

## A new species of the Neoplecostomine catfish *Pareiorhaphis* (Siluriformes: Loricariidae) from the Coastal basins of Espírito Santo, Eastern Brazil

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*Pareiorhaphis ruschii*, new species, is the first neoplecostomine catfish of the genus *Pareiorhaphis* described based on material from tributaries to the rio Piraquê-Açu and rio Reis Magos, both small coastal drainages in the State of Espírito Santo, eastern Brazil. The new species is promptly diagnosed from all its congeners by features related to the morphology of the lower lip margin, number of preadipose azygous plates, size and shape of the pectoral-fin spine, and caudal-fin skeleton. Additionally, sexual dimorphism of the new species is marked by hypertrophied odontodes on the lateral margins of head slightly directed forward in adult males.

*Pareiorhaphis ruschii*, espécie nova, é o primeiro cascudo neoplecostomíneo do gênero *Pareiorhaphis* descrito de afluentes dos rios Piraquê-Açu e Reis Magos, ambos pequenas bacias costeiras do estado do Espírito Santo, leste do Brasil. A espécie nova é prontamente diagnosticada de todas as demais congêneres por caracteres relacionados à morfologia da margem do lábio inferior, número de placas ázigas pré-adiposas, forma e tamanho do raio não ramificado das nadadeiras peitorais e forma do esqueleto da nadadeira caudal. O dimorfismo sexual da espécie nova é marcado pelos odontódeos hipertrofiados na margem lateral da cabeça que são ligeiramente orientados anteriormente em machos adultos.

**Key words:** Cascudos, Neotropical, Rio Piraquê-Açu, Rio Reis Magos, Taxonomy.

### Introduction

The first six species of what is currently known as *Pareiorhaphis* were described from 1907 to 1951, from a geographic area that encompasses most of the current geographic range of *Pareiorhaphis*. Such an area spans from the coastal rio Tubarão in southern Santa Catarina State to small coastal drainages near Ilheus Municipality in Bahia State, the species being *P. cameroni* (Steindachner, 1907), *P. garbei* (Ihering, 1911), *P. steindachneri* (Miranda Ribeiro, 1918), *P. regani* (Giltay, 1936), *P. bahianus* (Gosline, 1947), and *P. cerosus* (Miranda Ribeiro, 1951). With the exception of *Pareiorhaphis regani* from the rio Curicuriari of the upper rio Negro in the Amazon, a possibly wrong locality (see Pereira & Reis, 2002), those species inhabit small coastal drainages in a rather patchy distribution. After an interval of more than 40 years, the completion of such distribution in small coastal drainages continued through the descriptions of *P. splendens* (Bizerril, 1995), *P. nudulus* (Reis & Pereira, 1999), and *P. azygolechis*, *P. hypselurus*, and *P. stomias* by Pereira & Reis (2002), all from the coastal rivers of Santa Catarina and Paraná States, and *P.*

*stephanus* (Oliveira & Oyakawa, 1999), from the upper rio Jequitinhonha, a large coastal river in Minas Gerais State.

The first species described from the large rivers draining the Brazilian Shield towards the west was *Pareiorhaphis vestigipinnis* (Pereira & Reis, 1992), from the upper rio Canoas in southern Santa Catarina. Other species from large rivers on the Brazilian Shield were described in subsequent years: *P. mutuca* (Oliveira & Oyakawa, 1999) from the upper rio das Velhas in the São Francisco basin, and *P. eurycephalus*, from the upper rio Canoas, and *P. hystrix*, from the upper Uruguay and Taquari basins in Rio Grande do Sul State, by Pereira & Reis (2002), thus extending the southern end of the distribution of the genus a few hundred kilometers.

In more recent years, *Pareiorhaphis parmula* was described (Pereira, 2005) from the upper rio Iguaçu, and *P. nasuta* and *P. scutula* by Pereira *et al.* (2007, 2010), from the upper rio Doce in Minas Gerais State, comprising the first records of a *Pareiorhaphis* species in such river basins. In the present paper we describe another species of *Pareiorhaphis* from the coastal rivers Piraquê-Açu and Reis Magos, two small coastal rivers of the Espírito Santo State. Even with the description of the

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twentieth species in *Pareiorhaphis*, the distribution of the genus on the Brazilian coastal drainages and rivers draining the Brazilian Shield is rather patchy and the knowledge of the actual diversity of the genus is still being established.

