forquilha* and *A. kaaygua* species groups by having three abdominal bars in all stages of life (vs. always four abdominal bars in juveniles, and adults with three bars in about 50% and four in about 50% of all specimens examined); from *A. perdi* by having 26 total vertebrae (vs. 25); from *A. ykeregua* by the absence of dark marks on the suborbital region (vs. presence); from *A. agiru* by having a conspicuous rounded caudal-fin base spot (vs. spot very narrow or absent); from all its congeners of the *A. austrani* species group

(except *A. macacuensis*) by having posterior arm of trunk bar 7 wider than anterior one (vs. arms with the same width) (Fig. 4); from *A. austrani*, *A. capixaba*, *A. macacuensis*, *A. macaensis*, *A. saquarema* and *A. ribeirae* by having a complete red bar on posterior margin of caudal fin (vs. absence of red regions on caudal fin in *A. austrani*, *A. capixaba*, *A. macacuensis*, *A. macaensis*, *A. saquarema* and *A. ribeirae*; and two red regions on posterior margin of caudal-fin, one dorsal corner and other ventral corner in *A. robustus* and *A. paraibae*); from *A. saquarema*, *A. muriae*, *A. robustus*, *A. barbosa*, *A. macacuensis*, *A. ipatinguensis*, *A. paraibae* and *A. ribeirae* by having a longer caudal pedicel (caudal pedicel length 10.1–11.9 % SL in *A. montanus* sp. n. vs. 6.6–8.0% SL in *A. ipatinguensis*, 6.7–9.0% SL in *A. saquarema*, 5.1–7.9%

Table 2. Meristic data of *Australoheros mattosi* sp. n., *Australoheros montanus* sp. n. and *Australoheros tavaresi* sp.n. Pc = procurrent rays.

	<i>Australoheros mattosi</i> sp.n.	<i>Australoheros montanus</i> sp.n.	<i>Australoheros tavaresi</i> sp.n.
Dorsal-fin spines	16–17 (n=9)	15–17 (n=12)	16–17 (n=11)
Dorsal-fin rays	9–10 (n=9)	10–11 (n=9)	10–11 (n=11)
Anal-fin spines	6–8 (n=9)	6–8 (n=12)	7–8 (n=11)
Anal-fin rays	8–9 (n=9)	8–9 (n=9)	8–9 (n=11)
Pelvic-fin spines	1 (n=9)	1 (n=5)	1 (n=11)
Pelvic-fin rays	5 (n=9)	5 (n=5)	5 (n=11)
Caudal – fin rays	3pc+8+8+2–3pc (n=2)	3pc+8+8+3pc (n=5)	3pc+8+8+3pc (n=3)
Pectoral fin rays	14 (n=3)	13–14 (n=5)	14–15 (n=3)
Gill rakers on first branchial arch	–	3–6+15–16 (n=5)	6–9+18 (n=3)
Total vertebrae	26 (n=2)	26 (n=5)	26 (n=3)
Rib pairs	11 (n=2)	10–11 (n=5)	11 (n=3)
Precaudal vertebrae	14 (n=2)	14 (n=5)	14 (n=3)
Caudal vertebrae	12 (n=2)	12 (n=5)	12 (n=3)
Proximal radials on dorsal-fin base	24–25 (n=2)	24–25 (n=5)	26 (n=3)
Proximal radials on anal-fin base	12 (n=2)	13 (n=5)	13–14 (n=3)
Scales on upper lateral line	16–18 (n=9)	15–17 (n=12)	15–18 (n=11)
Scales on lower lateral line	7–10 (n=9)	7–9 (n=12)	7–9 (n=11)
E0	25–28 (n=9)	25–28 (n=12)	27–28 (n=11)
E1	25–29 (n=9)	27–29 (n=12)	27–29 (n=11)
E2	21–23 (n=9)	20–21 (n=12)	21–23 (n=11)
L1	4 (n=9)	4 (n=12)	4 (n=11)
L2	3 (n=9)	2–3 (n=12)	3 (n=11)
Anal-fin origin scales serie	8–9 (n=9)	8 (n=12)	8 (n=11)
Peduncle scales serie	7 (n=9)	7 (n=12)	7 (n=11)

SL in *A. macacuensis*, 5.5–8.7% SL in *A. barbosa*, 7.1–8.9% SL in *A. muriae*, 6.4–8.1% SL in *A. parai-bae*, 7.4–9.2% SL in *A. robustus* and 6.6–9.1 % SL in *A. ribeirae*); from *A. macaensis* and *A. saquarema* by not having depression on snout (*vs.* depression on snout present in specimens above 30.0 mm SL, just above eyes) (Fig. 5); from *A. macacuensis* by having fewer teeth along posterior margin of ceratobranchial 5 (22–24 *vs.* 25–29); from *A. macacuensis*, *A. macaensis* and *A. autrani* by having trunk bars usually forked ventrally (*vs.* never forked ventrally); from *A. mattosi* sp. n. by having anal-fin base squamation beginning at the sixth anal-fin spine (*vs.* anal-fin base squamation beginning at the third anal-fin spine); from *A. tavaresi* sp. n. by having mouth isognathous (*vs.* prognathous).

