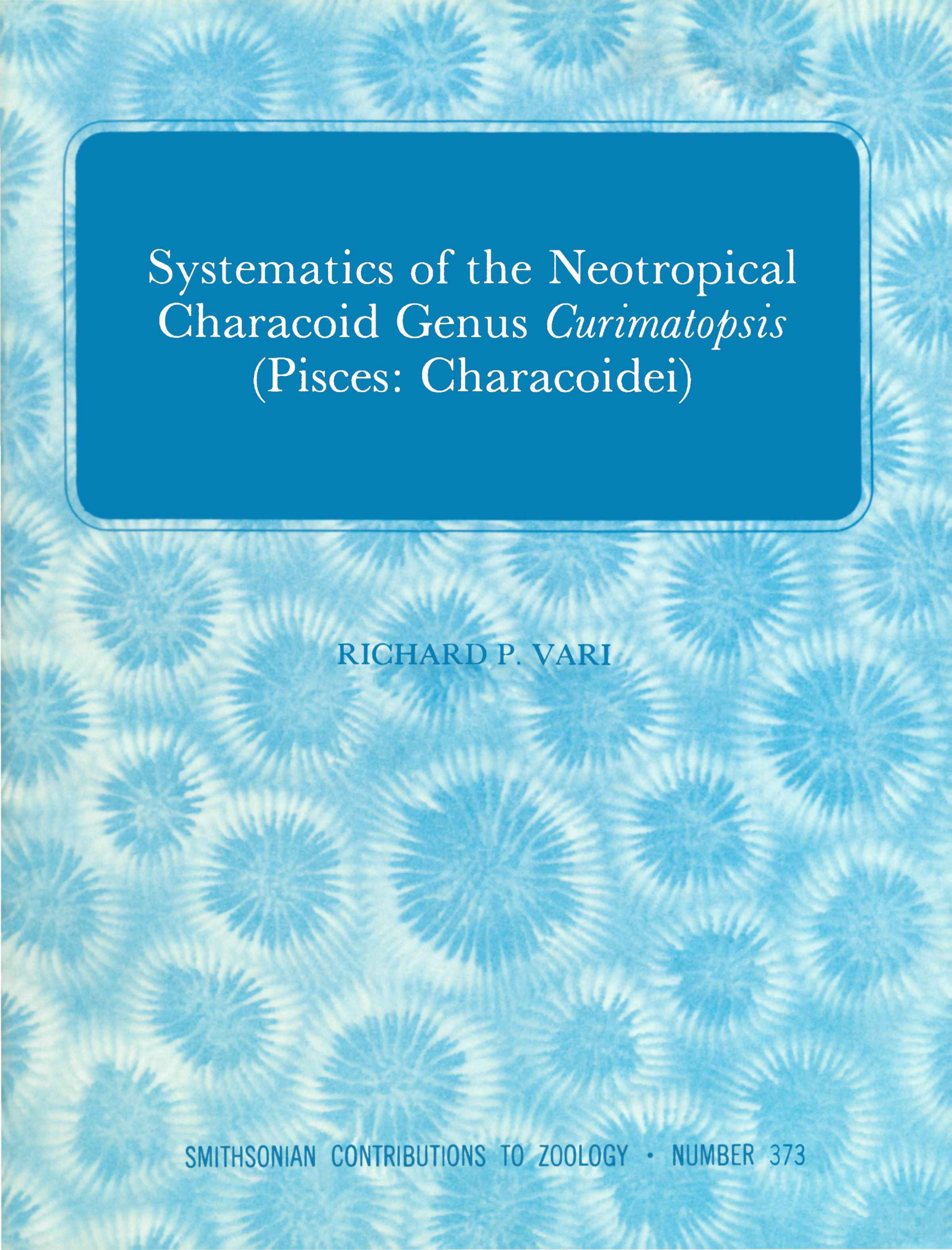

Systematics of the Neotropical Characoid Genus *Curimatopsis* (Pisces: Characoidei)

RICHARD P. VARI

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 373

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ABSTRACT

Vari, Richard P. Systematics of the Neotropical Characoid Genus *Curimatopsis* (Pisces: Characoidei). *Smithsonian Contributions to Zoology*, number 373, 28 pages, 21 figures, 1982.—The curimatid characoid genus *Curimatopsis* is redefined to form a monophyletic assemblage. Four species are recognized in the genus: *Curimatopsis macrolepis* (Steindachner, 1876), *C. microlepis* Eigenmann and Eigenmann, 1889, *C. evelynae* Géry, 1964, and *C. crypticus*, new species. These species share a number of derived osteological characters and form the sister group to all other members of the family. Synapomorphies unique to *Curimatopsis* among curimatids are (a) pronounced sexual dimorphism in caudal peduncle depth with associated modifications in caudal osteology, (b) morphology of the suspensorium, in particular the metapterygoid-quadrate fenestra, and (c) certain modifications of the dermal bones, particularly the absence of any discrete antorbital ossification.

Curimatichthys, created by Fernandez-Yepez (1948) for *C. microlepsis*, is placed into the synonymy of *Curimatopsis. Curimatopsis macrocephalus* Ahl, 1931, is considered a junior synomym of *C. macrolepis* (Steindachner). *Curimatopsis maculatus* Ahl, 1934, and *C. saladensis* Meinken, 1933, are more closely related to curimatids outside of *Curimatopsis* and are excluded from the genus. The two species of *Hemicurimata* considered by Fernandez-Yepez to form the group most closely related to *Curimatopsis* were found to be based on juveniles of *Psectrogaster amazonica* Eigenmann and Eigenmann and *Curimata spilura* Gunther. Each of the latter species in turn is more closely related to curimatid species outside of *Curimatopsis*.

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Contents

Systematics of the Neotropical Characoid Genus *Curimatopsis* (Pisces: Characoidei)

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Introduction

Steindachner (1876) first proposed the subgenus *Curimatopsis* in his description of the type-species *C. macrolepis* from the central portion of the Amazon River basin. In their revision of the Curimatidae, Eigenmann and Eigenmann (1889a) recognized *Curimatopsis* as a genus and described a second species, *C. microlepis*, based on a single specimen from Jatuarana, Brazil. Eigenmann (1912) subsequently reported on what he considered to be *C. macrolepis* from a number of sites in British Guiana (Guyana), and Myers (1929) described the pronounced sexual dimorphism that is present in Amazonian specimens he considered to be that same species. Except for these citations, little taxonomic activity involving the genus occurred until the description of *Curimatopsis macrocephalus* by Ahl in 1931, followed soon thereafter by the descriptions of *C. saladensis* Meinken (1933), *C. maculatus* Ahl (1934), and more recently *C. evelynae* Géry (1964a). These nominal *Curimatopsis* species formed a poorly defined assemblage reported from widely scattered localities in cis-Andean Neotropical fresh waters.

The primary basis for the association of these species in *Curimatopsis* was their common possession of a truncated pored lateral line. Arguing against the usefulness of this character as evidence of relationship were the data presented by various researchers (Eigenmann, 1914; Myers in Eigenmann and Myers, 1929) who had noted that the laterosensory canal system is ontogenetically and phylogenetically quite labile in its development within numerous groups of characoids. Those authors consequently suggested that caution be exercised in utilizing this character as an indicator of phylogenetic relationships, a caveat more recently echoed by other researchers (Roberts, 1967; Vari and Géry, 1981).

This reticence in placing much phylogenetic significance on the common possession of a reduced laterosensory system on the body was evident when Myers (1929) assigned two species with incompletely pored lateral lines (*Curimata esperanzae* and *C. pearsoni*) to the subgenus *Hemicurimata* of *Curimata*. In his discussion, Myers both questioned the utility of a truncated laterosensory system on the body as an indicator of phylogenetic relationships and noted that the jaw and mouth morphology in *C. esperanzae* and *C. pearsoni* indicated that they were more closely related to species placed at that time in *Curimata* than to the then-known species of *Curimatopsis*.

In his paper on the family Curimatidae, Fernandez-Yepez (1948) proposed a new phylogeny and classification of the family that departed

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Richard P. Vari, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

drastically from earlier taxonomic concepts on the group, including Myers' ideas on the phylogenetic relationships of *Hemicurimata.* In contrast to Myers, Fernandez-Yepez evidently considered the common possession of a truncated pored lateral line to be very significant phylogenetically. He consequently removed *Hemicurimata* from *Curimata* and elevated it to a genus. Within his phylogenetic scheme, *Hemicurimata* was considered to be most closely related to *Curimatopsis. Hemicurimata, Curimatopsis,* and *Curimatichthys* (which he created for *Curimatopsis microlepis* of Eigenmann and Eigenmann) formed the tribe Curimatopsini (Figure 8). Although Fernandez-Yepez' arrangement constituted a significant change from the previous taxonomy of the Curimatidae, he failed to detail the reasoning behind his restructuring of the hypothesized relationships of curimatid species with incompletely pored lateral lines and did not explicitly discuss his criteria for rejecting Myers' arguments for a closer phylogenetic relationship of *Hemicurimata* to *Curimata* rather than to *Curimatopsis.*

Unfortunately neither Myers nor Fernandez-Yepez thoroughly analyzed relationships within the family Curimatidae, and both limited their studies to external characters. In the absence of such a rigorous analysis it was impossible to evaluate the relative merits of their alternative phylogenetic speculations. Consequently the question of the monophyly of both *Curimatopsis* and the Curimatopsini was a matter of considerable uncertainty. The alpha-level taxonomy of the group was similarly poorly understood. Many of the nominal *Curimatopsis* species, particularly those of the German workers of this century, were poorly described, making their recognition difficult, and there was no real understanding of the distribution of most nominal species or of the phylogenetic relationships within the genus and tribe.

This paper is the first of a series dealing with the phylogeny and taxonomy of curimatid characoids. The objective of the study is the definition of the genus *Curimatopsis* as a monophyletic unit, an analysis of the relationships of curimatids with truncated pored lateral lines to other curimatids, and a revision of the included species. Hypotheses of the evolutionary relationships of the group in question are derived following the principles first proposed by Hennig (1966) and since discussed and updated by a variety of authors. Recognized taxa must be monophyletic in that they include all descendants of a hypothesized common ancestor. Monophyletic groups are defined on the basis of the most parsimonious hypothesis of relationships derived from the distribution of shared derived (synapomorphous) characters. Hypotheses of relationship derived from the possession of shared primitive characters (symplesiomorphies) and phylogenetic speculations based on concepts of overall phenetic similarity or degrees of difference are useless for the testing of phylogenetic hypotheses or incongruent with the aims of this study—the advancement of a hypothesis of the phylogenetic history of the taxa under consideration. Detailed discussions of these methodologies can be found in Nelson and Platnick (1980).

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METHODS AND MATERIALS.—Measurements were made with dial calipers, and data recorded to tenths of a millimeter. Methods of measuring follow Hubbs and Lagler (1958), with counts and measurements made on the left side of specimens whenever possible. Counts of total vertebrae were taken from radiographs and cleared-and-stained specimens. This number includes the four vertebrae incorporated into the Weberian apparatus and considers the fused PU_1+PU_2 as a single element. Drawings were made with a Zeiss microscopic camera lucida. Osteological preparations were cleared and counterstained for cartilage and bone, following the methods of Dingerkus and Uhler (1977).