### Material and Methods

Comparative data from all *Pareiorhaphis* species were taken directly from the type specimens (see comparative material). Counts and measurements were taken as described by Pereira *et al.* (2007). Counts of procurent caudal-fin rays and vertebrae were made only in cleared and counterstained specimens (c&s) prepared according to Taylor & van Dyke (1985). Vertebral counts include five centra in the Weberian Apparatus and the fused pre-ural centrum. Nomenclature and counts for body plates follow Schaefer (1997). Specimens examined belong to the following institutions: Auburn University, Auburn (AUM); Natural History Museum, London (BMNH); Institut Royal des Sciences Naturelles de Belgique, Brussels (IRSNB); Laboratório de Ictiologia de Ribeirão Preto, Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, Ribeirão Preto (LIRP); Museu de Biologia Melo Leitão, Santa Teresa (MBML); Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP); Museu Nacional, Rio de Janeiro (MNRJ); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP); Naturhistorisches Museum, Vienna (NMW); Universidade Federal do Rio Grande do Sul, Porto Alegre (UFRGS); and Zoologische Staatssammlung, München (ZSM). All morphometric features were measured with digital calipers to the nearest 0.1 mm and were made from point to point under a stereomicroscope. Standard length is expressed in millimeters while all other measurements are given as percents of standard length, except for subunits of the head, which are presented as percents of the head length. Descriptions of coloration were based on specimens preserved in ethanol. In the lists of examined material museum abbreviation and catalog number come first, followed by the number and SL range of specimens in that lot, the number and SL range of specimens measured for the morphometric comparisons, in parentheses, and locality.

Adult males of *Pareiorhaphis* are herein defined as specimens having distinctive modifications that involve the shape of the pectoral-fin spine, hypertrophied odontodes along the head margins, and fleshy lobes on the lateral margins of head, although not necessarily in reproductive maturity. The other specimens included in the list of material examined are a combination of females, young males, and immature specimens of both sexes.

### *Pareiorhaphis ruschii*, new species

#### Fig. 1

**Holotype.** MCP 46640, male, 84.7 mm SL, Brazil, Espírito Santo State, Santa Teresa Municipality, córrego Lombardia ca. 1 km NE of the Reserva Biológica Augusto Ruschi, tributary to rio Piraquê-Açu, 19°52'26"S 40°32'08"W, 23 Jan 2010, R. E. Reis, E. H. L. Pereira & P. Lehmann.

**Paratypes.** Brazil: Espírito Santo, Santa Teresa, rio Piraquê-Açu drainage: MCP 44807, 25, 33.6-96.7 mm SL (14, 51.7-96.7 mm SL) + 2 c&s, 53.1-61.8 mm SL, collected with the holotype. MCP 41867, 5, 34.8-90.5 mm SL (3, 57.9-90.5 mm SL + 1 c&s 73.4 mm SL), córrego Lombardia, near the Reserva Biológica Augusto Ruschi, 9 Mar 2005, R. L. Teixeira. MCP 27678, 3, 49.6-64.2 mm SL (1, 64.2 mm SL), MCP 41814, 3, 53.2-65.2 mm SL (2, 61.1-65.2 mm SL), and MBML 3374, 4, 51.6-74.4 mm SL (3, 64.4-74.4 mm SL), córrego Lombardia, near the Reserva Biológica Augusto Ruschi, 19°52'42"S 40°32'15"W, 12 Feb 2001, R. L. Teixeira. MCP 41790, 4, 52.1-80.5 mm SL (3, 67.4-80.5 mm SL), córrego Lombardia, near the Reserva Biológica Augusto Ruschi, 15 Sep 2003, R. L. Teixeira. MCP 41871, 3, 23.5-75.7 mm SL (1, 75.7 mm SL), córrego Lombardia, near the Reserva Biológica Augusto Ruschi, 19°52'30"S 40°32'10"W, 6 Oct 2003, R. L. Teixeira. MZUSP 23813 (1, 63.8 mm SL), córrego Lombardia, 2 Apr 1969, MZUSP Expedition.

**Additional non-type specimens.** Brazil, Espírito Santo, Santa Teresa, rio Reis Magos drainage: MCP 29508, 4, 31.4-87.7 mm SL, rio da Penha at Sítio do Rubinho, rio Timbuí basin, 24 Oct 2001, R. L. Teixeira. MCP 34411, 3, 34.4-76.7 mm SL, córrego Valão de São Lourenço, rio Timbuí basin, 24 Jul 2002, R. L. Teixeira. MCP 41811, 1, 98.8 mm SL, rio Santo Antônio da Penha at Sítio Águas Claras, rio Timbuí basin, Dec 2004, R. M. Pizzio. MCP 27320, 1, 40.4 mm SL, córrego Santo Antônio, 12 Oct 2000, R. L. Teixeira. MCP 41783, 1, 45.4 mm SL, rio Timbuí at Penha, 1997, R. L. Teixeira.

**Diagnosis.** *Pareiorhaphis ruschii* differs from all congeners except *P. azygolechis*, in having the lower lip margin densely fringed (Fig. 1; *vs.* smooth or just slightly fringed). The new species can be further distinguished from all other *Pareiorhaphis* species but *P. garbei* and *P. azygolechis* in having a series of six to ten (usually seven to nine) small median, preadipose azygous plates, forming a low postdorsal ridge between the dorsal and the adipose fins (Fig. 2, *vs.* none to five preadipose plates). *Pareiorhaphis ruschii* is further distinguished from all remaining species except *P. calmoni*, *P. bahianus*, *P. nudulus*, *P. hypselurus*, and *P. stomias* by having the pectoral-fin spine very long and straight, reaching the distal third of the pelvic fin when adpressed in adult males (Fig. 1, *vs.* spine short and curved and maximally reaching half of the pelvic-fin length). It is also differentiated from most species, except *P. eurycephalus*, *P. hypselurus*, *P. stomias*, and *P. stephanus* by having the hypural plate asymmetrical with the lower lobe longer than the upper (Fig. 3, *vs.* hypural plate approximately symmetrical).

