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Tometes camunani (Characiformes: Serrasalmidae), a new species of phytophagous fish from the Guiana Shield, rio Trombetas basin, Brazil

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A new species of Serrasalmidae, *Tometes camunani*, is described from the upper drainages of the rio Trombetas basin, Pará State, Brazil. The new species is distinguished from its congeners by having neurocranium with a slight concavity at the level of the frontal bone (*vs.* concavity absent, dorsal profile of neurocranium straight). It can be further distinguished from its congeners by having teeth with central cusp taller and acute (*vs.* central cusp shorter and with rounded edge in *T. trilobatus*), a terminal mouth (*vs.* upturned mouth in *T. lebaili*), and 12-26 prepelvic spines (*vs.* 0-9 in *T. makue*). The new species is strictly rheophilic like other species of *Tometes*, and occurs exclusively in the rapids of shield rivers, complex and fragile biotopes that are threatened by anthropogenic activities. An identification key to the species of the *Myleus* group is provided.

Uma espécie nova de Serrasalmidae, *Tometes camunani*, é descrita para as drenagens superiores da bacia do rio Trombetas, estado do Pará, Brasil. A espécie nova distingue-se dos congêneres pela presença de uma ligeira concavidade no neurocrânio na altura do frontal (*vs.* concavidade ausente, perfil dorsal do neurocrânio reto). Também pode ser adicionalmente distinguido dos seus congêneres por possuir dentes com a cúspide central mais alta e cume agudo (*vs.* cúspide central mais baixa e com cume arredondado em *T. trilobatus*), a boca terminal (*vs.* boca orientada para cima em *T. lebaili*), e 12-26 espinhos pré-pélvicos (*vs.* 0-9 em *T. makue*). A espécie nova é estritamente reofílica, como as demais espécies de *Tometes*, e ocorre exclusivamente nas zonas encachoeiradas dos rios de escudo, biótopos complexos, frágeis e ameaçados por ações antropogênicas. Uma chave de identificação para as espécies do grupo *Myleus* é apresentada.

Key words: Amazon basin, Herbivorous fishes, Rapids, Rheophily, Taxonomy.

Introduction

Tometes Valenciennes, 1850 is a genus of large-sized and strictly herbivorous serrasalmid fishes which reach approximately 500 mm SL and a weight of up to 4 kg (Jégu & Keith, 2005). All valid species of *Tometes* are known from left-bank tributaries of the lower Amazon basin, northeastern coastal rivers of the Guiana Shield, middle and upper rio Negro, and right-bank tributaries of the upper rio Orinoco (Jégu *et al.*, 2002a; Jégu, 2003). Species of *Tometes* are strictly rheophilic and exclusively inhabit rocky rapids associated with rupestral seedlings of Podostemaceae, their main source of food (Jégu *et al.*, 2002b; Jégu, 2003). Given their habitat hyperspecificity (Brito *et al.*, 2007), species of *Tometes* are especially vulnerable to the loss of lotic systems, and therefore are greatly threatened by the construction of hydroelectric dams (Junk & Mello, 1990; Jégu & Keith, 2005). In addition, rheophilic serrasalmids (*e.g.*, species of *Tometes*, *Myloplus*, and *Mylesinus*) are very important to the traditional culture of local communities (Pagezy & Jégu, 2002, 2003, 2010).

Valenciennes (1850) proposed the genus *Tometes*, based on its incisiform teeth. Ten years later, based only on information from the literature, Kner (1860) synonymized *Tometes trilobatus*, type-species of *Tometes* Valenciennes, 1850, with *Myleus setiger*, type-species of *Myleus* Müller & Troschel, 1844 (Jégu & Santos, 2002; Jégu *et al.*, 2002c). However, Jégu *et al.* (2002c) revalidated both the genus *Tometes* and its type species after the examination of the type series of *Tometes*, plus additional specimens attributed to the genus.

Tometes, *Myleus*, *Mylesinus* Valenciennes, 1850, and *Ossubtus* Jégu, 1992, comprise a monophyletic assemblage based on morphological data (Jégu, 2004). Considering the same taxa, except the monotypic *Ossubtus xinguense*, Ortí *et al.* (2008) confirmed those previous results using molecular data, and

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also proposed the term *Myleus* group. Currently, *Tometes* comprises three valid species, the type species *T. trilobatus* Valenciennes, 1850, *T. makue* Jégu, Santos & Belmont-Jégu, 2002, and *T. lebaili* Jégu, Keith & Belmont-Jégu, 2002.

The species of *Tometes* described herein occurs in sympatry with three other rheophilic serrasalmids, *Mylesinus paraschomburgkii* Jégu, Santos & Ferreira, 1989, *Myleus setiger* Müller & Troschel, 1844, and *Myloplus rhomboidalis* (Cuvier, 1818) in the upper reaches of the rio Trombetas basin, at the site that is planned for construction of the Cachoeira Porteira hydroelectric dam. An identification key to the species of the *Myleus* group is also provided.