Description. Morphometric data are summarized in Table 1, meristic data in Table 2. Body elongated and laterally compressed. Dorsal profile slightly convex from snout to caudal peduncle origin. Dorsal-fin base slightly curved, progressively descending from origin to end. Ventral profile slightly curved from snout to caudal peduncle origin. Caudal peduncle approximately straight ventrally and dorsally. Head profile

between tip of snout and orbit slightly curved. Nostrils in the middle between the tip of snout and anterior margin of orbit. Opercle not serrated. Mouth terminal, distal tip of maxilla not reaching vertical tangent to anterior margin of orbit. Lower lip fold covering distal portion of upper lip. Mouth isognathous.

Trunk and caudal peduncle covered with ctenoid scales. Chest scales cycloids. Sides of head (opercle, preopercle, subopercle and interopercle) covered with cycloid scales. Three rows of scales on cheek. Scales on head and chest not distinctly smaller than scales on flank. Two scales between lateral lines.

Dorsal-fin origin at level of posterior margin of opercle. Dorsal fin rounded, pointed on posterior region. Tip of dorsal fin reaching vertical through end of caudal fin. Dorsal-fin squamation beginning at 12th dorsal-fin spine. Anal fin rounded anteriorly, pointed posteriorly. Tip of anal fin reaching vertical through end of caudal fin. Anal fin squamation beginning at 6th anal-fin spine. Caudal fin long with distal margin convex. Caudal fin with ctenoid scales, smaller than scales of flank, covering about 25% of fin. Pectoral fin rounded, reaching vertical through first anal-fin spine or trunk bar 4 anterior margin. Pectoral-fin base on vertical through third spine of dorsal fin. Pelvic fin



Fig. 3. *Australoheros montanus* sp. n.; UFRJ 7795, 91.7 mm SL, paratype; Brazil: Rio de Janeiro state: Sumidouro municipality: rio Paquequer basin.

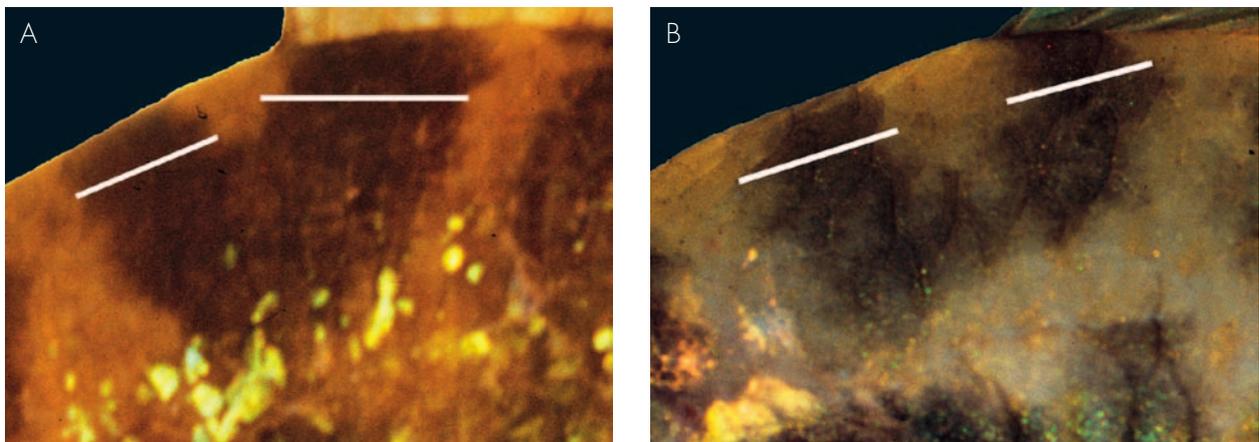


Fig. 4. Trunk bar 7: **A**, *Australoheros macacuensis*; specimens not preserved (*Australoheros montanus* sp. n. also have these bar patterns); and **B**, *Australoheros saquarema*; UFRJ 7221, 54.7 mm SL, paratype (all the others congeners of the *A. austrani* species group, except those cited above, have this bar pattern).

pointed. Pelvic-fin base on vertical through third or fourth spine of dorsal fin. Tip of pelvic fin reaching vertical through second spine of anal fin.

Jaw teeth caniniform, slightly curved, directed to inside of mouth. Teeth hyaline, red at tip. Outer row teeth increasing in size symphysiad, anterior teeth of upper jaw anterior longest, anterior teeth of lower jaw subequal. Ceratobranchial 5 partly sutured medially and relatively robust, with 6–8 (5) teeth along midline and 22–24 (5) teeth along posterior margin. Posterior teeth often more compressed laterally. Posterior and medial teeth larger than lateral and anterior teeth.

Posterior teeth unicuspid, curved forward. Large laterally compressed teeth bicuspid, with second cusp raising anteriorly shelf. Ectopterygoid wide (OTTONI & COSTA, 2008; Fig. 3 B). Arm of epibranchial 1 long and epibranchial 2 with two short processes (OTTONI & COSTA, 2008; Fig. 4 A and 4 D). Microbranchiospines present only on external side of ceratobranchial 4.

Coloration in alcohol. Side of body light brown with seven trunk dark brown bars (bars 1–5 continuous, 6–7 interrupted above longitudinal stripe) between caudal peduncle and posterior margin of opercle.