In the descriptions of each species the subunits of the head are presented as a proportion of head length (HL). Head length itself and measurements of body parts are discussed as proportions of standard length (SL). In the counts of median and pelvic fins, lower-case roman numerals indicate unbranched fin rays, and arabic numbers indicate branched fin rays. In all descriptions the range in the values of each count and measurement is presented with the value of the holotype or lectotype for a particular count or measurement indicated in brackets.

In the "Material Examined" section of each species account, data are arranged in the following sequence: number of specimens of the species examined (in parentheses the number of specimens that served as the basis for the presented meristic and morphometric data and the range of standard lengths (in mm) for these specimens), collection locality of specimens, collector (only for new species), institutional abbreviation, catalog number, number of specimens in the lot, and in parentheses the number of specimens in the lot from which counts and measurements were taken if less than the total number of specimens and the standard lengths (in mm) of individuals measured.

The following abbreviations for institutions and collections are used.

AMNH	American Museum of Natural History, New York
ANSP	Academy of Natural Sciences of Philadelphia
BMNH	British Museum (Natural History), London
CAS	California Academy of Sciences, San Francisco
CAS-IU	Indiana University (collections now at CAS)
CAS-SU	Stanford University (collections now at CAS)
GC	Jacques Géry, personal collection (no register numbers)
MCZ	Museum of Comparative Zoology, Cambridge
MNHN	Museum National d'Histoire Naturelle, Paris
MZUSP	Museu do Zoologia, Universidad de São Paulo
NMW	Naturhistorisches Museum, Vienna
UF	University of Florida, Gainsville
USNM	former United States National Museum collections deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

The following abbreviations are used in the figures.

ECT	ectopterygoid	MET	metapterygoid
EP	epurals	NS	neural spine
HS	haemal spines	OP	opercle
HYO	hyomandibular	PAR	parhypural
H	hypural (1 to 6)	PRE	preopercle
IH	interhyal	QUA	quadrate
IO	interopercle	SYM	symplectic
MES	mesopterygoid	URO	uroneural

Phylogenetic Analysis

Steindachner's original description of the subgenus *Curimatopsis* distinguished that then-monotypic taxon from other curimatids on the basis of two characters—a truncated pored lateral line and a lengthened lower jaw that entered into the anterodorsal profile of the snout. Steindachner's diagnostic characters were subsequently incorporated with minor modifications into Eigenmann and Eigenmann's (1889b) redefinition of the taxon as a genus. *Curimatopsis microlepis*, which those authors described in the same paper, agreed with the generic definition in both primary characters. The more recently described nominal *Curimatopsis* species (*C. macrocephalus* Ahl, 1931; *C. saladensis* Meinken, 1933; *C. maculatus* Ahl, 1934; and *C. evelynae* Géry, 1964a) had in common one of these characters, an incomplete laterosensory canal system on the body; however, the terminal or subterminal mouths and the jaws of equal length that characterize all but the first of these species were not in agreement with the second generic character. Although Fernandez-Yepez (1948) used a truncated pored lateral line as a defining character for his tribe Curimatopsini, Myers had previously considered this character to be of questionable value in phylogenetic inferences (in Eigenmann and Myers, 1929) and suggested that it had arisen at least twice among curimatids (Myers, 1929). If Myers was correct, then *Curimatopsis* as utilized by various researchers lacked any defining characters or character combinations and was questionably monophyletic.

The hypothesis of relationships derived from the following phylogenetic analysis necessitates a restriction of *Curimatopsis* to four species, *C. macrolepis* (with *C. macrocephalus* as a synonym), *C. microlepis* (formerly included in *Curimatichtys* by Fernandez-Yepez), *C. crypticus*, and *C. evelynae.* Thus in the following discussion, *Curimatopsis* is used in this more restrictive sense, excluding the other nominal *Curimatopsis* species (*C. maculatus* and *C. saladensis*), which are more closely related to other groups of curimatids.

A number of body systems were examined for information with potential bearing on the question of the monophyly of *Curimatopsis*, the intrageneric phylogeny, and the relationships of the genus to other curimatids. The majority of the characters that provided information useful in advancing a hypothesis of the phylogenetic history of *Curimatopsis* were either osteological or associated with male sexual dimorphism; however, the evident existence of only two specimens of *Curimatopsis microlepis*, a very distinct form, in systematic collections limits the anatomical data on that species to information available from external examination or radiographs. Furthermore, given the skewed sex ratios of *Curimatopsis macrolepis*, *C. crypticus*, and *C. evelynae*, the absence of sexual dimorphism in the extremely limited (two specimens) and unsexable sample of *C. microlepis* cannot be taken as an absence of the phenomena in that species. In the case of characters not amenable to examination under the constraints imposed by the available material, it is assumed that *Curimatopsis microlepis* possesses the shared derived characters of its more inclusive monophyletic group. *Curimatopsis microlepis* has, in common with *C. macrolepis*, a lengthening of the lower jaw and the reorientation of the mouth to a dorso-terminal position that results in the lower jaw entering into the dorsal profile of the head. This modification, which gives these taxa the "cyprinidontiform mouth" commented on by earlier researchers, is unique to these species among curimatids and is considered a synapomorphy for these species. Similarly, both taxa have the postorbital portion of the head lengthened over the typical curimatid condition. On the basis of these shared derived characters and in the absence of conflicting evidence, *Curimatopsis microlepis* and *C. macrolepis* are hypothesized to be sister species. For the purposes of the phylogenetic analysis it is consequently assumed that any apomorphic character common to *C. macrolepis* and the sister taxon of the *C. microlepis–C. macrolepis* assemblage is also synapomorphous for *C. microlepis.*

The pronounced sexual dimorphism in caudal peduncle depth among *Curimatopsis* species is reflected in a series of modifications of the caudal skeleton. These include synapomorphies both at the level of the entire assemblage and of less inclusive groupings. The generalized and hypothesized plesiomorphous form of caudal fin osteology among characoids is comparable to that in females of *Curimatopsis macrolepis* (Figure 1). All six hypurals are separate from one another and autogenous with the exception of hypural 2, which is joined anteriorly to the posteroventral portion of the fused PU_1+U_1. Hypurals 2 and 3 may be separated or in contact anteriorly, but their margins diverge posteriorly. The neural and haemal spines of the second and third preural centra have a central shaft with anterior or posterior flange development limited or absent. All caudal fin rays taper basally without any spurs or projections. The fin rays of the upper and lower lobes of the caudal fin form discrete assemblages, with a distinct median gap between the lobes. The only noteworthy difference in caudal fin osteology between the condition illustrated in Figure 1 and the situation hypothesized plesiomorphous for characoids is the presence of a single set of uroneurals in all *Curimatopsis* species.

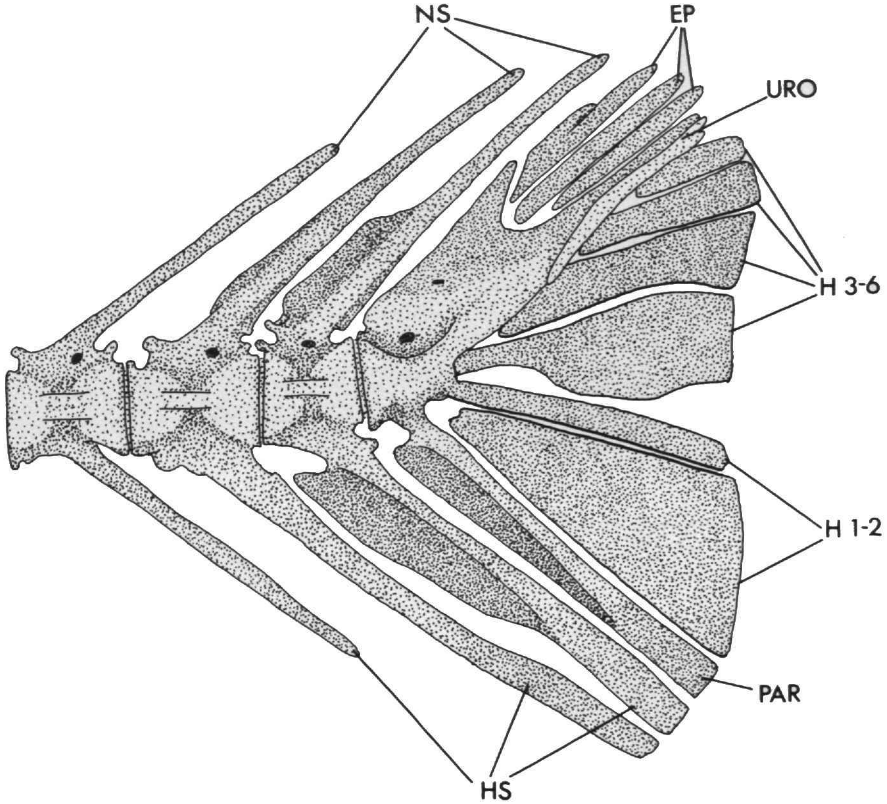

FIGURE 1.—*Curimatopsis macrolepis*, female, caudal osteology.

This is in contrast to the possession of two sets of these elements in other curimatids and most characoids.

Modifications of the caudal osteology pattern described above define *Curimatopsis* and subunits of that assemblage. In males of all *Curimatopsis* species the haemal and particularly the neural spines of the second and third preural centra bear greatly expanded anterior and posterior flanges that form broad platelike processes (Figures 2, 4). The horizontal and vertical elaboration of these elements results in the greatly increased depth of the caudal peduncle that is readily apparent externally in males of these species. Outgroup comparisons and published accounts have not revealed comparable adaptations in any other characoids. Additional synapomorphies in this group of species occur in the form of the caudal fin rays of males. In other characoids and in females of these species all caudal fin rays are smoothly tapered towards the base. Males of *Curimatopsis macrolepis*, *C. evelynae*, *C. crypticus*, and presumably *C. microlepis* have the five or six ventralmost rays of the upper lobe of the caudal fin and the four or five dorsalmost rays of the lower lobe of the fin with distinct lateral spurs basally (Figure 5). These processes serve as points of attachment for segments of the caudal fin musculature. Males of these species additionally have the next to last principal caudal ray of the ventral lobe modified in a unique manner. Contrary to the tapering fin form common to other curimatids and most characoids, this element in *Curimatopsis* is greatly expanded into a vertically thickened structure. Associated with this elaboration is a ventral shift and increase in the curvature of its ventrally

