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CONTENTS

NEWS AND NOTES — AN IMPORTANT NEW WORK ON FISH
PHYLOGENY AND CLASSIFICATION
Martin R. Brittan 207

ICHTHYOLOGICA TO BECOME QUARTERLY 209

A REVIEW OF CERTAIN TETRAGONOPTERINAE
(CHARACOIDEI), WITH THE DESCRIPTION OF TWO
NEW GENERA
Jacques Gery 211

ON THE MORPHOLOGY OF THE PHARYNGEAL FILTER
OF SOME SPECIES OF THE SUBGENUS *BRACHYDANIO*
Stanislav Frank 237

NEWS AND NOTES

AN IMPORTANT NEW WORK ON FISH
PHYLOGENY AND CLASSIFICATION

MARTIN R. BRITTON

The most important work on fish phylogeny and classification since that of Berg (1940) has just been printed. Titled *Phyletic Studies of Teleostean Fishes, with a Provisional Classification of Living Forms*, the authors are P. Humphrey Greenwood, Assistant Keeper, Department of Fishes, British Museum (Natural History); Doro E. Rosen, Associate Curator, Department of Ichthyology, The American Museum of Natural History; Stanley H. Weitzman, Associate Curator, Division of Fishes, United States National Museum, Smithsonian Institution, and George S. Myers, Professor of Biology and Curator of Zoological Collections, Stanford University. The introductory section of the work, is divided into portions on the history and theory of the classification of teleost fishes (jawless fishes, cartilaginous fishes, and non-teleost bony fishes are excluded from this work, but it should not be forgotten that the vast majority of fishes are teleosts) and on teleostean diversity and age. There follows a section on the nature of the major groupings adopted, illustrated by a diagram showing the authors' conception of the evolutionary relationships of the main groups of teleostean fishes. The authors here remark: "The principal innovations are the separation of the teleostean fishes into three divisions, and the realignment of taxa among eight superorders. Various smaller groups (suborders and families) are redistributed among orders, both new and old." This is succeeded by an outlining of the major trends within the divisions and suborders. The biggest single section in the book follows, detailing the relationships and composition of certain superorders, orders, and suborders.

EDITOR—Dr. Martin R. Britton, Sacramento State College, Sacramento 18, Calif.
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The authors' new classification, eagerly awaited by ichthyologists, comes next, and there seems to be no doubt that it will rank with those of Günther (1859), Cope (1871), and Gill (1872, 1893) in the latter half of the 19th century, and those of Woodward (1901), Boulenger (1904), Jordan (1923), Regan (1929), and Berg (1949), in the first half of the 20th, in importance. The classification, while considerably different than Berg's, uses his ordinal and subordinal endings, and should hence be palatable to those who prefer Berg's system to Regan's largely because of the uniformity of his ordinal suffixes. At present, except for a very small minority clinging to older systems, usually Jordan's, or to makeshifts of their own, most ichthyologists use either Regan's or Berg's system, with the latter slowly but surely supplanting the former. I think it quite likely that for teleosts the Greenwood-Kuen-Weitzman-Myers system may end up the dominant system of the second half of the 20th century.

Not the least feature of the work is a series of 32 full page charts containing outline drawings of all of the families of fishes recognized in this new classification (over 400 of them). This feature will be especially useful to the intelligent layman, and, suffice it to say, to most ichthyologists as well. The work terminates with an extensive bibliography and an index to the names used in the classification.

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ICHTHYOLOGICA TO BECOME QUARTERLY

This issue of *Ichthyologica, The Aquarium Journal* (May, 1966) is the last for a while to be published on a monthly basis. Until further notice, we will be publishing quarterly. The need for this change arises as a result of our inability to obtain enough papers of the quality we must have to meet the high standards we have set for this Journal. Subscribers will receive the number of issues to which they subscribed, each year of subscription entitling them to 12 issues.

It is our sincere hope that the number and quality of article submissions will increase in the near future to the extent that we can return to monthly publication.

A REVIEW OF CERTAIN TETRAGONOPTERINAE
(CHARACOIDEI), WITH THE DESCRIPTION OF
TWO NEW GENERA

JACQUES GÉRY¹

The original purpose of the present study was primarily to describe an interesting South-American tetragonopterine fish, already known to aquarists since 1956. Then, in order to appreciate its phylogenetic affinities, it was found useful to make a survey of the closest forms, which led to a review of about one fourth of the Tetragonopterinae and to a re-evaluation of some of them (including the description of another new genus). The subject, however, was too extensive to permit a true revision, and this paper raises more problems than it solves.

The tetragonopterine fish referred to at the beginning will be dealt with first. A few specimens were imported 10 years ago into the U.S.A. by Mr. Ferd Cochu, as well as into Europe by Tropicarium Frankfurt. They were sold under the name "Microbryum cochui," or "Cochu's blue tetra." As far as known, published mention of it began in 1957 in a Belgian journal with an account of its spawning. Sterba mentioned it in his *Südmossfische aus aller Welt* while, in the U.S., Axelrod and Vanderwalliker (*Encyclopedia of Tropical Fishes and Exotic Tropical Fishes*) published a color-photograph with some short comments.

The fish was first recorded, in a scientific paper, by Dr. James Böhlke (1958: 29), after the description of a new *Hemibrycon*, in the following terms:

"In a collection of aquarium fishes recently given me for identification, is a pair of specimens very definitely related to the new species (*H. orcuti*). They agree with *H. orcuti* in most respects, including the scaled caudal and completely toothed maxillary, but represent a distinct species (more anal rays, smaller size, etc.)—probably new."

The lack of definite locality did not allow the description of the form, although the subsequent examination of four more specimens (European imports), and their comparison with the specimens kindly lent by Dr. Böhlke, convinced me that they were unquestionably new, having nothing to do with *Microbryum cochui* Ladiges (see Géry, 1963: 12-13). *Microbryum cochui* is a synonym of *Tyrocharax madras*.

During a recent research trip in the U.S.A. (referred to in footnote 1), I was able to talk to the original collector who provided all locality data

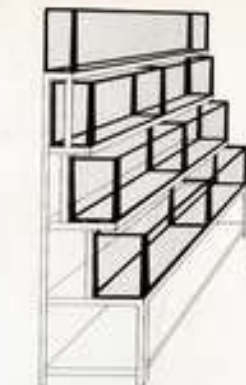
¹ Contribution number 47 to the study of characoid fishes. This study was sponsored by the N.A.T.O. Research Foundation, supplemented by a grant from the T.F.H. Fund, which permitted the re-examination of the most critical types in various U.S. natural history museums.



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needed for the description of the new form, while, thanks to Mr. Fred Gotha, Dr. Herbert R. Axelrod provided me with a good lot of adult specimens, well preserved, as well as excellent photographs *in vivo*.

I. BOBILKEA gen. nov.¹

¹ Small-sized *Hemibrycon*-like tetragonopterine characid (about 40 mm in maximal standard length), with a regression of the lateral line and scales on the base of the caudal fin. Body of medium depth, compressed, the body-form as well as the color-pattern approaching those of *Glandulocauda*; head (fig. 1) short, the cheek entirely covered by the great suborbital, the anterior fontanel reaching to the level of the middle of the eye; jaws fully toothed (fig. 2), two rows of teeth on the premaxillary, of which the inner one is composed of only four (rarely five) broad quincunspiral teeth; maxillary generally toothed nearly to its end, moderate in length, without (apparently) a positive allometry in the differential growth as in some *Hemibrycon* (fig. 3); dentary armed in front with four broad, quincunspiral teeth, followed on the sides by a series of much smaller, conical ones; base of anal with one row of scales; base of caudal clearly scaled (fig. 4), the scales of irregular size, some smaller than those of the body, the distal ones larger, extending up to the proximal third of the lobes; no apparent caudal "gland"; anal hooks of the males minute, extending only to the 5th-9th branched rays; lateral line very rarely complete, often lacking the pores on the caudal peduncle as well as some along the body (lateral line "stuttering" in Eigenmann's sense); few transverse scales relatively to the body depth; predorsal scaly.

Type-species *Bobilkea fredcochui* sp. nov.

The genus is, in comparison with *Hemibrycon*, in the same position as *Bryconoides* versus *Bryconamericus*. *Hemibrycon* *sensu* Böhlke (which has a complete lateral line and which is in the same position as *Knodus* versus *Bryconamericus*), may belong to *Bobilkea*: the "stuttering" lateral line is generally less stable, genetically, than the scaled caudal. Moreover, it may be phenotypic.

