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THE SOUTH AMERICAN FISH GENUS *RACHOVISCUS*, WITH A DESCRIPTION OF A NEW SPECIES (TELEOSTEI: CHARACIDAE)

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Abstract.—*Rachoviscus graciliceps,* a new species of characid fish, is described from small coastal blackwater streams near Prado, Bahia, Brazil. The relationships of this species appear close to *Rachoviscus crassiceps* Myers (1926) which is redescribed on the basis of the types and new specimens from small blackwater streams near the Atlantic coast 50 to 60 km south of Paranaguá, Paraná, Brazil. The new species, *R. graciliceps* appears to be less derived than *R. crassiceps*. The type locality of *R. crassiceps,* the neighborhood of Rio de Janeiro, is discussed and found to be questionable. *Rachoviscus* is redefined; its relationships to other characids remain obscure.

Rachoviscus Myers (1926) was established for two aquarium specimens of a new species, *Rachoviscus crassiceps* Myers (1926), sent to Myers by Arthur Rachow of Germany. The specimens were said to have been imported from the neighborhood of Rio de Janeiro but no specimens with verified locality information have ever been recorded. All the later aquarium reports cited below seem to be based on the account of Rachow in Holly Meinken, and Rachow (1939). The species remained known only from the specimens examined by Myers and from Rachow's account until September of 1975 when Persio de Santos Filho, a student at the Universidade de São Paulo, collected specimens about 50 km south of Paranaguá, Paraná, Brazil in small blackwater streams and ponds emptying into the Atlantic Ocean. In December of that same year, two small specimens of *Rachoviscus crassiceps* were obtained by N. Menezes and W. L. Fink from a small blackwater stream near the Atlantic Ocean not far from the locality visited by de Santos Filho. In spite of attempts to collect additional specimens, none was found. At that time many of the coastal blackwater streams and ponds were dry, including those visited by de Santos Filho. The two specimens, a pair, were brought alive to Washington, D.C. where they grew to adults but never spawned. Both were preserved after surviving three and one half years in aquaria and are now USNM 220732.

The new species, *Rachoviscus graciliceps,* was collected by Carlos Cruz in October 1977 from a small blackwater stream near the Atlantic Ocean about one km north of the town of Prado in Bahia, Brazil. Live specimens of this species were brought to Rio de Janeiro where they spawned in aquaria.

The coastal blackwater streams of eastern Brazil have been little collected and the distributions here reported for these two species may be greatly extended in the future.

The methods used here for counting and measuring specimens were those described for characoids by Fink and Weitzman (1974). All morphometric values in the descriptions are expressed as a percentage of standard length (SL) except where otherwise designated. The value for the holotype or lectotype is given first followed by values for the remaining males in parentheses ( ) and for the females in brackets [ ]. In some cases of meristic values, only a series of figures, in parentheses, is given after the holotype; these include counts for both males and females. Specimens have been deposited in the following museums: California Academy of Sciences (CAS) (note, SU following CAS means the number is a former Stanford University Natural History Museum number with the specimen now deposited at CAS), Museu de Zoologia da Universidade de São Paulo (MZUSP), Museu Nacional do Rio de Janeiro (MN), and the National Museum of Natural History, Smithsonian Institution (USNM).

Rachoviscus Myers

Rachoviscus Myers, 1926:1, original description, type by monotypy *Rachoviscus crassiceps* Myers 1926.

Diagnosis.—The following series of characters will distinguish *Rachoviscus* from all other genera of the Characidae: pelvic fins i,5 with only second and third branched rays of males bearing bony hooks or spines on ventral surface of fin; one bony spine to each ray segment that bears a spine.

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Diagnosis.—The following series of characters will distinguish *Rachoviscus* from all other genera of the Characidae: pelvic fins i,5 with only second and third branched rays of males bearing bony hooks or spines on ventral surface of fin; one bony spine to each ray segment that bears a spine. Other important characters for *Rachoviscus* are as follows. Premaxillary teeth in two rows, teeth of outer row one or two, unicuspid or tricuspid. Those of inner row five to six and mostly tricuspid, some bicuspid or unicuspid. Teeth of these two rows sometimes closely approximate, and giving appearance of a single undulating row of teeth. Lateral line incomplete, of about four to five perforated scales placed anteriorly. Maxillary bone set with teeth for about one-third to two-thirds of its length. These teeth unicuspid or anterior first to third teeth may be tricuspid, others unicuspid. Sub- and postorbital

area nearly completely covered by four infraorbital bones. Third infraorbital (=great or second suborbital of Eigenmann) with its ventral border in contact with preopercle. In life both known species have bright red adipose fins in both sexes and the distal one-quarter to one-third of anal fin pigmented with a stripe of red or yellow, especially in males.

Discussion.—The relationships of this genus to other characid genera are obscure. Myers (1926) originally placed it in the nominal subfamily Cheirodontinae because he believed the type species had a single row of premaxillary teeth. Myers further suggested the relationships might be with *Prionobrama* Fowler.

Géry (1977:347) placed *Prionobrama, Rachoviscus, Paragoniates* Steindachner, *Leptagoniates* Boulenger, *Xenagoniates* Myers, and *Phenagoniates* Eigenmann and Wilson in a group because they are reported to have a "very compressed, usually elongate body with a long anal fin." He further stated that "they usually have a single series of teeth on the upper jaw." Géry placed *Paragoniates, Rachoviscus,* and *Prionobrama* in a single group in his key because they share the following characters: the presence of an adipose fin, a relatively short body (compared to the other genera in his Paragoniatinae), an incomplete lateral line and less than 50 anal-fin rays. He associated the genera *Prionobrama* and *Rachoviscus* in his key by their common posession of 29 to 37 anal-fin rays, 10 to 16 maxillary teeth, and 35 to 41 scales. Géry was uncertain about this placement and remarked that both of these genera could be placed in the Aphyocharacinae.