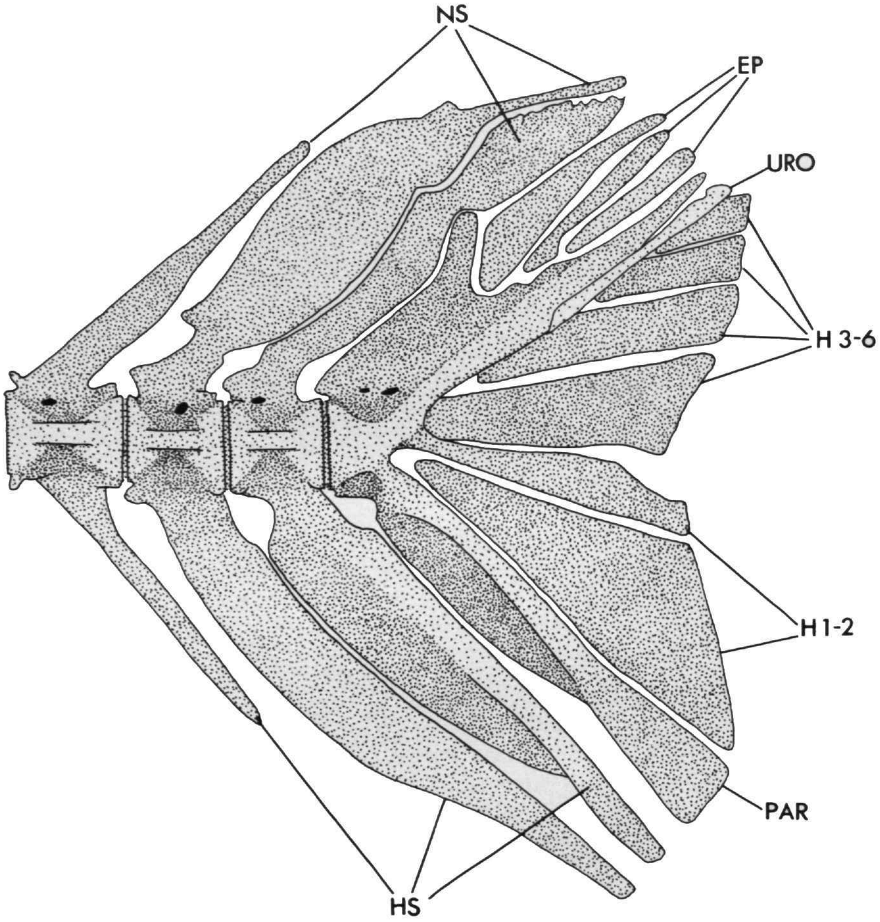

FIGURE 2.—*Curimatopsis macrolepis*, male, caudal osteology.

neighboring fin ray. Although apparent in *Curimatopsis macrolepis*, these alterations of the basic characoid form of these fin rays are most pronounced in *C. crypticus* (Figure 5) and *C. evelynae.* The orientation of the ventralmost ray of the upper caudal fin lobe in *Curimatopsis* also differs from the typical characoid condition. Among other members of the family the middle rays of the upper and lower lobes of the caudal fin are separated by a distinct gap and run roughly parallel to each other. In *Curimatopsis* males, however, the ventralmost ray of the upper caudal lobe is more posteroventrally oriented and has a closer association with the ventral lobe of the caudal than is typical for characoids.

A subunit of the assemblage sharing these synapomorphies demonstrates a further derived state of the above caudal form. In both males and females of *Curimatopsis evelynae* and *C. crypticus*, the first and second hypurals are fused into a single element (Figures 3, 4). Contrary to the plesiomorphous condition, hypural 2 is no longer joined to the fused PU_1+U_1. Furthermore, in the males of these species the resulting autogenous plate is closely approximated to the ventral surface of hypural 3 with irregular interdigitations joining these elements along the posterior portions of their common margins (Figure 4). An autogenous fused first and second hypural plate does not

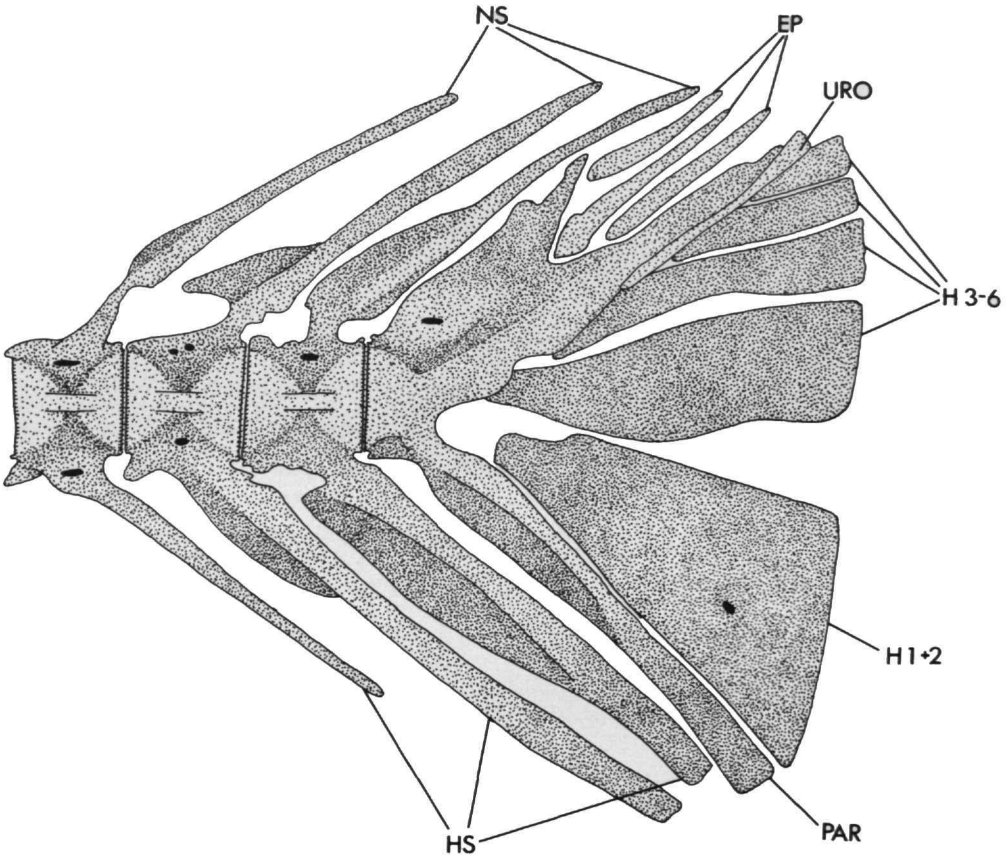

FIGURE 3.—*Curimatopsis crypticus*, new species, female, caudal osteology.

occur elsewhere within the Curimatidae, although it is found in various other groups of characoids, including citharinids and distichodontids (Vari, 1979), hemiodontids (Roberts, 1974), the African characoid genus *Lepidarchus* (Roberts, 1966), some members of the cynodontini (Vari, 1979), and various serrasalmines (Géry, 1972). Available information on characoid phylogeny indicates that each of the above groups is most closely related to subunits of the Characoidea retaining the plesiomorphous condition of separate hypurals 1 and 2 with the latter elements joined to the fused PU_1+U_1. Thus, the occurrence of an autogenous plate resulting from the fusion of the first and second hypurals, although homoplastic within characoids, is nonetheless most parsimoniously considered a synapomorphy for these *Curimatopsis* species. Interdigitations between the posterior portions of the closely opposed margins of hypurals 2 and 3 that characterize males of *Curimatopsis crypticus* and *C. evelynae* are an evidently unique synapomorphic condition for these species.

A second osteological system of importance for the elucidation of relationships within *Curimatopsis* is the suspensorium, in particular the metapterygoid-quadrate fenestra (Figure 6). The fenestra is usually a large, rotund or horizontally oblong aperture in the middle portion of the suspensorium. Such an opening has a widespread phylogenetic distribution within the suborder Characoidea and also occurs in some other ostar-

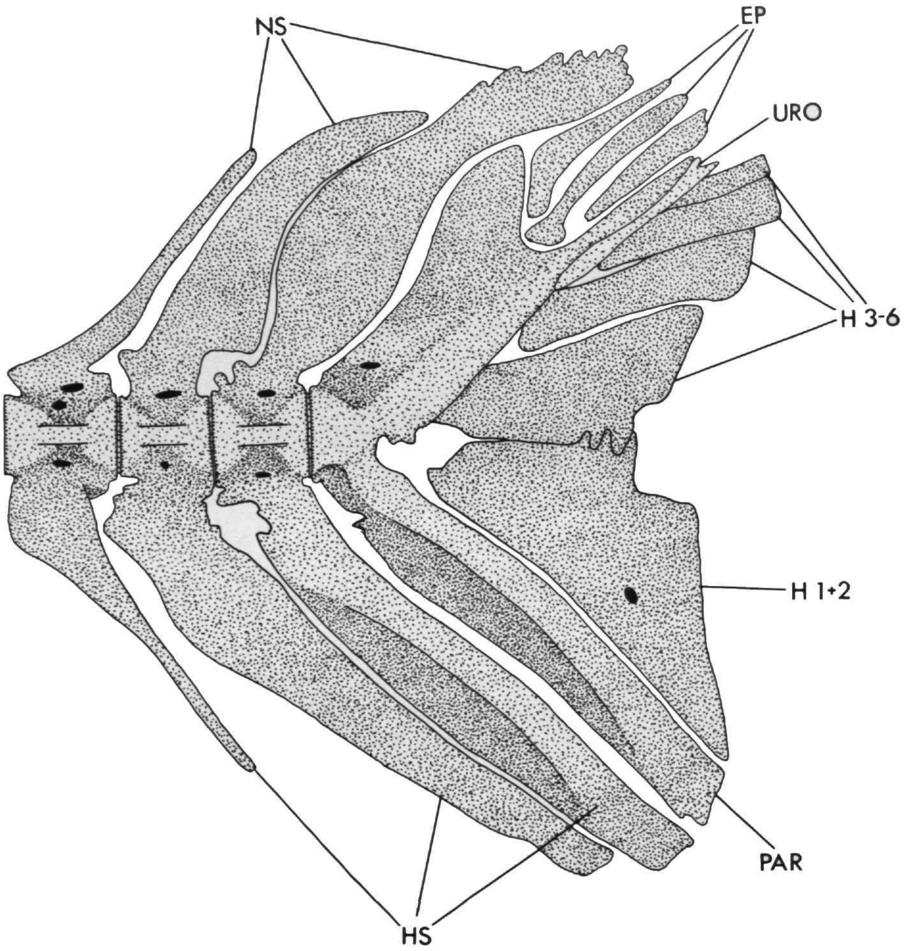

FIGURE 4.—*Curimatopsis crypticus*, new species, male, caudal osteology.

iophysans. The most common and hypothesized plesiomorphous condition of the fenestra has the opening delimited by the metapterygoid dorsally and posteriorly and by the quadrate anteriorly and ventrally, with the symplectic contributing to its posteroventral margin (see Weitzman, 1962; Figure 10). This form of fenestra occurs in at least some members of the family Curimatidae and would appear to represent the primitive condition of this system for the family. In contrast, the four *Curimatopsis* species under question have the metapterygoid expanded ventrally and the posterior part of the symplectic shifted dorsally. This apomorphous alteration of this portion of the suspensorium (Figure 6) is unique to these species among curimatids and results in the near elimination of the fenestra.

The final set of derived characters common to *Curimatopsis* species involves the dermal bones of the head and in some cases their associated sensory canals. Most significant is the absence of any discrete antorbital ossification in these species. This ossification is not only present in all other species of curimatids examined but in all other characoids as far as is known. These four species also have in common a reduction of the size of

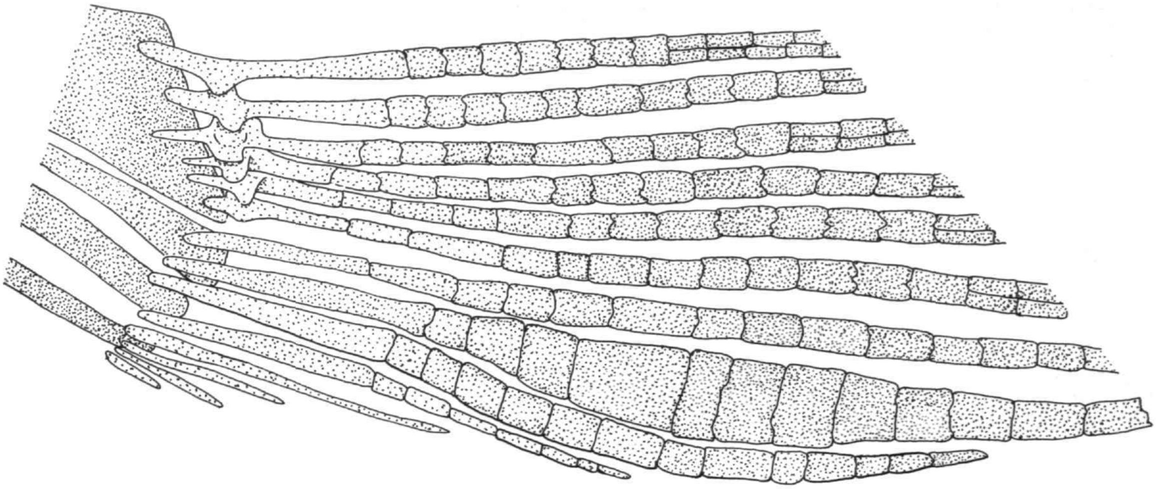

FIGURE 5.—*Curimatopsis crypticus*, new species, male, lower lobe of caudal fin showing enlarged penultimate principal caudal ray and basal spurs on middle rays.