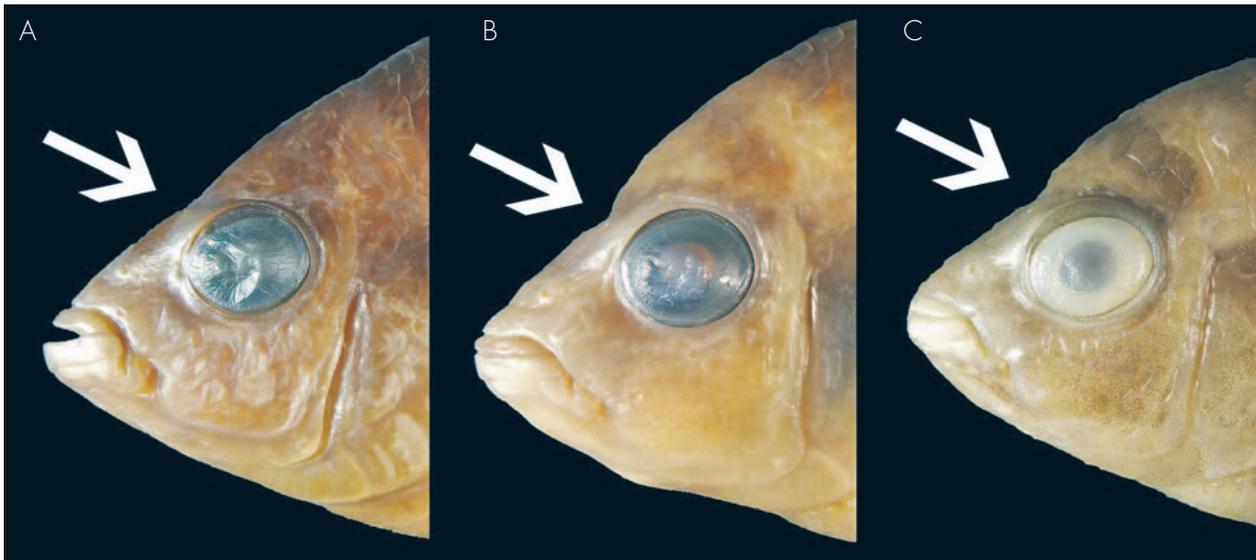


Fig. 5. Head profile of: **A**, *Australoheros autrani*; UFRJ 7256, 57.0 mm CP, holotype (all the others congeners of the *A. autrani* species groups, except those cited below, have this type of head); **B**, *Australoheros saquarema*; UFRJ 7255, 80.3 mm SL, holotype; and **C**, *Australoheros macaensis*; UFRJ 7573, 66.8 mm SL, holotype. **A**; snout without depression; **B** and **C**; snout with depression in specimens above 30.0 mm SL, just above eye.

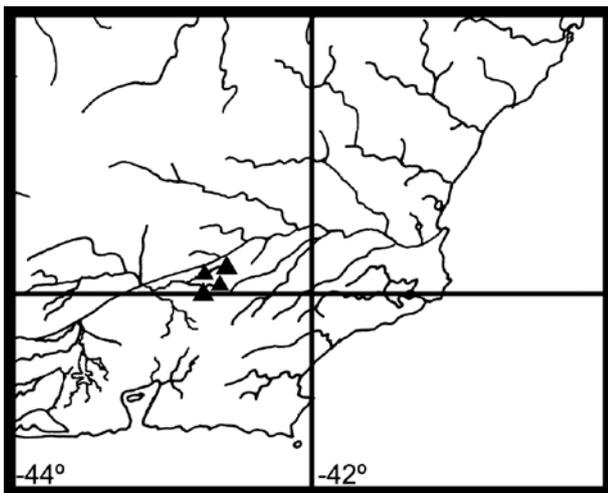


Fig. 6. Distribution map of: ▲, *Australoheros montanus* sp. n.

Trunk bars 2–4 dorsally inclined posteriorly. Trunk bar 5 un-forked dorsally and connected to trunk bar 6, above upper lateral line. Trunk bar 6 interrupted between longitudinal stripe and upper lateral line. Trunk bar 7 forked dorsally and interrupted above longitudinal stripe. Posterior arm of trunk bar 7 wider than anterior one (Fig. 2). Trunk bar 1 with an arch form. Three dark spots; first spot on caudal-fin peduncle (well developed round spot), through lower lateral line; second one on junction between longitudinal stripe and trunk bar 4; third spot on posterior margin of opercle and longitudinal stripe. Interrupted brown longitudinal stripe from trunk bar 1 to preopercle, lighter and inconspicuous between trunk bars 1–4, darker between trunk bar 4 and head bar 1.

Side of head with three brown bars, all continuous; head bar 1 on post-orbital region, close to eye, head bars 2–3 on supra-orbital zone, between eyes; head bar 2 on posterior orbital margin touching head bar 1 just above preopercle; head bar 3 curved and directed to snout. Head darker than trunk, especially on dorsal part between head bars 2–3.

Dorsal fin light brown, slightly invaded by dark brown trunk bars. Anal fin color pattern similar to dorsal fin. Caudal fin yellowish brown, darker near caudal peduncle. Pectoral fin light brown, pelvic fin just darker.

Coloration in life (Fig. 3). Based on six specimens. Side of body reddish brown; seven trunk bars usually varying from dark brown to light brown, greenish brown or black. Posterior arm of trunk bar 7 wider than anterior one. Three black spots. Rounded caudal-fin base spot. Green iridescence on flank, more concentrated near longitudinal stripe. Trunk bars usually lighter than longitudinal stripe. Chest with red coloration.

Side of head light brown to dark brown, yellowish brown or greenish brown; three head bars with same coloration as trunk bars. Darker similar coloration between head bars 1–2, and between snout and eye. Iris yellow, no dark mark crossing eye. Yellow and green iridescence on suborbital region, on opercle and between trunk bar 7 and eye.