The problem of the putative relationships among these six genera needs much study and will be considered here only as it may concern the relationships of *Rachoviscus*. The important questions that must be considered here are as follows. What are the unique characters shared by the species of *Rachoviscus* that can used to define the genus and phylogenetically relate the species? The same question must be asked for *Prionobrama* and *Paragoniates*. Finally are there any shared derived characters that might indicate a relationship between *Rachoviscus* and *Prionobrama,* or between *Rachoviscus* and *Paragoniates*?

The characters utilized by Géry (1977:347) are difficult to evaluate from a phylogenetic point of view. One character utilized by Géry, the posession of an adipose fin, can be eliminated for phylogenetic analysis because it is almost undoubtedly primitive for the family. Outgroup comparison of the Characidae with other characoids and the Otophysi as a whole shows that this character is not unique to the Characidae. The character probably occurred in the family's ancestor and therefore its presence cannot be used to relate genera or species in monophyletic lines within the family. The loss of the adipose fin appears to have occurred independently several times within the family making its absence difficult to use in phylogenetic analysis.

The other characters as listed by Géry (1977) occur commonly in diverse

groups of characids. Some of these characters, such as the reduced lateral-line count and a single row of premaxillary teeth, are "simple" loss characters which may have evolved independently and repetitively in characids. Attention to morphological detail of jaw modification and tooth arrangement may, in some cases at least, make a reduction in tooth rows useful in phylogenetic analysis. Other characters used by Géry are apparently genetically labile characters such as fin-ray counts and tooth counts, or body shape. The primitive versus derived nature of these kinds of characters is very difficult and perhaps often impossible to evaluate since the advanced versus plesiomorphic polarities of similar appearing characters may or may not be the same in these instances of labile characters. Therefore, these characters are often useless for phylogenetic analysis except in certain specific cases wherein a large series of such characters may correlate in their distributions among a series of taxa when processed by outgroup comparison and parsimony.

The species of *Rachoviscus* seem related by the unique pelvic-fin structure and color pattern described above in the generic description. The two species of *Prionobrama, P. filigera* Cope and *P. paraguayensis* Eigenmann, seem related to each other by a large series of characters none of which is unique to these two species but which occur nowhere else in this particular combination, producing a series of correlated synapomorphies that undoubtedly has real phylogenetic significance. They have large, white-tipped anterior anal-fin lobes and elongate strong pectoral fins with large pectoral-fin muscles and pectoral girdle. The dorsal-fin origin and anal-fin origin are nearly approximate or the dorsal-fin origin is a little anterior to the anal-fin origin. They have an elongate, compressed body with an elongate anal fin of 29–37 branched anal-fin rays, a nearly fully toothed maxillary bone with mostly unicuspid teeth, a single series of tricuspid teeth on the premaxillary bone, an incomplete lateral line and an oblique mouth upturned distally. A few of these derived characters were used by Myers (1926) to relate *Prionobrama* and *Rachoviscus*. They were stated to share a distally upturned mouth, a well toothed maxillary, an incomplete lateral line, and a single row of premaxillary teeth. New information shows that *Rachoviscus* has two rows of premaxillary teeth and that a well toothed maxillary occurs only in one species, *R. crassiceps,* the most derived. We believe than many more than the two remaining shared characters, a distally upturned mouth and an incomplete lateral line, are needed if *Prionobrama* and *Rachoviscus* are to be considered close relatives. This is especially convincing since both of these characters occur commonly in characoids of no apparently close phylogenetic relationship to either of these genera. We fail to find unique synapomorphic characters uniting *Rachoviscus* and *Prionobrama* more closely to each other than to any other characids.

The problem of a possible relationship of *Rachoviscus* with *Paragoniates*

Fig. 1. Localities reported for *Rachoviscus graciliceps* and *Rachoviscus crassiceps*. **Black disk within two circles,** type locality of *R. graciliceps,* Prado, Bahia. **Black star,** putative type locality for *R. crassiceps,* neighborhood of Rio de Janeiro; see text. **Black star within two circles,** new records for *R. crassiceps,* near Guarituba and Brejotuba, Paraná. All localities are in Brazil.

is more complex but involves much the same kinds of considerations. *Paragoniates* is a very compressed deep-bodied, rather elongate fish with a long anal fin of about 34–48 rays, according to Géry (1977). It has a combination of a distally upturned mouth and long slender jaw bones of a shape found nowhere else in characoids. This is associated with the two tooth rows of the premaxillary in at least some populations of *Paragoniates* being compressed together, producing an appearance somewhat similar to that of the premaxillary tooth rows in *Rachoviscus crassiceps*. The premaxillary tooth rows of *Paragoniates* were reported as one row by Eigenmann (1915), but two specimens of *Paragoniates* sp. from the Rio Tiznados, Guarico, Venezuela (MBUCV-V-7108), have one or two teeth in an outer row which are more or less pressed against the inner main row, giving the impression of a single undulating row. Six specimens of *Paragoniates alburnus* Steindachner from the Rio Pachitea at Porto Inca, Peru (FMNH 83874) appear to have a short inner row of two teeth instead of an outer row of two teeth. The main row of teeth is present as a continuous outer row. *Paragoniates* has a short lateral line of 13–16 perforated scales in the specimens recorded above. The dorsal fin originates well posterior to the origin of the anal fin and the pectoral fins are elongate, with enlarged pectoral-fin muscles and girdles. *Paragoniates* has a deep, short caudal peduncle relative to most characid species in genera that are presumably relatively primitive such as *Brycon* Müller and Troschel, *Astyanax* Baird and Girard, and *Moenkhausia* Eigenmann. The Venezuelan specimens of *Paragoniates* reported above have the pelvic-fin rays i,6 whereas the Peruvian population sample had i,7, the usual count for characids, including the primitive genera in the family.