**Description.** Counts and proportional measurements in Table 1. Small to medium-sized loricariid with standard length of measured specimens 51.7-96.7 mm SL. Body stout, moderately depressed. Greatest body width at cleithrum, progressively tapering to end of caudal peduncle. Dorsal profile of body slightly convex, from snout tip to dorsal-fin origin and almost straight from that point to end of adipose fin, then slightly concave to caudal fin. Greatest body depth at dorsal-fin origin. Least body depth at shallowest part of caudal peduncle. Trunk and caudal peduncle mostly oval in cross-section, flattened ventrally and more compressed caudally. Lateral-line canal in median series complete, pored tube visible from compound pterotic to caudal-fin base. Ventral profile almost straight between snout tip and pelvic girdle, slightly

elevating posteriorly along anal-fin base, almost straight along caudal peduncle. Dorsal surface of body covered by plates except for narrow naked area around dorsal-fin base. Predorsal plates arranged in two to four series of pairs in some specimens, or without any noticeable arrangement. Five lateral rows of dermal plates covering body, not forming keels; mid-dorsal and mid-ventral series of lateral plates incomplete, terminating 3-4 plates before caudal fin. Ventral surface of head, portion from pelvic-fin

insertion to anal-fin origin, and region around urogenital opening totally naked. Abdomen almost completely naked, except for small embedded platelets or few odontodes on each side just posterior to gill opening, visible externally, sometimes absent in specimens smaller than 50.0 mm SL.

Head broad and moderately depressed. Outline of head round in dorsal view; adult males more slender anteriorly. Interorbital space straight or slightly concave. Three weakly



**Fig. 1.** *Pareiorhaphis ruschii*, MCP 46640, holotype, 84.7 mm SL, male, Brazil, Espírito Santo State, Santa Teresa Municipality, córrego Lombardia ca. 1 km NE of the Reserva Biológica Augusto Ruschi, tributary to rio Piraquê-Açu, 19°52'26"S 40°32'08"W.



**Table 1.** Morphometric and meristic data of *Pareiorhaphis ruschii*. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD = Standard Deviation.

	H	n	Low	High	Mean	SD
Standard Length (mm)	84.8	30	51.7	96.7	66.4	-
	Percent of Standard Length					
Head length	34.4	30	31.8	35.2	33.3	0.84
Predorsal length	44.5	30	42.7	45.7	44.3	0.75
Postdorsal length	41.9	30	38.4	41.9	40.4	0.91
Preanal length	67.1	30	64.2	82.7	67.1	3.22
Preadipose length	82.2	30	80.4	84.8	81.8	1.06
Dorsal-fin spine length	23.6	30	20.9	24.6	22.2	0.96
Anal-fin spine length	16.0	30	13.6	17.5	15.5	0.83
Pectoral-fin spine length	21.3	30	18.9	23.0	20.7	1.04
Ventral-fin spine length	26.3	30	21.8	26.4	23.6	1.23
Upper caudal-fin ray	23.3	28	23.3	27.8	25.1	1.06
Lower caudal-fin ray	25.2	28	24.8	28.5	26.5	0.94
Adipose-fin spine length	7.8	28	5.8	8.5	7.6	0.68
Adipose to caudal fin distance	18.7	30	15.5	20.0	18.2	0.96
Trunk length	16.0	30	15.0	17.8	16.7	0.68
Abdominal length	25.8	30	25.7	28.7	27.0	0.91
Cleithral width	28.6	30	27.6	30.8	28.9	0.72
Body depth at dorsal-fin origin	21.7	30	18.1	22.8	20.3	1.09
Body width at dorsal-fin origin	23.0	30	19.7	24.7	22.0	1.41
Body width at anal-fin origin	13.1	30	13.1	16.4	15.0	0.79
Caudal peduncle length	32.9	30	30.2	35.0	33.2	1.17
Caudal peduncle depth	9.5	30	8.9	10.6	10.0	0.44
Caudal peduncle width	5.3	30	4.3	6.2	5.5	0.40
	Percent of Head Length					
Snout length	61.7	30	58.4	64.9	61.3	1.55
Orbital diameter	13.6	30	12.2	16.1	14.6	0.90
Interorbital width	26.1	30	26.1	31.5	28.9	1.25
Head depth	55.4	30	40.5	59.4	54.7	3.32
Mandibular ramus	20.5	30	19.7	22.2	20.9	0.64
	Meristics					
Premaxillary teeth left	56.0	29	47	72	57.3	6.47
Premaxillary teeth right	58.0	27	49	67	57.7	5.35
Dentary teeth left	57.0	26	44	71	57.0	5.94
Dentary teeth right	58.0	27	45	70	56.2	6.60
Plates in median lateral series left	27.0	27	25	28	26.3	0.76
Plates in median lateral series right	26.0	27	25	28	26.2	0.85
Plates at dorsal-fin base	6.0	30	6	7	6.0	0.18
Plates between dorsal and adipose	8.0	30	7	8	7.7	0.47
Plates between adipose and caudal	3.0	30	2	4	3.4	0.62
Plates at anal-fin base	3.0	30	2	3	2.8	0.38
Plates between anal and caudal	10.0	30	10	12	11.1	0.52
Pre-adipose azygous plates	7.0	29	6	10	7.5	1.09