Dorsal fin yellow or light brown, invaded by trunk bars, with grey margin. Light green marks near dorsal-fin base. Anal-fin dark brown, with light green marks near anal-fin base. Caudal fin yellowish brown or light



Fig. 7. *Australoheros tavaresi* sp. n.; MZUSP 50675 A, 1, 46.6 mm SL, holotype; Brazil: São Paulo state: Guarulhos municipality: upper rio Tietê basin.

brown, with blue bar on posterior margin. Complete red bar on posterior margin of caudal-fin, just anterior blue bar. Pelvic fin darker than trunk, with golden iridescence. Pectoral fin hyaline.

Distribution. Rio Paquequer drainage, rio Paraíba do Sul basin, Rio de Janeiro state, southeastern Brazil (Fig. 6).

Etymology. From the Latin *montanus*, in allusion to the mountainous relief of the region where the new species inhabits.

Australoheros tavaresi new species

Fig. 7

Holotype. MZUSP 50675 A, 46.6 mm SL; Brazil: São Paulo state: Guarulhos, lagoon on the margin of the rio Tietê; R. FRANÇA, 2 Oct. 1962.

Paratypes. Brazil: São Paulo state: MZUSP 50675 B, 5, 28.8–50.0 mm SL; collected with holotype. MZUSP 28169, 5 (3 C&S), 44.0–63.2 mm SL; Salesópolis, dam of Ponte Nova, between Salesópolis and Biritiba-mirim; Instituto de Pesca, 1977. MZUSP 88185, 2, 53.9–65.8 mm SL; Itapeceira da Serra, tributary of the rio Embu-mirim, street João Rodrigues de Moraes (23° 42' 58" S / 46° 48' 49" W); O. OYAKAWA, 23 Aug. 2005.

Diagnosis. *Australoheros tavaresi* sp. n. differs from all its congeners (except *A. facetus*) by having prognathous mouth (vs. isognathous) (Fig. 8); from species of the *A. facetus*, *A. forquilha*, *A. kaaygua* and *A. scitulus* species groups, and from *A. acaroides*, *A.*

ykeregua, *A. angiru* and *A. taura* by having 12 caudal vertebrae (vs. 13–15) and 14 precaudal vertebrae (vs. 12–13); from species of the *A. facetus*, *A. forquilha* and *A. kaaygua* species groups by having three abdominal bars in all stages of life (vs. always four abdominal bars in juveniles, and adults with three bars in about 50% and four in about 50% of all specimens examined); from *A. perdi* by having 26 total vertebrae (vs. 25); from *A. ykeregua* by the absence of dark marks on the suborbital region (vs. presence); from *A. agiru* by having a conspicuous rounded caudal-fin base spot (vs. spot very narrow or absent); from all its congeners of the *A. austrani* species group (except *A. mattsosi* sp. n. and *A. montanus* sp. n.) by having a fewer body depth (39.0–42.2% SL in *A. tavaresi* sp. n. vs. 45.7–50.9% SL in *A. austrani*, 44.6–49.0% SL in *A. barbosa*, 47.3–51.2% SL in *A. ipatinguensis*, 46.6–49.8% SL in *A. macacuensis*, 44.0–48.2% SL in *A. macaensis*, 43.8–50.1% SL in *A. muriae*, 42.6–46.1% SL in *A. paraibae*, 47.4–51.3% SL in *A. ribeirae*, 43.7–46.0% SL in *A. robustus*, 44.0–48.2% SL in *A. saquarema*, 42.6–50.3% SL in *A. capixaba*); from *A. saquarema*, *A. muriae*, *A. robustus*, *A. barbosa*, *A. macacuensis*, *A. ipatinguensis*, *A. paraibae* and *A. ribeirae* by having a longer caudal peduncle (caudal peduncle length 9.8–11.6% SL in *A. tavaresi* sp. n. vs. 6.6–8.0% SL in *A. ipatinguensis*, 6.7–9.0% SL in *A. saquarema*, 5.1–7.9% SL in *A. macacuensis*, 5.5–8.7% SL in *A. barbosa*, 7.1–8.9% SL in *A. muriae*, 6.4–8.1% SL in *A. paraibae*, 7.4–9.2% SL in *A. robustus* and 6.6–9.1% SL in *A. ribeirae*); from *A. barbosa*, *A. macacuensis*, *A. paraibae*, *A. ribeirae* and *A. saquarema* by having a fewer preorbital depth (51.2–60.0% SL in *A. tavaresi* sp. n. vs. 60.5–65.3% SL in *A. barbosa*, 62.2–65.4% SL in *A. macacuensis*,



Fig. 8. Prognathous mouth of *A. tavaresi* sp. n.: **A**, MZUSP 50675 A, 46.6 mm SL, holotype; and **B**, MZUSP 28169, 63.2 mm SL, paratype.

60.4–65.2% SL in *A. paraibae*, 64.2–73.3% SL in *A. ribeirae*, 66.0–69.1% SL in *A. saquarema*); from *A. macacuensis* and *A. montanus* sp. n. by having arms of trunk bar 7 with the same width (vs. posterior arm of trunk bar 7 wider than anterior one) (Fig. 2); from *A. mattosi* sp. n. by having anal-fin base squamation beginning at the sixth anal-fin spine (vs. anal-fin base squamation beginning at the third anal-fin spine); and from *A. ribeirae* by having a fewer head depth (head depth 80.6–94.2% HL vs. 95.4–98.9% HL).