Of the apomorphic characters recorded above for *Paragoniates, Rachoviscus* has a relatively deep caudal peduncle (especially in the more derived species, indicating an origin independent from that of *Paragoniates*), a reduced lateral line, and a distally upturned mouth. All these characters occur commonly elsewhere in the Characidae and probably represent independent derivations for these two genera. The trend toward a reduction in pelvic-fin rays in *Paragoniates* is undoubtedly independent of the reduction in *Rachoviscus,* and although both genera appear to have a trend toward compression of premaxillary tooth rows, in detail the premaxillary bones are very different. Furthermore, it is only the more derived species of *Rachoviscus* that has this character.

Géry (1977:347) suggests that *Rachoviscus* might be allied to *Aphyocharax* Günther, but discussed no evidence for this opinion. Although all species of *Aphyocharax* appear to have their premaxillary teeth in a single row, there is much morphological divergence in the jaws of these fishes (Eigenmann, 1915). We could find no synapomorphic character between species of *Aphyocharax* and *Rachoviscus*. Eigenmann's definition of *Aphyocharax* is extensive, but most of the characters listed are either primitive for the

Characidae or, when derived, are found in a number of apparently more or less remotely related, diverse characid genera. An examination was made of the pelvic fins of eight morphologically diverse species of *Aphyocharax* from localities in Paraguay, Argentina, Brazil, Bolivia and Venezuela. These specimens (USNM numbers 220869, 220870, 220871, 220872, 220873, 220874, 220875 and 220878) are unidentified because no recent and adequate study of the species and their relationships is available. In all those species that had no pelvic-fin spines, the males had an i,7 pelvic-fin ray count. Of those that had i,7 or i,6 pelvic-fin rays, some males had spines on all the fin rays except the anterior undivided ray (one species), spines on all soft rays (one species), on all soft rays except the last, or on the first, second, third and fourth soft rays but not on the three terminal soft rays. All specimens that had spines in the pelvic fin had the spines extending ventrally. The pelvic fins of the species of *Aphyocharax* examined are not remarkably different from those found in many other characids and do not show any synapomorphies with *Rachoviscus*. A more complete evaluation of the possible relationship of *Aphyocharax* and *Rachoviscus* must await a detailed phylogenetic study of the species of *Aphyocharax*.

This discussion indicates that the relationships of *Rachoviscus* within the Characidae remain unknown. This genus was placed with the "cheirodontin" characids by Myers (1926) following the traditional hypothesis established by Eigenmann (1915) that all small characoids with a single row of premaxillary teeth are phylogenetically related in a single characid subfamily, the Cheirodontinae. The phylogenetic unity of the Cheirodontinae was challenged by Fink and Weitzman (1974). In the present study, *Rachoviscus* was found to have two rows of premaxillary teeth, a fact which would place it in the characid subfamily Tetragonopterinae, following a traditional concept best expressed by Eigenmann (1917). The phylogenetic relationships among the tetragonopterin characids are essentially unknown and unstudied and the group is probably a paraphyletic assemblage or a series of paraphyletic assemblages with undetermined relationships.

Rachoviscus graciliceps, new species
Figs. 1–2

Holotype.—MZUSP 14387, SL 44.4 mm, Brazil, State of Bahia; taken from one of three small creeks about 1 km north of Prado and about 500 meters from Atlantic Ocean, 39°14′W, 17°19′S, 18 October 1977 by Carlos Alberto Gonçalves da Cruz.

Paratypes.—3, MZUSP 14388, 14389, and 14390, SL 39.8–42.9 mm; 2, USNM 220355, 40.3–47.6 mm; both lots with same data as holotype. 1 additional specimen, USNM 220355, SL 35.1 mm, is young of specimens collected with holotype. 2, MN 10585 and 10586, SL 33.2–37.2 mm, col-

lected at same locality as holotype, 1–4 December 1978 by E. Izecksohn, O. L. Peixoto and C. A. G. da Cruz.

Diagnosis.—This species differs markedly from *R. crassiceps* in shape of head and caudal peduncle, configuration of premaxillary and maxillary teeth as well as in number of scale rows around caudal peduncle and predorsal scale count. *Rachoviscus graciliceps* has a more slender head, interorbital width quite variable but 29.1–35.0% of head length (n = 5); *R. crassiceps* has an interorbital width 37.5–43.8% of head length (n = 12). The caudal peduncle of *R. graciliceps* is much more slender than that of *R. crassiceps*. Caudal peduncle length of *R. graciliceps* nearly same as caudal depth length, 93.0–100% of caudal peduncle depth; In *R. crassiceps,* caudal peduncle length is 62.7–74.1% of caudal peduncle depth. *Rachoviscus graciliceps* has 14 scale rows around caudal peduncle; *R. crassiceps* has 18. Predorsal scale count in *R. graciliceps* (n = 5) 14 to 16, $\bar{x}$ = 15, SD = 0.707, and in *R. crassiceps* (n = 11) 17 to 19, $\bar{x}$ = 18.2, SD = 0.751. Lateral series scale counts not significantly different; when tested with a two-tailed Student's *t* test using square root transformations to compute value of *t*, *t* = 1.88 and *P* = 0.04. In *R. graciliceps* (n = 5), always 35 scales in a lateral series and *R. crassiceps* (n = 11) 34–39 scales, $\bar{x}$ = 36.5, SD = 1.695.

