

A NEW, UNUSUALLY SEXUALLY
DIMORPHIC SPECIES OF *BRYCONAMERICUS*
(PISCES: OSTARIOPHYSI: CHARACIDAE)
FROM THE PERUVIAN AMAZON

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Abstract. — *Bryconamericus pectinatus*, a new species of characid fish, is described from the Río Manú basin in southeastern Peru. Males of the species are characterized by unique elaborations of the distal portions of the anterior branched rays of the anal fin. They are also distinctive in the expansion of the anterior basal pterygiophores of the anal fin, and in the presence of lobulate bodies, evidently consisting of glandular tissue, along the base of the anterior portion of that fin.

Resumen. — *Bryconamericus pectinatus* es una nueva especie de los carácidos que proviene de la cuenca del río Manú, al sureste del Perú. Los machos de esta especie se caracterizan por la singular elaboración de una porción distal de los radios anteriores no ramificados de la aleta anal. Se los puede distinguir por el ensanchamiento de los pterigióforos de la aleta anal y en la presencia de cuerpos lobulados que evidentemente consta de un tejido glandular a lo largo de la base de la parte anterior de esta aleta.

As presently defined, the characid genus *Bryconamericus* Eigenmann (*in* Eigenmann et al. 1907) consists of some three dozen relatively small-sized species (Géry 1977: 386). Species of *Bryconamericus* occur in a variety of freshwater ecosystems at lower altitudes across a broad expanse of South and Central America to both sides of the Andean cordilleras. The genus is most diverse, however, in the Atlantic drainages of the continent, in particular through the vast reaches of the Amazon basin. In their compendium of the freshwater fishes of Peru, Ortega & Vari (1986:7) listed ten species of *Bryconamericus* as occurring in the myriad river systems that drain the part of the country to the east of the Andean Cordilleras. Those authors, following Böhlke et al. (1978), noted, however, that the entire neotropical freshwater fish fauna is still poorly understood, and that their tentative listing of the species known from Peru would un-

doubtedly undergo numerous modifications in the future. In the course of studying a collection of fishes from Río Manú system of the Río Madre de Dios basin in southeastern Peru, we discovered an undescribed species assignable to *Bryconamericus* that differs from the other members of the genus in several striking features. The most noteworthy of these are the unusual modifications of the anterior anal-fin rays and associated basal pterygiophores in adult males. Males are also characterized by a series of lobulate, evidently glandular, bodies along the lateral surfaces of the anterior anal-fin rays.

Methods. — All measurements are given as proportions of standard length (SL) except for subunits of the head which are presented as proportions of head length. Vertebral counts were taken from radiographs, and cleared and counterstained specimens. This number includes the four vertebrae in-

corporated in the Weberian apparatus and considers the fused $PU_1 + U_1$ as a single element. In the counts of elements in the median and pelvic fins, lower-case Roman numerals indicate unbranched rays, and Arabic numerals indicate branched rays. For meristic values the range for each value for the holotype and measured paratypes is presented first, with the value for the holotype indicated in brackets.

The following abbreviations are used for institutions: CM—Carnegie Museum, Pittsburgh; FMNH—Field Museum of Natural History, Chicago; MHN-USM—Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru; and USNM—National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Bryconamericus pectinatus, new species
Figs. 1–5, Table 1

Holotype.—MHN-USM 2057, 27.3 mm SL, female. Peru, Departamento Madre de Dios, Provincia Manú, Parque Nacional de Manú, second large quebrada along Trail 1 leading to the east from Pakitza, tributary of Río Manú (approx. 11°50'S, 71°21'W); H. Ortega, D. Siebert, M. Rauchenberger, I. Samanez, G. Contreras, and J. Cánepa; 13 Sep 1988.

