PROC. BIOL. SOC. WASH.
90(2), pp. 348–357

A NEW SPECIES OF CHARACOID FISH, *HYPHESSOBRYCON DIANCISTRUS*, FROM THE RÍO VICHADA, ORINOCO RIVER DRAINAGE, COLOMBIA, SOUTH AMERICA (TELEOSTEI: CHARACIDAE)

Stanley H. Weitzman

The new species of characid fish described here, *Hyphessobrycon diancistrus*, was found in a small collection of South American fishes donated to the Smithsonian Institution by Mr. Ross Socolof. The specimens came from the Río Vichada and from small isolated lakes along a short distance of its course. The Río Vichada is a tributary of the Río Meta in Colombia.

Hyphessobrycon diancistrus is another example of a small, elongate species of freshwater fish, especially ostariophysans, having parts of the distal caudal-fin lobes black. There are many freshwater fishes with black markings on their dorsal and ventral caudal-fin lobes. For example, certain species of the African characoid genera *Paraphago* Boulenger and *Eugnathichthys* Boulenger, the South American characoid genera *Leporellus* Lütken and *Prochilodus* Agassiz, and the southeast Asian cyprinid genus *Barbus* Cuvier bear contrasting black markings on their caudal-fin lobes. Among the catfishes, the Asian bagrid genus *Leiocassis* Bleeker, the South American pimelodid genus *Microglanis* Eigenmann, the callichthyid genera *Corydoras* Lacépède and *Dianema* Cope, and the loricariid genera *Hemiancistrus* Bleeker and *Otocinclus* Cope, among several others, have member species with contrasting black marks on their caudal fins. Convergence towards this type of color pattern appears fairly common in freshwater fishes. There are many species of freshwater fishes which have their caudal-fin lobes of other strongly contrasting colors. For example the distal white tips on the lobes of the South American characids *Hemigrammus nanus* (Lütken) and *Boehlkea fredcochui* Géry contrast with the golden body color of the former and with the reflected blue of the latter. The red caudal-fin lobes (and red dorsal fin) of southeast Asian *Rasbora heteromorpha* Duncker show very strongly at least to human eyes in contrast to the deep blue to black mark on the posterior half of the body. The many species in the African cyprinodontid genus *Aphyosemion* Myers and its relatives have a variety of contrasting colors in their dorsal and ventral caudal-fin lobes.

Many additional fishes with distinctly contrasting caudal-fin colors could be listed but the numbers with a single black patch or large spot confined to the distal portion or center of each caudal-fin lobe (often contrasted by a white spot or spots) are relatively few. Such a pattern is found

in the southeast Asian cyprinid fish *Rasbora trilineata* Steindachner and the South American characids *Moenkhausia dichoroura* (Kner) and *Hemigrammus rhodostomus* Ahl.[1] A similar color-contrasting pattern occurs in *Hyphessobrycon diancistrus* although there is no information about the presence of white in the caudal fin of this fish.

The behavioral significance of this color pattern remains unstudied in nearly all the mentioned fishes and its behavioral role undoubtedly varies much among them. Brittan (1954:83) has noted that for *Rasbora trilineata* the color patern is obvious in life and in this particular species the caudal-fin lobes "flick" toward each other when the fish suddenly moves. He speculates that possibly this provides a sudden and confusing diversion while the fish moves away from a predator or perhaps the pattern serves a function of communication during courtship or both. *Hemigrammus rhodostomus* apparently does not display the same kind of swimming motion as *Rasbora trilineata*. However, members of the characoid genus *Prochilodus* bearing black and white marked caudal-fin lobes do have a somewhat similar swimming motion or tail "flick" as they begin movement. I have not seen *Moenkhausia dichoroura* alive. Whatever the function or functions of the various contrasting marks in caudal-fin lobes may be in the species bearing them, it is a pattern of repeated convergence occurring in a wide variety of families and genera of freshwater fishes.