Premaxillary tooth rows of *R. crassiceps* "compressed" together (see description below) but remain separate in *R. graciliceps* as in most other characids with 2 premaxillary tooth rows. *Rachoviscus graciliceps* with fewer teeth (3–8) on maxillary, occurring on about anterior one-fourth to one-third of its length, whereas more (8–14) teeth occur along about one-half to two-thirds of that length in *R. crassiceps*.

Description.—Morphometric values based on 2 males and 3 females unless otherwise designated. Specimens spawned and raised in aquaria were not utilized in taking morphometric or meristic values. Eight specimens with locality data were in good enough condition for some of the meristic values. Body moderately compressed, relatively elongate, greatest depth most often at dorsal-fin origin, occasionally anterior to that origin. Greatest depth 35.5 (32.4–35.5, $\bar{x}$ = 34.0) [32.0–35.2, $\bar{x}$ = 33.7]. Depth at dorsal-fin origin same as greatest depth in males, in females [31.7–34.0, $\bar{x}$ = 32.6]. Predorsal body profile slightly convex, slightly concave over nape, continuing anteriorly to dorsal to eye. Snout slightly convex. Body profile along base of dorsal fin slightly convex, nearly straight between posterior dorsal-fin termination and adipose fin. Posterior to adipose fin, body profile slightly convex up to origin of anterior procurrent rays of dorsal lobe of caudal fin. Dorsal-fin origin about equidistant between snout tip and caudal-fin base or slightly nearer to the latter. Distance between snout tip and dorsal-fin origin 54.1 (53.2–54.1, $\bar{x}$ = 53.7) [52.6–53.8, $\bar{x}$ = 53.3]. Distance between dorsal-fin origin and caudal-fin base 50.9 (50.9–51.3, $\bar{x}$ = 51.1) [49.7–50.4, $\bar{x}$ = 50.2]. Distance

Fig. 2. **Above:** *Rachoviscus graciliceps,* new species, MZUSP 14387, SL 44.4 mm, holotype, male. **Below:** *Rachoviscus graciliceps,* MZUSP 14389, SL 42.9 mm, paratype, female. Both specimens from 1 of 3 small blackwater streams about one km north of Prado, Bahia, Brazil, 18 October 1977.

between posterior border of eye and dorsal-fin origin as a percentage of distance between dorsal-fin origin and caudal-fin base 89.7 (82.0–89.7, $\bar{x}$ = 85.9) [83.4–85.4, $\bar{x}$ = 84.2]. Ventral body profile moderately convex from symphysis of lower jaw to posterior termination of anal-fin base. Distance between snout tip and pectoral-fin origin 27.7 (26.9–27.7, $\bar{x}$ = 27.3) [26.3–26.6, $\bar{x}$ = 26.5]. Distance between snout tip and pelvic-fin origin 49.5 (48.5–49.5, $\bar{x}$ = 49.0) [48.7–50.5, $\bar{x}$ = 49.4]. Distance between snout tip and anal-fin origin 59.9 (57.1–59.9, $\bar{x}$ = 58.5) [56.3–63.8, $\bar{x}$ = 60.2]. Caudal peduncle depth 14.2 (12.6–14.2, $\bar{x}$ = 13.4) [12.3–13.3, $\bar{x}$ = 12.9]. Caudal peduncle length 13.5 (12.6–13.5, $\bar{x}$ = 13.1) [12.3–13.2, $\bar{x}$ = 12.6].

Head deep, relatively short, bony head length 25.0 (23.9–25.0, $\bar{x}$ = 24.5) [23.3–25.9, $\bar{x}$ = 24.6]. Snout moderately acute, not blunt, lower jaw protruding slightly beyond upper jaw. Mouth gape angled ventrally. Posterior ventral border of maxillary bone reaching to or somewhat beyond a vertical

line drawn ventrally from anterior border of pupil of eye. Horizontal eye diameter 31.5% (31.5–32.5, $\bar{x}$ = 32.0) [28.2–34.0, $\bar{x}$ = 30.8] of bony head length. Snouth length 26.1% (26.1–27.2, $\bar{x}$ = 26.7) [21.4–27.0, $\bar{x}$ = 24.6] of bony head length. Least bony interorbital width 33.3% (30.7–33.3, $\bar{x}$ = 32.0) [29.1–35.0, $\bar{x}$ = 31.8] of bony head length.

Dorsal-fin rays ii,9 in all specimens (last ray not split to its base). Dorsal-fin length (=dorsal-fin origin to distal tip of longest ray when fin adpressed to back) 25.0 (25.0–25.2, $\bar{x}$ = 25.1) [23.1–25.6, $\bar{x}$ = 24.0]. Distal margin of dorsal fin strongly convex in both sexes (Fig. 2).

Adipose fin present. Anal-fin rays iv,26 (iv,24–iv,25) [iv,23 in one and iv,24 in two]. Last anal-fin ray split to its base. Margin of anal fin slightly concave, nearly straight (Fig. 2). Pectoral-fin rays i,13 in all specimens. Posterior tip of longest ray not reaching pelvic-fin origin in either males or females.

Anal-fin spines of a male specimen, SL 47.6 mm, USNM 220355 as follows: second branched ray through twenty-fifth branched ray with spines, these about five in number for about anterior 12 fin rays, gradually diminishing in number to one spine at twenty-fifth anal-fin ray. One spine for each side of each ray segment in all cases. Spines in a continuous series with distal 5 or 6 ray segments free of spines. All spines extend laterally and curve somewhat dorsally. Females without anal-fin spines.

Caudal fin 10/9 in all specimens, its dorsal and ventral lobes equal in length. Caudal fin and dorsal fin without bony hooks.