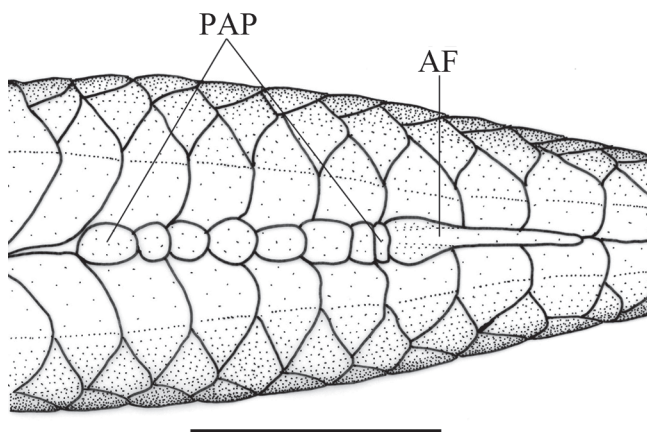
elevated ridges between orbits and snout tip. Outer ridges from middle of snout to upper margins of orbits slightly more prominent. Ridges ornamented with many short hypertrophied odontodes directed upward in adult males. Odontodes straight, conical and pointed distally, densely covering these ridges and making this area somewhat hispid (Fig. 4). Snout convex in lateral profile; snout tip with small ovoid area of naked skin. Adult males with slender soft fleshy lobes extending along lateral portion of head. Soft fleshy area ornamented with hypertrophied odontodes; larger odontodes bent anteriorly (Fig. 4). Eye small, dorsolaterally placed; orbital diameter 12.2-16.1% HL. Iris operculum absent or very small. Nares ovoid, slightly longer than wide, positioned much closer to anterior margin of orbit than to snout tip. Lips well developed, occupying most of ventral surface of head. Lower lip wide and long but not reaching pectoral girdle, upper lip narrow. Lower lip densely covered by minute papillae. Papillae surrounded by small naked areas, decreasing in size towards edge but then

increasing again to become slightly larger than those in central region of lip. Margin of lower lip densely fringed. Maxillary barbel short and united to lip by membrane basally, free distally. Teeth series in both premaxillae and dentaries with mesial ends slightly curved inwards. Teeth slender, asymmetrically bifid, medial cusp slightly curved inwards. Lateral cusp small and pointed, reaching or almost reaching half-length of medial cusp.

Dorsal fin originating on vertical line passing through pelvic-fin origin. Dorsal fin short, usually not contacting preadipose azygous plates when adpressed, sometimes contacting in adult males. Nuchal plate exposed, not covered by skin. Dorsal-fin spinelet present but dorsal-fin locking mechanism non-functional. Dorsal-fin spinelet transversely oval-shaped, as wide or slightly wider than base of dorsal-fin spine. Dorsal-fin spine moderately flexible, followed by seven branched rays. Adipose fin with well-ossified leading spine bearing odontodes. Adipose-fin membrane short or extended slightly beyond adipose-fin spine. Adipose fin preceded by six to ten (usually seven to nine)