Bobilkea fredcochui sp. nov.² (figs. 5 & 6)

Microbrycon *cochui* (non Ladiges), De Deken, *Aquariumvereld*, 9 (10): 148-151, 1957—Sterba, *Sitzmanuscripte aus aller Welt*, pl. 30 fig. 186, 1959—Axelrod and Vorderwinkler, *Enycl. Trop. Fishes*, sixth edit., figs. pp. 566 and 664, 1959—Axelrod, Vorderwinkler and Pessenk, *Exotic Trop. Fishes*, P. 399.00, 1962.

HOLOTYPE: ♂, 41.2 mm in standard length, import Paramount Aquarium

² For James E. Böhlke, Chaplin Chairman of Ichthyology, the Academy of Natural Sciences, Philadelphia.

³ Honoring Mr. Fred Gotha, Paramount Aquarium, who introduced the species.

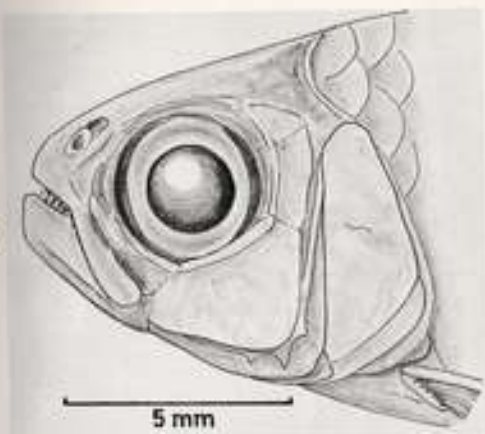


Fig. 1.—Head of *Bobilkea fredcochui* gen. sp. nov.

(via Tropicarium Frankfurt/Main), 1956 ("Upper Amazon"); pers. No. 0124.1, deposited in the A.N.S.P.

PARATYPES: 3 ♂♂, 36.0, 33.1, and 32.5 mm in standard length, same data; pers. No. 0124.4, 5 and 8.

— 2 ♀♀, 26.0 and 24.8 mm in standard length, import Paramount Aquarium (via Mr. Aaron Dvoskin), 1956 ("Upper Amazon"); in the A.N.S.P., prev. No. 0124.18 and 19.

— 11 (2 ♂♂ + 11 ♀♀ or immatures), 27.8-37.3 mm in standard length, import Paramount Aquarium (via Dr. Herbert R. Axelrod), end of 1964, from surroundings of Leticia, Upper Amazon; pers. No. 0124.2-3, 5, 7, and 9-17; two deposited in the U.S.N.M.

TYPICAL LOCALITY: The species was discovered in 1954 by a collector for Paramount Aquarium in brooks near Loreto Yacu, on the Colombian side of the Upper Amazon, about 45 miles west of Leticia; it is probable that the species occurs along the Upper Amazon (or Marañon) from Iquitos to Leticia downstream.

Measurements (mm) and counts of the type: sd, lgh. 41.2; depth 13.0; head (without membrane) about 10.3; eye (vertical) 3.5; bony interorbital

3.5-3.6; apparent lgh. of maxillary 3.1-3.2; snout (oblique) 2.5; snout-to-dorsal 21.6; dorsal-to-caudal about 21; depth of peduncle about 4.5; lgh. of peduncle about 5.2; dorsal ii 8; anal iii or iv 24(5); two to seven small hooks on the distal part of the first rays (up to the 8th, including the last, unbranched one); ventral i 6, numerous strong hooks; pectorals i 10; caudal 19.8 (not counting accessory rays); scales in longitudinal series 35-36, with lateral line pores distributed as follows:

	Perforated scales	Non-perforated scales
Right side	1-14	
	30-32	15-29
	36	33-35
Left side	1-13	14-17
	18-19	20-24
	25-29	30-31
	32-33	
		34-35

Transverse scales 5/3; about 11 predorsal, in a rather regular series, 11 preventral, 14 around peduncle; 5 ext. pmx. teeth, tricuspid; 4 int. pmx. teeth, quincuspid; about 16 mx. teeth, the first ones tricuspid, the following ones conical on the largest part of the bone; 4 large, quincuspid mandibular teeth, followed by about 11 smaller ones (the first of the side-series somewhat intermediate in size); 6/12 gill-rakers.

DIACURTIOS ANIS VARIABILIS (table 1): depth of body 3.16-3.77, depth of peduncle 8.45-10.3 and length of head 5.54-4.27 in the standard length; snout-to-dorsal 0.90-0.99 in dorsal-to-caudal; eye 2.6-3.4, interorbital 2.69-3.35, maxillary 2.92-3.57 and snout 3.85-4.87 in the length of head; dorsal ii 7i or ii 8(1); anal iii or iv 22-24 (once 21); the branched rays distributed as follows (19 specimens): 21: one; 22: five; 23: seven; 24: six; 35-37 scales in longitudinal series, of which 15-37 are perforated; transverse scales 5 above lateral line, 2-3 below; predorsal line with 11-12 scales; 4 or 5 external premaxillary teeth, rarely 6; 4 internal premaxillary teeth, rarely 5; 11-21 maxillary teeth, the number possibly feebly correlated with the size of the fish (Spearman's rank correlation coefficient about +0.45); 3 or, more generally, 4 frontal mandibular teeth, 10-13 ones on sides of dentary; gill-rakers 5-7/10-12; dorsal fin generally

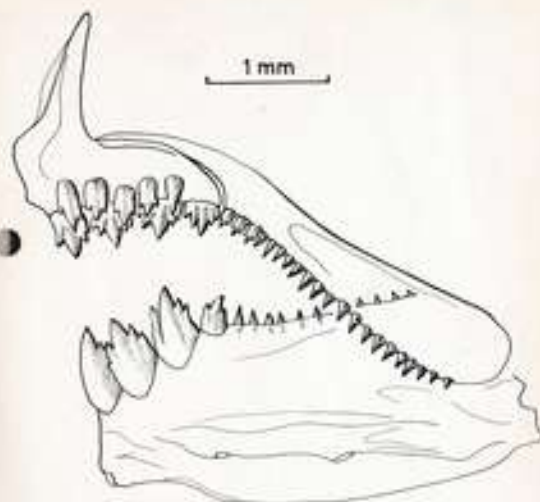


Fig. 1.—Jaws of *Buthus fructuosa* gen. sp. nov. (1) anterior, left side, external view.

slightly behind the middle of the body; caudal peduncle slightly longer than deep; pectorals and ventrals rather short, generally not quite reaching to snout (respective) fin; tip of maxillary generally reaching to the level of the pupil or a little in front of it; other characters as in the generic description.

In vivo (Fig. 6), the body is of a somewhat metallic, light blue, with a shimmer of purple, depending on the light; the blue glaze is particularly intense along a longitudinal band, two scales high, from opercle to caudal, which darkens in formalin; there is no true humeral spot; a darker zone at the base of the caudal rays ("vandal spot") may be present; the fins are greyish, the tip of both caudal lobes, as well as the adipose, white; the caudal color-pattern, when closely inspected (see the upper fish of Fig. 6) seems to be rather asymmetrical, the upper lobe brighter.

Buthus fructuosa, when compared with the species of *Hemibrycon*, would fall rather apart any species, owing to its small number of transverse

scales. Relative to *ovata*, apparently the nearest form, it is more elongate, with smaller head, more anal rays and less transverse scales. If considered as a *Knodus* with increased number of maxillary teeth, the nearest form could be the geographically remote *B. arumensis*, which also has a straggling lateral line. *B. fredcochui* is more elongate with more anal rays but fewer longitudinal scales.

II. REVIEW OF SOME TETRAGONOPTERINAE

Basilichia belongs to a group of tetragonopterine characids which seem (remotely) monophyletic and obviously well delimited, despite the apparently

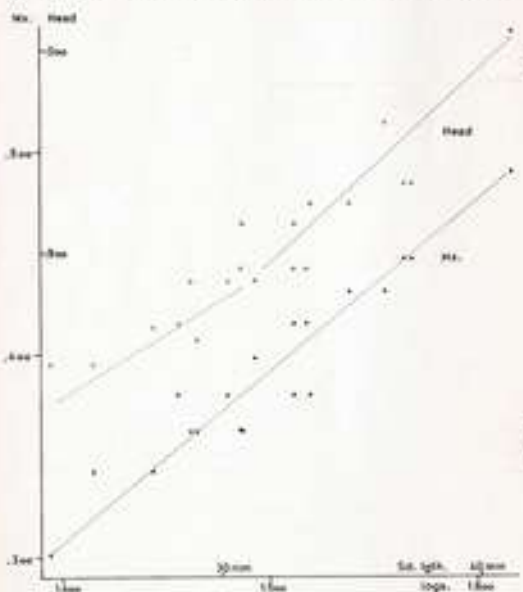


Fig. 3.—Relative growth of head and maxillary in 19 ex. of *Basilichia fredcochui*: length of head, without membrane, and apparent length of maxillary (on the ordinate), plotted against standard length (on the abscissa); log-log coordinates; the regression lines have been approximated by eye.