Paratypes.—15 specimens collected with holotype, MHN-USM 2058, 7 specimens; USNM 303442, 8 specimens including 3 males, 17.0–23.6 mm SL (1 specimen cleared and counterstained for cartilage and bone). Ten specimens collected downstream of holotype locality by same collectors, 17 Sep 1988; MHN-USM 2059, 5 specimens including 2 males; USNM 303441, 5 specimens, 19.8–34.8 mm SL (1 specimen cleared and counterstained for cartilage and bone).

Diagnosis.—The combination of a single row of teeth on the dentary, two rows of teeth on the premaxilla with four teeth in the inner series that are larger than those of

the outer row, the limited number of teeth along the anterior margin of the maxilla, the simple curve to the border of the upper jaw, the lack of scales on the caudal fin, the large third infraorbital contacting the preopercle along its posterior and ventral margins, setiform gill-rakers, the complete laterosensory canal system on the body, and the absence of a glandular pouch on the caudal fin in males serve to assign the species to *Bryconamericus*. Within the genus, *B. pectinatus* can be distinguished by autapomorphic modifications of the anterior rays of the anal fin and of the associated basal pterygiophores, and by the presence of lobulate, evidently glandular, bodies along the anterior anal-fin rays (see “Description” below). The species is also distinctive within the genus on the basis of the combination of a relatively low number of anal-fin rays, a robust body that is relatively deep in adults, the possession of 32 or more lateral-line scales to the hypural joint, the absence of dark pigmentation on the tips of the caudal-fin lobes, and the presence of 5 or 6 moderately sized teeth on the maxilla.

Description.—Body robust, slightly more compressed in smaller individuals (Figs. 1, 2). Dorsal profile of head nearly vertical along upper lip, distinctly convex from margin of upper lip to vertical line through posterior nostril, slightly convex from that line to rear of head. Dorsal profile of body smoothly curved from rear of head to origin of dorsal fin, more convex in larger, deeper bodied specimens; straight and posteroventrally slanted at base of dorsal fin, gently convex from base of last dorsal-fin ray to caudal peduncle, convexity more pronounced in larger individuals. Ventral profile of head notably convex anteriorly, less so posteriorly. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle; convexity more pronounced in larger specimens. Greatest body depth located slightly anterior of origin of dorsal fin. Caudal peduncle somewhat laterally compressed, deeper in adult males (0.146–0.164

of SL) than adult females (0.121–0.139 of SL). No sexual dimorphism obvious in other examined morphometric features.

Head relatively large, overall profile rounded anteriorly. Jaws equal, mouth terminal; lips fleshy with brown tips of teeth in outer row on premaxilla visible when mouth closed; ventral margin of upper jaw concave, main axis of maxilla aligned posteroventrally, posterior tip of maxilla extending below orbit, reaching posteriorly nearly to vertical line through center of eye. Nostrils on each side of head very close to each other; opening of anterior nares vertically ovoid; opening of posterior nares crescent-shaped; thin flap of skin extending laterally from strip of tissue separating two nares. Orbital rim free, no adipose eyelid present.

Six well-ossified infraorbitals present, each bearing laterosensory canal segment. Third infraorbital very large, ventral and posterior margins contacting lateral surface of preopercle. Fourth infraorbital without posterior branch of laterosensory canal. Laterosensory canal segment in sixth infraorbital (dermosphenotic) consisting of a single tube. No supraorbital present.

Lower jaw with single series of 11 to 13 teeth. First three teeth largest, fourth tooth somewhat smaller, fifth tooth through end of dentary series distinctly smaller than fourth, gradually diminishing in size posteriorly. First five teeth typically tricuspidate with central cusp distinctly larger. Second tooth often with additional very small cusp on lateral margin. Fourth tooth either tricuspidate or bicuspid, sometimes with two conditions in a single specimen; when bicuspid posterior cusp large, posterior margin straight, not recurved. Sixth tooth bicuspid; remaining teeth on lower jaw unicuspid.