Material and Methods

Measurements and counts follow Jégu *et al*. (2002b, c). Measurements were taken point to point to the nearest 0.1 mm with digital calipers, and counts were taken under a stereomicroscope; both were taken from the left side whenever possible. Meristic data are given in the description. The range of counts is followed by the value observed on holotype in parentheses. Measurements of the body are given as percentages of Standard Length (SL), and subunits of the head are given as percentages of Head Length (HL). Counts of vertebrae and supraneurals were obtained from examination of two skeletonized (skel.) specimens (MPEG 23448 and MPEG 23449) and radiographs of ten alcohol preserved specimens: MPEG 23440, MPEG 23442, MPEG 23445, MPEG 23446 (3 of 6), MPEG 23447, MPEG 23450 (1 of 2), MPEG 23451 (1 of 2), and ZUEC 7066. Vertebral counts included the Weberian apparatus as four additional vertebrae, and the fused PU1+U1 of the caudal region counted as a single vertebrae. Vertebral counts are categorized into: predorsal vertebrae, which are all vertebrae anterior to the vertical through the first dorsal-fin pterygiophore; postdorsal vertebrae, all vertebrae posterior to the vertical through the last dorsal-fin pterygiophore; the number of vertebrae between the last dorsal-fin pterygiophore and first anal-fin pterygiophore; and the total number of vertebrae. Osteological terminology follows Weitzman (1962). The entire gastrointestinal tract (GIT) from the esophagus to the anus was removed and measured (= GITL ± 1 mm) in eight specimens: MPEG 23448(1), MPEG 23449(1), MPEG 23450(2), MPEG 23451(2), and MPEG 23452(2), 90.8-382.0 mm SL. The relative length of the GIT (= RLGIT) was calculated as RLGIT=GITL/SL. Stomach contents were preserved in 70% ethanol solution and examined under a stereomicroscope to identify food items to the lowest taxon possible.

Institutional abbreviations are ANSP, The Academy of Natural Sciences, Philadelphia; INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus; MCP, Museu de Ciências e Tecnologia, Porto Alegre; MNHN, Muséum National d'Histoire naturelle, Paris; MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro; MPEG, Museu Paraense Emilio Goeldi, Belém; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; UFPA, Universidade Federal do Pará, Belém; and ZUEC, Museu de Zoologia da Universidade Estadual de Campinas, Campinas.

Tometes camunani, new species
Fig. 1

Utiaritichthys sp.: Ferreira, 1993: 24 (Brazil, Pará, rio Trombetas basin; species caught upstream of the Cachoeira Porteira).

Holotype. MPEG 23447, 224.3 mm SL, Brazil, Pará, Trombetas basin, rio Erepecuru, upstream of the Cachoeira do Chuvisco, 00°59'59"S 56°04'42"W, T. Giarrizzo, 30 Oct 2003.

Paratypes. All from rio Trombetas basin, Pará, Brazil: MPEG 23439, 248 mm SL, rio Trombetas, upstream of Cachoeira Porteira, 00°57'01"S 57°01'13"W, M. C. Andrade & T. Giarrizzo, 27 Feb 2011; MPEG 23440, 384 mm SL, rio Trombetas, Cachoeira Porteira, 01°03'47"S 57°02'31"W, T. Giarrizzo, 10 Nov 2003; MPEG 23441, 276 mm SL, rio Trombetas, Cachoeira Porteira, 01°03'47"S 57°02'31"W, T. Giarrizzo, 9 Nov 2003; MPEG 23442, 98 mm SL, rio Trombetas, Iteiro Grande, rapids of Traval, upstream of Cachoeira Porteira, 00°46'17"S 56°52'15"W, M. C. Andrade & D. A. Bastos, 25 Oct 2008; MPEG 23443, 2, 247-293 mm SL, rio Trombetas, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, M. C. Andrade & T. Giarrizzo, 24 Feb 2011; MPEG 23444, 3, 291-329 mm SL, rio Trombetas, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, M. C. Andrade & T. Giarrizzo, 27 Feb 2011; MPEG 23445, 127 mm SL, rio Trombetas, rapids of Enseada, 00°49'38"S 56°57'28"W, M. C. Andrade & D. A. Bastos, 24 Oct 2008; MPEG 23446, 2, 212-235.4 mm SL, rio Erepecuru, upstream of Cachoeira do Chuvisco, 00°59'59"S 56°04'42"W, T. Giarrizzo, 30 Oct 2003; INPA 2310, 167 mm SL, rio Cachorro, 2 km above confluence with rio Trombetas, E. G. Ferreira, 28 Nov 1987; INPA 2311, 180 mm SL, rio Mapuera, Cachoeira Patauá, 01°45'56"S 55°51'57"W, E. G. Ferreira, 27 Nov 1987; INPA 3639, 299 mm SL, rio Trombetas, Cachoeira Porteira above confluence with rio Cachorro, 00°59'21"S 57°04'09"W, E. G. Ferreira & M. Jégu, 15 Apr 1985; INPA 5173, 230 mm SL, rio Trombetas, downstream of Cachoeira Quebra Pote, E. F. Ferreira & M. Jégu, 9 Oct 1985; INPA 5176, 325 mm SL, rio Trombetas, near rio Caxipacoré, E. G. Ferreira & M. Jégu, 5 Oct 1985; MCP 47376, 2, 208-242 mm SL, rio Erepecuru, upstream of Cachoeira do Chuvisco, 00°59'59"S 56°04'42"W, T. Giarrizzo, 30 Oct 2003; MNRJ 40204, 2, 211-212 mm SL) rio Erepecuru, upstream of Cachoeira do Chuvisco, 00°59'59"S 56°04'42"W, T. Giarrizzo, 30 Oct 2003; MZUSP 15893, 5, 201-274 mm SL, rio Mapuera, Ilha da Facada, close to the confluence with the rio Trombetas, R. M. C. Castro, 21 Jul 1979; ZUEC 7066, 236 mm SL, rio Erepecuru, upstream of Cachoeira do Chuvisco, 00°59'59"S 56°04'42"W, T. Giarrizzo, 30 Oct 2003; ZUEC 7067, 291 mm SL, rio Trombetas, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, M. C. Andrade & T. Giarrizzo, 24 Feb 2011.