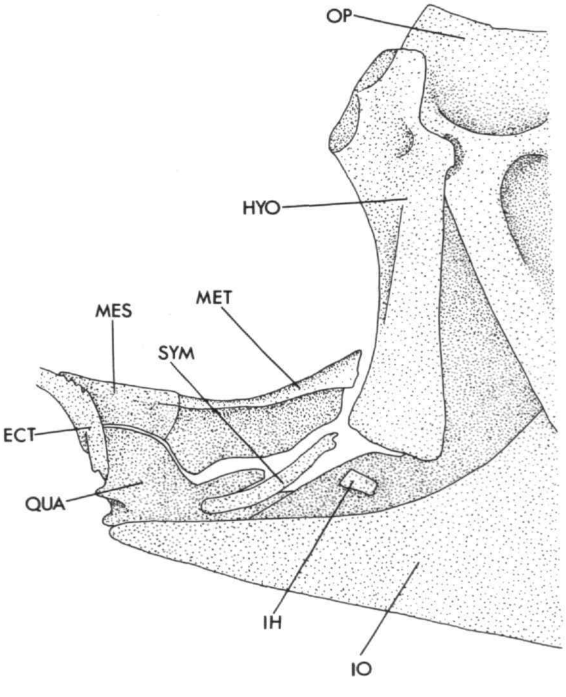

FIGURE 6.—*Curimatopsis macrolepis*, posterior portion of suspensorium and anterior section of opercular apparatus, right side, medial view.

the supraorbital, a less pronounced development of infraorbital 6 (the dermosphenotic), and a simplification of the laterosensory canal in infraorbital 6 to a single tube rather than the tripartite system plesiomorphous for characoids. These last three characters are considered apomorphous for these species, although information on characoid phylogeny indicates that they have arisen independently in other groups within the suborder.

Figure 7 presents the synapomorphy scheme for *Curimatopsis* based on the information discussed above. On the basis of available evidence it is hypothesized that *Curimatopsis macrolepis, C. microlepis, C. crypticus*, and *C. evelynae* form a monophyletic subunit of the family Curimatidae. Within this assemblage two less inclusive subunits are defined by their possession of synapomorphies having more restricted phylogenetic distributions. *Curimatopsis macrolepis* and *C. microlepis* are considered to have a sister group relationship. The assemblage that they consistute is most closely related to the lineage consisting of *C. crypticus* and *C. evelynae*. Interestingly, *Curimatopsis crypticus*, which a number of researchers have mistakenly identified as *C. macrolepis*, is not most closely related to the latter species but rather to *C. evelynae*.

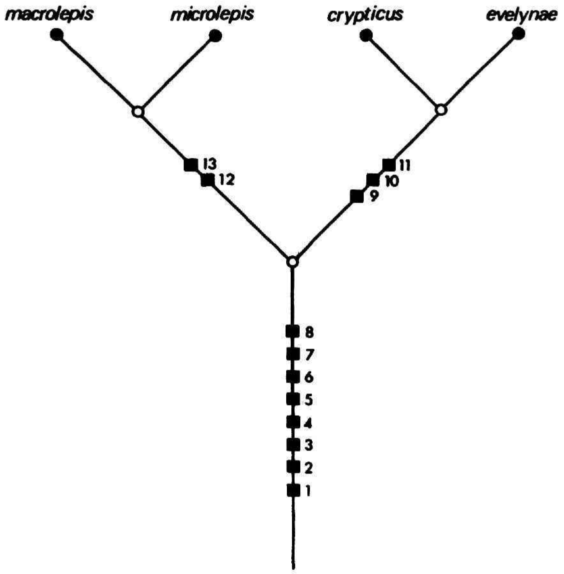

FIGURE 7.—Distribution of synapomorphies within *Curimatopsis*: (1) expansion of posterior neural and haemal spines in males, (2) presence of basal spurs on middle caudal rays in males, (3) expansion of penultimate principal caudal ray of lower caudal lobe in males, (4) ventral orientation of ventralmost ray of upper caudal fin lobe, (5) expansion of metapterygoid and reduction of metapterygoid-quadrate fenestra, (6) reduction to a single pair of uroneurals, (7) loss of antorbital, (8) reduction of dormosphenotic and supraorbital, (9) pronounced expansion of penultimate principal caudal ray of lower caudal lobe of males, (10) hypural 2 autogenous from PU_1+U_1 and fused to hypural 1, (11) contact in males of hypural 3 and fused hypural 1 and 2 with development posteriorly of interdigitations between these elements, (12) expansion of postorbital portion of head, (13) mouth terminal and upturned.

The only author to present a detailed phylogenetic tree of those curimatids characterized by a truncated lateral line was Fernandez-Yepez (1948), who united all nominal curimatid species sharing that character in his tribe Curimatopsini. The phylogenetic concepts of that author as taken from his tree detailing relationships within the Curimatidae are presented in Figure 8. That phylogenetic scheme differs drastically from the hypothesis of relationships arrived at in this study both in arrangement and inclusiveness and in the resultant taxonomic conclusions. *Curimatopsis* as defined by Fernandez-Yepez consisted of four species, *C. macrolepis*, *C. macrocephalus*, *C. saladensis*, and *C. maculatus*. As will be discussed in detail below, the last two species are most closely related to curimatids outside of *Curimatopsis*. *Curimatopsis macrocephalus* in turn is considered to be a junior synonym of *C. macrolepis* (see "Remarks" under the latter species). Thus, of his nominal *Curimatopsis* species, only *C. macrolepis* is retained in that genus in this study. *Hemicurimata* was recognized by Fernandez-Yepez as a full genus for species originally described by Myers (1929) as *Curimata (Hemicurimata) esperanzae*, and *C. (H.) pearsoni*. These species were, however, based on juveniles of species that had been previously described as *Psectrogaster amazonica* and *Curimata spilura* respectively. Neither of the latter forms retains an incompletely pored lateral line as an adult, and both are more closely related to curimatids with completely formed lateral lines than to members of *Curimatopsis*.

The exclusion of the nominal *Hemicurimata* species from the Curimatopsini, along with the removal from that assemblage of *Curimatopsis saladensis* and *C. maculatus*, reduces Fernandez-Yepez' phylogenetic scheme to two species each in a separate genus, *Curimatopsis* for *C. macrolepis* and *Curimatichthys* created by Fernandez-Yepez for *Curimatopsis microlepis* of Eigenmann and Eigenmann. Comparison of the tree proposed by Fernandez-Yepez to the phylogenetic scheme arrived at in this study reveals an incompatability be-

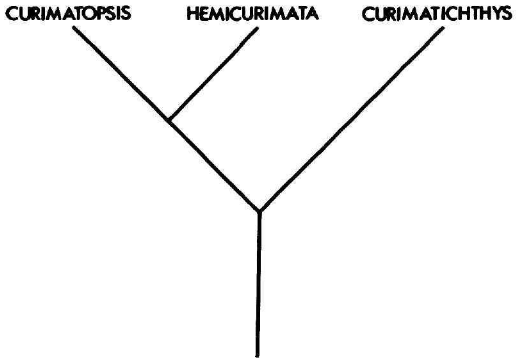

FIGURE 8.—Phylogenetic scheme within the Curimatopsini as proposed by Fernandez-Yepez (1948).

tween his taxonomic treatment of these taxa and a basic principal of classification followed in this study, that all taxa represent a monophyletic group. Fernandez-Yepez presumably utilized a morphological gap concept of generic definition in recognizing *Curimatichthys* as a taxon separate from *Curimatopsis.* The primary factor in the recognition of the genus appears to have been the unique high longitudinal body scale count of its only contained species, *C. microlepis. Curimatopsis* was by default thus defined on the basis of an apparently shared primitive character—the retention of a low longitudinal scale count. Reference to the hypothesized phylogeny of the four *Curimatopsis* species recognized in this study reveals that such a procedure fails to define *Curimatopsis* as a natural assemblage of species. The continued recognition of *Curimatichthys* would result in *Curimatopsis* being nonmonophyletic, since it would not contain all the descendants of its hypothesized common ancestor. *Curimatichthys* is consequently synonymized into *Curimatopsis,* which in this more inclusive sense is now monophyletic.

The four species of *Curimatopsis* recognized in this study form an assemblage whose hypothesized monophyly is highly corroborated by available data. Contrary to previous practice, *Curimatopsis maculatus* Ahl, 1934, and *C. saladensis* Meinken, 1933, are excluded from *Curimatopsis.* Furthermore the species that constituted the genus *Hemicurimata* (*H. esperanzae* and *H. pearsoni*) are not considered to be closely related to *Curimatopsis.* As discussed above, neither *Hemicurimata* nor the two nominal *Curimatopsis* species possess the shared derived characters characteristic of *Curimatopsis.* The lack of the synapomorphies characterizing the genus is not, however, incongruent with the hypothesis that these species are more closely related to *Curimatopsis* than to other curimatids. Rejecting the hypothesis of relationships implicit in the original placement of these species in *Curimatopsis* or explicit in their placement in the Curimatopsini by Fernandez-Yepez (1948) or both requires evidence that their retention in *Curimatopsis* would make that taxon nonmonophyletic. An in-depth analysis of curimatid interrelationships based on a variety of anatomical systems will be the subject of a later paper. Consequently only a brief outline of some of the characters indicating that *Hemicurimata* and the two nominal *Curimatopsis* species of Ahl and Meinken are most closely related phylogenetically to curimatids outside of *Curimatopsis* is presented.