Two rows of teeth on premaxilla; teeth of inner row larger. Six teeth in outer row, orientation of main axis of teeth alternating slightly anteriorly and posteriorly, resulting in a wavy margin of tooth edges when ex-

amined in ventral view. Outer row teeth bicuspid, with medial cusp much larger. Four teeth in inner row of premaxilla; with three to five cusps, middle cusp distinctly larger. Maxilla with five or six small tricuspidate teeth along upper half of exposed anterior margin; dorsal tooth on maxilla situated proximate to lateral tooth of inner row of premaxilla.

Dorsal-fin rays ii,8 or ii,9 [ii,9]. Margin of dorsal fin rounded, second unbranched and first branched rays subequal; depressed fin not reaching anterior margin of adipose fin in smaller specimens, overlapping anterior of fin in largest specimens examined. Adipose fin moderately developed in all specimens. Pectoral-fin rays 10 to 12 [11]. Margin of pectoral fin rounded; tip of fin extends nearly to vertical line through insertion of pelvic fin in smaller specimens, just slightly short of that line in largest specimens examined. Pelvic-fin rays 6 to 8 [7]. Margin of pelvic fin rounded; reaches beyond vertical line through origin of anal fin in smaller specimens, barely reaches or just short of that line in larger individuals. Caudal fin forked, lobes rounded; 7 or 8 procurrent rays both dorsally and ventrally. Anal-fin rays vi,12 to 14 (counts taken from radiographs; two or three anterior unbranched rays not apparent in specimens that have not been cleared and stained or radiographed).

Anal fin with pronounced sexual dimorphism in adults (sex verified by dissection). First branched anal-fin ray in females longest, remaining branched rays becoming progressively shorter posteriorly. Margin of anal fin in females somewhat emarginate (see Fig. 1).

Males with posterior unbranched and anterior branched anal-fin rays distinctively modified, longest rays proportionally shorter than in females (compare Figs. 1 and 2). Unbranched anal-fin rays of males, in particular last unbranched ray, but also rays hidden by body tissue and scales, thickened basally (Fig. 4). First branched ray with