Non-type specimens examined. All from Trombetas basin, Pará State, Brazil: MPEG 23449, 910.8 mm SL, skel., Trombetas river, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, J. R. Carvalho Jr, 2 Dec 2007; MPEG 23448, 382 mm SL, skel., rio Trombetas, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, M. C. Andrade & T. Giarrizzo, 24 Feb 2011; MPEG 23452, 2, 355-382 mm SL, rio Trombetas, upstream of Cachoeira Porteira, 00°55'07"S 57°01'36"W, M. C. Andrade & T. Giarrizzo, 24 Feb 2011; MPEG 23451, 2, 175-322 mm SL, rio Mapuera, upstream of Cachoeira Porteira, 01°07'26"S 57°14'35"W, M. C. Andrade & D. A. Bastos, 26 Jun 2008; MPEG 23450, 2, 133-206

Fig. 1. *Tometes camunani*, MPEG 23447, holotype, mature male, 224.3 mm SL; Brazil, Pará, Oriximiná, Trombetas basin, rio Erepecuru, upstream of Cachoeira do Chuvisco.

mm SL, rio Trombetas, Iteiro Grande, rapids of Traval, upstream of Cachoeira Porteira, 00°46'17"S 56°52'15"W, M. C. Andrade & D. A. Bastos, 25 Oct 2008; INPA 1238, 43.94 mm SL, rio Mapuera, Cachoeira Porteira, E. G. Ferreira & M. Jégu, 10 Apr 1985; INPA 3637, 44.74 mm SL, rio Trombetas, Cachoeira Porteira, 01°03'47"S 57°02'31"W, E. G. Ferreira & M. Jégu, 10 Apr 1985.

Diagnosis. *Tometes camunani* is distinguished from its congeners by having neurocranium with a slight concavity at the level of the frontal bone (*vs.* concavity absent, dorsal profile of neurocranium straight). *Tometes camunani* is further distinguished among congeners by: five dentary teeth (*vs.* 6-11 in *T. makue*, and 7-8 in *T. lebaili*), 81-99 total scales in lateral-line (*vs.* 63-79 in *T. trilobatus* and 72-79 in *T. lebaili*), and 37-42 scales around caudal peduncle (*vs.* 27-34 in *T. trilobatus* and 32-36 in *T. lebaili*). *Tometes camunani* is also distinguished from *T. trilobatus* by having teeth with central cusp taller and acute (*vs.* central cusp shorter and with rounded edge). It also differs from *T. lebaili* by a relatively shorter distance from snout to pectoral-fin origin, 19.1-24.2% SL (*vs.* 24.5-30.4% SL), shorter head length, 21.4-25.9% SL (*vs.* 26.6-29.8% SL), and by possessing a terminal to scarcely subterminal mouth (*vs.* upturned mouth). *Tometes camunani* is further distinguished from *T. makue* by having 12-26 prepelvic spines (*vs.* 0-9), 29-44 total spines (*vs.* 10-23), and by always possessing a pair of symphyseal dentary teeth, behind the main series (*vs.* symphyseal dentary teeth sometimes absent).

Description. Morphometric data is presented in Table 1. Body extremely compressed, overall aspect of body profile ovoid. Highest body depth at the level of the dorsal-fin origin. Dorsal head profile convex from mouth to vertical line through anterior portion of orbit, from latter point to supraoccipital base with a slight concavity (readily visible in radiography or skeletonized fish), supraoccipital spine straight to slightly convex, and approximately straight from supraoccipital tip to dorsal-fin origin. Dorsal-fin base scarcely convex; body profile straight from posterior end of dorsal-fin base to adipose-fin origin. Ventral profile of head and body (*i.e.*, from lower lip to vertical through anterior portion of orbit and from the latter point to anal-fin origin) slightly convex. Caudal peduncle relatively short, profile of lower caudal peduncle slightly concave.

Snout broadly rounded. Mouth terminal to scarcely subterminal, jaws equally sized. Premaxillary teeth in labial row contacting teeth in lingual row. Five teeth in labial row, two teeth in lingual row (Fig. 2c). Premaxilary and dentary teeth incisiform, relatively robust and shorter when compared with the teeth of *Ossubtus* and *Mylesinus*, which are slender

Table 1. Morphometric data for *Tometes camunani*, new species. Range for paratypes includes holotype. N = number of specimens; Min = Minimal; Max. = Maximal; SD = Standard Deviation.