One of the most readily accessible of these characters involves jaw structure, specifically the form of the maxilla. Although adult *Curimatopsis* lack dentition, the form of the maxilla in the members of the genus approximates that of many characoids. The anterior margin of the bone is distinctly convex, and the posterior border relatively straight with no pronounced processes (Figure 9, left). In contradistinction, all other curimatids, including the species excluded from the Curimatopsini in this study, have the anterior margin of the maxilla reduced either to a relatively straight (Figure 9, right) or in some cases a distinctly concave margin. The assemblage defined by the presence of the common possession of this apomorphous maxillary form is also characterized by the presence of a derived posteriorly directed process on the posterodorsal margin of the bone. Both characters are considered apomorphous on the basis of outgroup comparison and indicative of the monophyly of the group formed by all non-*Curimatopsis* curimatids. The above characters, the possession of an elaborate fourth epibranchial, the presence of a specialized ligament joining the suspensorium and the neu-

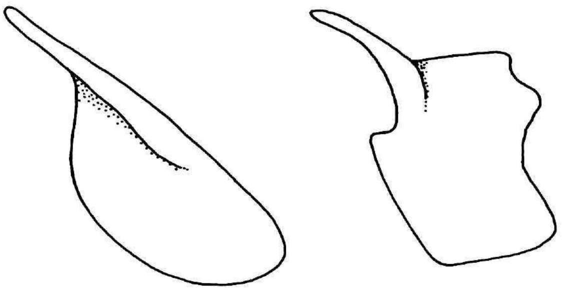

FIGURE 9.—Maxillary form in *Curimatopsis macrolepis* (left) and *Curimata altamazonica* (right).

rocranium, and other derived adaptations all are congruent with the hypothesis that the two nominal *Curimatopsis* species described by Ahl and Meinken, along with *Hemicurimata* of Fernandez-Yepez, have their closest relatives outside of *Curimatopsis*. This evidence is also congruent with the hypothesis that all non-*Curimatopsis* curimatids form a monophyletic assemblage. *Curimatopsis* is thus hypothesized to be the sister group to all other members of the Curimatidae.

Curimatopsis Steindachner

Curimatopsis Steindachner, 1876:81 [proposed as a subgenus; type-species: *Curimatus (Curimatopsis) macrolepis* Steindachner, 1876, by monotypy].

Curimatichthys Fernandez-Yepez, 1948:71 [type-species: *Curimatopsis microlepis* Eigenmann and Eigenmann, 1889a, by original designation].

DIAGNOSIS.—*Curimatopsis* is a distinctive group of small curimatids characterized by an unreduced anterior border of the maxilla and a partially pored lateral line. The pronounced sexual dimorphism in caudal osteology and caudal peduncle depth (situation uncertain in *Curimatopsis microlepis*), the reduced supraorbital, a loss of uroneural 2, a reduction of the laterosensory canal system in infraorbital 6, a loss of the antorbital, and a reduction of the metapterygoid-quadrate fenestra as a consequence of the expansion of the metapterygoid are apomorphies distinguishing the genus within the family. Rayed dorsal fin rays ii,8,i or ii,9; anal fin rays ii,7–8 or ii,7,i or iii,8; pectoral fin rays 12 to 17; pelvic fin rays i,6,i, or i,7,i; adipose fin always present. Scales in a longitudinal series from supracleithrum to hypural joint ranging from 24 to 63, with 3 to 13 pored lateral line scales. Total number of vertebrae 28 to 30. A single row of conical dentition in each jaw of postlarvae, but no jaw teeth present in the adults. Sex ratios greatly skewed, with males relatively rare and never forming more than 20% of the material examined.

REMARKS.—The definition of *Curimatopsis* proposed here is more restrictive than that of Meinken, Ahl, and Fernandez-Yepez, who included two other species in the genus. As discussed previously, the available information on relationships within the Curimatidae supports the hypothesis that those additional species are more closely related to groups outside of *Curimatopsis* than they are to members of that genus. The continued recognition of *Curimatichthys*, which was created by Fernandez-Yepez for *Curimatopsis microlepis* Eigenmann and Eigenmann, would result in *Curimatopsis* being a nonmonophyletic taxon. *Curimatichthys* is consequently synonymized into *Curimatopsis*, which in this more inclusive sense now forms a monophyletic assemblage (see "Phylogenetic Analysis").

Key to the Species of the Genus *Curimatopsis*

1. Fifty-seven to 63 scales in a longitudinal series from supracleithrum to hypural joint; 12 or 13 pored lateral line scales; approximately 25 scales in a transverse series extending posteriorly from origin of rayed dorsal fin to midventral line .... ***C. microlepis***

   Twenty-four to 30 scales in a longitudinal series from supracleithrum to hypural joint; 3 to 5 pored lateral lines scales; 11 to 13 scales in a transverse series extending posteriorly from origin of rayed dorsal fin to midventral line 2

2. Lower jaw longer than upper and overlapping anterior portion of upper lip; dorsal profile of head nearly straight to tip of upper jaw; hypurals 1 and 2 separate; postorbital portion of head 0.45–0.53 of head length .... ***C. macrolepis***

Lower jaw not longer than upper and not overlapping the anterior portion of the upper lip; dorsal profile of head gently curved, particularly anteriorly; hypurals 1 and 2 fused; postorbital portion of head 0.39–0.44 of head length 3

3. Posterior nostril rounded or slightly transversely elongate; distance between anterior and posterior nostrils equal to or greater than diameter of anterior nostril; caudal peduncle unmarked or with a patch of faint chromatophores, if marking on the caudal peduncle present it is in the form of an horizontally elongate spot centered below the lateral midline .... ***C. evelynae***

Posterior nostril crescent-shaped; distance between anterior and posterior nostrils less than diameter of anterior nostril; caudal peduncle with a prominent spot centered on lateral midline .. ***C. crypticus*, new species**

Curimatopsis macrolepis (Steindachner)

FIGURES 10–12

Curimatus (Curimatopsis) macrolepis Steindachner, 1876:81 [type-locality: Brazil, Tabatinga, Manacapuru, mouth of the Rio Negro].

Curimatopsis macrolepis.—Eigenmann and Eigenmann, 1889b:414 [Brazil, Tabatinga, Lake Hyanuary, Codajas]; 1891:45 [listed].—Eigenmann, 1910:420 [listed].—Cockerell, 1914:94 [scale anatomy].—Pearson, 1924:26 [in part, Bolivia, Lake Rogoagua, Reyes, and one specimen from Cachuela Esperanza].—Myers, 1929:618 [? in part, Santarem; Sexual dimorphism].—Fowler, 1940:98 [listed]; 1950:298 [bibliography]; 1975:376 [listed].—Fernandez-Yepez, 1948:69, fig. 36 [placement in Curimatopsini].—Géry, 1964a:48 [in part, middle Amazon]; 1964b:66, fig. 16 [Colombia, Leticia; Peru; Brazil, Tabatinga].—Urquidi, 1970:31 [listed]. [Not Eigenmann, 1912; Boeseman, 1952; Hoedeman, 1974.]

Curimata esperanzae.—Myers, 1929:620 [in part, one specimen from Bolivia, Cachuela Esperanza].

Curimatopsis macrocephalus Ahl, 1931:207, fig. 1 [type-locality: Amazon River].—Fernandez-Yepez, 1948:69 [listed].—Fowler, 1975:376 [listed].

DIAGNOSIS.—A stout-bodied *Curimatopsis* species that reaches 62 mm SL. This species is readily distinguished from its closest relative, *C. microlepis*, by its relatively larger scales (24 to 30 in a longitudinal series from the supracleithrum to the hypural joint, in contrast to 57 to 63 in *C. microlepis*), lower number of pored lateral line scales (3 to 6 in contrast to 10 to 12), and by the presence of a dark, longitudinally elongate spot on the lateral surface of the caudal peduncle. *Curimatopsis macrolepis* can be differentiated from the remaining species in the genus (*C. evelynae* and *C. crypticus*) by the longer postorbital portion of the head (0.45–0.53 of HL in contrast to 0.40–0.44), the lower jaw longer than the upper with the lower lip overlapping the upper lip anteriorly, the nearly straight dorsal profile of the anterior portion of head, and the lack of fusion between hypurals 1 and 2.

DESCRIPTION.—Body moderately elongate, slightly compressed. Dorsal profile of head straight. Dorsal profile of body smoothly curved from rear of head to dorsal portion of caudal peduncle. Dorsal body surface anterior and posterior to rayed dorsal fin without longitudinal keels. Ventral profile of body smoothly arched. Prepelvic ventral region of body somewhat flattened, but without definite longitudinal keels laterally. Ventral body surface posterior to insertion of pelvic fin transversely rounded. Greatest body depth at origin of rayed dorsal fin, 0.33–0.40 [0.40], body depth increasing allometrically with size; snout tip to origin of rayed dorsal fin 0.48–0.54 [0.51]; snout tip to origin of anal fin 0.80–0.86 [0.82]; snout tip to insertion of pelvic fin 0.58–0.63 [0.60]; snout tip to anus 0.75–0.80 [0.77]; origin of rayed dorsal fin to hypural joint 0.48–0.55 [0.55]. Rayed dorsal fin pointed, anteriormost rays more than twice length of ultimate rays. Pectoral fin pointed, length of pectoral fin 0.18–0.23 [0.18], reaching about three-quarters distance to insertion of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.19–0.24 [0.20],

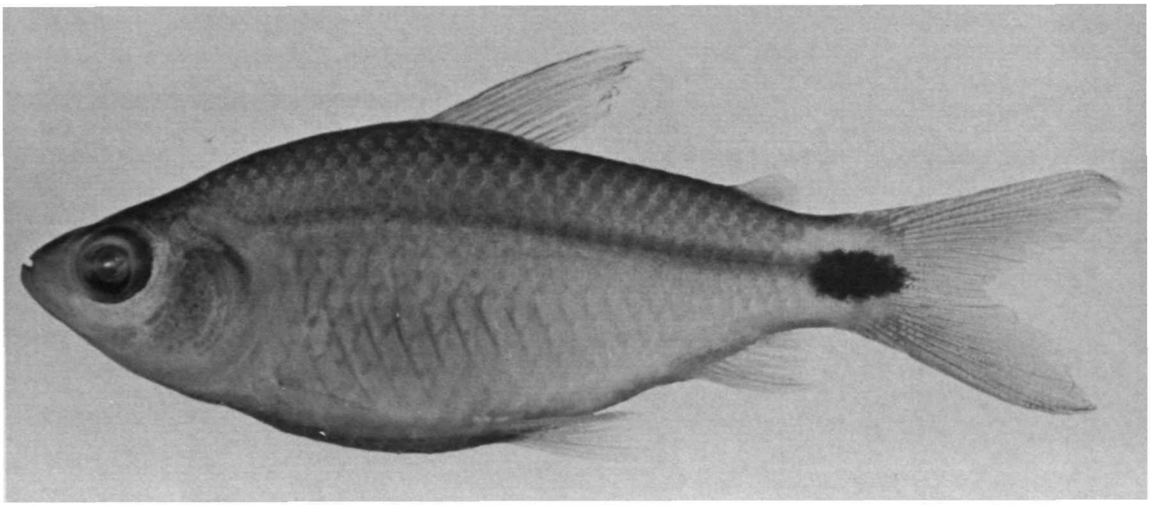

FIGURE 10.—*Curimatopsis macrolepis*, female, AMNH 45093.