Description. Morphometric data are summarized in Table 1, meristic data in Tabela 2. Body elongated and laterally compressed. Dorsal profile slightly convex from snout to caudal peduncle origin. Dorsal-fin base slightly curved, progressively descending from origin to end. Ventral profile slightly curved from snout to caudal peduncle origin. Caudal peduncle approximately straight ventrally and dorsally. Head profile between tip of snout and orbit slightly curved. Nostrils in the middle between the tip of snout and anterior margin of orbit. Opercle not serrated. Mouth terminal, distal tip of maxilla not reaching vertical tangent to anterior margin of orbit. Lower lip fold covering distal portion of upper lip. Mouth prognathous (Fig. 8).

Trunk and caudal peduncle covered with ctenoid scales. Chest scales cycloids. Sides of head (opercle, preopercle, subopercle and interopercle) covered with cycloid scales. Three rows of scales on cheek. Scales on head and chest not distinctly smaller than scales on flank. Two scales between lateral lines.

Dorsal-fin origin at level of posterior margin of opercle. Dorsal fin rounded, pointed on posterior region. Tip of dorsal fin reaching vertical through end of caudal fin. Dorsal-fin squamation beginning at 12th dorsal-fin spine. Anal fin rounded anteriorly, pointed posteriorly. Tip of anal fin reaching vertical through end of caudal fin. Anal fin squamation beginning at 6th anal-fin spine. Caudal fin long with distal margin

convex. Caudal fin with ctenoid scales, smaller than scales of flank, covering about 25% of fin. Pectoral fin rounded, reaching vertical through first anal-fin spine or trunk bar 4 anterior margin. Pectoral-fin base on vertical through third spine of dorsal fin. Pelvic fin pointed. Pelvic-fin base on vertical through third or fourth spine of dorsal fin. Tip of pelvic fin reaching vertical through second spine of anal fin.

Jaw teeth caniniform, slightly curved, directed to inside of mouth. Teeth hyaline, red at tip. Outer row teeth increasing in size symphysiad, anterior teeth of upper jaw anterior longest, anterior teeth of lower jaw subequal. Ceratobranchial 5 partly sutured medially and relatively robust, with 6 (3) teeth along midline and 21–23 (3) teeth along posterior margin. Posterior teeth often more compressed laterally. Posterior and medial teeth larger than lateral and anterior teeth. Posterior teeth unicuspid, curved forward. Large laterally compressed teeth bicuspid, with second cusp raising anteriorly shelf. Ectopterygoid wide (OTTONI & COSTA, 2008; Fig. 3 B). Arm of epibranchial 1 long and epibranchial 2 with two short processes (OTTONI & COSTA, 2008; Fig. 4 A and 4 D). Microbranchiospines present only on external side of ceratobranchial 4.

Coloration in alcohol (Fig. 7). Side of body light brown with seven trunk dark brown bars (bars 1–5 continuous, 6–7 interrupted above longitudinal stripe) between caudal peduncle and posterior margin of opercle. Trunk bars 2–4 dorsally inclined posteriorly. Trunk bar 5 un-forked dorsally and connected to trunk bar 6, above upper lateral line. Trunk bar 6 interrupted between longitudinal stripe and upper lateral line. Trunk bar 7 forked dorsally and interrupted above longitudinal stripe. Arms of trunk bars 7 with the same width (Fig. 2). Trunk bar 1 with an arch form. Three dark spots; first spot on caudal-fin peduncle (well developed round spot), through lower lateral line; second one on junction between longitudinal stripe and trunk bar 4; third spot on posterior margin of opercle and longitudinal stripe. Interrupted brown longitudinal stripe from trunk bar 1 to preopercle, lighter and inconspicuous between trunk bars 1–4, darker between trunk bar 4 and vertical head bar 1.

Side of head with three brown bars, all continuous; head bar 1 on post-orbital region, close to eye, head bars 2–3 on supra-orbital zone, between eyes; head bar 2 on posterior orbital margin touching head bar 1 just above preopercle; head bar 3 curved and directed to snout. Head darker than trunk, especially on dorsal part between head bars 2–3.

Dorsal fin light brown, slightly invaded by dark brown trunk bars. Anal fin color pattern similar to dorsal fin. Caudal fin light brown, darker near caudal peduncle. Pectoral fin light brown, pelvic fin just darker.

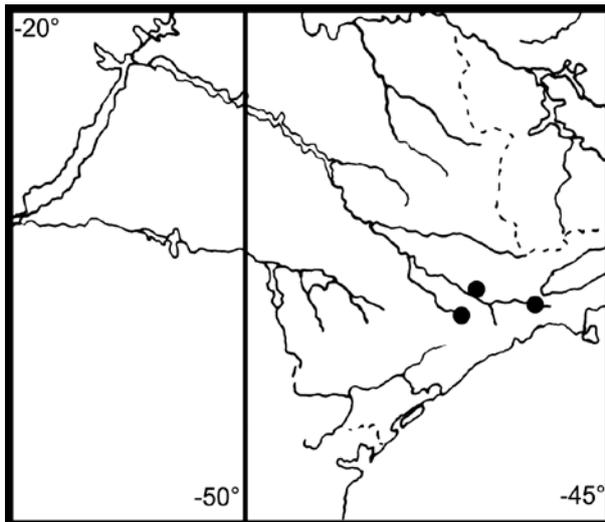


Fig. 9. Distribution map of: ● *Australoheros tavaresi* sp. n.