Hyphessobrycon diancistrus, new species
Figs. 1–5, Table 1

Holotype.—USNM 216607, male 25.2 mm SL: Colombia, State of Vichada, Río Vichada, about 50 km west of San José de Ocuné (70°20′W, 4°14′N), Orinoco river basin, collected by Ross Socolof, July 3–5, 1974.

Paratypes (all with the same locality data as holotype).—MZUSP 13179 and 13180, 1 male 25.9 and 1 female 25.0 mm SL; BMNH 1977.1.12.1–2, 1 male 23.2 and 1 female 24.1 mm SL; USNM 216606, 1 male 25.9 and 1 female 24.8 mm SL.

Diagnosis.—This species may be distinguished from all other known members of genus *Hyphessobrycon* by its possession of two very large bony hooks (in males) curving dorsally on each side of its anal fin (see Figs. 2 and 3), anterior hook longest, being a process of fourth anal-fin ray and posterior, smaller hook a process of fifth (first dichotomous) anal-fin ray. Caudal-fin rays black for part of distal one-third of their length. Distal tips of caudal-fin rays and adjoining membrane translucent, without black pigment.

Description.—See Table 1 for morphometrics of all specimens. Methods of counting and measuring characoids follow Fink and Weitzman (1974). Body elongate, slender, with sides compressed. Greatest depth at anterior