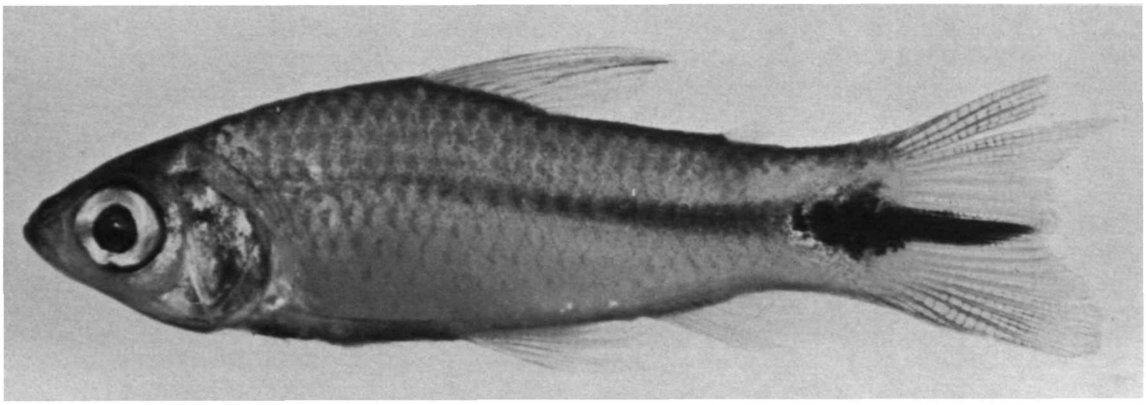

FIGURE 11.—*Curimatopsis macrolepis*, male, USNM 228354.

reaching three-quarters distance to origin of anal fin. Caudal peduncle depth sexually dimorphic, peduncle depth 0.12-0.15 [0.15] in females, 0.15-0.17 in males. Caudal fin scaled only at base. Caudal fin form sexually dimorphic, bifid in females, middle caudal rays slightly elongate in males, fin trifid with upper lobe longest.

Head pointed anteriorly, head length 0.34-0.39 [0.34]; lower jaw extending further anteriorly than and slightly overlapping anterior portion of upper jaw; snout length 0.23-0.30 [0.23]; nostrils separated by distance equal to diameter of anterior opening, anterior nostril rounded, posterior crescent-shaped; orbital diameter 0.27-0.34 [0.28]; postorbital portion of head elongate, length 0.45-0.53 [0.49]; gape width 0.27-0.34 [0.29]; interorbital width 0.38-0.45 [0.39].

Twenty-four to 30 [30] scales in a longitudinal series from supracleithrum to hypural joint; 3 to 6 pored lateral line scales, lateral line canals straight; 3 or 4 series of scales extending beyond hypural joint onto caudal fin base; 11 to 13 [13] scales in a transverse series extending posteriorly from the origin of rayed dorsal fin.

Rayed dorsal fin rays ii,8–9 or ii,8,i [ii,9]; anal fin rays ii,7–8 or ii,7,i or iii,8 [ii,7]; pectoral fin rays 13 to 15 [13?]; pelvic fin rays i,6–7,i [i,7,i].

Total vertebrae 28(2), 29(12), 30(3) [29].

Color in Alcohol: Alcohol-fixed specimens with head and body silvery. Formalin-fixed specimens lacking guanine. Head darker dorsally, with scattered large chromatophores on opercle and lower jaw. Body darker dorsally, with scales outlined by small chromatophores. In some darker individuals chromatophore distribution practically uniform, forming a nearly solid pigmentation pattern. Pigmentation less pronounced ventral to lateral midline. A progressively widening lateral stripe running from supracleithrum to midlateral surface of caudal peduncle. Stripe intense silver in alcohol-preserved material. Stripe continuous with a longitudinally elongate spot on midlateral surface of caudal peduncle. Spot extending slightly onto base of middle caudal rays in females, continuous with a stripe on lengthened middle caudal rays in males. Caudal peduncle spot slightly ocellated, ocellation less pronounced in some individuals. Median fins with varying amounts of scattered chromatophores. Pigmentation most pronounced along dorsalmost and ventralmost caudal rays of males, particularly in overall darker individuals. Paired fins hyaline or with scattered chromatophores posterodorsally.

DISTRIBUTION.—Orinoco River basin, Amazon River basin upriver of Santarem (Figure 12).

REMARKS.—Steindachner's original description of *Curimatopsis macrolepis* lists the localities for the species as the mouth of the Rio Negro, Tabatinga, and Manacapuru. Specimens labeled as "types" from Tabatinga (NMW 75992) and Manacapuru (NMW 68766) were located in the Naturhistoriches Museum, Vienna. Probable syntypes from the mouth of the Rio Negro (NMW 67109 and 67110) and Tabatinga (NMW 75991) were also located in the holdings of that institution. The Rio Negro material was collected by Natterer, whereas the specimens from the other localities probably represent Thayer expedition material acquired by Steindachner during his stay at MCZ. A single specimen from Tabatinga, NMW 75992, is designated as the lectotype of the species; and the remaining specimens thus become paralectotypes.

Ahl (1931:307) described a new species, *Curimatopsis macrocephalus*, from the Amazon. He stated that "this species is differentiated from the other two known species by its large head" (my translation); however, the stated head length for *C. macrocephalus* of "3 in body length," a value in agreement with the photograph of the illustrated specimen, approximates the head lengths of the two species (*C. microlepis* and *C. macrolepis*) already described at that time. The longitudinal scale count reported for the species (29) falls within the range for this count of *C. macrolepis*, *C. evelynae* and *C. crypticus* (24 to 30), but not *C. microlepis* (57 to 63); however, the elongate postorbital region of the head and the curved dorsal profile of the head differentiate *C. macrocephalus* from both *C. evelynae* and *C. crypticus*. The holotype of *Curimatopsis macrocephalus* does not appear to be extant (H. J. Paepke, pers. comm.). On the basis of the available evidence, however, the species must be considered a synonym of *C. macrolepis*.

As defined here, *Curimatopsis macrolepis* is known only from the Amazon and Orinoco river basins. Eigenmann (1912:261) reported this species from eight localities on the Atlantic slopes of Guyana. Examination of the material from three of his collections has shown the specimens to be *C. crypticus*, as in all other material examined from the Atlantic drainages of the Guyanas. It is thus probable that the remaining Eigenmann localities, along with the specimens reported on by Boeseman (1952:183) as *C. macrolepis* from Suriman, are actually *C. crypticus*.

Myers (1929:618), in his discussion of sexual dimorphism in *Curimatopsis*, followed Eigenmann in incorrectly considering the Guyanan populations of the genus to be *C. macrolepis*. It is uncertain whether the Amazonian material he examined actually represented *C. macrolepis*. The specimens

FIGURE 12.—Geographic distribution of *Curimatopsis macrolepis.* (Square = type-locality; some symbols represent more than one collecting locality or lot of specimens.)

were collected at Santarem, Brazil, an area that is within the area of distribution of both *C. macrolepis* and *C. crypticus.* Given his failure to note any differences between the Amazonian material and Eigenmann specimens of *C. crypticus* to which he compared them, it seems likely that the individuals from Santarem represented *C. crypticus.*

Pearson (1924:26) listed *Curimatopsis macrolepis* from the Beni region of Bolivia on the basis of 21 specimens from Lake Rogoagua, Reyes, and Cachuela Esperanza. I have been unable to locate the three specimens from the first two localities. Myers (1929), however, confirmed their identification as *C. macrolepis.* Examination of the material from Cachuela Esperanza, which was the basis for Myers' (1929) description of *Curimata esperanza,* has shown that one specimen is actually a *Curimatopsis,* and the remainder juveniles of *Curimata spilura.* Due to the small size and poor condition of the *Curimatopsis* specimen it can only be tentatively identified as *C. macrolepis.* Urquidi's (1970) listing of *Curimatopsis macrolepis* as a member of the Bolivian ichthyofauna appears to be based on Pearson's paper. This citation is tentatively considered to be correct, although the majority of the specimens on which it was based were incorrectly identified or could not be located.

Schindler (1939:275) followed by Ringuelet (1975:72) reported *Curimatopsis macrolepis* from Nueva Germania, Paraguay, in the La Plata drainage. I have been unable to locate the specimens forming the basis for that report. This single unconfirmed report of this species from that drainage system is highly suspect.

Material Examined.—Approximately 435 specimens (77, 24.3–60.0). Colombia: Rio Putumayo, Tarapacoon, AMNH 32946, 3 (38.25–48.6). North of Leticia, UF 23832, 1 (34.5). Leticia, USNM 216827, 1 (36.7). Lomalinda, ANSP 11929, 1 (44.0). Peru: Ucayali River, Cocha Lobo, AMNH 45093, 1 (44.4). Pebas, AMNH 45090, 1 (51.9). Yaguas Yacu, AMNH 45089, 3 (32.5–33.4); AMNH 45088, 2 (30.2–38.9); CAS-SU 59302, 4 (32.0–36.7); CAS-SU 59219, 1 (27.7); CAS-SU 59502, 1 (30.2); CAS-SU 59216, 1 (38.5). Rio Nanay, GC, 5. Iquitos, USNM 190285, 4 (33.8–37.7). Rio Chapulle, GC, 7. No specific locality, CAS-SU 60512, 1 (36.9); CAS-SU 59258, 1 (30.6); CAS-SU 60562, 1 (40.45). Brazil: Tabatinga, NMW 75992, 1 (59.5, lectotype of *Curimatopsis macrolepis*), NMW 75991, 2 (50.0–62.0). Obidos, NMW 68765, 4 (48.4–65.7). Teffe, MCZ 19492, ~ 100. Villa Bella, MCZ 19739, 3. Manacapuru, NMW 98766, 4 (34.7–42.5, paralectotypes of *C. macrolepis*). Lake Hyanuary, MCZ 20266, 148 (5, 29.3–35.7); MCZ 19514, 10 (2, 36.7–40.0). Cudajas, MCZ 20243, 14 (3, 25.3–46.0); MCZ 19739, 3. Jatuarana, MCZ 19976, 15 (5, 33.8–38.0). Rio Urubu, USNM 179559, 6 (38.0–46.0). Vicinity of Manaus, USNM 228687, 4, USNM 220004, 3 (24.3–30.0). Mouth of Rio Negro, NMW 67109, 25 (paralectotypes of *C. macrolepis*); NMW 67110, 15 (paralectotypes of *C. macrolepis*). Rio Negro, Ilha da Tamaguare, USNM 226887, 4; USNM 226890, 4; USNM 226891, 3; USNM 226889, 2 (1, 25.8); USNM 226888, 7 (2, 30.1–34.4); MZUSP 15978-81, 4. Mouth of the Rio Negro, Arirara, MZUSP 15982-83, 2. Rio Negro near Lago Alexo, MCZ 19700, 3. Rio Negro at the Colombian border, AMNH 45091, 1 (45.8). No specific locality, MCZ 20024, 3 (37.1–39.2). Bolivia: Cachuela Esperanza, CAS-IU 17281, 1. Venezuela: Caicara, Orinoco River, AMNH 45092, 1 (29.2). Lower Orinoco River, USNM 226975, 3 (25.0–36.8); USNM 226976, 9; USNM 226911, 2 (29.0–29.9); USNM 226910, 1.

Curimatopsis microlepis Eigenmann and Eigenmann

Figures 13, 14

Curimatopsis microlepis Eigenmann and Eigenmann, 1889a:7 [type-locality: Brazil, Jatuarana]; 1889b:414 [description; Brazil, Jatuarana].—Eigenmann, 1910:420 [listed].—Marlier, 1968:53 [Brazil, Rio Prêto da Eva].

Curimatichthys microlepis.—Fernandez-Yepez, 1948:71 [listed].—Fowler, 1975:376 [listed].

Diagnosis.—An elongate *Curimatopsis* species that reaches 89 mm SL. This species is readily distinguishable from its congeners by the relatively high number of scales in a longitudinal series from the supracleithrum to the hypural joint (57 to 63 vs. 25 to 30 in the remaining species of the genus), the number of pored lateral line scales (10 to 12 in contrast to 2 to 6), and in the number of scales in a transverse series extending posteriorly from the origin of the rayed dorsal fin (25 vs. 10 to 12).