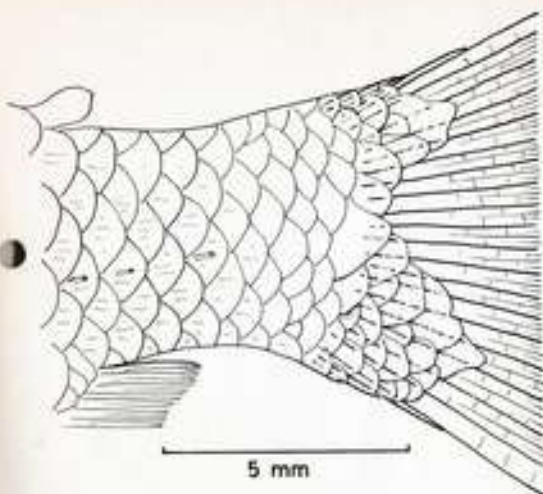


Fig. 4.—Caudal peduncle of the type of *Basilichia fredcochui* gen. et sp. nov.

insignificant common characters of the forms, i.e. the presence of only four lower premaxillary teeth, frequently associated with a great development of the third suborbital, and, quite often, the irregular implantation of the outer premaxillary row of teeth. It is difficult to explain the consistency of these characters by their adaptive value. More satisfactorily, it is necessary to admit their genetic linkage with some other, important character. The remarkable stability of the number 4 in the group for the inner upper teeth is also found in a different phyletic line, the Myliidi of the Serrasalminae, less the primitive genus *Colomesus*.

Most of the forms are at the present time in rather isolated basins in the Andes and Southeastern South America. Their evolution involves geographic speciation in very intricate Rassenkreis-patterns. From the generalized type represented at present by *Hemibrycon* arose different lines which are well recognizable. *Bryconamericus*, *Knodus*, *Bryconacidus* and *Basilichia*, dwarf species with one or another "regressive" character, probably evolved

by "pseudomorphosis" (see Géry, 1962). *Microgony* and *Gratrobanchia*, which differ only by the specializations of their dentition, as well as *Hemibrycon*, diverged very probably from the same primitive type. A quite large group developed sexual adaptations, and it is at present classified by convenience within the Stevardiids (*Glandulocaudinae* snc.), although it is clear that the latter are polyphyletic (see Böhlke, 1954 and 1958, Nelson, 1964 and Géry, 1964). Those *Hemibrycon*-like forms with a caudal "gland" or "pouch" are *Glandulocauda* (at least the type-species, *solonogoyi*), as well as three very close genera, *Phenacobrycon*, *Acoplystus* and *Planalima*; they probably arose from some *Bryconamericus*. Another form, *Arobrycon*, is descended directly from *Hemibrycon*, whereas the very specialized *Pterobrycon* gave rise to the remarkable filamentous, paddle-like sex-signal (?) of *Stenardis* (*Cosypoia*) by a different but convergent path, at the same time retaining a general body structure which also appears to be derived from *Hemibrycon*.

To the *Hemibryconini* as here defined, which forms part of the Tribe Tetragonopterini, it is possible to add another sub-tribe, the *Croagratini*. Almost perfect links between them are represented by *Phaboscha* and *Croagratia*. The latter genus appears near *Hemibrycon* (although with a very different but very characteristic shape of the head, see fig. 7) when adult, and very near *Croagratia* when young. Then *Croagratia* may represent another "noteric" line (*noteric*, a still controversial evolutionary mechanism, seems to play a very large role in the radiation of South American characoids). *Croagratia*, as well as *Croagratia* and *Phaboscha*, have a large suborbital associated with only four premaxillary teeth in the row which corresponds, in the more generalized *Hemibrycon*, to the inner row; but the teeth are heavier, the snout is prominent, and the frequent irregularity of the outer row in the *Hemibryconini* has given place to a third row, as in the rather remote *Brycon*.

All other Tetragonopterinae, including the *Stethopomini*, have generally more than four teeth in the inner row of the upper jaw (when there are two

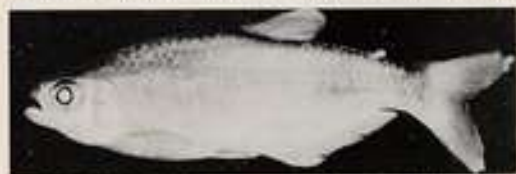


Fig. 5—Type of *Hemibrycon frenckei* gen. et sp. nov., 41.7 mm in standard length, in the A.M.S.P.



Fig. 6—Two of the types of *Hemibrycon frenckei* (photograph by Dr. H. K. Axelson).

rows), and frequently a weaker suborbital (see exceptions at the end). Among the latter forms, a small group centered on *Pseudochalarus* may be at the origin of the genus *Hemibrycon*. This group is very ancient, as attested by the presence of the endemic *Pseudochalarus* and *Hellandichthys* in both "ends" of tropical South America. These forms are systematically so close together that it is even permitted to believe they are congeneric (see Schultz, 1966). The hypothesis of evolutive convergency is unbelievable and we have to accept them as having a common origin. To the group (*Pseudochalarini*, including *Scissorini* Fowler, 1958) belong *Arymanicus*, maybe *Scisor*, a poorly known genus, probably the curious *Rachoniscus*, which combines the exact body-form of *Glandulocauda* (without caudal gland, unless the types are all females) with the characters of a young *Arymanicus* (again by pseudomorphosis?) and, very hypothetically, *Arymanicus micropomus*.

None of these taxa having been revised in the strict sense, the above schema is grossly approximate. A number of forms, as may be expected with such an evolutive group, do not exactly fall within the limits of the recognized taxa. Some of the more critical instances will now be discussed, the whole review being resumed at the end by means of a key to the genera.

(1) Some *Hemibrycon*-species (*hoplias*, *decurtus*, *dentatus*) may have a low number of maxillary teeth, and *Bryconamericus*, which evolves parabolically to *Hemibrycon*, is closer to it than indicated—for practical purposes—in the

TABLE 1. Principal proportions and counts of the 19 typical specimens of *Baobilia baobilia* gen. et sp. nov. (head without mandibles; bony structures; snout measured in oblique); counts of pores of lateral line approximately; number of maxillary teeth estimated from direct examinations, without dissection—probably too low, as compared with paratype No. 5 which was dissected.

No.	Casts																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SL, mm.	41.2	35.1	36.7	36.0	34.6	35.1	35.0	35.5	35.3	35.1	35.7	36.5	36.2	36.2	36.9	36.8	36.8	37.0	36.8
SL, gph. depth	5.17	5.29	5.46	5.21	5.19	—	5.97	—	5.38	5.35	5.66	5.55	5.39	5.70	5.57	5.66	5.52	5.75	5.45
SL, gph. head	4.7	5.06	4.37	5.91	4.12	5.96	4.25	4.17	5.07	6.04	5.79	5.92	5.92	6.05	5.78	6.09	5.91	5.72	5.54
Head girth	2.66	3.31	2.47	3.26	2.66	3.23	2.66	3.36	2.65	3.75	3.01	2.69	2.45	2.68	3.21	2.62	2.68	3.04	2.63
Head length	4.81	5.10	2.68	3.17	2.65	3.25	2.65	3.12	2.65	3.46	3.14	2.68	2.75	2.68	3.05	2.65	2.65	3.02	2.65
Head width	3.27	3.45	3.07	3.41	3.15	3.70	3.45	3.29	3.68	3.67	3.46	3.31	3.15	3.15	3.45	3.31	3.16	3.50	3.50
Head count	4.12	4.80	4.50	4.59	4.20	4.67	4.59	4.67	4.15	4.67	4.15	4.15	4.15	4.15	4.67	4.15	4.67	4.67	4.67
SL:GL (S:G)	97	69	107	95	96	91	97	95	96	95	96	92	90	91	96	95	95	91	93
SL, gph. post. depth	6.15	6.15	6.16	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15
Eye length	15.96	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Pore in line	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Eye, girth, teeth	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Eye, girth, teeth	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SL, teeth	16	13	17	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mandib. teeth	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Gillrakers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

key. Some *Knodus*-species may well be classified within *Bryconamericus*, and vice versa, depending on what one calls "caudal scaled" or not. Some overlapping may also be found concerning other characters, and the exact level (generic or subgeneric) of *Bryconamericus*, *Knodus*, *Bryconacidus*, *Baobilia*, *Phaboncha*, and maybe others, is still under debate (see for the *Bryconamericus* question, Géry, 1962, and for the *Knodus* question, Schultz, 1944, and Böhlke, 1958). Nevertheless the situation is not much worse than in *Hemigrammus* versus *Hyphessobrycon*, for instance (concerning *Hyphessobrycon*, see note following), and the problem could only be solved by a revision of the whole family of characids. A better knowledge of the ecology and ecotaxonomy of these taxa would also be useful (see Géry, 1962): *Baobilia*, for instance, and some *Bryconamericus* or *Knodus*, are apparently inhabitants of the Amazonian plain, whereas the *Hemibrycon*-species are so far restricted to fast-moving mountain- or hill-streams, which suggests rather drastic physiological differences. Following the general use as started by Eigenmann, and despite the above mentioned critics, I have here provisionally "standardized" the taxa at the genus-level.