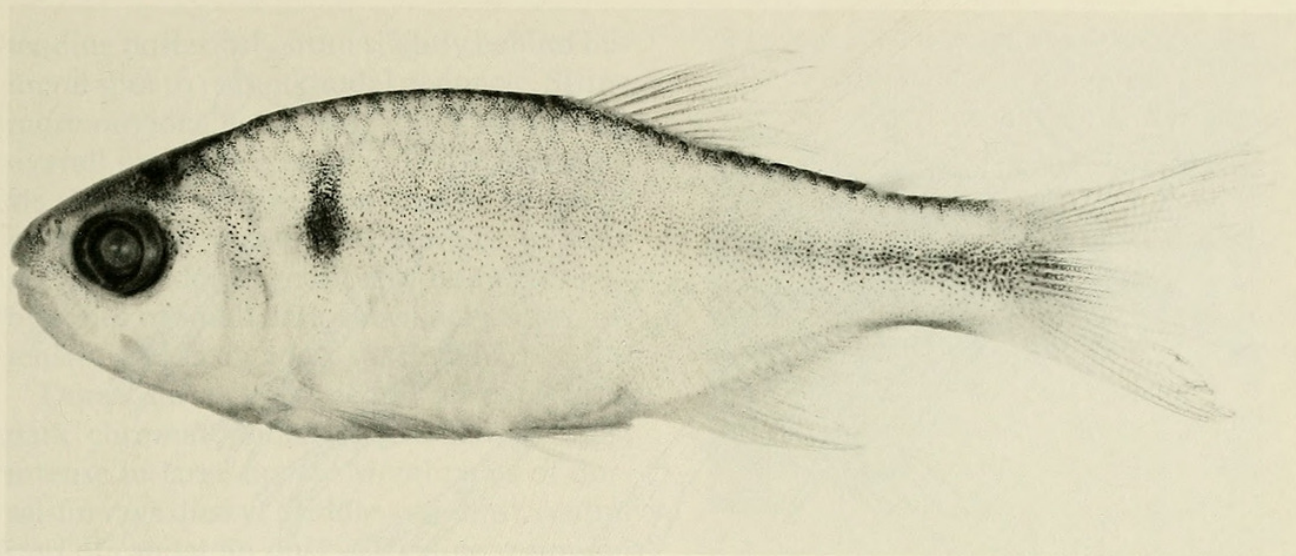


Fig. 1. *Bryconamericus pectinatus*, new species, holotype, MHN-USM 2057, 27.3 mm SL, female. Peru, Departamento Madre de Dios, Provincia Manú, Parque Nacional de Manú.

distal portion significantly expanded anteroposteriorly, division of distal ray segments highly asymmetrical, with progressive subdivision of posterior, but not anterior half of each branched ray segment (Fig. 3). This condition contrasts with typical progressive distal subdivision of both anterior and posterior branches of anal-fin ray in females of the species and other characiforms (compare Fig. 3 with figs. 38 to 43 in Weitzman & Fink 1985). Distal por-

tions of second through fourth branched anal-fin rays also somewhat expanded anteroposteriorly; degree of distal expansion progressively decreasing posteriorly along fin, never as pronounced as in first branched ray (Fig. 3). Form of posterior anal-fin rays comparable to those in females of species.

Proximal portions of enlarged anal-fin rays and ventral sections of associated basal pterygiophores of males thickened relative

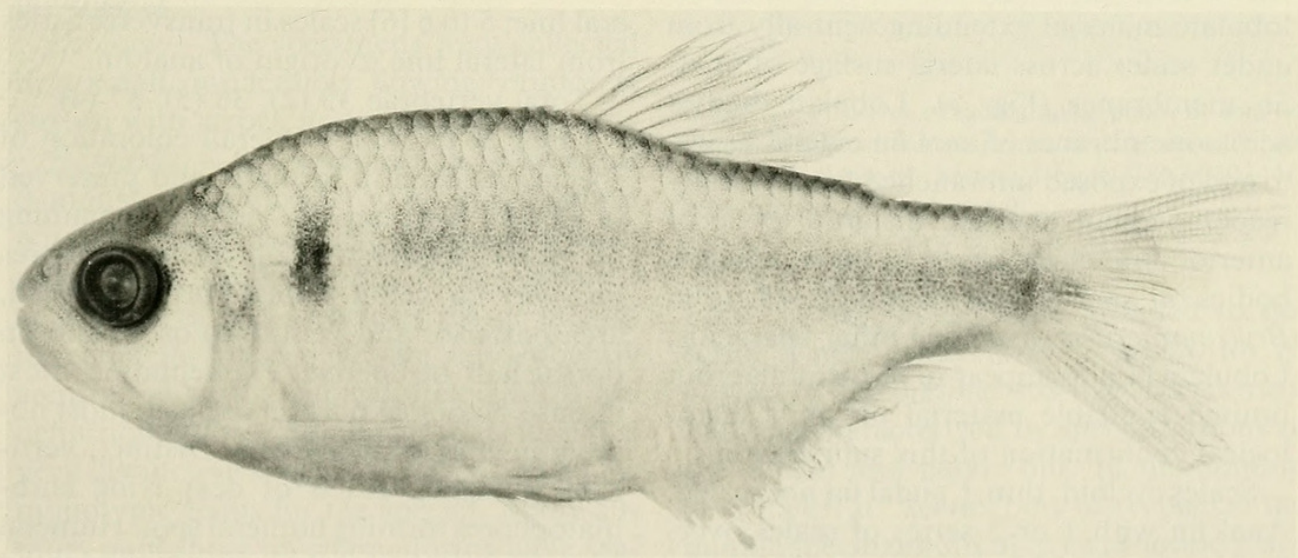


Fig. 2. *Bryconamericus pectinatus*, new species, paratype, USNM 303441, 34.8 mm SL, male. Peru, Departamento Madre de Dios, Provincia Manú, Parque Nacional de Manú.