	Holotype	Paratypes					Non-type material				
		N	Min.	Max.	Mean	SD	N	Min.	Max.	Mean	SD
Standard length (mm)	224.3	26	126.89	384	244.4	-	11	90.8	382.0	235.0	-
Percentages of standard length											
Body depth	64.3	26	56.6	65.8	62.6	2.2	10	56.2	65.7	60.0	2.8
Head length	25.3	26	22.1	25.9	23.9	1.2	11	21.4	25.8	23.5	1.4
Supraoccipital process	32.0	26	28.2	32.4	30.3	1.1	11	26.2	36.5	30.3	2.7
Predorsal length	59.5	26	56.7	61.8	58.6	1.1	11	52.4	61.9	57.6	2.5
Dorsal-fin base length	31.2	26	27.7	32.4	29.7	1.2	11	27.4	31.1	29.2	1.2
Interdorsal length	10.9	26	10.9	14.3	12.5	1.0	11	11.2	13.7	12.3	0.6
Adipose-fin base length	7.0	26	4.5	7.0	6.0	0.5	11	4.9	6.2	5.7	0.5
Caudal peduncle height	11.7	26	10.8	12.0	11.4	0.3	11	10.5	11.9	11.2	0.5
Anal-fin base length	32.6	26	31.2	34.4	32.7	0.8	11	28.4	33.7	31.8	1.6
Preanal length	79.6	26	75.0	80.5	77.9	1.5	10	73.6	81.1	76.7	2.4
Prepelvic length	59.5	26	54.1	59.5	57.1	1.5	11	53.5	58.9	56.0	2.1
Prepectoral length	23.2	26	21.4	24.0	22.7	0.8	11	19.1	24.2	22.3	1.4
Anal/pelvic distance	22.3	26	21.9	24.7	23.2	0.9	10	20.2	23.2	22.0	1.0
Pelvic/pectoral distance	36.8	26	32.8	37.2	34.9	1.1	10	30.0	37.0	33.8	1.9
Width of peduncle	3.9	26	3.6	6.4	4.8	0.7	11	3.5	5.6	4.5	0.7
Pectoral-fin length	23.2	26	20.4	23.8	22.0	1.0	11	20.0	23.5	21.7	1.2
Pelvic-fin length	17.7	26	12.2	17.7	16.0	1.4	11	13.0	17.8	15.8	1.4
1st anal-fin lobe length	29.1	15	20.2	29.3	26.0	2.5	9	19.5	27.7	24.1	2.9
2nd anal-fin lobe length	14.1	8	11.1	15.5	12.9	1.4	3	12.1	14.1	12.9	1.1
Dorsal-fin length	27.1	17	24.3	34.1	29.8	2.6	7	25.1	34.9	29.0	3.3
Percentages of head length											
Snout length	23.3	26	23.0	32.4	28.3	3.2	9	24.6	31.5	27.5	2.8
Interorbital width	49.8	26	45.5	55.6	49.8	2.7	9	46.4	53.6	50.2	2.3
Postorbital distance	33.5	26	30.7	39.5	34.4	2.3	11	32.1	40.5	34.1	2.4
4th infraorbital width	14.0	26	10.7	16.2	12.6	1.3	11	10.3	16.5	13.0	2.0
Eye vertical diameter	33.9	26	32.1	40.5	36.0	2.4	9	33.1	39.5	35.5	2.4
3rd infraorbital width	9.1	26	11.9	20.4	15.0	2.2	9	11.8	19.4	15.9	2.5
Cheek gap width	9.3	26	8.6	12.7	10.0	1.0	11	8.2	11.4	9.8	1.0
Mouth length	13.7	26	8.2	12.2	10.0	1.0	11	7.4	10.5	8.9	1.0
Mouth width	31.5	26	28.0	36.1	32.6	2.0	9	27.2	36.3	32.4	3.0

and taller. Premaxillary teeth 1-3 in labial row, each with sharp edge; teeth 1 and 2 separated by gap (Fig. 2c,d). Premaxillary teeth 4 and 5 in labial row shorter and broader than remaining teeth and with sigmoid edge (Fig. 2c,d). Dentary teeth 5, bi- to tricuspid, with the anterior cusp larger than posterior cusp; posterior cusp externally overlapping anterior cusp of the next tooth (Fig. 2a). Pair of symphyseal dentary teeth always present behind the main series of teeth. Maxillary edentulous.

Scales cycloid, numerous, diminutive and irregular in size, slightly larger in supracleithrum region and on caudal peduncle, decreasing in size toward flanks. Perforated lateral-line scales from supracleithrum to hypural plate 74-92 (90). Total perforated lateral-line scales 81-99 (96). Scale rows between dorsal-fin origin and lateral-line 51-68 (68). Scale rows between lateral-line and pelvic-fin insertion 52-75 (73). Circumpeduncular scales 37-42 (40). Ventral serrae reduced, with small prepelvic serrae weakly inserted on abdomen; prepelvic serrae 12-26 (22); simple postpelvic serrae 8-12 (12); double postpelvic serrae 5-8 (8); total serrae 29-44 (42).

Dorsal-fin origin at midbody, preceded by a strong, forward-directed spine. Distal margin of dorsal-fin falcate. Dorsal-fin rays ii-iii,20-22 (iii,21). Anal-fin rays iii-iv,31-34 (iii-31). Pectoral-fin rays i,15-18 (i,17). Pelvic-fin rays i,7. Adipose fin present, with moderately long obliquely truncate distal margin. Caudal-fin forked, lobes similarly-sized.

Premaxillary lacking interdigitations at symphysis. Ascending premaxillary process elongated, moderately pointed and oblique in relation to antero-posterior axis of bone (Fig. 2d,e). Lateral premaxillary process short, sub-rectangular and protruding in relation to fifth tooth in labial row to one-third size of tooth (Fig. 2c). Lateral premaxillary process with a concavity where maxillary is inserted (Fig. 2c). Transversal process aligned with fifth tooth in labial series and protruding to one-fifth its size (Fig. 2c). Four replacement teeth trenches on premaxillary (Fig. 2e). Slender dentary, slightly arched, with 4 or 5 bony lamellae at symphysis (Fig. 2a). Antorbital club-shaped, wide anteriorly and lacking sensory canal. Supraorbital with serrated margins on inner and posterior portions. Infraorbitals 1, 5 and 6 with unbranched sensory canal, 2 and 3 with branched sensory canal, and 4 with canal shaped like an inverted Y.