(2) *Microgonyx* and *Ceratobranchia*, judging from their shape, have probably a common origin. They have now considerably diverged in their dentition, maybe by the adaptation of the latter, *Ceratobranchia*, to a *Dystrochilichthys*-like diet. Its jaw structure (figs. 8 and 9) would support the hypothesis: they are closely aberrant, the predominance of the outer premaxillary series being very rare within the Tetragonopterinae (other instances are *Hemichilus* and *Rhinopentia*).



Fig. 7.—Head of the type of *Ceratopoma muriei* Myers.



Fig. 8.—Head of the type of *Ceratobranchia obtusirostris* Eigenmann.

I have seen the type and some "topotypes"¹ of *Ceratobranchia obtusirostris*, *R. chanchomayo*, as well as numerous paratypes of *C. bojkani*, *R. urubamba*. I am unable to see any difference between the Urubamba sample and the supposedly Chanchomayo sample. On the other hand, the single, very bad type of *obtusirostris* has the slightly different teeth-form (fig. 9, above left) already recorded by its describer, Eigenmann, together with supposedly bifurcated gill-rakers (which gave its rather inappropriate generic name). The third species, *Ceratobranchia olivae* Tortoise (Bull. Mus. Zool. Univ. Torino, 49 (117): 57-58, pl. 4 fig. 2 (not fig. 1), 1947), which I have not seen, does not belong to *Ceratobranchia*, at least judging from the length of the anal and the teeth structures. The question is still open whether *Ceratobranchia* is monotypic or not.

Microgerys myranchi Fowler (Not. Nat. Philadelphia No. 159: 3-4, fig. 4, 1945) does not seem congeneric with the type-species *M. minuta*. It differs in the following way (repeated first, from the description, then *minuta*, following a re-examination of the type): "2-3 large, quadridentate maxillary teeth," versus 4 narrow, tricuspid teeth; "10 mandibular teeth,

¹ 12 ex., California Acad. Sci. No. 21868, from "La Merced, Rio Chanchomayo, Peru," coll. W. B. Allen, 1920; with one specimen of *C. bryconoides* (this species said to be typical of the Rio Urubamba, as is *Ceratobranchia bojkani*). Not recorded by Allen (in Eigenmann & Allen, 1942), who cites only the type of *obtusirostris*.

anterior ones largest," versus 5 narrow, tricuspid teeth; "posterior scales of the lateral line without distinct tubes," versus lateral line complete (scales at present difficult to count). The characters of *myranchi* agree rather closely with *Bryconoides*. It would differ from *B. olivae*, the type-species, only in the absence of the many chromatophores "peppering" the sides in the latter form.

(3) The three other species which fit in the definition of *Bryconoides* (*olivae*, *Aringommas* and possibly *paucirostris*—fig. 10) could be polyphyletic, as was suggested by Myers (1929: 546) for the first two forms. This was somewhat discussed by Giry (1963: 27-28). On the other hand the short anal fin and the very similar body-shape, well recognizable in my figure 10 (the species were not originally figured) may be more important than the regression of the lateral line, at least more "characteristic" (the incomplete

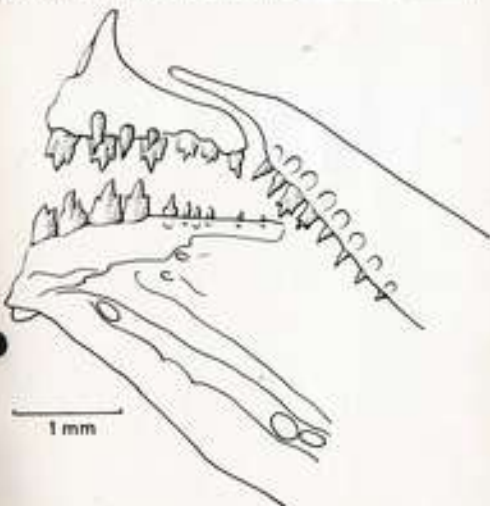


Fig. 9.—Jaws of a paratype of *Ceratobranchia bojkani* Eigenmann (♂ admetris, left side, internal view); above left, one external premaxillary tooth of the type of *C. obtusirostris*.

with the other species (which altogether, as discussed by Böhlke [1958: 45], are a rather heterogeneous assemblage of "abnormal" forms, apparently derived from *Hyphessobrycon*-like forms—something like *nanoccephala* for *melanota* or something like *darwini* for *maxillaris*); *H. bilineata* has the dorsal fin in advance of the middle of the body, a very short lateral line (only 3 perforated scales), a very short anal, and chiefly very aberrant mandibular teeth (*Pseudorasbora*-like multicuspoid incisors) which number only 3 on each side. There is not in the Tetragonopterinae a single form having the latter structure. *H. bilineata* obviously represents the type of a new genus, which will be described as follows:

COPTOBYCON gen. nov.¹

Type-species *Haemulon bilineata* Ellis (Rio Tietê Basin, Brazil) (fig. 11).

Teeth in two rows on premaxillary, the outer row with one tri- or quadricuspoid tooth, the inner one with four multicuspoid incisors (about 9 cusps); no teeth on maxillary, which is short, almost vertical; only 3 frontal multicuspoid incisors on dentary, each with about 10-11 cusps, arranged in a slightly curved coming part like the upper teeth of some *Pseudorasbora* (fig. 11); great suborbital leaving a naked area on the cheek; post-orbitals apparently reduced to their canals; anterior fontanel reaching to the level of the center of the eye; no adipose fin; anal short (46 III) in the holotype of *bilineata*, the only one species of the genus thus known; lateral line very short; caudal naked; predorsal with an irregular series of scales.

Differing from the Tetragonopterinae without adipose fin (genus *Haemulon*), by the form of the teeth, their number, and the reduction of the suborbitals; differing from the Tetragonopterinae with multicuspoid incisors (*Deterodon*, *Hyphessobrycon lichenot*, *Byconameris deuterodonoides*, *Ceratobranchia*, etc.) by the lack of an adipose fin and the very different dentition of the dentary, amongst other characters.

(5) *Astyanax aureocaudata* Eigenmann, from the Upper Cauca, needs to be critically studied. It may be the type of a new genus close to *Haemulon*, with rather numerous maxillary teeth and only 4 inner premaxillary teeth, but a reduced suborbital. Its most distinctive feature would be the thorn-like form of the third mandibular tooth, as mentioned by Eigenmann.

The generic position of other *Astyanax*, *foxii* and *rigaudi* on the one hand (which have 4 inner premaxillary teeth), and the *paucidens*-group on the other, with *multidens*, *haemuloides*, *gambusia*, *scutellus*, etc. (which have an entire suborbital), is also to be re-evaluated.

(6) *Hyphessobrycon melanopleura* Ellis (from the Rio Tietê like *Coptobrycon bilineata*), apparently does not belong to *Hyphessobrycon*, even in

¹ Gender: masculine, following the general use of *Bycon*, *Hyphessobrycon*, etc. Meaning, approximately, a "mutilated Brycon," i.e. which has lost its adipose fin as well as its posterior mandibular teeth.

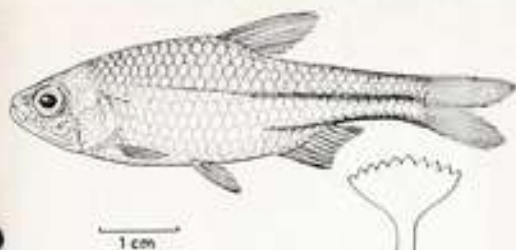


Fig. 15.—Type of *Haemulon bilineata* Ellis, type-species of *Coptobrycon* gen. nov.; below, a mandibular tooth, greatly enlarged.

the present very extended definition of the genus, which includes all the small Tetragonopterinae with incomplete lateral line and naked caudal, two well separated rows of teeth on the premaxillary, and a few minor other characters (see note on the genus *Hyphessobrycon*, below). *H. melanopleura* would be characterized by its complete suborbital, only 4 inner premaxillary teeth, maxillary teeth rather numerous, and chiefly by its general body-form approaching that of the group here reviewed, with the dorsal fin behind the middle of the body and the rather long anal fin originating below the first rays of dorsal.