Distribution. Upper rio Tietê drainage, upper rio Paraná basin, São Paulo state, southeastern Brazil (Fig. 9).

Etymology. Name in honor of FELIPE TAVARES AUTRAN, who was a student in Laboratório de Sistemática e Evolução de Peixes Teleosteos, Universidade Federal do Rio de Janeiro (UFRJ), Brazil, during the 1990's. He first recognized this species as new in his unpublished monograph (AUTRAN, 1995) on the "*Cichlasoma*" *facetum* species complex, under orientation of WILSON COSTA. This study, although widely known among Brazilian ichthyologists, was never published.

Discussion

With the addition of the three new species herein described, *Australoheros* currently comprises 27 valid species, divided in five species groups (Table 3). Three other species names have been listed as synonyms of *Australoheros facetus* by KULLANDER (2003), RÍCAN & KULLANDER (2003; 2006; 2008) and OTTONI & COSTA (2008): *Chromys oblonga* CASTELNAU, 1855 from the rio Tocantins, Goiás, Brazil; *Heros autochthon* GÜNTHER, 1862, from Brazil, without any precise locality; and, *H. jenynsii* STEINDACHNER, 1869, from Montevideo, Uruguay.

RÍCAN & KULLANDER (2003) claimed that *Chromys oblonga*, from the rio Tocantins in Goiás, Brazil, would be similar to '*C.*' *facetum*, although the holotype being in bad state of conservation, considering the type locality as doubtful. The original description (CASTELNAU, 1855) does not include any character state making possible to recognize *C. oblonga* as a mem-

ber of *Australoheros*. Since the genus *Australoheros* is presently diagnosed by color patterns, it is difficult to assume *C. oblonga*, represented only by material in bad state of conservation as belonging to the genus. Finally, the distribution of the genus does not comprise the rio Tocantins basin, a region well sampled for fish during the last decades, and densely inhabited by other cichlid genera. Due to the bad state of conservation of the unique available material, not permitting to check diagnostic chromatic characters, *Chromys oblonga* is herein considered as a *nomen dubium* until some evidence supporting that synonymy being provided.

Heros autochthon (Fig. 10) was described from "Brazil", without any additional information about the type locality (RÍCAN & KULLANDER, 2003; RÍCAN & KULLANDER, 2008; OTTONI & COSTA, 2008). GÜNTHER (1862: 299) described *Heros autochthon* on the basis of four specimens from Brazil, collected by Lord STUART (apparently CHARLES STUART [1779–1845], ambassador of Brazil in 1825–1826), probably in Rio de Janeiro according to RÍCAN & KULLANDER (2003). However, apparently there is no justification for that supposed collecting site. RÍCAN & KULLANDER (2003) considered *H. autochthon* as a synonym of *A. facetum* without examining the type specimens of the latter species. In addition, the original description of *H. autochthon* does neither mention the diagnostic characters of the genus *Australoheros*, nor includes any illustration of specimens. Examination of recent photographs of syntypes revealed that the best preserved specimen (NHMUK V 1961776, herein designated as lectotype; Fig. 10) does not belong to the genus *Australoheros*, not possessing interruptions of trunk bars 6–7, probably, even not belonging to the tribe Heroini. The other specimens (NHMUK V 1961772, NHMUK V 1961773 and NHMUK V 1961774) are not in good conditions of conservation, not allowing positioning. Thus, that synonymy is here rejected.

Heros jenynsii, described from Montevideo, Uruguay by STEINDACHNER (1869), was subsequently illustrated by STEINDACHNER (1870). According to RÍCAN & KULLANDER (2003), the character states used to distinguish *H. jenynsii* from *Chromis facetus*, both occurring in the same area, were mere individual variations or reflected the better state of preservation of *H. jenynsii*. Thus, RÍCAN & KULLANDER (2003) synonymized *H. jenynsii* with *Australoheros facetus*, what is followed here.

Despite RÍCAN *et al.* (2011) affirmed that all the described species from the southeastern Brazil (the *A. austrani* species group) are, in fact, members of the *A. facetus* species, in this current paper we present several evidences opposing with that affirmation. All the species from the *A. austrani* species group possess 14 precaudal vertebrae (except *A. perdi*), as well as, 12

Table 3. Character differences among the *Australoheros* species group.

Characters	<i>A. autrani</i> species group	<i>A. facetus</i> species group	<i>A. forquilha</i> species group	<i>A. kaaygua</i> species group	<i>A. scitulus</i> species group
vertebrae counts	14–15+12, except in <i>A. perdi</i> (13+12)	13+13–14	13+13–15	13+13–14	12–13+13–15
caudal-fin base spot	rounded and conspicuous	rounded and conspicuous	absent	<i>A. kaaygua</i> similar to the <i>A. scitulus</i> species groups and <i>A. minuano</i> similar to the <i>A. facetus</i> species group	very narrow and inconspicuous
longitudinal stripe	longitudinal stripe inconspicuous, almost missing	longitudinal stripe inconspicuous, almost missing	longitudinal stripe inconspicuous, almost missing	<i>A. kaaygua</i> similar to the <i>A. scitulus</i> species groups and <i>A. minuano</i> similar to the <i>A. facetus</i> species group	longitudinal stripe wider and conspicuous
abdominal bars in juveniles	3	4	4	<i>A. kaaygua</i> similar to the <i>A. scitulus</i> species groups and <i>A. minuano</i> similar to the <i>A. facetus</i> species group	3
pectoral-fin rays	modally 14	modally 13	modally 13	modally 12	modally 13