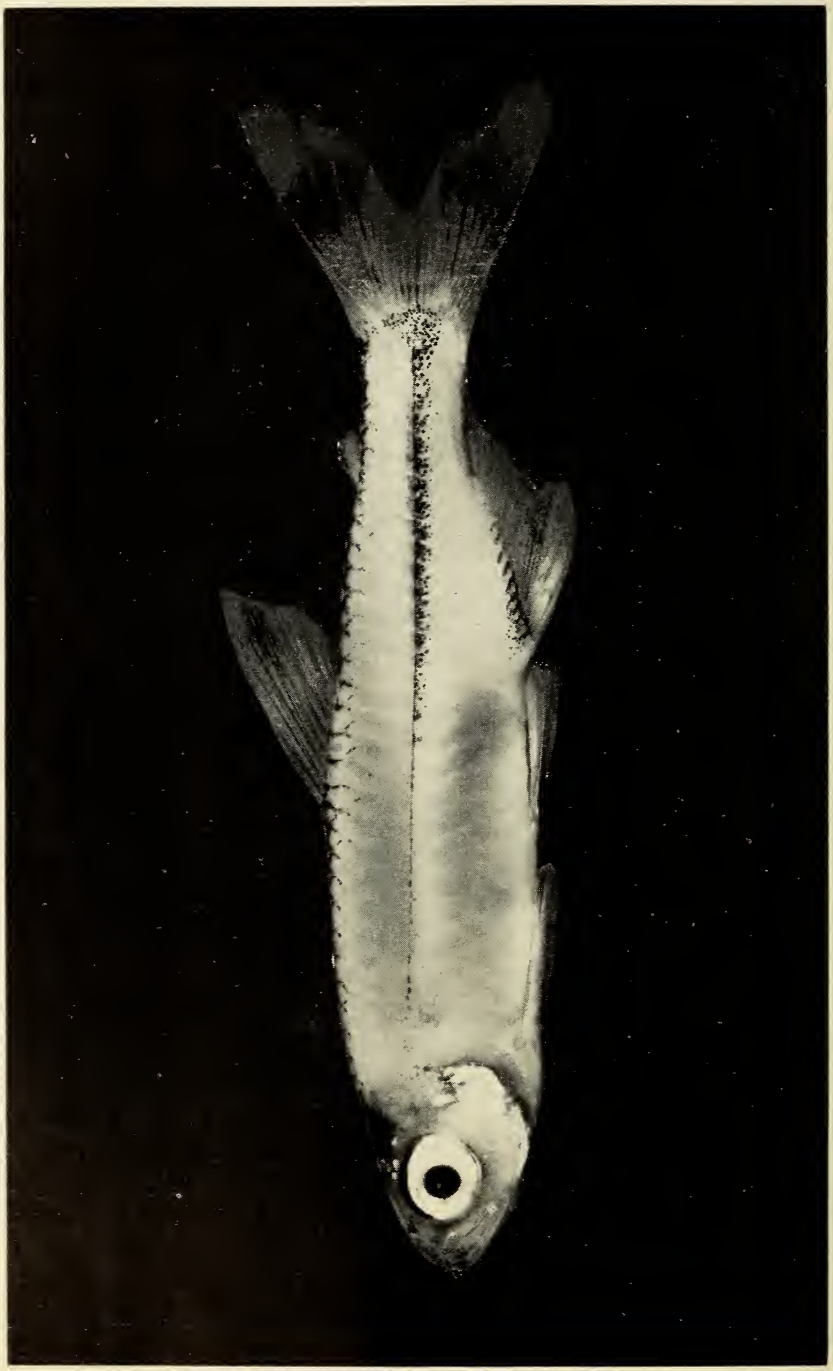

Fig. 1. *Hyphessobrycon diancistrus*, USNM 216607, male, 25.2 mm SL, holotype; Colombia, State of Vichada, Río Vichada, about 50 km west of San José de Ocuné, July 3 or 4, 1974.

Table 1. Morphometrics of *Hyphessobrycon diancistrus*, new species. Standard length is expressed in mm. Other figures are percentages of standard length.

	Holotype	Paratypes						
	♂	♂	♂	♂	♀	♀	♀	$\bar{x}$
Standard length	25.2	23.2	24.9	25.9	24.1	25.0	25.8	24.9
Greatest depth	21.8	20.7	22.0	21.2	19.9	22.4	22.5	21.5
Snout to dorsal-fin origin	50.8	50.9	48.6	52.1	50.6	50.8	51.6	50.8
Snout to pectoral-fin origin	26.2	26.3	26.9	25.9	26.1	25.6	26.4	26.2
Snout to pelvic-fin origin	47.2	49.1	48.6	49.0	47.7	47.6	49.6	28.4
Snout to anal-fin origin	65.9	67.2	66.7	66.4	66.4	65.6	67.4	66.5
Peduncle depth	10.3	9.1	10.4	9.7	8.7	10.4	9.3	9.7
Peduncle length	17.9	16.8	15.7	17.0	18.7	17.6	17.1	17.3
Pectoral-fin length	20.6	21.6	19.7	21.2	17.0	19.2	19.0	19.8
Pelvic-fin length	17.9	17.7	16.9	18.9	16.2	17.2	16.3	17.3
Dorsal-fin length	23.8	25.0	24.1	24.7	22.0	25.2	23.3	24.0
Anal-fin length	15.1	17.7	15.3	15.4	14.5	16.0	15.9	15.7
Head length	25.0	25.0	25.3	25.1	24.1	23.6	24.0	24.6
Eye diameter	9.5	9.9	9.2	9.7	9.5	9.2	9.7	9.5
Snout length	5.6	6.5	5.6	6.6	6.2	6.0	6.2	6.1
Interorbital width	7.9	6.9	7.6	7.3	7.1	8.0	7.4	7.5
Upper jaw length	8.3	9.1	8.8	8.9	8.7	8.4	8.9	8.7
Eye to dorsal-fin origin	36.5	35.8	37.4	38.6	36.9	37.6	37.6	37.2
Dorsal-fin origin to caudal-fin origin	52.8	51.3	53.0	52.1	49.4	54.0	53.1	52.2