A number of other small Tetragonopterinae have also to be re-evaluated. The most critical seem to be *Moenchodus tridentata* Holly, and some *Hemigrammus* or "*Hyphessobrycon*" which appear to be quite apart in one or another character: *H. riddii* and *stramineus*, *H. darwini*, *lichenot* and *sanctae*, *H. poeciloides*, *H. brevis*, etc.

(7) Finally I do not know to which group *Glyphisochirus* belongs. I have not seen the type-species, *obsoletus*. Three species at least (*caucanus*, *major*, and *vulcania*) have, consistently or not, 4 inner premaxillary teeth and an entire suborbital. The genus would be a good link between the two subtribes (Glandulocaulini, including *Argopoma* and *Pterobrycon*, and Stevardiini, including *Heteronotus*) which, united as above mentioned, would form the polyphyletic Stevardiidi. I place it, with a question mark, near *Argopoma*.

Apparently, some very elaborate features of the males of certain small characids, such as a filament ending in a dermal flap on the sides, the separation of the lower caudal rays forming a distinct "spur" or other fin-differentiations (filaments, hooks etc.), as well as the more common caudal

"gland," play an important role in sexual isolation: they have been achieved in a number of phylogenetic lines which are strikingly convergent.

Another dubious case is that of *Glandulocauda* (at least some species, including the type-species) versus *Mimagoniates-Coelacanthus*, which look so similar, but which, despite the opinion of Schultz (1959), seem to be of different origin, judging from their anatomy (see Géry, 1964).

Dr. Keith Nelson (Dec. 2, 1964) has published an important paper on the *Glandulocauda-Mimagoniates* question just before my own short discussion (Dec. 15, 1964). We independently agreed in preserving *Glandulocauda*. Nelson discovered that the difficult "polytypic species" of the coastal region of Brazil between Rio de Janeiro and the Rio Itapocu (form called "*harperi*" by aquarists and rather generally *microlepis* by ichthyologists, including myself), is composed of two good, sympatric species: *microlepis*, which is a large, relatively deep form characterized by its caudal hooks and its rather numerous hooked anal rays (last unbranched and 7th-9th first rays), and *tonoi* (of which *lateralis* may be the female), a small, elongate, dark form without caudal hooks, and with only the first anal rays hooked (generally the last unbranched and the first 2 or 3 branched ones). Both have prominent interhaemals and only one hook on each ray of anal, together with an elaborate caudal gland, which we independently figured (Nelson: fig. 3, c, d, and f; Géry: figs. 6 and 8), with some disagreement concerning the numbering of the caudal rays. The structure of the gland seems to be an important generic character and Nelson proposes to revive *Coelacanthus* (type-species *sporanga*, which is an absolute synonym of *microlepis*, according to some authors) to accommodate *microlepis* and *lateralis-tonoi*.

The aspect of the caudal gland is apparently the only valid character permitting the separation of *microlepis* and *tonoi* from the more southern form *insipalis* (Rio Grande do Sul and Uruguay), which is still (at least for me) of uncertain generic assignment. This last species has a simpler caudal gland (cf. fig. 5, d in Nelson, not quite agreeing with my own material from Uruguay), but it has prominent interhaemals and only 1 hook (sometimes 2, according to Nelson) on the first anal rays. It may be pointed out that all the above characters are only to be seen on mature males, some of them probably only at the breeding season.

The following key, based on my material and on the literature for *melanopleura* and *harperi*, is mostly intended to provoke further discussion and more refined morphological studies. It runs from the apparently "generalized" type to the apparently most specialized one:

Key to the males of the Mimagoniates-Coelacanthus-Glandulocauda complex.

- a. Rather generalized forms coming probably from some *Hemibrycon*-like offshoot; two regular series of teeth on premaxillary, the inner one

composed generally of only 4 rather heavy teeth; dorsal fin slightly behind the middle of the body; caudal gland a rather simple organ, without elaborate features; no prominent interhaemals; anal hooks numerous on each ray (*Glandulocauda*).

- b. Vertebrae 34 (after Schultz); anal iv 15-16; scales 6(4-5) 36-5; pinn. teeth 3-4, quincuspoid (max. teeth 3; dorsal very slightly behind the middle; depth 3.33)

.....*Glandulocauda melanopleura* Eigenmann, 1911 (Rio Iguaçu)

- bb. Vertebrae more than 34; anal more than 15-16 branched rays; scales 37-39; more than 3 external pinn. teeth; teeth mostly tri- or quadricuspoid

- c. Dorsal almost in the middle of the body in adults; anal iv-v 26-31; transverse scales 5-6(4-4); perforated (8-11) (0-4); predorsal 12-13; pinn. teeth 4 or 5/4 or 5; max. teeth 3-6 (depth 2.7-3.4)

.....*Glandulocauda terafali* Géry, 1964 (Argentina, Rio Lujan)

- cc. Dorsal behind the middle of the body in adults; anal iv 22(); transverse scales 7-6, perforated (11) (0), predorsal 16; pinn. teeth 5/4, max. teeth 4 (depth about 3)

.....*Glandulocauda melanogonyx* Eigenmann, 1911

type-species (*Alto da Serra, São Paulo*) (the holotype, which I have seen, may be a female or an immature male)

- aa. More specialized forms, apparently coming from a different ancestor than (a), possibly from some *Pseudochalcini*; premaxillary teeth in two irregular rows, often with prominent outer row of 5-6 narrow teeth, and a few "internal" teeth, not heavy, tricuspoid at the most; dorsal fin clearly behind the middle of the body; caudal gland more or less complicated (not seen by me in *harperi*); probably always prominent interhaemals and no more than 1 (rarely 2) hooks on each anal ray

- d. Caudal gland as in *Glandulocauda*; depth 2.7-3.3 (one or two anal hooks on the first 7 anal rays; vertebrae 35-38; anal iv 24-29; scales 7(5-7) 38-6; predorsal 15-18; pinn. teeth irregular, 2 or 4/4 or 6; max. teeth 4-6)

.....*insipalis* Eigenmann, 1911, described originally as a *Glandulocauda* (Rio Grande do Sul, Uruguay)

- dd. Caudal gland probably always similar to that figured by Nelson (figs. 3, c, d, and f) or Géry (fig. 6); depth more than 3; dorsal very far behind, its tip overlapping adipose

- e. Vertebrae 41 (after Schultz); anal hooks not known

(anal iv 34-36; scales (6-7) 44-47; pms. teeth 3-6; max. teeth 4-5; depth 3-3.6)

.....*Mimogonistius barbeyi* Regan, 1907, type-species (Paraguay)

66. Ventrals 36-39 (anal iv or v 28-32; scales (5-8) 40-46; max. teeth 5-9; depth 3.1-4.4)

f. Up to 35 mm in standard length; mature under 30 mm; depth 3.66-4.4; one anal hook on the last unbranched to the 3rd br. ray; no hooks on caudal rays (anal iv or v 28-30; scales (5-6) 40-43; max. teeth 5-6)

.....*Cocherichthys rosai* Nichols, 1913 (synonym *latrachi?*) (S.E. Brazil, probably mostly from Santos to Paranaguá)

ff. Up to 50 mm in standard length or more; immature under 30 mm (?); depth 3.1-3.3; one anal hook on the last unbranched to the 7th-9th br. ray; numerous hooks on caudal rays (anal iv 28-32; scales (6-8) 42-66; max. teeth 6-9)

.....*Cocherichthys microlepis* (Steindachner) 1876 (synonym *apouraque* Miranda Ribeiro, type-species) (S.E. Brazil from Rio de Janeiro to Rio Itapocu)