**Fig. 10.** Lectotype of *Heros autochthon*: NHMUK V 1961776. Scale = 3 cm.

caudal vertebra, while *A. facetus* possesses 13 precaudal vertebrae and 13–14 caudal vertebrae. Additionally except from *A. tavaresi*, all the species from the *A. autrani* species group possess an isognathous mouth, while *A. facetus* possess a prognathous mouth. Others interesting characters are the dorsal-fin and anal-fin base squamation. While *A. facetus* possesses the dorsal-fin base squamation beginning at the 15th dorsal-fin spine (see RÍCAN & KULLANDER, 2008; fig. 8 B), all the species from the *A. autrani* species group possess the dorsal-fin squamation beginning at about the 12th dorsal-fin spine, as well as, all the species of the *A. autrani* species group possess the anal-fin squamation

beginning at the 6th anal-fin spine (except *A. mattsosi* sp. n.), while *A. facetus* possesses the anal-fin base squamation beginning between the 4th/5th anal-fin spines (see RÍCAN & KULLANDER, 2008; fig. 8 B). Observing the number of abdominal bars, another difference between *A. facetus* and the *A. autrani* species group can be observed. While the *A. facetus* groups possess always four abdominal bars in juveniles, and adults with three bars in about 50% and four in about 50% (RÍCAN & KULLANDER, 2008), the *A. autrani* species group possess just three abdominal bars in all stages of life.

Furthermore, others several differences were also observed between the new species herein described

and *A. facetus*. *Australoheros mattsosi* is also distinguished from *A. facetus* by possessing: anal-fin base squamation beginning at the 3rd anal-fin spine, while *A. facetus* possess the anal-fin base squamation beginning between the 4th and 5th anal-fin spines (see RÍCAN & KULLANDER, 2008; fig. 8 B); a higher interorbital width (14.4–15.9 % SL vs. 10.6–13.3 % SL) and a longer snout (snout length 12.6–15.2 % SL vs. 9.3–12.6 % SL). *Australoheros montanus* is also distinguished from *A. facetus* by having: a complete red bar on posterior margin of caudal fin (Fig. 6 B), while this character state was never mentioned for *A. facetus*, neither observed in any colour in life photograph; a reddish ground colour, while *A. facetus* possess a greyish ground color (according to RÍCAN & KULLANDER, 2008); a higher interorbital width (15.2–17.4 % SL vs. 10.6–13.3 % SL); and a longer caudal peduncle (caudal peduncle length 10.1–11.9 % SL vs. 5.9–8.2 % SL). And *A. tavaresi* also differs from *A. facetus* by having: 27–28 scales on E0 rows, while *A. facetus* posses 23–26; a fewer body depth (39.0–42.2 % SL vs. 43.9–52.8 % SL); a longer caudal peduncle (caudal peduncle length 9.8–11.6 % SL vs. 5.9–8.2 % SL); and higher interorbital width (14.4–15.7 % SL vs. 10.6–13.3 % SL).

According to RÍCAN *et al.* (2011) the morphological data used in their Appendix 1 and 2 for the Atlantic coast species of Brazil (*A. austrani* species groups) are taken from the respective species descriptions: OTTONI *et al.* (2008), OTTONI & COSTA (2008) and OTTONI (2010). Observing RÍCAN *et al.* (2011; Appendix 1) some interesting aspects could be observed. At first, the characters 20–39 can not be used for the species of the *A. austrani* species group, because they need some frequencies and statistics not provided by the original descriptions. Additionally, the characters 1, 2, 5, 9, 10, 11 and 15 were not described in the original descriptions, as well as, the character 17 depends of the knowledgement of the colour in life of the species (only the colour in life of *A. austrani*, *A. capixaba*, *A. macaensis*, *A. macacuensis* and *A. ribeirae* were described). The character 7 depends of the examination of the colour pattern of juveniles, what was not described in the original descriptions. Among the 39 characters listed in RÍCAN *et al.* (2011, Appendix 1), only 10 (characters 3, 4, 5, 6, 8, 12, 14, 16, 18 and 19) can be observed in the original descriptions, and most of them are the same in the species of the *A. austrani* species group. Thus, is concluded that the phylogeny proposed by RÍCAN *et al.* (2011; fig. 11) is suitable to test the *Australoheros* species from the southern Brazil, northeastern Argentina and Uruguay, but is not suitable to test the species from the southeastern Brazil (the *A. austrani* species group) and to conclude that all the species of the *A. austrani* species group are, in fact, *A. facetus*.