dorsal-fin origin. Predorsal body profile slightly convex from nape to anterior dorsal-fin origin. Dorsal head profile slightly convex. Body profile at base of dorsal fin nearly straight and slightly convex between posterior termination of dorsal fin and adipose fin. Posterior to adipose fin, body profile slightly concave as it is between posterior termination of anal fin and origin of ventral caudal-fin lobe. Base of anal fin nearly straight. Ventral head profile convex, especially in area ventral to opercular region. Belly from region of pectoral girdle to vent nearly straight. Head of moderate length, snout blunt and mouth terminal. Posterior tip of maxillary bone extends to a point nearly reaching a line extending ventrally from anterior border of eye. Ventral maxillary border nearly parallels ventral mandibular profile with mouth closed. Eye large in proportion to head, about 2.5–2.7 in head (about 38% of total head length).

Teeth mostly multicuspid, usually in 2 rows on premaxillary; 2 rows in holotype (1 row in one specimen, 2 rows in four specimens); outer row of 1 or 2 usually tricuspid teeth. Inner premaxillary row with 4 large teeth bearing 4 or 5 cusps. Some specimens with a very small laterally placed conic to tricuspid fifth tooth which can usually be seen only in alizarin preparations (see Fig. 4). Maxillary bone toothless. Dentary with one row