Description.—Body relatively elongate, compressed. Dorsal profile of head straight. Dorsal profile of body gently curved from rear of head to dorsal portion of caudal peduncle. Dorsal body surface anterior and posterior to rayed dorsal fin smoothly arched in the transverse plane. Ventral profile of body smoothly arched. No longitudinal prepelvic or postpelvic keels still visible in specimens, but Eigenmann and Eigenmann (1889b:7) reported the preventral region as flattened. Body deepest at origin of rayed dorsal fin, greatest body depth 0.34–0.35 [0.34]; snout tip to origin of rayed dorsal fin 0.50–0.51 [0.51]; snout tip to origin of anal fin 0.78–0.80 [0.80]; snout tip to insertion of pelvic fin 0.54–0.55 [0.55]; snout tip to anus 0.75–0.79 [0.79]; origin of rayed dorsal fin to hypural joint 0.52–0.54 [0.54]. Rayed dorsal fin pointed, anteriormost rays more than twice length of ultimate rays. Pectoral fin pointed, length of pectoral fin 0.16 [0.16], reaching two-thirds distance to pelvic fin insertion. Pelvic fin pointed, length of pelvic fin 0.18–0.20 [0.18], reaching three-quarters distance to anal fin origin. Depth of caudal peduncle 0.13 [0.13], with

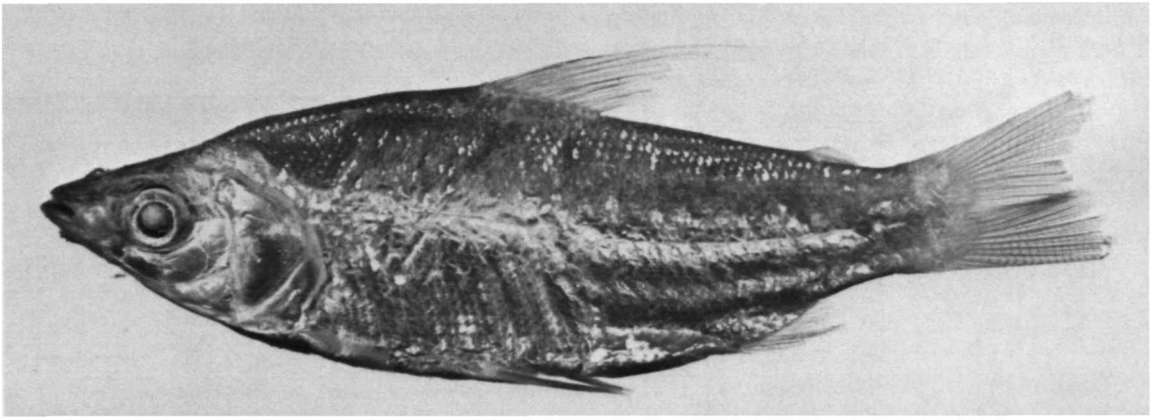

FIGURE 13.—*Curimatopsis microlepis*, holotype, MCZ 20344.

FIGURE 14.—Geographic distribution of *Curimatopsis microlepis*. (Square = type-locality.)

no sexual dimorphism in caudal peduncle depth apparent in limited sample available.

Head pointed anteriorly, head length 0.32 [0.32]; lower jaw extending further anterior than and slightly overlapping anterior portion of upper jaw; snout length 0.26–0.28 [0.28]; nostrils separated by a distance equal to diameter of anterior opening, anterior nostril round, posterior crescent-shaped; orbital diameter 0.27 [0.27]; postorbital portion of head elongate, length 0.47–0.49 [0.49]; gape width 0.29–0.33 [0.33]; interorbital width 0.40–0.43 [0.43].

Specimen partially descaled, approximately 57 to 63 [~57] scales in a longitudinal series from supracleithrum to hypural joint; 12 or 13 [13] pored lateral line scales, lateral line canals straight; 3 series of scales extending beyond hypural joint onto caudal fin base; 13 scales in a transverse series from pored lateral line to origin of rayed dorsal fin [13]; 12 scales in a transverse series from pored lateral line to origin of anal fin [12].

Rayed dorsal fin ii,9; anal fin ii,7–8 [ii,8]; pectoral fin rays 15 to 17 [17]; pelvic fin rays i,7,i; adipose dorsal fin present.

Total vertebrae 29–30 [30].

Color in Alcohol: Both available specimens are faded. Eigenmann and Eigenmann (1889a:6) describe the holotype as "light brown, with iridescent metallic reflections. Margins of the jaws and inner surface of the lower jaw dark brown. A U-shaped dark bar in base of mouth."

DISTRIBUTION.—Central Amazon River Basin (Figure 14).

REMARKS.—This species is very poorly represented in collections, with only two specimens located to date. As a consequence of their poor condition, the sex of the specimens could not be determined. That factor and the limited sample size made it impossible to discover whether *Curimatopsis microlepis* demonstrates the pronounced sexual dimorphism common to all other species in its monophyletic group. I have been unable to confirm the identity of the specimen reported as *Curimatopsis microlepis* by Marlier (1968:53) from Rio Prêto da Eva, Brazil. Pearson (1924:26) reported *C. microlepis* from Cachuela Esperanza, Bolivia. Myers (1929:621) subsequently pointed out that the specimen in question was not *C. microlepis*, a decision confirmed by examination of the individual. Urquidi's listing (1970:31) of *Curimatopsis microlepis* as part of the Bolivian ichthyofauna is evidently based on Pearson's erroneous report.

MATERIAL EXAMINED.—Two specimens, (83.7–89.0). BRAZIL: Jatuarana, MCZ 20344, 1 (83.7, holotype of *Curimatopsis microlepis*). Tonantins, MNHN 09-226, 1 (89.0).

Curimatopsis crypticus, new species

FIGURES 15–18

Curimatopsis macrolepis.—Eigenmann, 1912:260 [British Guiana (Guyana), Maduni Creek, Lama Stop-Off, Rockstone, ?Cave Grove Corner, ?Botanic Gardens, ?Konawaruk, ?Gluck Island, ?Wismar].—Myers, 1929:618 [in part, Guyana; ?Brazil, Santarem, sexual dimorphism].—Boeseman, 1952:183 [Surinam].—Hoedeman, 1974:609, pl. II: fig. 122 [Surinam, breeding].

DIAGNOSIS.—A relatively stout-bodied *Curimatopsis* species reaching 46 mm SL. This species is distinguishable from its nearest relative, *C. evelynae*, in having a crescent-shaped posterior nostril separated from the anterior opening by less than the diameter of the latter aperture. In *C. evelynae* the posterior nostril is a round or slightly transversely elongate opening separated from the anterior nostril by a distance equal to or usually greater than the diameter of the anterior opening. The caudal peduncle spot in *C. crypticus* is more intense than in its sister species and centered in the midlateral plane of the caudal peduncle. In *C. evelynae* the fainter caudal peduncle markings are centered ventral to the midlateral plane of the peduncle or may be lacking totally. Males of *C. crypticus* have the peduncle spot continued onto middle caudal rays as a distinct stripe. *Curimatopsis evelynae* males, in contrast, have only scattered chromatophores on the middle caudal rays. Larger specimens of these species can also be distinguished by the relatively deeper body of *C. crypticus* (see Figure 17). *Curimatopsis crypticus* is

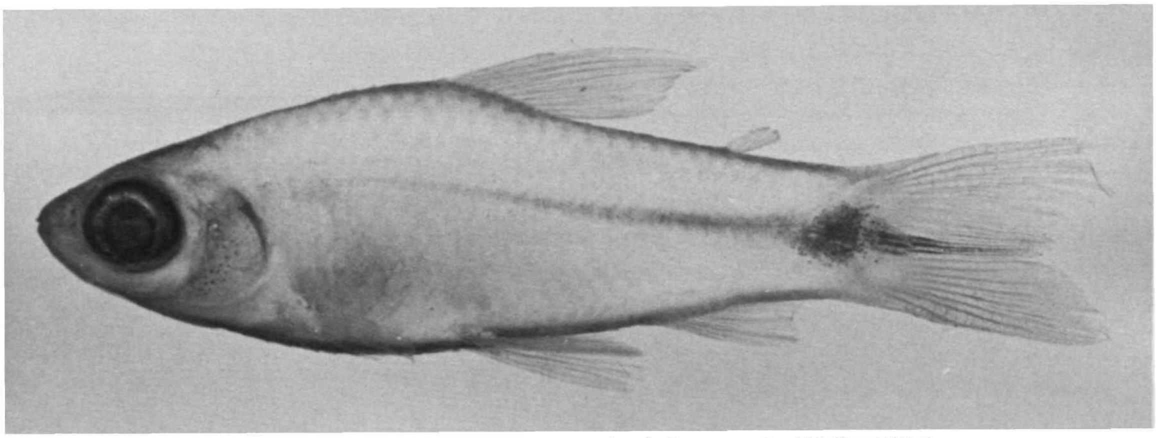

FIGURE 15.—*Curimatopsis crypticus*, new species, holotype, male, USNM 226878.

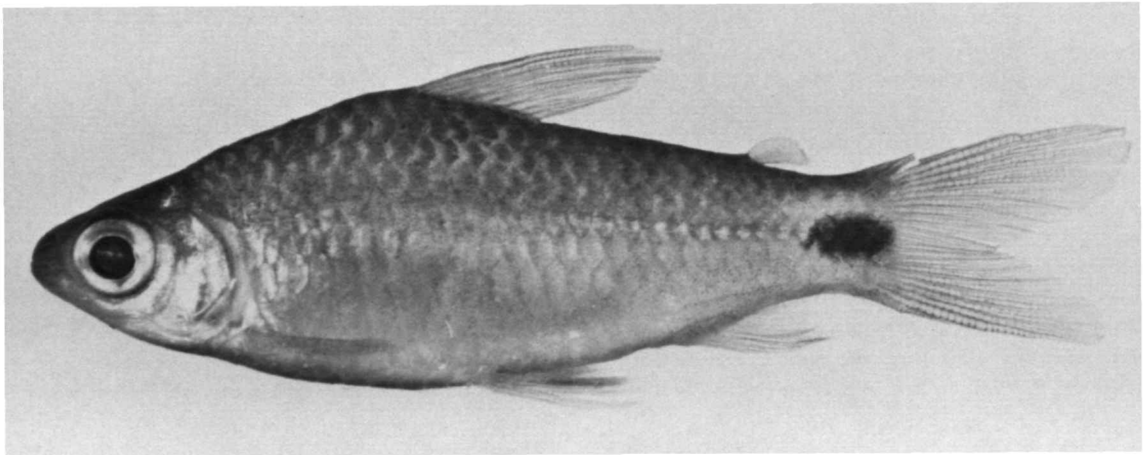

FIGURE 16.—*Curimatopsis crypticus*, new species, female, BMNH 1926.10.27:208-227.

readily distinguished from *C. microlepis* by its lower number of longitudinal body scales (27 to 30 in contrast to 57 to 63). Various researchers have previously misidentified *Curimatopsis crypticus* as *C. macrolepis* (see "Remarks"). These species are readily distinguished by the relatively shorter postorbital portion of the head in *C. crypticus* (0.40–0.44 of HL) than in *C. macrolepis* (0.45–0.53 of HL) and the lack in *C. crypticus* of the overlap of the anterior portion of the upper lip by the lengthened lower jaw that is characteristic of *C. macrolepis*, along with numerous osteological characters (see "Phylogenetic Analysis").