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References

- AUTRAN, F.C.T. (1995): Revisão taxonômica do complexo de espécies “*Cichlasoma*” *facetum* (Perciformes: Cichlidae). Rio de Janeiro, UFRJ, IB, iii, 137 pp.
- CASCIOTTA, J.R., ALMIRÓN, A.E. & GÓMEZ, S.E. (2006): A new species of *Australoheros* (Teleostei: Perciformes: Cichlidae) from the río Iguazú basin, Argentina. – *Zoologische Abhandlungen*, **55**: 77–83.
- CASCIOTTA, J.R. & ARRATIA, G. (1993): Jaws and teeth of American Cichlids (Pisces: Labroidei). – *Journal of Morphology*, **217**: 1–36.
- CASCIOTTA, J.R., GÓMEZ, S.E. & TORESANI, N.L. (1995): “*Cichlasoma*” *tembe*, a new cichlid species from the rio Paraná basin, Argentina (Osteichthyes: Labroidei). – *Ichthyological Exploration of Freshwaters*, **6**: 193–200.
- CASTELNAU, F. (1855): Animaux nouveaux ou rares de L’Amérique du Sud, de Rio de Janeiro a Lima, et de Lima au Para, **2**. Paris.
- COSTA, W.E.M. (2006): Descriptive morphology and phylogenetic relationships among species of the Neotropical annual killifish genera *Nematolebias* and *Simpsonichthys* (Cyprinodontiformes: Aplocheiloidei: Rivulidae). – *Neotropical Ichthyology*, **4**(1): 1–26.
- DAVIS, J.I. & NIXON, K.C. (1992): Populations, genetic variation, and the delimitation of phylogenetic species. – *Systematic Biology*, **41**: 421–435.
- GÜNTHER, A. (1862): Catalogue of the fishes in the British Museum, **4**. London.
- HENSEL, R. (1870): Beiträge zur Kenntnis der Wirbelthiere Südbrasilens. (Fortsetzung). – *Archiv für Naturgeschichte*, **36**: 54.
- KULLANDER, S.O. (1983): A Revision of the South American Cichlid genus *Cichlasoma* (Teleostei: Cichlidae). – *The Swedish Museum of Natural History, Stockholm, Sweden*, 296pp.
- KULLANDER, S.O. (2003): Family Cichlidae. Pp. 605–654. In: R.E. REIS, S.O. KULLANDER, C.J. FERRARIS, JR (Eds), *Check*

- List of The Freshwater Fishes of South and Central America. Editora Universitária – EDIPUCRS, Porto Alegre, Brasil, x + 603 pp.
- OTTONI, F.P. (2010): *Australoheros capixaba*, a new species of *Australoheros* from south-eastern Brazil (Labroidei: Cichlidae: Cichlasomatinae). – *Vertebrate Zoology*, **60**(1): 19–25.
- OTTONI, F.P.; LEZAMA, A.Q., TRIQUES, M.L., FRAGOSO-MOURA, E.N, LUCAS, C.C.T. & BARBOSA. F.A.R. (2011): *Australoheros perdi*, new species (Teleostei: Labroidei: Cichlidae) from the lacustrine region of the Doce River Valley, south-eastern Brazil, with biological informations. – *Vertebrate Zoology*, **61**(1): 137–145.
- OTTONI, F.P.; OYAKAWA O.T. & COSTA, W.J.E.M. (2008): A new species of the genus *Australoheros* from the rio Ribeira do Iguape basin, São Paulo, Brazil (Labroidei: Cichlidae: Cichlasomatinae). – *Vertebrate Zoology*, **58**(1): 75–81.
- OTTONI, F.P. & COSTA, W.J.E.M. (2008): Taxonomic revision of the genus *Australoheros* RÍCAN & KULLANDER, 2006 (Teleostei: Cichlidae) with descriptions of nine new species from southeastern Brazil. – *Vertebrate Zoology*, **58**(2): 207–232.
- OTTONI, F.P. & CHEFFE, M.M. (2009): A new species of *Australoheros* from the upper rio das Antas, laguna dos Patos System, southern Brazil (Labroidei, Cichlidae, Cichlasomatinae). – *Spixiana*, **32**(1): 153–159.
- RÍCAN, O. & KULLANDER, S.O. (2003): “*Cichlasoma*” *scitulum*: A new species of Cichlid fish from the río de La Plata region in Argentina, Brazil, and Uruguay. – *Copeia*, 2003: 794–802.
- RÍCAN, O. & KULLANDER, S.O. (2006): Character and tree-based delimitation of species in the “*Cichlasoma*” *facetum* group (Teleostei, Cichlidae) with the description of a new genus. – *Journal of Zoological Systematics and Evolutionary Research*, **44**: 136–152.
- RÍCAN, O. & KULLANDER, S.O. (2008): The *Australoheros* (Teleostei: Cichlidae) species of the Uruguay and Paraná River drainages. – *Zootaxa*, 1724, 1–51.
- RÍCAN, O.; PIÁLEK, L.; ALMIRÓN, A.; & CASCIOTTA, J. (2011): Two new species of *Australoheros* (Teleostei: Cichlidae), with notes on diversity of the genus and biogeography of the Río de la Plata basin. – *Zootaxa*, 2982, 1–26.
- SCHINDLER, I.; OTTONI, F.P. & CHEFFE, M.M. (2010): *Heros acaroides* HENSEL, 1870, a valid species of *Australoheros* (Teleostei: Cichlidae) from Laguna dos Patos system, south Brazil. – *Vertebrate Zoology*, **60**(2): 139–146
- STEINDACHNER, F. (1869): Abhandlung über einige neue Fischarten aus den Sammlungen des Wiener Museums. – *Anz. Akad. Wiss. Wien*, **6**: 149–150.
- STEINDACHNER, F. (1870): Ichthyologische Notizen (IX). – *Sitzungsber. Akad. Wiss. Wien*, **60**: 290–318.
- TAYOR, W.R. & VAN DYKE, O.C. (1985): Revised procedures for staining and clearing small fishes and others vertebrates for bone and cartilage study. – *Cybium*, **9**: 107–109.