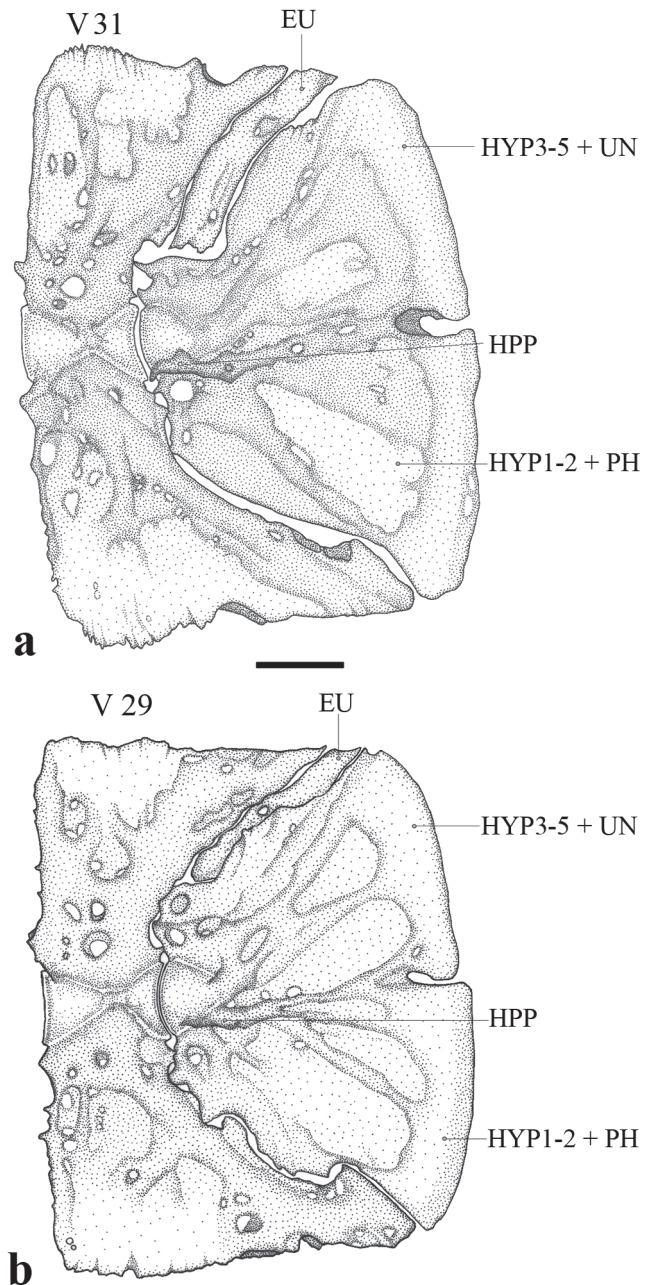
median preadipose azygous plates. Pectoral-fin origin situated more dorsally than pelvic-fin origin. Pectoral fin moderate in size, with spine distinctly straight and flattened, covered by minute odontodes in females, immature males and juveniles. Adult males with pectoral-fin spine very long and straight, tip reaching beyond half length of pelvic fin when adpressed; broadening from insertion to tip, bearing few straight, short hypertrophied odontodes on entire outer face. Pectoral fin with six branched rays, first and second as long as spine. Subsequent branched rays decrease gradually in size, last ray half length of first one. Posterior margin of pectoral fin straight, surpassing mid-length of pelvic fin when adpressed. Pelvic fin with one unbranched and five branched rays, not reaching or just reaching to origin of anal fin when adpressed. Pelvic-fin unbranched ray depressed, covered with minute odontodes ventrally and laterally. Dermal flap on its dorsal surface present and well developed, extending to ray tip in adult males; absent in females. Anal fin long with one unbranched and five branched rays; passing vertical at adipose-fin origin when adpressed. Caudal fin forked or slightly concave; upper and lower lobes approximately equal in size, or lower lobe slightly longer than upper; 14 branched rays. Upper caudal-fin lobe with six and lower lobe with four or five plate-like procurent rays, posteriormost elongate. Odontodes on principal and procurent rays small and irregularly arranged. Hypural plate asymmetrical with lower lobe longer than upper. Total vertebral centra 29-30.

**Color in alcohol.** Overall background color of dorsal and lateral surface of head and trunk dark gray or sometimes light to dark brown; yellowish or whitish pale ventrally. Dorsum and part of flanks covered by irregularly scattered darker brown blotches. Blotches usually arranged in four inconspicuous transverse saddles: at predorsal and anterior dorsal-fin base, posterior portion of dorsal-fin base, at preadipose and anterior adipose fin, and between adipose and caudal fin. Lips yellowish. Ventral surface of head and abdomen either completely whitish or pale



**Fig. 2.** *Pareiorhaphis ruschii*, MCP 44807, paratype, 53.1 mm SL. Postdorsal trunk, dorsal view. Odontodes omitted. AF, Adipose fin; PAP, Preadipose azygous plates. Scale bar = 5 mm.

yellow (some juveniles) or with small dark grey spots scattered on lateral portion of abdomen. Ventral portion of caudal peduncle dusky. Some specimens with numerous small dark spots. Mid-ventral line on caudal peduncle unpigmented, forming thin ventral light stripe limited by dusky lateral portions of caudal peduncle. Paired and dorsal fins with 3-4 transverse irregular dark bars. Caudal fin with five and anal fin with 2-3



**Fig. 3.** Skeleton of the caudal fin, left side, lateral view. **a** - *Pareiorhaphis azygolechis*, MCP 21663, paratype, 68.9 mm SL; **b** - *Pareiorhaphis ruschii* MCP 44807, paratype, 61.8 mm SL. EU, Epural; HYP, Hypural; UN, Uroneural; HPP, Hypurapophysis; PH, Parypural; V, Vertebra. Scale bar = 2 mm.



transverse irregular dark bars. One yellowish blotch on both upper and lowermost caudal fin rays in some specimens.

**Distribution.** Known from the upper reaches of the rio Piraquê-Açu and rio Reis Magos in Espírito Santo State, Brazil (Fig. 5). Only specimens from the rio Piraquê-Açu basin were included as paratypes in order to maintain the entire type series from a single river basin.

**Habitat and ecological notes.** The rio Reis Magos and rio Piraquê-Açu are both coastal basins of the Espírito Santo State of Brazil. The headwaters of the córrego Lombardia, where most specimens of *Pareiorhaphis ruschii* were collected, is a shallow creek (0.5 m depth and approximately 4 to 5 m wide) that crosses the Augusto Ruschi Biologic Reserve. The type material was collected immediately downstream from the reserve limit, where the river

was still well preserved. A few hundred meters downstream there are *Eucalyptus* plantations and the river is highly impacted.