Neurocranium high, triangular, and elongated. Mesethmoid elongated, pointed and triangular anteriorly. Ethmoidal wings elongated, slender antero-posteriorly, positioned on anterior half of mesethmoid. Neurocranium presenting a slight concavity at the level of the frontal. Parietal club-shaped, narrower anteriorly, increasing slightly in width posteriorly. Supraoccipital spine well

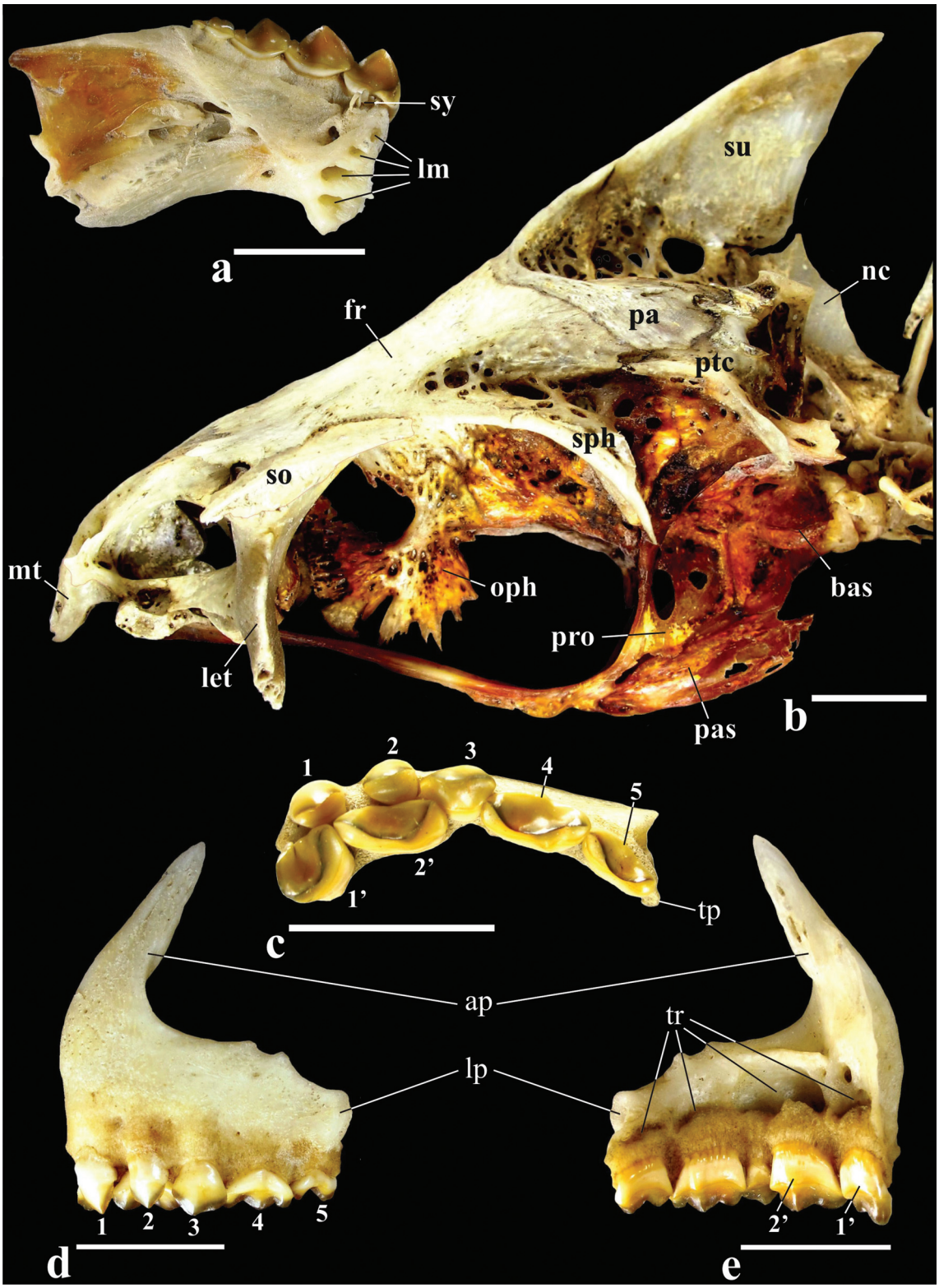

Fig. 2. *Tometes camunani*, MPEG 23448, 382 mm SL. **a**, lingual view of left dentary. **b**, lateral view of the neurocranium. **c-e**, ventral, labial and lingual views of the left premaxilla (1-5: teeth in labial row; 1'-2': teeth in lingual row). ap = ascending process of premaxilla; bas = basioccipital; fr = frontal; let = lateral ethmoid wing; lm = lamellae at symphysis; lp = lateral process of premaxilla; mt = mesethmoid; nc = neural complex; oph = orbitosphenoid; pa = parietal; pas = parasphenoid; pro = prootic; ptc = pterotic; su = supraoccipital; so = supraorbital; sph = sphenotic; sy = position of symphyseal tooth; tp = transversal process; tr = replacement teeth trenches. Scale bar: 10 mm.

developed, thin, dorsal portion slightly curved. Broad orbital region. Supraorbital with anteroventral margin slightly convex and posteroventral axis slightly downturned. Orbitosphenoid with two laterally compressed bony lamellae, anterior process widened distally and upturned. Orbitosphenoid posteroventral process narrow and projecting ventrally. Ventral margin of orbitosphenoid not reaching parasphenoid. Parasphenoid lacking midventral keel, and with a ventral aperture forming two thin projections parallel to each other across the ventral margins of the prootic and basioccipital. Pterotic triangular, with posterior process directed downward. Sphenotic thin with concave ventral margin; anterior portion wide, narrowing posteriorly from middle portion of bone (Fig. 2b).

First branchial arch with gill rakers elongated, stiff and recurved; 11-14 epibranchial gill rakers; ceratobranchial gill rakers 13-15; one gill raker at cartilage between ceratobranchial and epibranchial. Four branchiostegal rays; three branchiostegal rays on anterior ceratohyal and one on posterior ceratohyal. Total vertebrae 40-42 (41); predorsal vertebrae 10-11 (11); postdorsal vertebrae 14-16 (15). Vertebrae between verticals through last dorsal-fin pterygiophore and first anal-fin pterygiophore 2-3 (3). Supraneurals 6-8 (7).