Pelvic-fin rays i,5 in all specimens. Pelvic fin length 12.2 (12.2–12.6, $\bar{x}$ = 12.4) [12.1–12.8, $\bar{x}$ = 12.4]. Second branched pelvic-fin ray of a male specimen, SL 47.6 mm, USNM 220355, with 11 thick conical spines with their apices pointing medially. Third branched pelvic-fin ray of this specimen bears 8 similar spines. All these spines confined to ventral surface of fin. Females without pelvic-fin spines.

Scales cycloid. Lateral line incomplete, perforated lateral-line scales 5 (3 or 5 in males, 5 in all females). Scales in a lateral series 35 in all specimens. Scale rows between dorsal-fin origin and pelvic-fin origin 15 in all specimens. Predorsal scales 16 (14–16, $\bar{x}$ = 15 in all specimens).

Premaxillary teeth in 2 very distinct rows, outer row teeth tricuspid and 1 to 2 in number, not placed far back and pressed against or between inner row teeth. Outer row teeth lie anterior to space between first and second, and second and third inner row teeth. Inner row teeth 5 in all specimens, all tricuspid. Medial tooth with a very small medial cusp. Maxillary bone with 3–8 teeth along approximately anterior one-fourth to one-third of its total length. Anterior 1 to 3 teeth tricuspid, others unicuspid. Dentary with a single row of teeth. Anterior 5 teeth large and tricuspid; posterior 5 to 9 teeth unicuspid and small. Small specimens with fewer dentary teeth than large specimens.

Total vertebrae including Weberian apparatus and terminal complex centrum (35–36, $\bar{x}$ = 35.4, n = 8). Gill rakers 7/10 in holotype, (6–7 on upper limb, 10–11 on lower limb, never more than a total of 17 or less than 16 rakers, $\bar{x}$ = 16.6, n = 8).

Color in alcohol.—Body and head a pale brown, immaculate, shading to dark borwn along dorsum and to white on belly. Cheeks and opercle pale brown. Top of head and snout dark brown. Color much like that of *R. crassiceps* except none of specimens at hand are nearly black or very dark brown. Fins hyaline except for dorsal and anal fins. Dorsal fin with a row of dark pigment spots between first or second through fourth or fifth fin rays. This pigment located in about mid-length of these rays and producing a horizontal dark line across fin (Fig. 2, above, MZUSP 14387). A similar line of dark pigment occurs along length of anal fin at about distal two-thirds of fin-ray length from base of fin.

Color in life.—This color description is taken from color slides of specimens kept in aquaria. Pigment distribution and colors very similar to those in *R. crassiceps*. Back olive brown with a considerable amount of yellow. Sides of body silver but with lemon yellow in abdominal area. Caudal peduncle and area dorsal to anal fin reflect a light pink silvery color. Caudal fin greenish lemon yellow, tips of lobes, especially ventral lobe, pale red, sometimes tipped white. Adipose fin deep red, especially in male. Dorsal fin white to greenish or reddish white, distal to dark streak or line across its middle length, hyaline ventral to that streak. Anal fin with distal one-quarter to one-third of its length a dusky red or sometimes yellow, especially in males. Basal portion of anal fin hyaline. Pelvic fins of males with a distal reddish or yellowish spot, otherwise hyaline. Pectoral fins hyaline.

Sexual dimorphism.—Sexual differences not as apparent in *R. graciliceps* as in *R. crassiceps*. Females a little paler in life colors than males, and red of adipose fins likely to be less extensive. Difference in caudal-peduncle depth noted below for males and females in *R. crassiceps* appears absent or at least not as obvious in *R. graciliceps*. Males have this depth 12.6 to 14.2, $\bar{x}$ = 13.4% of standard length, females 12.3 to 13.3, $\bar{x}$ = 12.9%. Only males have hooks on pelvic and anal fins.

Etymology.—From Latin *gracilia,* slender or thin, and *ceps,* head. The name is used in reference to the fact that this species has a more slender head than *R. crassiceps*.

Rachoviscus crassiceps Myers
Figs. 1, 3, 4

Rachoviscus crassiceps Myers, 1926:389, original description, figure, Brazil, neighborhood of Rio de Janeiro.—Rachow, 1928:18, aquarium description, figure.—Arnold and Ahl, 1936:115, aquarium description, figure.—

Fig. 3. *Rachoviscus crassiceps*, USNM 220732, SL 38.5 mm, male, small blackwater stream just south of Guarituba, Paraná, Brazil, 28 December 1975. Bent fin rays of caudal, dorsal, anal, and pectoral fins are due to regrowth from damage in an aquarium.

Rachow *in* Holly *et al.*, 1939:284, restatement of original description, aquarium description, figure, breeding habits in aquaria.—Sterba, 1959:120, aquarium description, figure.—Géry, 1977:350, rediscovery near Rio de Janeiro; reference actually to specimens (USNM 220732) recorded below from near Guarituba, Paraná, Brazil.

Comments.—This incomplete synonymy lists the major aquarium publications in which this fish has appeared. This fish has never been accorded systematic treatment subsequent to its original description. The species is little known to aquarists and to systematic ichthyologists. All of the above aquarium reports appear to have been taken from Myers (1926), Rachow (1928) and Rachow *in* Holly *et al.* (1939). The last reference contains a brief comment on its original importation as an aquarium fish into Germany. The stated type locality can be considered questionable. The fish was first imported by M. Gregor of Hamburg in 1926 from the "Umgelbung von Rio de Janeiro." At that time the German aquarium import trade was receiving fishes from coastal or near coastal cities in southern Brazil such as Rio de Janeiro, Santos, Paranaguá and Pôrto Alegre. There is no certain record of this species from anywhere except the two localities cited below, both within 10 kilometers of Guarituba, a small town about 50 km south of Paranaguá. Although this species may occur (or may have occurred) in small blackwater streams as far as or further north than Rio de Janeiro, there is no firm

evidence that the type locality is correct. The fish could have been imported from Paranaguá and transshipped to Rio de Janeiro before shipment to Germany.