**Sexual dimorphism.** Mature males possess the remarkable morphological modifications already known to occur in other *Pareiorhaphis* species, a skin fold on the dorsal surface of the unbranched pelvic-fin ray, a thickened pectoral-fin spine, fleshy lobes on the lateral margins of head, and hypertrophied odontodes emerging from those fleshy lobes and on the pectoral-fin rays. When compared to males, females possess an enlarged, swollen urogenital opening, while males have a small and pointed urogenital papilla.

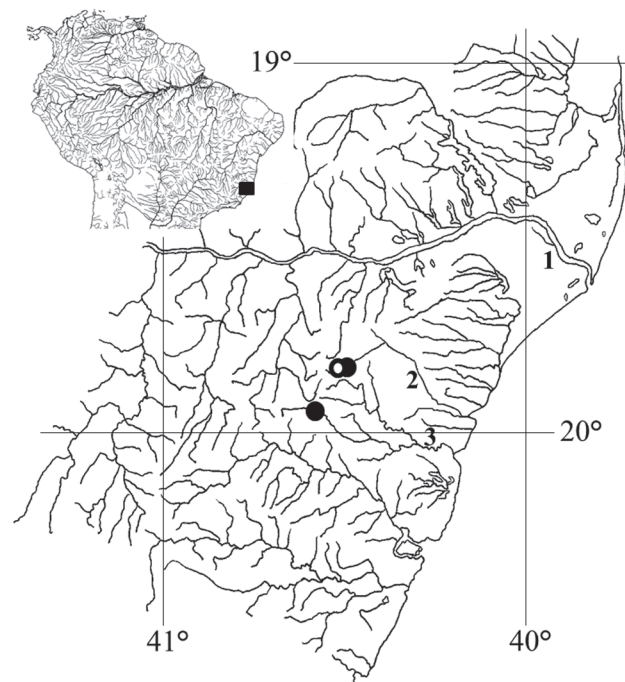
**Etymology.** Species name is given in honor of the late eminent Brazilian naturalist Augusto Ruschi in recognition for his outstanding contributions to the knowledge of Atlantic Forest hummingbirds and his unwearied efforts to create the conservation area Reserva Biológica Augusto Ruschi, where now *Pareiorhaphis ruschii* is preserved.

### Discussion

Among *Pareiorhaphis* it is not unusual to find species that share the relatively common sexually dimorphic features of a skin fold on the dorsal surface of the unbranched pelvic-fin ray, the thickened pectoral-fin spine, fleshy lobes on the lateral margins of head, and hypertrophied odontodes on the dorsal surface of the pectoral-fin spine and on the lateral margins of the head. All these features were found in adult males of *Pareiorhaphis ruschii*.



**Fig. 4.** *Pareiorhaphis ruschii*, MCP 41811, 98.8 mm SL. Lateral and dorsal views of the head showing development and orientation of hypertrophied odontodes.



**Fig. 5.** Distribution of *Pareiorhaphis ruschii* in eastern Brazil. 1, rio Doce. 2, rio Piraquê-Açu. 3, rio Reis Magos. Each dot covers more than one lot or locality. Open symbol is type-locality.

However one of the most diagnostic features used to distinguish *P. ruschii* from all other congeners is related to the shape, size, and covering of the pectoral-fin spine of adult males. Despite of similar patterns on sexual dimorphism observed in *Pareiorhaphis* species that are also characterized by thickened pectoral-fin spine, a clear interspecific variation on morphology of the pectoral-fin spine in adult males of *Pareiorhaphis* can be detected and revealed three distinct conditions. The first condition associated with the size while the second and third with the shape and ornamentation of the pectoral spine.

The length of the pectoral-fin spine is a sexually dimorphic feature in some *Pareiorhaphis* species. Most species have the pectoral-fin spine short, its posterior tip just reaching to or not reaching the origin of the pelvic fin when addressed to the body. However, adult males of *P. bahianus*, *P. cameroni*, *P. hypselurus*, *P. nudulus*, and *P. stomias* have the pectoral fin surpassing half length of pelvic fin when addressed. This condition also was observed in adult males of the new species which, however, is clearly differentiated from all previous species by having six to ten small preadipose azygous plate (vs. none to five). In addition, *P. hypselurus*, *P. nudulus*, and *P. stomias* shared the possession of four branched anal-fin rays while *P. ruschii* shares the plesiomorphic condition for loricariids of having five branched anal-fin rays. *Pareiorhaphis ruschii* can be further distinguished from *P. cameroni* and *P. bahianus* by having the pelvic-fin unbranched ray clearly wider than the pectoral-fin spine in ventral view (vs. pectoral-fin spine slightly wider than pelvic-fin unbranched ray).