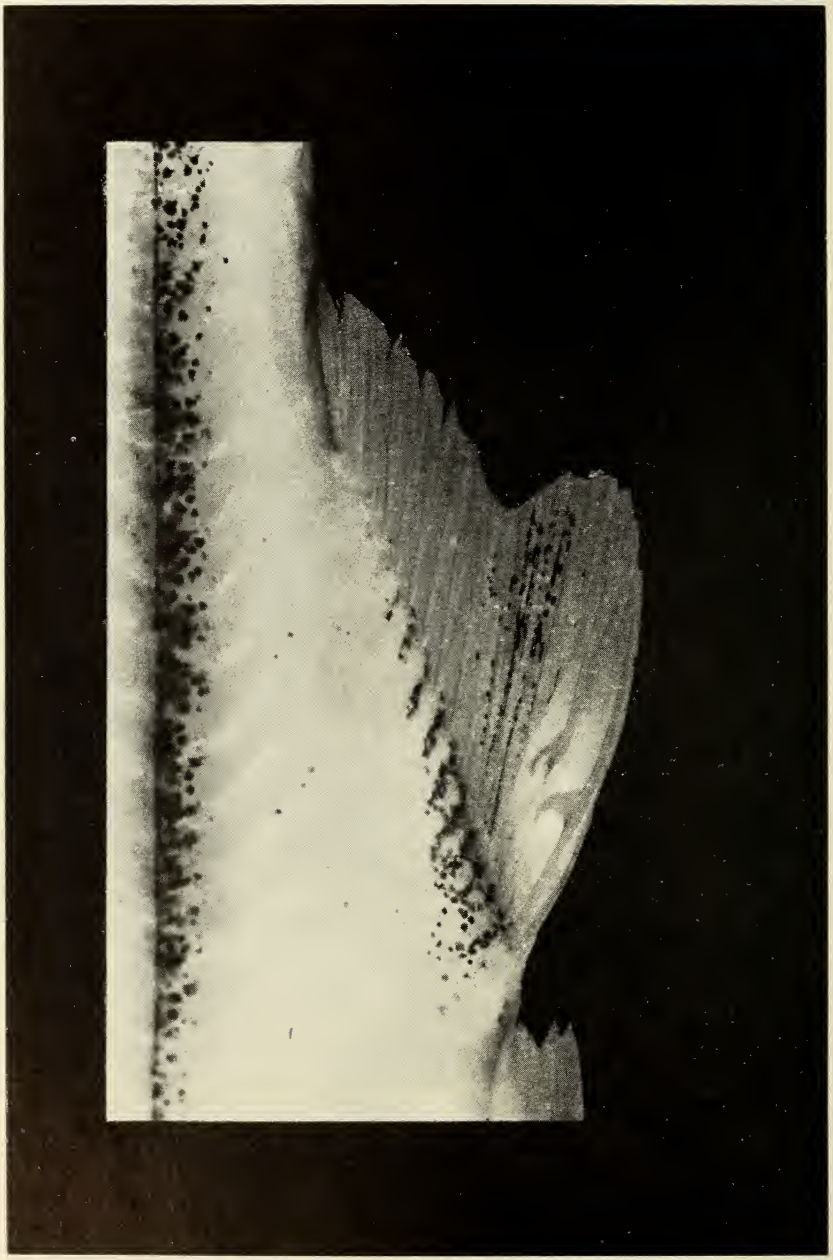

Fig. 2. Anal fin of holotype of *Hyphessobrycon diancistrus*, USNM 216607. Note thickened skin around anal-fin hooks of fourth and fifth anal-fin rays.

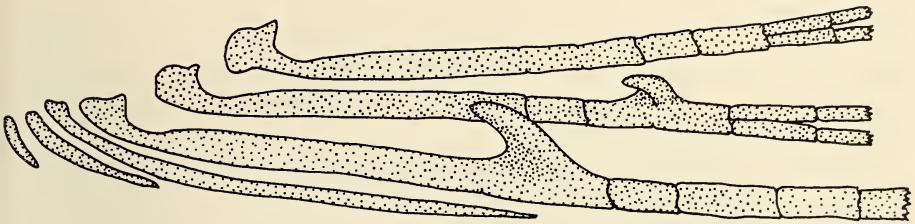

Fig. 3. Anterior six rays of anal fin of a male, 24.9 mm SL, USNM 216606, a paratype of *Hyphessobrycon diancistrus*. The fifth ray, bearing the second hook is the first fin ray to be dichotomously branched.

of eight teeth; anterior 3 very large and with 4 to 5 cusps; fourth tooth intermediate in size and with 2 to 3 cusps; fifth through eighth teeth small, unicuspid (see Fig. 5). All palatine and pterygoid bones toothless. Branchiostegal rays 4; ceratohyal with 3 rays, epihyal with 1 ray. Gill rakers moderately elongate 8/16 in all specimens. Frontal-parietal fontanel well developed, separating parietals completely. Frontals in contact only at

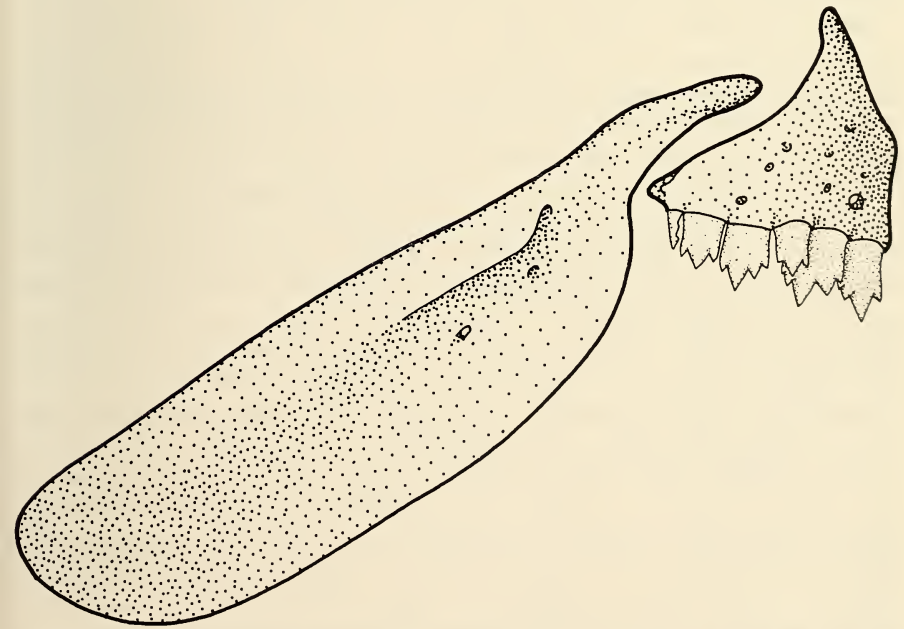

Fig. 4. Lateral view of the maxillary and premaxillary bones of a male, 24.9 mm SL, paratype, USNM 216606, of *Hyphessobrycon diancistrus*. Anterior is to the right. Note that the third tooth is the only tooth of the outer row. The fourth and smallest tooth of the inner row is in a state of dissolution preparatory to being replaced.