Material examined.—Lectotype, USNM 92971, 32.7 mm SL, male, pelvic rays with hooks; lectotype here selected from two syntypes originally in collection of G. S. Myers, number 86. Second original syntype, 1, CAS(SU) 18146, 28.1 mm SL, same locality data as lectotype. USNM 220732, 2, SL 34.1 mm and 38.5 mm, Brazil, State of Paraná, small blackwater stream just south of Guaritubа, about 25 to 50 meters from Atlantic Ocean, 24°37′W, 25°55′S, collected by N. Menezes and W. L. Fink, 28 December 1975. MZUSP 14635, 4, SL 21.8–30.5 mm, largest a male, others females, Brazil, State of Paraná, stream pond at beach of Brejotuba, 10 km south of Guaritubа (24°37′W, 25°55′S), collected by Persio de Santos Filho, September 1975. USNM 220756, 2, SL 21.5–24.4 mm, females, same locality data as MZUSP 14635. USNM 220757, 2, SL 23.7 and 29.5 mm, both cleared and stained with alizarin, both with same locality data as MZUSP 14635.

Diagnosis.—See diagnosis above under *R. graciliceps*.

Description.—Morphometric values based on 4 males and 7 females unless otherwise designated. Body moderately compressed, relatively deep, greatest depth usually anterior to dorsal-fin origin 38.5 (36.7–40.0, $\bar{x}$ = 38.6) [37.5–39.3, $\bar{x}$ = 38.5]. Depth at dorsal-fin origin 37.0 (36.7–39.0, $\bar{x}$ = 37.8) [35.8–38.5, $\bar{x}$ = 37.1]. Predorsal body profile slightly convex, somewhat concave at nape and again convex over eye and snout. Base of dorsal fin and body profile from base of dorsal fin to origin of adipose fin origin nearly straight. Body profile posterior to adipose fin straight to origin of caudal fin at beginning of anterior procurrent caudal-fin rays. Dorsal-fin origin nearer to caudal-fin base than to snout tip. Distance between snout tip and dorsal-fin origin 55.7 (55.1–58.7, $\bar{x}$ = 56.3) [56.2–59.5, $\bar{x}$ = 58.1]. Distance between dorsal-fin origin and caudal-fin base 49.2 (48.6–49.8, $\bar{x}$ = 49.1) [45.4–50.8, $\bar{x}$ = 47.6]. Distance between posterior border of eye and dorsal-fin origin as a percentage of distance between dorsal-fin origin and caudal-fin base 94.4 (93.3–97.3, $\bar{x}$ = 95.1) [90.7–102.0, $\bar{x}$ = 97.1]. Ventral body profile moderately convex from symphysis of lower jaw to anterior procurrent fin ray of caudal fin. Distance between snout tip and pectoral-fin origin 32.4 (26.5–32.4, $\bar{x}$ = 28.8) [26.6–28.4, $\bar{x}$ = 27.8]. Distance between snout tip and pelvic-fin origin 51.7 (49.1–51.7, $\bar{x}$ = 50.0) [49.2–53.5, $\bar{x}$ = 50.9]. Distance between snout tip and anal-fin origin 62.1 (60.3–62.1, $\bar{x}$ = 61.1) [59.8–65.1, $\bar{x}$ = 62.4]. Caudal peduncle depth 16.5 (15.3–16.5, $\bar{x}$ = 15.9) [13.5–15.0, $\bar{x}$ = 14.2]. Caudal peduncle length 11.3 (9.9–11.3, $\bar{x}$ = 10.7) [9.4–10.6, $\bar{x}$ = 10.0].

Head deep, short; bony head length 24.2 (24.1–25.1, $\bar{x}$ = 24.5) [23.5–28.4, $\bar{x}$ = 25.5]. Snout blunt, lower jaw protruding beyond upper jaw. Mouth gape angled posteroventrally. Posterior ventral border of maxillary bone reaching to or somewhat beyond a vertical line drawn ventrally from anterior border

Fig. 4. *Rachoviscus crassiceps,* USNM 220732, SL uncertain at time of photograph, live adult male, same specimen as Fig. 3. Note black color of adipose fin, due to its deep red color in life.

of pupil of eye. Horizontal eye diameter 30.5% (30.5–33.3, $\bar{x}$ = 32.0) [32.8–37.9, $\bar{x}$ = 35.3] of bony head length. Snout length 17.1% (16.9–20.4, $\bar{x}$ = 17.9) [11.9–16.3, $\bar{x}$ = 14.1] of bony head length. Least bony interorbital width 39.0% (38.7–42.3, $\bar{x}$ = 40.5) [37.5–43.8, $\bar{x}$ = 40.4] of bony head length.

Dorsal-fin rays ii,9 in all specimens (last ray not split to its base). Dorsal-fin length (=dorsal-fin origin to distal tip of longest ray when fin adpressed to back) damaged (31.2–33.1, $\bar{x}$ = 32.1, n = 3) [29.3–32.1, $\bar{x}$ = 30.4]. Distal margin of dorsal fin convex in both sexes (Figs. 3, 4).

Adipose fin present. Anal-fin rays iv,25 (iv,25 in two, iv,27 in one, and iv,28 in one, males) [iv,25 in one, iv,26 in one, iv,27 in three, and iv,28 in two, females]. Last anal-fin ray split to its base. Anterior distal margin of anal fin convex, posterior distal margin concave (Fig. 4).