Generally adult males of *Pareiorhaphis* species have the pectoral-fin spine strongly ossified and slightly to strongly intumescenced, making the spine thicker than that of females or immature males. *Pareiorhaphis ruschii* has the pectoral-fin spine with a singular condition, where the distal half is more strongly intumescenced making the spine club-shaped. Three species among *Pareiorhaphis*, *P. cameroni*, *P. parmula*, and *P. vestigipinnis* share a similar condition, however *P. ruschii* is distinguished from the previous species by having the lower lip margin densely fringed (Fig. 1; vs. smooth or just slightly fringed). In addition, *P. ruschii* can be further distinguished from *P. cameroni* by having small platelets or few odontodes embedded on each side of the abdomen just posterior to the gill opening (vs. abdomen totally naked in *P. cameroni*). From *P. parmula* it is further distinguished by the smaller number of lateral plates in the median series (25-28 vs. 28-31 in *P. parmula*). Finally, it is also distinguished from *P. vestigipinnis* by having a well-developed adipose fin (vs. adipose fin absent in *P. vestigipinnis*).

A greater development of hypertrophied odontodes on the pectoral-fin spine is a feature shared by most adult males of *Pareiorhaphis* species. Contrary to this condition, in adult males of *P. azygolechis*, *P. steindachneri*, *P. regani*, *P. cerosus*, and *P. mutuca*, however, the pectoral-fin spine is not covered by hypertrophied odontodes and the odontodes present on the spine are not distinct from those on the dorsal region of the head and trunk, and the pectoral-fin spines has no dimorphic modifications on their coverings. On the other hand, adult males of *P. ruschii* and most other species of the genus possess the

pectoral-fin spine bearing many hypertrophied odontodes (Fig. 1). In addition, there is a variation in the type of the covering of the pectoral-fin spine. With the exception of *P. hystrix*, *P. parmula*, and *P. vestigipinnis*, where the hypertrophied odontodes do not cover the entire length of the spine or are not arranged in a clear pattern, in remaining congeners the pectoral-fin spine of adult males bear hypertrophied odontodes from the base to the tip, covering the entire length of the spine. Although the odontodes show different degrees of development within the group the hypertrophied odontodes are approximately uniform in each species and show a relatively uniform ornamentation on the ray. Despite *P. ruschii* shares a similar condition on the covering to the pectoral-fin spine it is distinguished from all other *Pareiorhaphis* species by having the odontodes on the distal portion distinctly longer than those covering the remainder of the spine (vs. odontodes approximately equal in size on the entire length of the ray). In addition to the characters presented by Pereira *et al.* (2007: 445) the features of hypertrophied odontodes described above are not shared by any other neoplecostomine genera and are also useful to distinguish *Pareiorhaphis* species from *Isbrueckerichthys*, *Kronichthys*, *Neoplecostomus*, and *Pareiorhina*.

**Comparative material examined. Brazil:** *Delturus brevis*: MCP 26927, 3 paratypes, 1 c&s, 86.5 mm SL, Minas Gerais, Rubelita, rio Salinas, tributary of rio Jequitinhonha near Rubelita. *Hemipsilichthys gobio*: MCP 13654, 4, 1 c&s 67.7 mm SL, Rio de Janeiro, Teresópolis, rio dos Frades, near mouth of córrego da Chácara. *Hemipsilichthys nimius*: MCP 30671, 9 paratypes, 1 c&s 84.6 mm SL, Rio de Janeiro, Parati, rio Carrasquinho below the Cachoeira do Tobogã, upper Perequê-Açu basin. *Isbrueckerichthys alipionis*: MCP 19607, 21, 1 c&s 70.2 mm SL, São Paulo, Iporanga, rio Betari at Parque Estadual Turístico do Alto Ribeira. *Isbrueckerichthys epakmos*: MZUSP 79804, 103.1 mm SL, holotype, São Paulo, Tapirai, Ribeira de Iguape drainage, rio Verde at Piúva, on road to Rio Verde. *Kronichthys heylandi*: BMNH 1899 12.18.1, 126.2 mm SL, holotype, São Paulo, near Santos. *Kronichthys subteres*: MCP 20150, 32, 38.1-76.8 mm SL, São Paulo, Iporanga, córrego Areias, ca. 1 km SE from bairro da Serra. *Pareiorhina rudolphi*: MCP 18052, 23, 2 c&s 48.5-48.6 mm SL, São Paulo, Piquete, creek tributary to rio Piquete at Benfca. *Neoplecostomus microps*: MCP 18031, 3, 1 c&s 79.2 mm SL, São Paulo, Piquete, rio Piquete, tributary to rio Paraíba do Sul at Vila Esperança. *Pareiorhaphis azygolechis*: MCP 19670, 116.6 mm SL, holotype, Paraná, Guaratuba, rio Araraquara, ca. 8 km N of Garuva. MCP 21663, 7 paratypes, 1 c&s 68.9 mm SL, collected with the holotype. *Pareiorhaphis bahianus*: MNRJ 4243, 76.3 mm SL, holotype, Bahia, Ilhéus, Fazenda Almada. *Pareiorhaphis cameroni*: ZSM 4837, 104.5 mm SL, lectotype, Santa Catarina, Teresópolis, rio Cubatão. MCP 17276, 15, 1 c&s 83.8 mm SL, Santa Catarina, Águas Mornas, rio Teresópolis, tributary to rio Cubatão. *Pareiorhaphis cerosus*: MNRJ 648, 110.1 mm SL, lectotype, and MNRJ 22213, 1, 81.7 mm SL, paralectotype, locality unknown. *Pareiorhaphis eurycephalus*: MCP 19778, 62.3 mm SL, holotype, Santa Catarina, Urubici, creek tributary to rio Canoas E of vila São José, on road to Serra do Corvo Branco. MCP 22341, 24, 5 c&s 16.4-52.3 mm SL, rio Urubici at bridge S of Urubici. *Pareiorhaphis garbei*: MZUSP 1163, 105.4 mm SL, lectotype, Rio de Janeiro. MZUSP 47060, 107.2 mm SL, paralectotype, rio Macaé. MCP 35862, 2, 2 c&s 45.1-50.1 mm SL, Rio de Janeiro, rio Macaé near dam at Berdum Farm. *Pareiorhaphis hypselurus*: MCP 19665, 64.7 mm SL, holotype, Rio