The gut of *T. camunani* is long and elaborately coiled. The relative length of gastrointestinal tract (RLGIT=GITL/SL) ranges between 4.2 and 5.5 times in SL (mean 4.9).

Color in alcohol. General coloration of body brownish-yellow, darker on dorsal portion. Dorsal, anal and caudal fins hyaline in proximal portion, darker towards margin. Caudal fin with a distal, wide, dark, diffuse band. Adipose fin uniformly brown. Pectoral and pelvic fins hyaline. Juvenile specimens up to 100 mm SL with a round dark blotch at the humeral region (Fig. 3).

Color in life. Based on observations of freshly preserved specimens: general body color silver, dorsal and anal fins dark-brownish, caudal-fin with a distal, wide, dark band. During the reproductive period, irregularly-shaped red spots evident over flanks, in supracleithrum region and on the anal-fin, mainly in mature males.

Sexual dimorphism. Sexually mature males of *Tometes* (≥ 210 mm SL) are characterized by the presence of an additional anal-fin lobe (Jégu *et al.*, 2002c). In *T. camunami*, the second lobe is centered on branched anal-fin rays 14 to 16. The dorsal-fin rays of mature males of *T. camunami* are also elongated, forming filaments. Irregularly-shaped reddish blotches are present on the body in mature females, but are more conspicuous in mature males.

Based on the presence of the second anal-fin lobe, the smallest mature male of *Tometes camunani* observed measured 210 mm SL, which is similar to the size of the smallest recorded mature male of *T. makue* (Jégu *et al*., 2002b). In contrast, a second anal-fin lobe is only evident in specimens of *Tometes trilobatus* and *T. lebaili* at about 300 mm SL (Jégu *et al*., 2002a,c). In some mature males of *Tometes*, the distal portions of the rays of the second anal-fin lobe have a pair of stiff, laterally curved hooks, which is similar to the condition observed in *Mylesinus paraschomburgkii* (Jégu *et al*., 1989: fig. 8). Anal-fin rays with stiff hooks were observed in specimens of *Tometes trilobatus*, *T. makue*, and *T. lebaili* at about 400 mm SL (Jégu *et al*., 2002a,b,c). Similarly-sized mature males of *Tometes camunani* (MPEG 23448, 382 mm SL; MPEG 23440, 384 mm SL), however, lack stiff laterally curved hooks on second anal-fin lobe.

Distribution. *Tometes camunani* is known from the upper rio Trombetas and its tributaries rio Mapuera, rio Cachorro, and rio Erepecuru draining the Guiana Shield, Pará State, Brazil (Figs. 4-5).

Etymology. Species refers to "camunani", its common name in the Wai-Wai language. The Wai-Wai inhabit the upper rio Trombetas basin, and consider the species of great cultural importance. The common name is also employed by local quilombolas (*i.e.*, inhabitants of settlements founded by escaped slaves of African origin), who capture the fish using as bait the fruit of the camu-camu tree (*Myrciaria dubia*, Myrtaceae).

Ecological notes. The diet of the two smallest specimens examined (MPEG 23449 and MPEG 23450; 90.8 and 133 mm SL, respectively) was composed mainly of fragments of Podostemaceae and benthic macroinvertebrates (Leptophlebiidae, Simuliidae and Chironomidae). The largest specimens examined (MPEG 23448; MPEG 23450; MPEG 23451; MPEG 23452; n = 6, 175-382 mm SL) consumed mainly leaves of Podostemaceae, and fragments of grass and whole seeds of Myrtaceae and Fabaceae. Oxyuroid nematodes (*Rondonia rondoni*) were also found in the gastrointestinal tract of all dissected specimens.

Discussion

All genera of the *Myleus* group occur exclusively in shield drainages, and are rheophilic and phytophagous, feeding mainly on Podostemaceae (Jégu, 2004). *Tometes camunani* occurs in association with swift-flowing rapids and rocky outcrops in clear water rivers of the upper rio Trombetas. During the dry season, schools of large specimens (about 300 mm SL) were observed swimming against the current along very shallow stretches of rapids (depth ≤ 0.35 m).

Given the habitat hyperspecificity of *Tometes camunani* to river stretches with rapids in the rio Trombetas basin, it seems that the slow-flowing lower reaches of this basin and the Rio Amazonas channel are barriers to its dispersal. Based on personal observations of the last author around Cachoeira Porteira during the 2007 low-water period, larval and small juveniles of *Mylesinus* and *Tometes* are restricted to within 200 m downstream of the rapids. A high concentration of larval and juvenile specimens of *Mylesinus* and *Tometes* was observed within the rapids among leaves of Podostemaceae, suggesting positive rheotropism from a larval stage. As a consequence, the species is likely sensitive to the impacts caused by the construction of

Fig. 3. *Tometes camunani*, INPA 3637, juvenile, 44.7 mm SL; Brazil, Pará, Oriximiná, rio Trombetas, Cachoeira Porteira.

hydroelectric dams. Like its congeners and several other serrasalmid genera, *T. camunani* has a typical "shield" distribution pattern (*i.e.*, restricted to shield areas of northern cis-Andean South America; Lima & Ribeiro, 2011). Considering the ecoregions for the Guiana Shield proposed by Vari & Ferraris (2009), *T. camunani* is endemic to the Brazil-Pará ecoregion.