Anal-fin spines as follows on a male alizarin preparation, SL 29.5 mm, USNM 220757. Second branched anal-fin ray first to bear spines. This ray and next 8 rays bear 5 spines on each ray, 1 for each ray segment that bears spines. Spines and their respective segments occur consecutively 6 or 7 segments from distal end of fin rays. Spines occur only on posterior segments of branched portions of rays when they occur on branched portions of rays. Eleventh branched ray bears 4 spines, twelfth and thirteenth branched rays with 3 spines and fourteenth with 1 spine. Each spine relatively short, conical and extends dorsally and laterally. In a large, old male

specimen, SL 38.5 mm, USNM 220732, about 17 rays bear spines. First anal-fin ray to bear spines is posteriormost unbranched ray. Number of spines per ray about same as in smaller specimen but spines extend in a more lateral direction than in smaller specimen. Spines occur on both sides of anal fin. Females without anal-fin spines.

Pectoral-fin rays i,14 (i,12 in one, i,13 in three) [i,12 in one, i,13 in three, i,14 in two, and i,15 in one]. Posterior tip of longest pectoral-fin ray reaching beyond pelvic-fin origin. Pectoral-fin length 24.2 (21.8–24.6, $\bar{x}$ = 23.3) [21.1–24.2, $\bar{x}$ = 22.2]. Distal pelvic-fin tip reaching to or somewhat beyond anal-fin origin in both sexes. Pelvic-fin rays i,5 in all specimens.

Pelvic-fin length 14.7 (11.7–14.7, $\bar{x}$ = 13.6) [12.4–14.2, $\bar{x}$ = 13.3]. Second branched ray of pelvic fin bears 8 spines and third ray bears 6 spines in a male specimen, SL 29.5 mm, USNM 220757. These spines relatively elongate, curved, and conical, with their sharp apices directed medially. These spines only occur on ventral surface of fin. A male specimen, SL 38.5 mm, USNM 220732, bears 11 spines on its second branched pelvic-fin ray and 9 spines on its third branched ray. Females without pelvic-fin spines.

Caudal fin 10/9 in all specimens, its dorsal and ventral lobes equal in length. Caudal fin, dorsal fin, and pectoral fin without bony hooks.

Scales cycloid. Lateral line incomplete, perforated lateral-line scales 5, (4–5, $\bar{x}$ = 4.5, n = 12, in both sexes). Scales in a lateral series 36 (33–39, $\bar{x}$ = 36.5, n = 12, in both sexes). Scale rows between dorsal-fin origin and pelvic-fin origin 15 (14–15, $\bar{x}$ = 14.4, n = 12, in both sexes). Predorsal scales 18 (17–19, $\bar{x}$ = 18.2, n = 12, in both sexes).

Premaxillary teeth in 2 rows. Outer row teeth unicuspid and 1 to 2 in number. Usually these teeth placed far back, against and nearly between inner row teeth, causing Myers (1926) to describe premaxillary teeth as occurring in a single row. Occasionally an outer row tooth well forward of inner row teeth. Outer row teeth lie between first and second inner row teeth and/or second and third inner row teeth. Inner row teeth 5 to 6, medialmost bicuspid or tricuspid but with a very tiny medial cusp. Proceeding laterally and posteriorly next 1 to 3 teeth tricuspid or sometimes 1 or 2 of these bicuspid or unicuspid. Posteriormost 1 to 2 teeth usually unicuspid, occasionally bi- or tricuspid. Maxillary bone with 8 to 14 mostly unicuspid teeth, occasionally anteriormost tooth tricuspid. Teeth occur along about anterior one-half to nearly two-thirds of maxillary length. Dentary with a single row of teeth. Anterior 5 (sometimes only 4) teeth large and tricuspid; posterior 6 to 8 teeth small and unicuspid. Ectopterygoid and palatine without teeth.

Total vertebrae including Weberian apparatus and terminal complex centrum 34–36, $\bar{x}$ = 35.4, n = 10. Gill rakers 7/10 in lectotype, 3–7 on upper limb, 10–12 on lower limb, never more than a total of 18 or less than 13 rakers, $\bar{x}$ = 15.5, n = 10.

Color in alcohol.—Body dark, sometimes almost black in freshly preserved specimens caught in black acid waters with a black muddy substrate. Dark chromatophores most dense on back, becoming less dense ventrally (Fig. 3). Scattered, relatively dark chromatophores on all fins except adipose fin which is pale with very small scattered dark chromatophores. Area of medial rays of pectoral fins with dark chromatophores on membranes between fin rays. Sides of head, eye, and operculum with scattered dark chromatophores. Pigment on sides of body and head silvery beneath dark chromatophores.

Color in life.—This color description is from an aquarium specimen kept in dark acid water with a dark sandy substrate. Brown to black pigment about same as described above for color in alcohol. Back olive brown, especially in area anterior to dorsal fin, top of head, along dorsal part of back, ventral and posterior to dorsal fin. Dorsal part of caudal peduncle olive brown; see dark area along back in Fig. 4. Adipose fin bright deep red in both sexes. Eye silvery yellow with dorsal portion rusty red. Snout and distal portion of lower jaw olive brown. Pale areas of cheek and operculum in Fig. 4 yellowish silver in color. Dark areas of operculum brown. Abdominal area silvery yellow on sides, ventrally silvery white. Area dorsal to anal fin silvery blue with much pale pink or pale purple pink color. Pectoral fin hyaline with pale yellow color in male. Pelvic fin yellow brown distally. Anal fin hyaline except about one-third of its distal length forms a yellowish brown border with darker pigment along dorsal portion of this bordering band of color (Fig. 4). Distal tips of anal-fin rays and dorsal-fin rays white. Dorsal fin hyaline except for some brown and yellow pigment in branched portions of first two branched rays and a little of this same pigment distally in succeeding two rays. Caudal peduncle without distinct dark spot but bases of dorsal and ventral caudal-fin lobes with darkened brown pigment. Caudal fin otherwise hyaline except for some yellow color in dorsal portions of dorsal lobe and ventral portions of ventral lobe. A small wild specimen caught in black acid water with a black mud substrate had a very dark brown olive back and sides with scales reflecting golden green along sides of body. Adipose fin intensely blood red. Other pigment of fins and body more intense and darker than aquarium specimen described above.