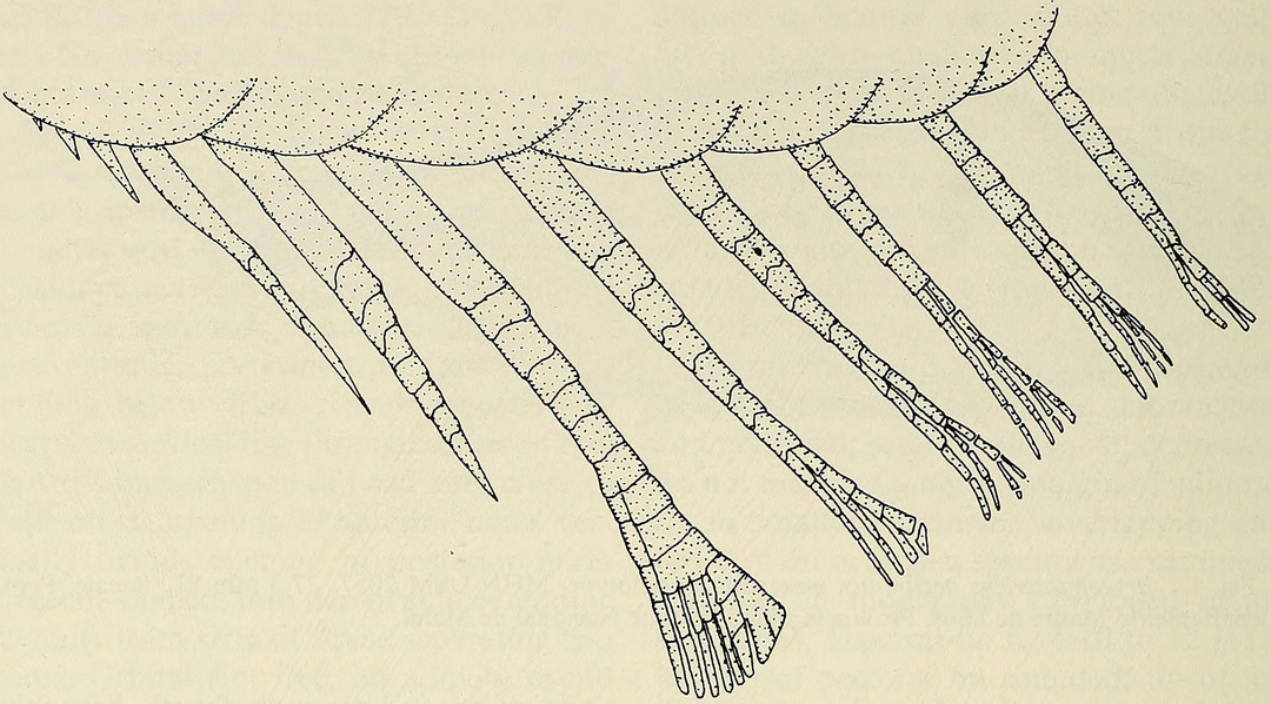


Fig. 3. *Bryconamericus pectinatus*, male paratype, USNM 303441; 32.0 mm SL; anterior rays of anal fin and associated basal sheath of scales; anterior to left.

to condition in females (compare within Fig. 4), and in comparison to typical morphology of these elements in other characids. First and second basal pterygiophores in males more closely associated with hemal spines of proximate vertebrae than in females (Fig. 4). Large males with mass of lobulate material extending ventrally from under scales across lateral surface of anal-fin membranes (Fig. 5). Lobulate bodies across membranes of anal fin extend nearly to end of exposed unbranched fin-rays; only reaching about one half distance to tip of anterior branched fin rays. Such lobulate bodies on anal fin not known elsewhere in *Bryconamericus* or among other characids. Lobulate bodies appear to be glandular, but limited available material prevents histological confirmation of this supposition.