III. Note on the genus *Hyphlosbrycon* and correction of some type localities:

I believe *Hyphlosbrycon* to be restricted to its type-species *Hemigrammus compressus* Meek (and perhaps *milnei* Durbin, if the latter is not synonymous with the former). It is unfortunate that Miss Durbin (in Eigenmann, 1909) did not realize that *compressus* was an aberrant, northern offshoot of a much more generalized southern type. The characters of *Hemigrammus compressus* may be restated as follows (from the holotype, in Chicago Natural History Museum No. 4041 and some paratypes): body deep (depth about 2.5-2.6 in the ad. lgth.) and compressed; an adipose fin; caudal fin not scaled; a small pseudotympanum (=buccal hiatus); scales numerous: 45-49 in longitudinal series and 16-18 from dorsal to ventral; pores of the lateral line on the 6-7 first scales; *predorsal line naked*, without a median series of scales and the two lateral series not overlapping in the middle; teeth numerous, narrow, tricuspid at the most; premaxillary with 1-3 teeth in the outer row and generally 6 in the inner one; maxillary with 4-8 teeth (fig. 17), reaching to the level of the anterior margin of eye; anterior frontal long, reaching almost to the same level; great suborbital covering only the half of

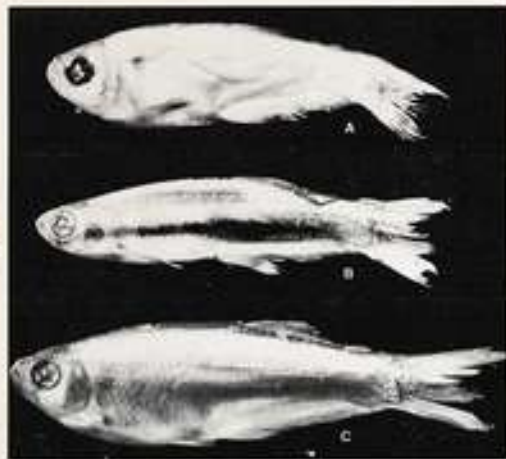


Fig. 12.—Males of three "*Glanidolodus*" species: A, *Glanidolodus (T.) inapali* Eigenmann; B, *Cocherichthys rosai* Nichols; and C, *Cocherichthys microlepis* (Steindachner). A from Uruguay; B and C from Santos, Brazil.

the cheek; post-orbitals (SO^1 to SO^6) reduced to their canal; dorsal in the middle of the body, pectorals and ventrals overlapping next (respective) fin. The characters in *italics* are at least of sub-generic value in the other tetragonopterine taxa, and it is clear that most of the so-called *Hyphlosbrycon*-species have to be redistributed.

I also believe the present note to be a convenient place to fix or correct the type localities of some small Tetragonopterinae:

(1) The type-locality of *Hyphlosbrycon similans* is not the Rio Purus, as I stated in *Trop. Fish. Bull.*, Apr., 1963, but the Rio Jafaris (or Tupari), which empties into the Rio Negro just above the Rio Branco. Mr. Schwartz, who collected the species, provided the above correction. Needless to say, the accompanying photograph in the 1963 paper (p. 13) concerns only the two well-known "neon tetras" *Parachanna innesi* (first and third fish, starting from the top) and *Chlorodon axelrodi*. *H. similans* has been introduced into the U.S.A. only last year.

(2) The habitat of the three "neon tetras" is now rather well known.

Chirodon axelrodi occurs in the tributaries of the left bank of the Rio Negro, depending on the minerals of the water, from some tributaries lying only a few hours above Manaus, up to Santa Rosa on the Colombian border, and also in the Rio Muco, a tributary of the Orinoco (according to Mr. Fred Liebocker); it is sympatric with *simulans* in the Rio Jufuris. *Parachirodon dowii* is apparently never sympatric with either *simulans* or *axelrodi*, depending probably on a slightly different mineral content; it was abundant, and perhaps still is in the tributaries of the Marañon from Sao Paulo de Olivença to Iquitos upstream, chiefly in the Putumayo according to certain sources, but it occurs as well in the Rio Purus at the level of Boca de Tapasa. As these fishes are actively collected (and sometimes transplanted, at least tentatively), the above pattern may be altered in the future.

(3) According to Mr. Fred Liebocker, *Megalaspilodon anglicus* does not come from Leticia, as I stated in *Trop. Fish Herb.*, May, 1961. It was collected by him in the Rio Muco, upper Orinoco basin, in 1954. Since the description of the species, I have seen many specimens from the upper Rio

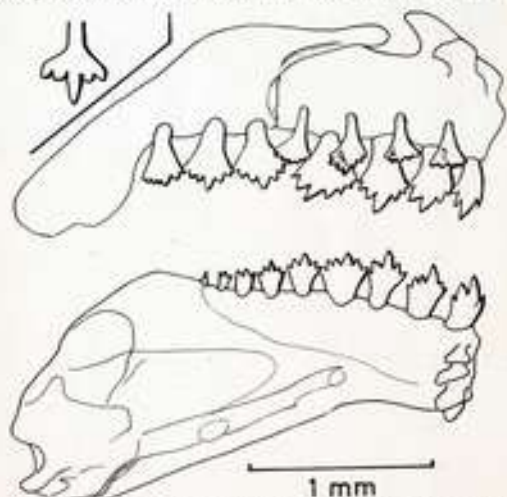


Fig. 53—jaws of a paratype of *Megalaspilodon compressus* (Fleck) (1) schematic, left side, external view.

Meta and its tributaries, also in the upper Orinoco drainage: Rio Muco and upper Meta is the typical locality as here corrected.

(4) Travassos (*Ichthyologica*, Jan. 1966) has justly pointed out that *Hemigrammus ayassary* Durbin in Eigenmann (not Eigenmann!) was never found again in the lake January, said to be near Manaus (left bank of the Amazon according to Travassos, who cites a geographical source; right bank, near the mouth of the Purus, according to Eigenmann's map). I have recently collected rather extensively around Manaus and did not find the fish (but the specimens are not yet closely studied). On the other hand, *ayassary* seems to be abundant from Iquitos to Sao Paulo de Olivença downstream (I have redescribed it in *D.A.T.Z.*, 15, Jahrg., 4, Heft: 110-112, Apr., 1962, and cited it in *Trop. Fish Herb.*, 13 (6): 32, Dec., 1964—these papers overlooked by Travassos). There are some doubts concerning *H. ayassary* to be a middle-Amazonian species.

Artificial key to the Hemibryconini, Creagrutini, and Glandulocaudini

1. Males without a caudal "gland" or "pouch" 2
- Males with a caudal "gland" or "pouch" (*Glandulocaudini*) 18
2. Premaxillary teeth in two series, the outer one more or less irregular (*Hemibryconini*) 3
- Premaxillary teeth in three series, except in adults of *Creagrutini*; dentition generally heavier than in *Hemibryconini* and *Glandulocaudini*; snout projecting (*Creagrutini*) 16
3. Maxillary with 6-20 teeth or more, at least in full-grown specimens 4
- Maxillary with less than 6 teeth 7
4. Maxillary generally rather long; caudal fin forked; adipose fin present; great suborbital generally entire 5
- Maxillary rather short, with about 11 teeth; caudal fin three-pronged; adipose fin absent; great suborbital slightly reduced (lateral line complete) *Nemabrycon* (Colombia)
5. Lateral line complete; more than 4 scales under lateral line; no small scales on the caudal lobes 6
- Lateral line rarely complete; less than 4 scales under lateral line; base of caudal lobes scaled *Brevibius* g.n. (Leticia)
6. Great suborbital nearly entire, at least below; frontal mandibular teeth all alike *Hemibrycon* (North and West S.A., Trinidad, Guiana; see key in Géry, 1962)
7. Adipose fin present; lateral line complete or not; post-orbitals developed; more than 3 mandibular teeth 8
- Adipose fin absent; lateral line incomplete; post-orbitals weak; only 5 multicupid incisors on dentary *Copebrycon* g.n. (Rio Taré)