Like several other species occurring in shield areas, the complete distribution and vagility of *Tometes*

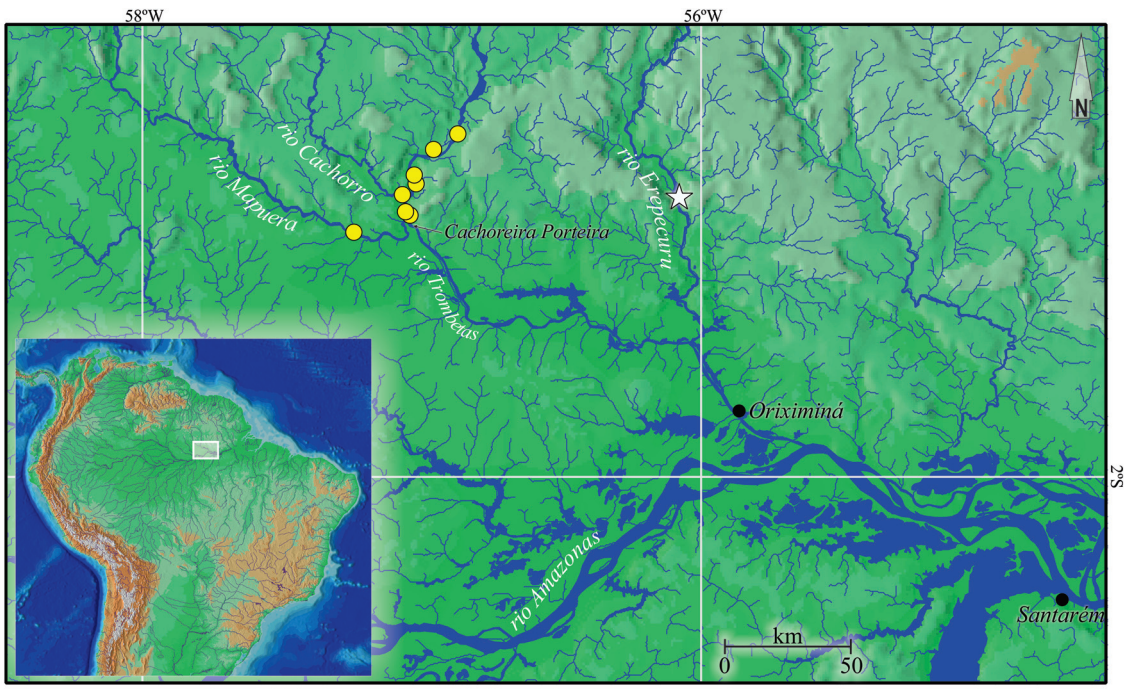

Fig. 4. Map of upper rio Trombetas basin and adjoining areas, showing the distribution of *Tometes camunani*. Star indicates type locality.

Fig. 5. Typical habitat of *Tometes camunani*, rapids and waterfalls in rio Trombetas basin, Pará, Brazil. Rocks are covered with Podostemaceae, rheophilic aquatic plants typical of the diet of species of *Tometes* (Photo by D. Bastos, 2008).

camunani is poorly understood at present time. Future studies involving molecular analysis of *T. camunani* and other fishes typical of shield areas are needed to evaluate the roles of dispersal and vicariance in the distributional patterns observed across rivers draining the Brazilian and Guiana Shields.

Identification key to species of the *Myleus* group

1. Frontal premaxillary teeth form a continuous row; pair of symphyseal dentary teeth very small; dentary teeth molariform to incisiform with a wide base; prepelvic serrae pronounced, forming an abdominal keel 2
1'. Frontal premaxillary teeth clearly separated; pair of symphyseal dentary teeth large (when present); dentary teeth incisiform with a slender base, bi- to trilobed with the anterior lobe inserted into a groove of the tooth immediately anterior; prepelvic serrae (when present) reduced to a row of spines, not forming an abdominal keel 3
2. Branched dorsal-fin rays 18-20 ..... *Myleus setiger* (tributaries of the Guiana and Central Brazilian Shield; from Maroni basin to coastal rivers of western Guyana; right-bank tributaries of Orinoco on Guiana Shield)
2'. Branched dorsal-fin rays 24 ..... *Myleus knerii* (Steindachner, 1881) (Maroni River basin; known only from type specimen)
3. Premaxillary teeth in labial row similarly sized, very compressed anteroposteriorly, and with cusps aligned 4
3'. Two posteriormost premaxillary teeth in labial row shorter and wider than anterior ones, not compressed anteroposteriorly, and with sinuous cusps 7
4. Mouth markedly downturned; prepelvic spine absent; branched anal-fin rays 22-25; dentary with four teeth in labial row; humeral spot triangular and pointed ventrally ..... *Ossubtus xinguense* (rio Xingu basin)
4'. Mouth terminal; prepelvic spines present; branched anal-fin rays greater than 25; dentary with more than five teeth in labial row; humeral spot absent or rounded, when present 5
5. Pair of symphyseal dentary teeth present; dentary with 7-10 teeth in labial row; lateral-line scales 60-79; scales around caudal peduncle 30-34 ..... *Mylesinus paucisquamatus* Jégu & Santos, 1988 (rio Tocantins basin)
5'. Pair of symphyseal dentary teeth absent; dentary teeth in labial row 8-14; lateral-line scales 75-96; scales around caudal peduncle 34-41 6
6. Snout length 31-38% of HL; eye diameter 30-34% of HL ..... *Mylesinus paraschomburgkii* (left-bank tributaries of rio Amazonas from Uatumã basin to rio Araguari basin)
6'. Snout length 41% of HL; eye diameter 28% of HL ..... *Mylesinus schomburgkii* Valenciennes, 1850 (río Essequibo basin; known only from type specimen)
7. Mouth clearly upturned; 7-8 dentary teeth in labial row ..... *Tometes lebaili* (río Maroni and río La Mana basins)
7'. Mouth terminal; 5-11 dentary teeth in labial row 8
8. Dentary teeth in labial row 6-11; prepelvic spines 0-9; pair of symphyseal teeth on dentary absent in some specimens ..... *Tometes makue* (rio Negro and rio Orinoco basins)
8'. Dentary teeth in labial row 5; more than 9 prepelvic spines; pair of symphyseal teeth on dentary always present 9
9. Dorsal profile of neurocranium straight; lateral-line scales 63-79; scales around caudal peduncle 27-34; central cusp of all teeth shorter and with rounded edge ..... *Tometes trilobatus* (Eastern Guiana Shield drainages from Oyapock basin to Araguari basin)
9'. Neurocranium with a slight concavity at the level of frontals; lateral-line scales 81-99; scales around caudal peduncle 37-42; central cusp of all teeth taller and acute ..... *Tometes camunani* new species (rio Trombetas basin)