their junction with ethmoid and at epiphyseal bar. Antorbitals well ossified, but fifth and sixth infraorbital bones ossified around sensory tubes only. Third infraorbital bone not in contact with sensory tube of preopercle. Lateral extrascapular bone present, primary and secondary pectoral girdle bones not markedly reduced.

Dorsal fin ii,8,i and anal fin iv,14 in all specimens. Pectoral fin i,11,i in holotype (i,10 in one specimen, i,10,i in four specimens, and i,11,i in one specimen). Pelvic fin ii,7 and principal caudal-fin rays 10/9 in all specimens. Adipose fin present. Anal fin of males with 2 enlarged hooks mostly buried in thick flesh (see Figs. 2 and 3). Anterior and largest hook always on fourth and largest undivided ray; second and smaller hook on fifth ray (first branched ray).

Scales belonging to third horizontal scale series and lying ventral to dorsal fin, having exposed field of concentric circulae and 5 to 6 exposed radii; 7 to 8 radii visible in scale removed from body so that dorsal and ventral fields have one radial groove each. Scales in a lateral series 32 in holotype (31 to 33); 4 scales above lateral line to anterior dorsal-fin base and 3 scales below lateral line to anal-fin base; 6 to 7 perforated lateral-line scales; 10 median predorsal scales (11 in one specimen). Total vertebrae 32 (32 in two and 33 in three specimens).

Color in alcohol.—Ground color pale yellowish white with dark narrow midside horizontal stripe extending from just posterior to dorsal termination of opercular opening to dark blotch on posterior termination of caudal peduncle. Stripe occurs along junction between epaxial and hypaxial muscle masses. Stripe very narrow anterior to an imaginary vertical line taken from midbase of dorsal fin. Posterior to that point horizontal stripe increases in width until it merges with caudal-peduncle spot. Scales on back (from nape to dorsal caudal-fin origin) bordered by dark brown chromatophores. Anterior to dorsal fin this includes only median predorsal scales and posterior borders of each scale of scale row just ventral to median row. Scale row just ventral to dorsal-fin base and dorsal portion of borders of scales in scale row just ventral to this row also posteriorly bordered by dark brown chromatophores. These same scale rows continue to adipose fin with same pigmentation. From adipose fin to dorsal area of caudal-fin root, scales of dorsal median scale row and scale row of each side just lateral to median row bordered by dark brown chromatophores. Body along anterior two-thirds of anal-fin base outlined in dark pigment at junctions of inclinator muscle masses with each other (see Fig. 2). No well-developed humeral spot but a few scattered dark chromatophores in humeral area posterior to operculum. Belly nearly white.

Head with dense patch of dark brown chromatophores dorsal to brain in region of frontal-parietal fontanel just posterior to epiphyseal bar. Anterior to epiphyseal bar, skin dorsal to frontal-parietal fontanel with thinly