Scales cycloid, thin. Caudal fin not scaled. Anal fin with 1 or 2 series of scales overlapping bases of fin rays along anterior two thirds of fin. One series of scales overlapping proximal portions of unbranched rays, 2 series over bases of anterior 4 or 5

branched rays. Pored lateral-line scales extend from supracleithrum to hypural joint 32 to 36 [33]; all scales of lateral line pored, canals in lateral-line scales straight; 3 series of scales extend beyond hypural joint onto caudal-fin base; 6 to 6½ [6½] scales in transverse series from origin of dorsal fin to lateral line; 5 to 6 [6] scales in transverse series from lateral line to origin of anal fin.

Total vertebrae 35 (2), 36 (5), 37 (4).

Color in alcohol.—Overall coloration of specimens fixed in formalin and preserved in alcohol light tan. No guanine remaining on scales. Scattered small chromatophores on lower lip, snout, dorsal portion of head, area posterior and ventral to orbit, and on dorsal half of opercle. Pigmentation most intense on dorsal portion of head, most notably in smaller specimens. Distinct, vertically elongate, patch of deep-lying chromatophores forming humeral spot. Humeral spot separated anteriorly from pigmented portion of opercle by region with few or no dark chromatophores. Diffuse mid-lateral stripe of small dark chromatophores ex-

tending posteriorly from slightly behind humeral spot to rear of caudal peduncle. Stripe more obvious posteriorly at all body sizes, overall intensity greater in larger individuals. Portion of stripe on caudal peduncle most heavily pigmented. Margins of scale pockets on dorsal portion of body outlined by series of small dark chromatophores, intensity greater in adult specimens.

Dorsal-fin rays outlined by series of small dark chromatophores, pigmentation most intense in large males. Membranes of dorsal-fin rays dusky. Middle and most ventral rays of caudal fin dusky. Hyaline region on fin separates dusky dorsal caudal-fin rays from pigmented middle rays. Similar unpigmented patch on basal portion of middle rays of lower lobe of caudal fin. Anal fin hyaline in smaller specimens, with small chromatophores giving distal portions of rays dusky appearance in larger individuals. Paired fins hyaline in specimens of all sizes.

Distribution. — Known only from the type locality, the upper Río Manú of southeast Peru.

Etymology. — The species name, *pectinatus*, from the Latin for rake or comb, refers to the stiffened, subdivided, comb-like anterior rays of the anal fins in the males of the species.

Ecology. — The specimens were collected in a small, moderately flowing, rainforest stream with a rock and mud bottom.

Remarks. — *Bryconamericus pectinatus* demonstrates a number of striking features not encountered elsewhere in the genus, most notably the modifications of the anterior anal-fin rays and associated basal pterygiophores in males. We are consequently confronted with a choice of expanding the definition of *Bryconamericus* to include this very distinctive species or proposing a new monotypic genus for the species. Many authors publishing on characiforms have segregated equally distinctive species in monotypic genera rather than expand the definition of previous genera to accommodate the features of newly discovered species.