Comparative material examined. *Tometes lebaili*: MNHN 2001-2384, holotype; 108.6 mm de SL, village Antecume Pata, Maroni River, 03°18'06"N 54°04'54"W; MNHN 1993-3452, 251 mm SL, French Guyana, St. Laurent du Maroni, Maripasoula, Maroni River; MNHN 1993-3453, 202 mm SL, French Guyana, St. Laurent du Maroni, Maripasoula, Maroni River; MNHN 1998-0294, 119 mm SL, French Guyana, St. Laurent du Maroni, Saut Fracas, Mana River, 04°46'01"N 53°39'00"W; MNHN 1998-0298, 271 mm SL, French Guyana, St. Laurent du Maroni, Saut Fracas, Mana river, 04°46'01"N 53°39'00"W; MNHN 1998-1347, 5, 42-72 mm SL, French Guyana, St. Laurent du Maroni, Antecume Pata, rio Maroni, 03°18'00"N 54°04'01"W; MNHN 1999-0641, 282 mm SL, French Guyana, St.

Laurent du Maroni, Antecume Pata, Maroni River. *Tometes makue*: Brazil, Amazonas, São Gabriel da Cachoeira, rio Negro, 00°07'49"S 67°05'21"W. INPA 7344, holotype; 240 mm SL; INPA 3179, 125 mm SL; INPA 4913, 370 mm SL; INPA 4914, 2, 330-355 mm SL; INPA 4915, 2, 138-158 mm SL; INPA 4916, 2, 239-307 mm SL; INPA 4917, 261 mm SL; INPA 4920, 4, 172-229 mm SL; INPA 4924, 12, 53-78 mm SL. *Tometes trilobatus*: MNHN A.8650, lectotype, 340 mm SL, syntype of *Tometes trilobatus* Valenciennes; MNHN A.8649, paralectotype, 370 mm LS, syntype of *Tometes trilobatus* Valenciennes; MNHN A.8651, 274 mm SL, holotype of *Tometes unilobatus* Valenciennes; MNHN 1998-0099, 248 mm SL, French Guyana, Cayenne, Saut Maripa, rio Oyapock, 03°46'01"N 51°54'00"W; MNHN 1981-0508, 149 mm SL, French Guyana, Cayenne, Saut Maripa, rio Camopi; MNHN 1998-0307, 5, 36-86 mm SL, French Guyana, Cayenne, Saut Maripa, rio Camopi, 03°51'00"N 051°51'00"W; INPA 19967, 116 mm SL, Brazil, Amapá, Macapá, Rio Araguari, Cachoeira Santa Rosa. *Mylesinus paraschomburgkii*: INPA 1226, holotype, 250 mm SL, Brazil, Pará, Rio Trombetas downstream of the Cachoeira Vira Mundo; INPA 4498, 6, 136-273 mm SL, Brazil, Amapá, Laranjal do Jari, Rio Jari downstream of the Cachoeira São Raimundo, 01°07'12"S 52°40'03"W; INPA 4471, 214 mm SL, Brazil, Pará, rio Trombetas, upstream of the Cachoeira Porteira, 00°57'01"S 57°01'13"W; INPA 4466, 6, 99-277 mm SL, Brazil, Pará, rio Trombetas, upstream of the Cachoeira Porteira, 00°57'01"S 57°01'13"W; INPA 3047, 6, 127-257 mm SL, Brazil, Amazonas, Presidente Figueredo, rio Uatumã, 02°02'03"S 60°01'29"W. *Mylesinus paucisquamatus*: INPA 1808, holotype, 162 mm SL, Brazil, Pará, Tucuruí, rio Tocantins, igarapé Jatobal, 03°45'57"S 49°40'20"W. *Utiaritichthys longidorsalis*: INPA 3638, holotype, 198 mm SL, Brazil, Mato-Grosso, Madeira basin, Aripuanã, rio Aripuanã, downstream of the Cachoeira Dardallenos, 10°10'00"S 59°27'33"W. *Utiaritichthys sennaebragai*: MZUSP 82021, 2, 146.4-154.5 mm SL, Brazil, Mato-Grosso, Tapajós basin, Sapejal, rio Juruena, Usina. *Ossubtus xinguense*: INPA 6535, holotype, 170 mm SL, Brazil, Pará, Altamira, rio Xingu, 03°12'11"S 52°12'23"W. *Myleus setiger*: INPA 3781, 2, 197.8-282.4 mm SL, Brazil, Pará, Tucuruí, Capuarana, rio Tocantins, 03°45'57"S 49°40'20"W, INPA-2347 381.97 mm SL, Brazil, Pará, Tucuruí, rio Tocantins, 03°45'57"S 49°40'20"W.

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