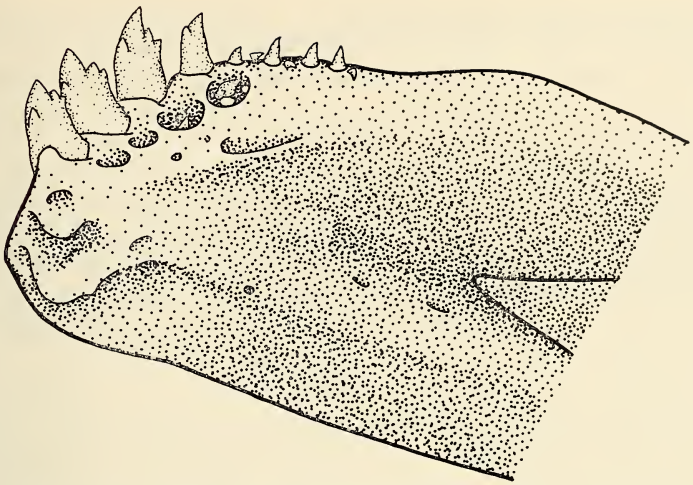

Fig. 5. Medial view of the anterior tooth-bearing portion of the dentary of a male 24.9 mm SL, paratype, USNM 216606. The replacement teeth of the large teeth are placed in pits posterior to their respective large functional teeth. The replacement teeth of the smaller unicuspid teeth are not in pits but simply lie in the flesh posterior to their respective functional teeth.

scattered dark brown chromatophores and these nearly absent along midline in this area. Scattered dark brown chromatophores dorsal to snout, between nares, in skin external to premaxillary bones, on dorsal portion of maxillary bones and on symphyseal area of lower jaw. Small dark brown chromatophores along posterior ventral border of orbit. Remainder of head white.

Dorsal fin with a distal dark brown blotch confined to fourth through ninth fin rays; a few scattered dark chromatophores along proximal half of each of first 6 dorsal-fin rays (see Fig. 1). Adipose fin with scattered dark brown chromatophores along its dorsal border. Anal fin with dark brown chromatophores along most of length of second through fifth branched fin rays, otherwise fin hyaline. Caudal fin hyaline except for a dark blotch in midregion of both dorsal and ventral lobes (see Fig. 1). Pectoral and pelvic fins hyaline. Distribution of dark pigment same in both sexes. Color in life unknown.

Etymology.—From the Greek prefix *di-* meaning two and the Greek *ankistron* meaning fishhook.

Relationships.—The relationships of this species to other species of characids remain unknown. It is here placed in the genus *Hyphessobrycon* Durbin only on the basis of its possession of the characters used by Eigenmann (1917) to define that genus (few if any teeth on maxillary, an adipose fin present, an incomplete lateral line, with the third orbital bone [second

orbital in Eigenmann's terminology] not in contact with the sensory tube of the preopercle, with two series of premaxillary teeth, and with a caudal fin naked of scales except at its base). Böhlke (1955) has provided an excellent account of the difficulties of distinguishing *Hemigrammus* Gill and *Hyphessobrycon* which are separated by the amount of caudal-fin squamation, *Hemigrammus* having a more or less scaly caudal fin on ¼ to ½ of its basal length. In my opinion these genera cannot be distinguished as separate taxa either from a phylogenetic or a typological point of view because, as Böhlke (1955) pointed out, there are some species which are intermediate in their caudal-fin squamation. The problem of generic relationships based on phylogeny in the numerous small characid species currently placed in the genera *Hemigrammus*, *Hyphessobrycon*, *Knodus* and *Moenkhausia*, for example, is far more complex than appears indicated by the characters used by Eigenmann (1917) to separate them. However, to treat this problem properly would require a revision of well over 100 species in these and related genera. Although these genera cannot be completely separated typologically, as a temporary practical expedient, I recognize them here in a typological sense. See Weitzmann and Fink (in press) for a discussion of the problems of determining phylogenetic relationships of small characids and for a beginning attempt to propose some characid genera having phylogenetic significance.