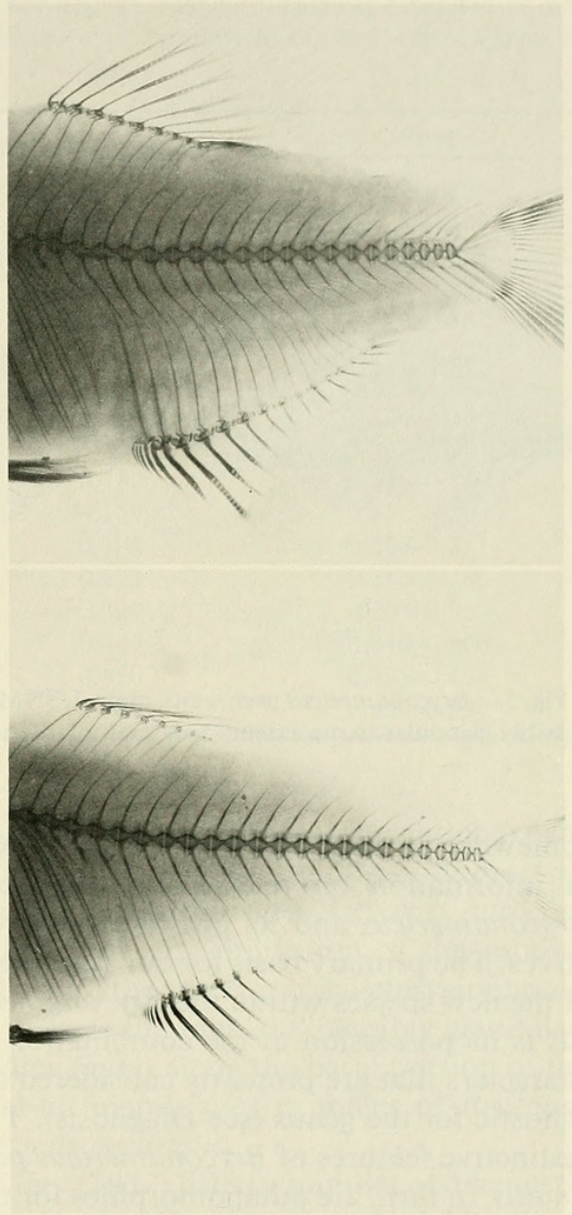


Fig. 4. Positives of radiographic plates of anal-fin regions of *Bryconamericus pectinatus*; top, male, USNM 303441, 34.8 mm SL; bottom, female, USNM 303441, 28.6 mm SL. Anterior to left.

Fink (1976), for example, decided to describe a new genus, *Eretmobrycon*, for *E. bayano*, a *Bryconamericus*-like species from Panama characterized by specializations of the caudal and pelvic fins. In his opinion (1976:340) it “seems best to recognize the unique specializations of *E. bayano* and place it in a monotypic genus.”

The choice between these alternatives, the expansion of the definition of a previous genus, and the proposal of a new genus, is



Fig. 5. *Bryconamericus pectinatus*, male, USNM 303441; 34.8 mm SL. Close-up of anal fin showing lobulate, possibly glandular tissue extending lateral to anterior fin-rays. Anterior to left.

somewhat arbitrary given the general lack of information on relationships between *Bryconamericus* and its possible close relatives. The primary basis for our placement of the new species within the *Bryconamericus* is its possession of the combination of characters that are presently considered diagnostic for the genus (see Diagnosis). The distinctive features of *Bryconamericus pectinatus*, in turn, are autapomorphies for the species, with no bearing at present on the question of its phyletic associations. We must admit, however, that we have little confidence that *Bryconamericus* in this broad sense represents a natural (monophyletic) component of the Characidae, or that the closest relatives of *B. pectinatus* consequently occur within that genus. Problems with the naturalness of *Bryconamericus* have been long recognized, even by Eigenmann who first proposed the genus in 1907. Eigenmann subsequently commented (1927: 358) "There are three or four recognizable groups in the genus *Bryconamericus* and these may have been independently derived from various species of *Astyanax* and *Hemibrycon*." Questions concerning the

naturalness of many New World characiform taxa and problems with the utility of many commonly used diagnostic features within the order, including those pertinent to *Bryconamericus*, also have been noted more recently by Fink (1976), Vari & Géry (1980), Weitzman & Fink (1983), and others. Given these general problems and the specific questions concerning the monophyly of *Bryconamericus* cited by Eigenmann, there is little likelihood that the inclusion of *B. pectinatus* in the genus will disrupt a natural assemblage. In light of this situation the provisional inclusion of *B. pectinatus* within *Bryconamericus* is, in our view, preferable to the creation of a new monotypic genus.