Sexual dimorphism.—In life, males more deeply colored than females and adipose fin a deeper red. Sometimes red of adipose fin slightly less extensive in female than in male. Males may grow larger; in single pair kept in aquaria for three and a half years, male grew to a standard length of 38.5 mm and the female to 34.1 mm. Depth of caudal peduncle different in sexes, 15.3–16.5, $\bar{x}$ = 15.9% of standard length in males and 13.5–15.3, $\bar{x}$ = 14.2% in females. Only males have bony hooks in anal and pelvic fins.

Etymology.—From Latin *crassus,* thick or stout, and *ceps,* head, in ref-

erence to the stout head of this fish relative to the head of most other characids (Myers, 1926).

Remarks.—Jaws, head shape, and caudal peduncle depth all appear to be more derived in *R. crassiceps* than in *R. graciliceps*.

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Summary

Rachoviscus graciliceps, a new species of characid fish, is described from small coastal blackwater streams near Prado, Bahia, Brazil. The relationships of this species appear close to *Rachoviscus crassiceps* Myers (1926), which is redescribed on the basis of a new examination of the types and recently discovered specimens from small blackwater streams along the Atlantic coast about 50 to 60 km south of Paranaguá, Paraná, Brazil. The head is more slender in *R. graciliceps* and the least bony interorbital width is 29.1–35.0% of the head length while *R. crassiceps* has a bony interorbital width 37.5–43.8% of the head length. The caudal peduncle of *R. graciliceps* is much more slender, being 93.0–100% of its depth, while in *R. crassiceps* the caudal peduncle length is 62.7–74.1% of its depth. *Rachoviscus graciliceps* has 14 transverse scale rows around the caudal peduncle whereas *R. crassiceps* has 18. Other differences are noted in the text.

Myers (1926) tentatively considered *Rachoviscus* to be related to *Prionobrama,* and Géry (1977) suggested that it might be related to *Prionobrama* or *Paragoniates*. *Rachoviscus* and *Paragoniates* might be related but we think it doubtful. Too little is known about these fishes for useful hypotheses about their relationships. The genus *Rachoviscus* is redefined and the type locality of *R. crassiceps,* stated as being the neighborhood of Rio de Janeiro,

is discussed. Since the original specimens described by Myers (1926) were imported into Germany for the aquarium trade and since the fish has never been found again in the vicinity of Rio de Janeiro, it may be that the fish was originally imported from Paranaguá and transshipped to Germany through Rio de Janeiro.

Resumo

Rachoviscus graciliceps, uma nova espécie de caracídeo, é descrita de um pequeno riacho litorâneo, de água preta, próximo à cidade de Prado, Estado da Bahia, Brasil. Esta espécie está intimamente relacionada com *Rachoviscus crassiceps* Myers (1926) a qual é aqui redescrita com base em novo exame dos tipos e exemplares recentemente colecionados em pequenos córregos, de agua preta, ao longo da costa atlântica, distando cerca de 50 a 60 quilometros ao sul da cidade de Paranaguá, Estado do Paraná, Brasil. As duas espécies podem ser distinguidas pelos seguintes caracteres: a forma da cabeça é mais delgada em *R. graciliceps* e a memor largura óssea interorbital e de 29,1 a 35,0% do comprimento da cabeça enquanto que *R. crassiceps* tem uma largura óssea interorbital de 37,5 a 43,8% do comprimento da cabeça. O pedúnculo caudal de *R. graciliceps* é muito mais delgado, sendo o seu comprimento cerca de 93,0 a 100% da sua altura enquanto que em *R. crassiceps* o comprimento do pedúnculo caudal é de aproximadamente, 62,7 a 74,1% de sua altura. *R. graciliceps* possui 14 fileiras transversais de escamas em torno do pedúnculo caudal enquanto *R. crassiceps* possui 18 fileiras. Outras diferenças são assinaladas no texto.

Myers (1916) tentativamente considerou *Rachoviscus* relacionado com *Prionobrama,* e Géry (1977) sugeriu um relacionamento entre *Rachoviscus* e *Prionobrama* ou *Paragoniates. Rachoviscus* e *Paragoniates* podem ser relacionados mas achamos isso duvidoso. Contudo, pouco se sabe suas esses peixes para que se possa formular hipótesis consistentes sobre suas afinidades. O gênero *Rachoviscus* é redefinido e a localidade típica de *R. crassiceps,* tida como sendo nos arredores do Rio de Janeiro, é discutida. Tendo em vista que os exemplares originais descritos por Myers (1926) foram importados para a Alemanha pelo comércio de aquario e visto que o peixe nunca foi reencontrado nas vizinhanças do Rio de Janeiro, podemos considerar provável que aquele material fosse originalmente importado de Paranaguá e, atraves do Rio de Janeiro, transportado para a Alemanha. A localidade típica deve ser os arredores de Paranaguá, onde os peixes foram agora colecionados, ao invés do Rio de Janeiro.

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