8. Snout produced, pointed, smooth inferior; eye somewhat vertically elongate; branched anal rays 11-15 (see discussion in Géry, 1964)..... 9
 — Snout not produced, rounded, mouth more or less terminal; eye rounded or somewhat horizontally elongate..... 10
9. Lateral line complete; upper lip developed, covering the relatively weak outer row of teeth; anterior fontanel moderate; branched anal rays 11-12..... *Allocheilichthys* (Rio Negro)
 — Lateral line interrupted on caudal peduncle; upper lip reduced, uncovering the prominent outer row of teeth; anterior fontanel almost closed..... *Allocheilichthys* (Rio Araguai)
10. Anal with more than 13 branched rays (rarely 13 in *Knodus surudae*); great suborbital covering entire cheek..... 11
 — Anal with 13 branched rays or less; great suborbital generally not quite entire..... 14
11. Lateral line complete..... 12
 — Lateral line incomplete (caudal naked)
 Hyporhamphichthys melanopleura (Rio Terti)
12. Anal originating under middle or end of dorsal..... 13
 — Anal originating in front of first ray of dorsal; a large scale at the base of the caudal..... *Platycheilichthys* (Paraguay)
13. Caudal not scaled..... *Bryconamericus* (S.A., mostly North-Western and South-Eastern)
 — Caudal more or less scaled..... *Knodus* (mostly Amazonian)
14. Lateral line complete; teeth not as in *Bryconamericus* etc.
 — Lateral line lacking a few pores on the peduncle; otherwise much like *Bryconamericus* or *Knodus* (caudal scaled in *B. paipayensis*)..... *Bryconacridius* (Peru, Bolivia)
15. Teeth narrow, tricuspid at the most; inner premaxillary teeth larger than those of the outer row; about 5 mandibular teeth only; caudal naked..... *Microgerys* (Colombia and Bolivia)
 — Teeth broad, multicuspoid; upper lip uncovering the outer premaxillary row, which conceals the weaker inner one; mandibular teeth numerous; base of caudal moderately scaled..... *Ceratobranchia* (Peru)
 — Maxillary short, with 2-4 teeth; snout blunt, dentary included..... 17
 — Maxillary long, almost horizontal with a concave curve, fully toothed; snout very long; premaxillary teeth in three rows in the young, the teeth of the middle series (one or two on each side) migrating forwards with age; anal short..... *Ceagrion* (Rio Negro, Guiana)
17. Anal with about 18-21 branched rays. *Platina* (Rio S. Francisco, Patana)
 — Anal with about 10-15 branched rays. *Ceagrion* (mostly North-Western S.A.—see key in Géry, 1964)
18. Less than 6 maxillary teeth..... 19
 — Maxillary with 8 or 9 teeth; characters of *Hemibrycon*
 Amblybrycon (Peru and Bolivia)
19. Males without an expanded scale on the sides and the last anal ray not prolonged..... 20
 — Males with an expanded scale, filamentous with a paddle-like end, on the dorsal part of the side; last anal ray filamentous; lower accessory caudal rays separated from the rest of the fin (great suborbital entire; lateral line incomplete)..... *Pterobrycon*, spn.
 Microbrycon (Colombia)
20. Teeth as in *Bryconamericus* etc.; great suborbital entire..... 21
 — Teeth incisor-like, crenulate, very broad, forming a continuous cutting edge; great suborbital leaving a narrow naked area on cheek..... *Lundinia* (Ecuador)
21. Lateral line complete..... 22
 — Lateral line incomplete..... *Glandulocauda* (South-Eastern Brazil)
22. Accessory rays on lower caudal lobe of males not separated from the rest of the fin..... 23
 — Base of lower caudal lobe forming a distinct "spur" in males..... 24
23. First ten and last ten anal rays of males with hooks; anal filament, about 33 rays; breast probably rounded..... *Phenacobrycon* (Ecuador)
 — First ten anal rays of males with hooks; anal with a straight margin, $v \geq 20$; breast keeled, although not very trenchant..... *Platanina* (Goias, Brazil)
24. Dorsal in the middle of the body; breast rounded; mouth terminal; 10th to 15th anal rays of males with hooks, anal about 33-45..... *Argoplana* (Colombia)
 — Dorsal behind the middle of the body; breast trenchant; mouth superior; first ten anal rays of males with hooks, anal about 26-34..... *Gophyroskalaris* (Bolivia, North-Western S.A. and Venezuela)

RESUME

L'A. décrit deux nouveaux genres des Tetragonopterinae: *Bichthea* (espèce type *B. fredericki* sp. nov., connu des aquariophiles sous le nom de "*Microbrycon cochui*") et *Ciposteryon* (pour *Heteromantis bilineata* Ellis). Certains Tetragonopterinae sont discutés: *Hemibryconini*, *Ceagrionini*, *Pseudochalcisini* (Tetragonopteridi) et la tribu polyphylétique des *Stenacidi* (*Glandulocaudinae* strict.); *Knodus* est probablement plus proche

de *Pseudochanna* que des Characodontinae au sens de Eigenmann; *Gerrhonichthys* est peut-être monotypique; *Microgerys nyranchi* pourrait être synonyme de *Bryconichthys ellis*; *Hyphobrycon melanopleurus* Ellis est différent de *Hyphobrycon* au sens large.

Dans une note sur le genre *Hyphobrycon*, il est souligné que sa définition actuelle est trop étendue et que le genre doit être restreint à son espèce type, *compressus*; aucun nom de remplacement n'est toutefois proposé dans la présent travail pour les autres espèces; les localités typiques de *Hyphobrycon simulans* et de *Megalomphodus singleri* sont corrigées.

Deux clés de détermination sont proposées: celle du complexe *Monoemus-Gualricichthys-Glandulocanda*, ainsi que celle des genres des *Hemibryconini* discutés dans ce travail.

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ON THE MORPHOLOGY OF THE PHARYNGEAL FILTER OF SOME SPECIES OF THE SUBGENUS BRACHYDANIO

STANISLAV FRANK

Zoologický Ústav Přírod

Fakulty University Karlov

Ichthyology Branch

Praha 2, Vinohrá 7

Czechoslovakia

In most fishes the concave pharyngeal margins of the branchial arches are fringed with a double or single series of cartilaginous or bony tubercles or filaments, the gillrakers. One often assigns an ecological and systematic significance to these gillrakers. But when evaluating some meristic characters (fin rays, number of scales in lateral line) of fishes kept in an aquarium, some doubts arose as to the possibility of correctly determining the species of these fishes according to these marks. For this reason, I have taken up the study of the gillrakers of some species of fishes of the ostariophysian suborders Characinoidei and Cyprinoidi (Frank 1965).

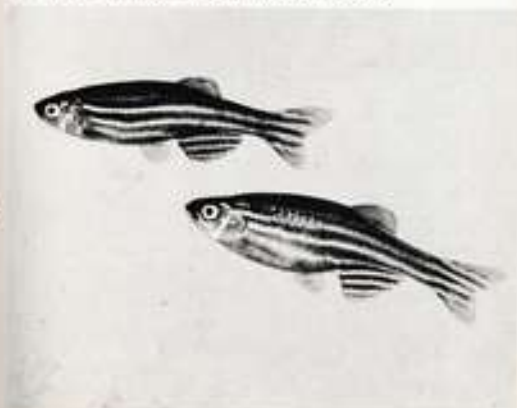


Fig. A.—*Danio* (*Brachydanio*) *rerio*, male above, female below. Photo by Milos Cizek.



Fig. 8.—*Danio* (*Brachydanio*) *frankei*, female above, male below. Photo by Milton Crossin.



Fig. 9.—Hybrid between *Danio* (*Brachydanio*) *rerio* male and *Danio* (*Brachydanio*) *frankei* female (first filial generation), male above, female below. Photo by Milton Crossin.

At first many authors regarded the gillrakers as a mechanical filter protecting the respiratory organs, the gill filaments or lamellae, from dirt and alien bodies entering the mouth with the current of water. Some recent authors directed their attention farther to the interesting structure of this organ, often considerably different even in closely related species of fishes living in different life conditions. Thus, it was discovered that in planktonophagous fishes these gillrakers for straining from the water small pelagic organisms were far more developed (it forms a much thicker sieve) than in species feeding typically on the fauna of the bottom, or in predatory fishes in which the gillrakers were often missing. On the basis of observations of different species of fishes, many papers came into existence in which the authors investigated the origin, development, and morphology of this pharyngeal filter from different points of view.

We shall direct our attention only to three species of the subgenus *Brachydanio*, belonging to the genus *Danio* (as to the systematic position see Smith 1945: 95-97), namely: *Danio* (*Brachydanio*) *rerio*, *Danio* (*Brachydanio*) *nigrofasciatus* and *Danio* (*Brachydanio*) *frankei*. During the last two years, opinions have been expressed (e.g. Haux 1964, Eick 1965, Táborčík 1965) that the species *Danio* (*Brachydanio*) *frankei* is only a subspecies or a color variation of the species *Danio* (*Brachydanio*) *rerio*.



Fig. 10.—*Danio* (*Brachydanio*) *nigrofasciatus*, two females above left, male below right. Photo by Milton Crossin.

On studying the gillrakers of the three species in question, I have observed as follows:

1—In the species *D.(B.) variis* the gill tubercles on the branchial arches are in two series, the same as in the remaining two species. It does not make any difference whether it is a matter of fishes coming directly from native waters or kept for a number of generations in an aquarium, the number of gillrakers in the front and back series on the first left branchial arch is identical. The range (between lower and upper limit) of the number of gillrakers remains within the limits of species variability (see table 1). Likewise, the form and the structure of the distribution of the gillrakers on the branchial arch are identical (see fig. 1 and 2).