One other genus in the Characidae, *Carlastyanax* Géry (1972) demonstrates certain similarities with *Bryconamericus pectinatus* which raises the question of a possible close relationship between these two taxa. The type species of *Carlastyanax*, *Astyanax aurocaudatus* Eigenmann (1913:26), was collected in the upper Río Cauca, a tributary of the Río Magdalena of northwestern Colombia, which drains into the Caribbean Sea.

Table 1.—Morphometrics of *Bryconamericus pectinatus*, new species. Standard length is expressed in mm; measurements 1 to 11 are proportions of standard length; 12 to 16 are proportions of head length. Values for paratypes represent ranges of measured specimens.

	Holotype	Paratypes
Standard length	27.3	17.0–34.8
1. Greatest body depth	0.395	0.328–0.420
2. Snout to dorsal-fin origin	0.623	0.561–0.631
3. Snout to pectoral-fin insertion	0.296	0.269–0.288
4. Snout to pelvic-fin insertion	0.532	0.484–0.537
5. Snout to anal-fin origin	0.691	0.636–0.689
6. Origin of dorsal fin to hypural fin	0.454	0.430–0.482
7. Length of longest dorsal-fin ray	0.234	0.220–0.244
8. Pectoral-fin length	0.227	0.206–0.237
9. Pelvic-fin length	0.150	0.136–0.169
10. Caudal-peduncle depth	0.139	0.121–0.164
11. Head length	0.308	0.295–0.311
12. Snout length	0.223	0.210–0.260
13. Orbital diameter	0.329	0.291–0.350
14. Postorbital length	0.447	0.440–0.500
15. Upper jaw length	0.450	0.435–0.456
16. Interorbital width	0.329	0.320–0.350

Eigenmann (1927:322) subsequently noted that the species “ought probably to be distinguished generically,” but did not propose a new genus for the species. Géry (1972:16–21), however, following on that suggestion, proposed *Carlastyanax* for *Astyanax aurocaudatus*. *Carlastyanax aurocaudatus* and *Bryconamericus pectinatus* are similar in their blunt, massive heads, heavy bodies, and in the presence of two series of scales along the base of the anal fin. These features are, however, hardly unique to these species within the Characidae. Géry (1972:18) also notes that the anterior rays of the anal fin in *Carlastyanax aurocaudatus* are sexually dimorphic, with those in males being thickened, another possible similarity with *Bryconamericus pectinatus*.

Examination of the holotype of *Astyanax aurocaudatus* (FMNH 56882, formerly CM 5162) and part of the paratype series of the species (FMNH 56883, formerly CM 5163a-d) has shown that those specimens and *Bryconamericus pectinatus* differ in numerous details. The basally expanded anterior anal-fin rays in the holotype of *Astyanax aurocaudatus* show none of the asymmetrical

distal branching and anteroposterior expansion characteristic of *Bryconamericus pectinatus*. Neither does *Astyanax aurocaudatus* show any indication of the modifications of the anterior basal pterygiophores, or possess the lobulate, possibly glandular, bodies found along the basal portion of the anal-fin membranes in males of *Bryconamericus pectinatus*.

Géry (1972) listed a number of diagnostic features for *Carlastyanax*. Notable differences between that genus and *Bryconamericus pectinatus* include the degree of development of the third infraorbital (small in *aurocaudatus*, very well developed in *pectinatus*), morphology of the third dentary tooth (posterior cusp greatly recurved in *aurocaudatus*, tricuspid or non-recurved bicuspid in *pectinatus*), and form of the anterior nostril (tubular in *aurocaudatus*, a simple opening in *pectinatus*). Admittedly, neither these differences, nor others we could detail would serve to refute a hypothesis that these two species are closely related. Alternatively we have been unable to identify any derived feature indicative of a close relationship between the two taxa. In the

absence of such information we prefer to take a conservative course of action and assign *pectinatus* to *Bryconamericus*.

Acknowledgments

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