The only characin known which has only two large anal-fin hooks in nearly the same position as *Hyphessobrycon diancistrus* is *Tyttobrycon hamatus* Géry (1973). This small fish from the Loreto District of Perú attains up to about 17 mm SL in adult males and differs from *H. diancistrus* in numerous characters. For example, all the jaw teeth of *T. hamatus* are unicuspid whereas *H. diancistrus* has multicuspid teeth in both upper and lower jaws; the premaxillary of *T. hamatus* bears eight teeth while that of *H. diancistrus* bears six. There are iv,10 or 11 anal-fin rays in *T. hamatus* and iv,14 in *H. diancistrus*. I do not consider *H. diancistrus* and *T. hamatus* related since *T. hamatus* belongs to a genus of apparently pygmy characids showing much reductive evolution not found in *H. diancistrus*. Anal-fin hooks vary widely in characid fishes and it would seem easily probable that the possession of large anal-fin hooks in these two species is a convergent character. Whether *Tyttobrycon* Géry (1973) represents a phylogenetically related group of pygmy characid species or an artificial assemblage of small characids having similar and convergent reductive characters is a question that needs fuller investigation.

Large anal-fin hooks are known in the genera *Hemigrammus* and *Hyphessobrycon*. For example, the males of *Hemigrammus ocellifer* (Steindachner) (1883) have one fairly large hook on each side of the anterior five branched anal-fin rays. *H. ocellifer* does not appear phylogenetically or typologically related to *H. diancistrus*, differing from the latter in having

a much more extensive caudal-fin squamation, a greater body depth, a very different color pattern, and a different gill-raker count (6 + 11 in *H. ocellifer* and 8 + 16 in *H. diancistrus*).

Acknowledgments

I am grateful to Mr. Socolof of Bradenton, Florida for sending specimens of the species herein described, to Robert Kanazawa who prepared the X-ray negatives and aided with the photographs. Marilyn Weitzman provided technical assistance and Sara Fink prepared Figs. 4 and 5. Tyson Roberts read the manuscript and offered useful suggestions.

Literature Cited

Böhlke, J. E. 1955. Studies on fishes of the family Characidae.—No. 8. The description of a new *Hemigrammus* from the Rio Negro of Brazil. Trans. Kansas Acad. Sci. 58(1):229–236, 3 figs.

Brittan, M. R. 1954. A revision of the Indo-Malayan fresh-water fish genus *Rasbora*. Monographs Inst. Sci. and Technol., Manila (3):1–224, 51 figures.

Eigenmann, C. H. 1917. The American Characidae, part 1. Mem. Mus. Comp. Zool., Harvard College 43(1):102 pp.

Fink, W. L., and S. H. Weitzman. 1974. The so-called cheirodontin fishes of Central America with description of two new species (Pisces: Characidae). Smithsonian Contrib. Zool. no. 172:1–46.

Géry, J. 1973. New and little-known *Aphyoditeina* (Pisces, Characoidei) from the Amazon basin. Studies on the Neotropical Fauna 8(1973):81–137, 35 figures.

Géry, J, and H. Boutière. 1964. *Petitella georgiae* gen. et sp. nov. (Pisces, Cypriniformes, Characoidei). Vie et Milieu, suppl. 17(1964):413–484.

Steindachner, F. 1883. Beiträge zur Kenntniss der Flussfische Südamerika's. (IV). Denk. K. Akad. Wiss. Wien., mathem.-naturwiss. Cl. 46(1):1–44, 7 pls.

Weitzman, S. H., and W. L. Fink. (in press). Interrelationships of the neon tetras, a unique group of South American characids (Pisces), with comments on the interpretation of the phylogeny of New World characoid fishes. Smithsonian Contrib. Zool.

Department of Vertebrate Zoology, National Museum of Natural History, Washington, D.C. 20560.

Footnote

[1] Géry and Boutière (1964) described and discussed a new genus and species of South American characid, *Petitella georgiae*, apparently from the Río Huallaga of Perú, with a color pattern and body shape closely similar to that of *H. rhodostomus*. The placement of *P. georgiae* in a separate genus, *Petitella*, should be open to further investigation. In both *H. rhodostomus* and *P. georgiae* there is an additional black area on the center rays of the caudal fin.