Grande do Sul, Maquiné, rio Forqueta tributary to rio Maquiné. MCP 25445, 38, 1 c&s 66.3 mm SL, Maquine, arroio Pavão. *Pareiorhaphis hystrix*: MCP 19779, 110.2 mm SL, holotype, Rio Grande do Sul, Bom Jesus, creek tributary to rio dos Touros, on road from Silveiras to Rondinha. MCP 14348, 68 paratypes, 4 c&s 24.8-92.5 mm SL, collected with the holotype. *Pareiorhaphis mutuca*: MCP 18805, 14 paratypes, 1 c&s 72.7 mm SL, Minas Gerais, Nova Lima, São Francisco drainage, córrego Mutuca on km 20 of road from Belo Horizonte to Nova Lima. MCP 32968, 2, 2 c&s 63.9-73.8 mm SL, same locality of paratypes. *Pareiorhaphis nasuta*: MCP 41764, 78.6 mm SL, holotype, Minas Gerais, Abre Campo, District of Granada, rio Doce drainage, ribeirão Areia Branca, tributary to rio Matipó. MCP 37176, 12 paratypes, 2 c&s 60.2-65.5 mm SL, collected with the holotype. *Pareiorhaphis nudulus*: MCP 20278, 33.6 mm SL, holotype, Santa Catarina, Nova Veneza, rio Araranguá drainage, rio Jordão at Jordão Alto. MCP 10436, 126 paratypes, 11 c&s 12.9-32.4 mm SL, collected with the holotype. *Pareiorhaphis parmula*: MCP 35826, 93.3 mm SL, holotype, Paraná, Lapa, rio Iguaçu drainage, rio dos Patos, tributary to rio da Várzea on road PR-427 from Lapa to Campo Tenente. MCP 35827, 61 paratypes, 2 c&s 62.4-75.4 mm SL, collected with the holotype. *Pareiorhaphis scutula*: MCP 44046, 84.7 mm SL, holotype, Minas Gerais, Nova Era, rio Doce drainage, córrego Prainha, tributary to rio Piracicaba. MCP 37182, 29 paratypes, 2 c&s 57.1-59.6 mm SL, Nova Era, córrego Prainha on road to Cachoeira da Fumaça. *Pareiorhaphis splendens*: MNRJ 13326, 21 paratypes, 45.7-51.1 mm SL, Santa Catarina, rio Cubatão near Joinville. MCP 18325, 19, 1 c&s 45.8 mm SL, Queçaba, rio Cubatão on road SC 431 near São Bonifácio. *Pareiorhaphis steindachneri*: NMW 92790, lectotype, 133.5 mm SL, Santa Catarina, rio Itapocu drainage, rio Paulo. MCP 16582, 57, 1 c&s 92.3 mm SL, Santa Catarina, Águas Mornas, rio Teresópolis, tributary to rio Cubatão. *Pareiorhaphis stephanus*: MZUSP 36971, 97.1 mm SL, holotype, Minas Gerais, ribeirão das Pedras, tributary to rio Jequitinhonha, 3 km N of Diamantina. LIRP 4562, 59.8 mm SL, Minas Gerais, Grão Mogol, tributary to rio Itacambiruçu, rio Jequitinhonha drainage. *Pareiorhaphis stomias*: MCP 19666, 48.4 mm SL, holotype, Santa Catarina, Treviso, rio Araranguá drainage, rio Mãe Luzia at Forquilha. MCP 19200, 84 paratypes, 2 c&s 43.6-50.4 mm SL, collected with the holotype. *Pareiorhaphis regani*: IRSNB 47, 113.0 mm SL, holotype, Amazonas, rio Curicuriari, S of rio Negro. *Pareiorhaphis vestigipinnis*: MCP 14344, 97.5 mm SL, holotype, Santa Catarina, Lages, rio Uruguai drainage, creek tributary to rio Caveiras at Paineal, on the road from São Joaquim to Lages. MCP 14345, 21 paratypes, 1 c&s 78.1 mm SL, collected with the holotype. **Guyana**: *Corymbophanes andersoni*: AUM 28149, 1, 1 c&s 56.6 mm SL, Potaro River, Kaiteur Falls, Chenapou Cataract 14.7 mi SW Mende's Landing.

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