2—The species *D.(B.) franki* in the number of gillrakers in the front series strikingly approaches the species *D.(B.) nigrofasciatus* (see table). However, this is even more evident from the form and the manner of distribution of the front as well as the back series of gillrakers (see fig. 3 and 5).

3—In hybrids *D.(B.) variis* x *D.(B.) franki* there was a striking drop in the number of gillrakers (see table and fig. 4). The small number of gill tubercles is, from the genetic point of view, a manifestation of the dominant characteristic of the species *D.(B.) franki*, even though in other respects the

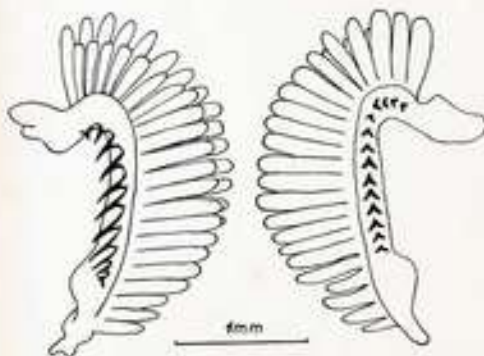


Fig. 1.—Examples of the arrangement of the front and back series of gill tubercles on the first left branchial arch in a *Danio (Brachydanio) rerio* with a body length of 22 mm. Specimens collected by Fischer von Martell Expedition in India.

Table 1. Number of gill tubercles on the first left branchial arch.

Fish species	Number of fish	Body length in mm	Front series of gill tubercles										Back series of gill tubercles									
			7	8	9	10	11	12	13	Average	12	13	14	15	16	Average						
<i>Danio (Brachydanio) rerio</i> (Singapore)	8	20 (20-21)	1	2	2	1	13.5	4	2	13.5												
<i>Danio (Brachydanio) rerio</i> (Singapore-Malaya)*	2	22					11-	1	1	13.5												
<i>Danio (Brachydanio) rerio</i> (Singapore-Malaya)	91	21 (17-20)	1	20	54	30	6.6	9	17	47	23	1	14-									
Hybrid— <i>Danio (Brachydanio) rerio</i> x <i>Danio (Brachydanio) franki</i> (Singapore) by Thersfelder	4	21 (19-20)	1	4	1		6-	3	4	1												
<i>Danio (Brachydanio) nigrofasciatus</i> (Singapore)	21	20 (17-20)	5	7	9	1	6.5	2	5	8	7											

* Financed by the courtesy of Mr. Altkovner

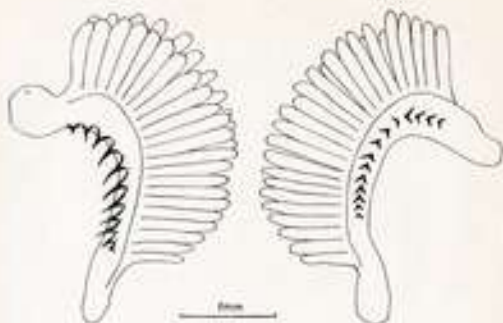


Fig. 1.—Example of the arrangement of the front and back series of gill rakers on the first left branchial arch in a *Danio (Brachydanio) rerio* with a body length of 29 mm. From the head for several generations in an aquarium.

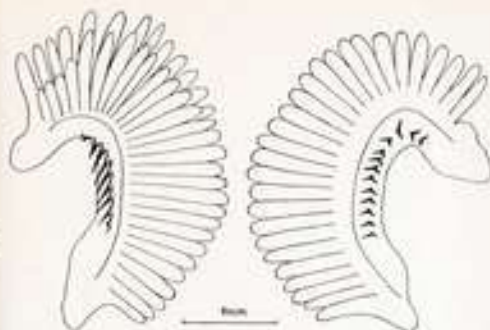


Fig. 4.—Example of the arrangement of the front and back series of gill rakers on the first left branchial arch in a hybrid *Danio (Brachydanio rerio male and Danio (Brachydanio) aequipinnatus female)* with a body length of 29 mm. Aquarium-born and raised fish.

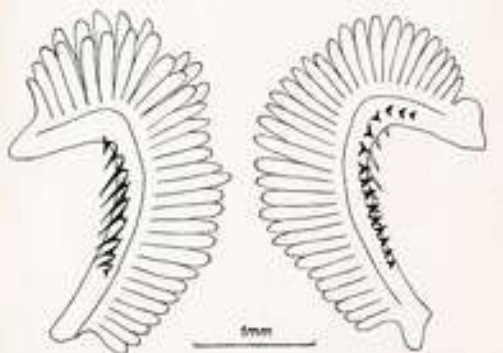


Fig. 2.—Example of the arrangement of the front and back series of gill rakers on the first left branchial arch in a *Danio (Brachydanio) aequipinnatus* with a body length of 23 mm. Aquarium-born and raised fish.

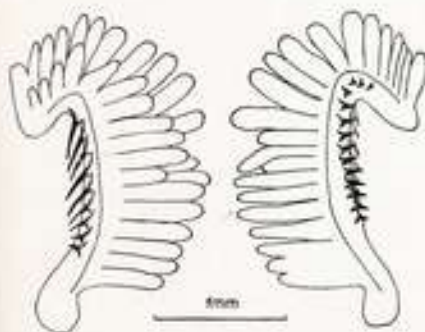


Fig. 3.—Example of the arrangement of the front and back series of gill rakers on the first left branchial arch in a *Danio (Brachydanio) nigrofasciatus* with a body length of 20 mm. Aquarium-born and raised fish.

hybrids of the first filial generation remind one, with their external appearance, of the species *D.(B.) vieis* (Petrovsky 1964 and 1965).

From observations of the gillrakers of the mentioned three species of the genus *Danio* it follows, consequently, that *D.(B.) franki* is much nearer to *D.(B.) nigrofasciatus* than to *D.(B.) vieis*, whose affinity with the first one some authors were taking for granted on the basis of the facility of hybridization of these two species (Hosse 1964, Tábořský 1965). The possibility of getting fertile offspring even in intergeneric hybridization in fishes is no isolated rarity; one may mention, just at random Suzuki's (1962) experiments and results concerning the successful intergeneric hybridization of *Gnathopogon elongatus* x *Pseudorasbora parva* as well as de Wit's (1961) hybridization of *Tanakaia tangata* x *Achellognathus himantopus*.

It is, therefore, impossible to judge the validity or invalidity of the description of *D.(B.) franki* as an independent species on the basis of any individual meristic character or of genetic relations. In consideration of the total quantity of characters which are easily distinguishable from the other species of the genus *Danio*, the very detailed original description by Meinken (1965) has, on the contrary, full validity. The cited articles (above all, Elek 1965 and Tábořský 1965) which throw doubt on the correctness of the description of *D.(B.) franki* as a valid species and not supported by sufficient factual material, seem to the writer to express only the personal and unfounded theoretical opinions of the writers.

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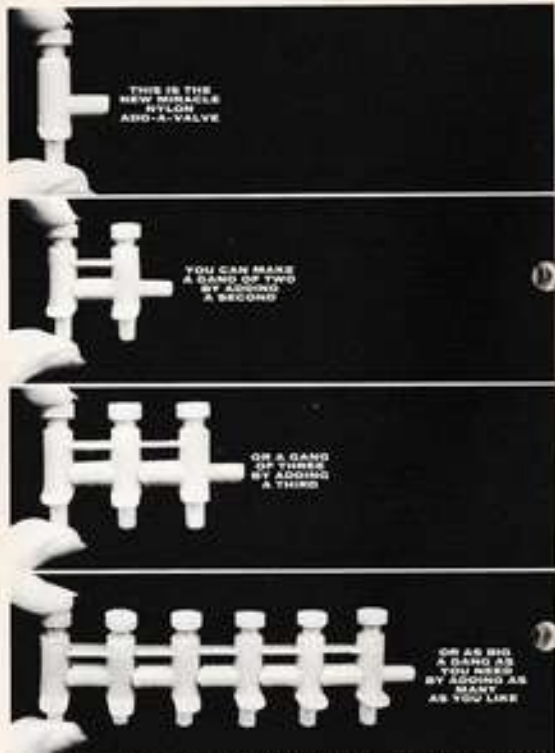
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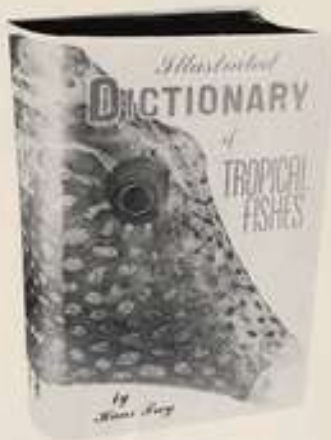
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