DESCRIPTION.—Body moderately elongate and compressed. Dorsal profile of head straight or slightly convex. Dorsal profile of body nearly straight to origin of rayed dorsal fin, gently convex from that point to base of ultimate dorsal ray and nearly straight from rear of fin to dorsal portion of caudal peduncle. Dorsal surface of

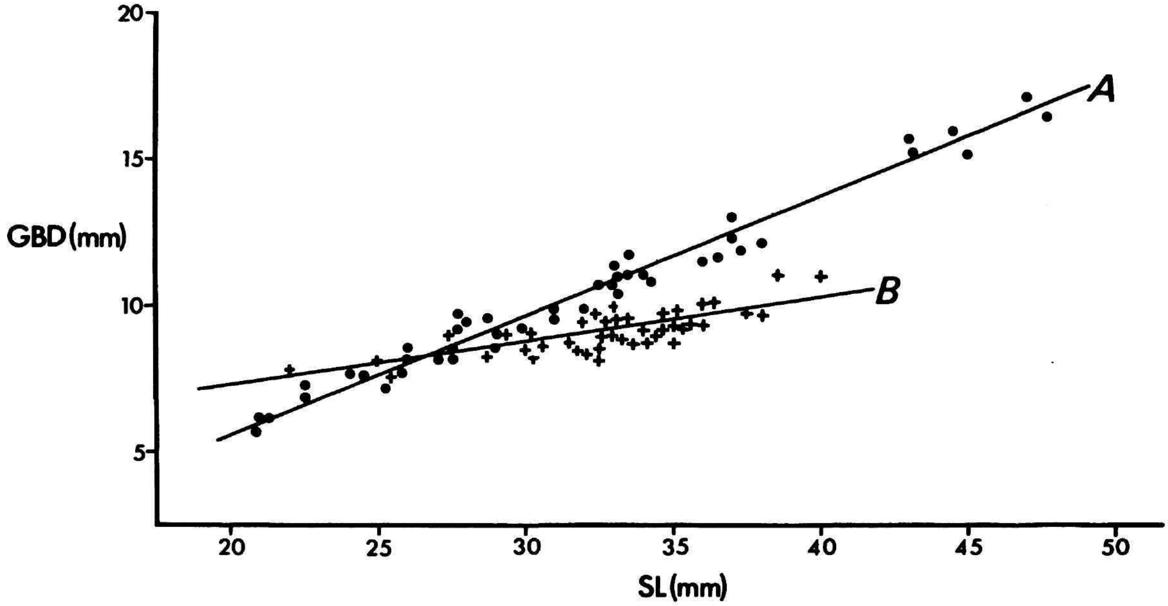

FIGURE 17.—Graph of greatest body depth (GBD) against standard length (SL) for *Curimatopsis crypticus*, new species (*A*), and *Curimatopsis evelynae* (*B*) with regression lines for each species (some symbols represent more than one data point; r^2 = .95 or above, regression lines significantly different [P=.05]).

body anterior to rayed dorsal fin somewhat flattened but without definite longitudinal ridges. Dorsal body surface posterior to rayed dorsal fin transversely curved. Ventral profile of body smoothly convex, convexity more pronounced in females. Ventral region of body anterior to pelvic fin insertion somewhat flattened but without definite longitudinal keels laterally. Ventral surface of body posterior to insertion of pelvic fin transversely rounded. Greatest body depth at origin of rayed dorsal fin 0.31–0.35 [0.35]; snout tip to origin of rayed dorsal fin 0.47–0.55 [0.55], (0.47–0.53 in females, 0.51–0.55 in males); snout tip to origin of anal fin 0.74–0.78 [0.74]; snout tip to insertion of pelvic fin 0.55–0.61 [0.55]; snout tip to anus 0.78–0.83 [0.80]; origin of rayed dorsal fin to hypural joint 0.52–0.56 [0.53]. Rayed dorsal fin pointed, anterior rays about twice length of ultimate elements. Pectoral fin pointed, pectoral fin length 0.16–0.23 [0.22], reaching two-thirds distance to insertion of pelvic fin. Pelvic fins pointed, pelvic fin length 0.18–0.24 [0.22], reaching or falling slightly short of origin of anal fin. Caudal peduncle depth sexually dimorphic, peduncle depth 0.12–0.15 in females, 0.16–0.18 [0.18] in males. Caudal fin scaled only at base. Caudal fin form sexually dimorphic, bifid in females; middle rays of caudal fin lengthened in males, fin trifid with upper lobe longest.

Head pointed, head length 0.30–0.35 [0.33]; lower jaw as long as upper, not overlapping the tip of upper lip; snout rounded, snout length 0.22–0.27 [0.22]; nostrils separated by a distance less than diameter of anterior nostril, anterior nostril rounded, posterior nostril crescent-shaped or distinctly transversely elongate; orbital diameter 0.31–0.36 [0.35]; postorbital portion of head 0.40–0.44 [0.43]; gape width 0.22–0.24 [0.23]; interorbital width 0.37–0.40 [0.40].

Twenty-seven to 30 [29] scales in a longitudinal series from supracleithrum to hypural joint; 3 to 5 pored lateral line scales, lateral line canals straight; 2 or 3 series of scales extending beyond hypural joint onto base of caudal fin; 11 to 13 [11] scales in a transverse series extending posteriorly from the origin of rayed dorsal fin.

Rayed dorsal fin rays ii,8,i or ii,9 [ii,9]; anal fin rays ii,7–8 [ii,8]; pectoral fin rays 12 to 14 [13]; pelvic fin rays i,7,i.

Total vertebrae 28(4), 29(36), 30(1) [29].

Color in Alcohol: Alcohol-fixed specimens with overall coloration silvery. Formalin-fixed specimens lacking guanine. Head darker dorsally with scattered chromatophores on opercle. Body darker dorsally with scales outlined by series of small chromatophores. Pigmentation less pronounced ventral to lateral midline of body. A progressively widening lateral body stripe running from behind supracleithrum to midlateral surface of caudal peduncle. Stripe more intense and extending farther anterior in larger specimens. Stripe continuous with a round or slightly horizontally oblong spot on rear of caudal peduncle. Spot terminating at base of middle caudal rays in females, continuous with stripe on middle caudal fin rays in males. Median fins with chromatophores outlining fin rays. Paired fins hyaline or with scattered chromatophores.

DISTRIBUTION.—Atlantic slopes of the Guianas, Rio Branco, and lower portions of the Amazon River and Rio Negro (see Figure 18).

ETYMOLOGY.—From the Greek for hidden or secret, referring to this species having been "hidden from science" as a consequence of the

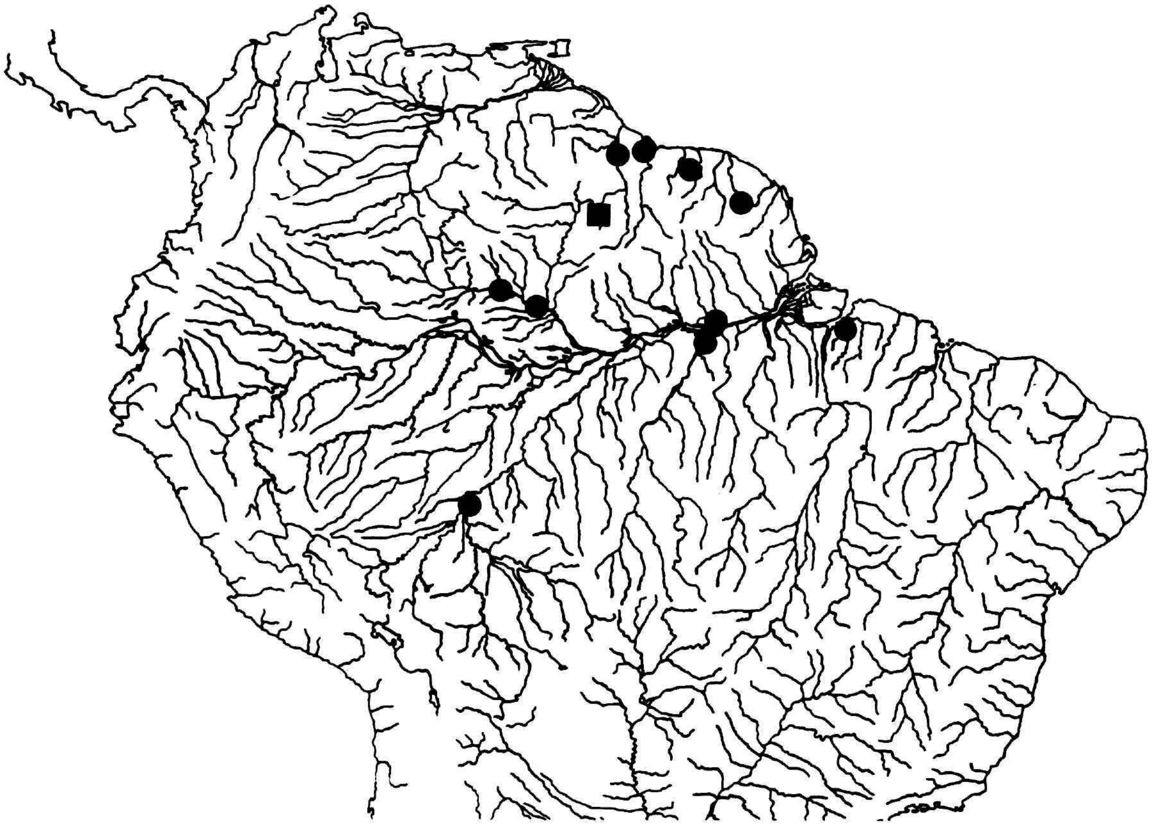

FIGURE 18.—Geographic distribution of *Curimatopsis crypticus*, new species. (Square = type-locality; some symbols represent more than one collecting locality or lot of specimens.)

long-term confusion that has existed between it and *Curimatopsis macrolepis.*

REMARKS.—This species was misidentified as *Curimatopsis macrolepis* by Eigenmann (1912:260) from a number of localities in British Guiana (Guyana). Examination of the bulk of his material has shown that all examined specimens of his nominal *C. macrolepis* were actually *C. crypticus.* The remaining Guyanese materials listed by that author is also presumably the latter species. Later authors (Myers, 1929; Boeseman, 1952; Géry, 1964b; and Hoedeman, 1974) followed Eigenmann in considering the *Curimatopsis* species populations in the Guyanas to be *C. macrolepis*; however, all examined material of the genus from that region has been found to be *C. crypticus.* It is possible that the specimens reported upon by Myers (1929) from Santarem, Brazil, were actually this species rather than *C. macrolepis* (see "Remarks" for that species). *Curimatopsis crypticus* is the most sexually dimorphic species within the genus, with the difference in caudal peduncle depths of males and females being the most obvious external manifestation of this difference. Males are relatively rare and represent only 10% of the specimens examined.

MATERIAL EXAMINED.—*Holotype:* GUYANA: Rupununi District, stream 2 km east of Lake Amucu (~ 3°43′N, 59°25′W), USNM 226872 (27.7), male.

Paratypes: Sixty-five specimens. BRAZIL: Igarape Anapichi leading to Rio Negro 64 miles northwest of intersection of Rio Negro and Rio Branco, Sep 1975, H. Axelrod, USNM 226880, 15 (21.2–37.2); ANSP 146864, 1 (24.3); AMNH 45096, 1 (31.6); MZUSP 15974-75, 2 (25.2–29.0); BMNH 1981.4.27:1, 1 (27.8). Para, Monte Alegre, C. Ternetz, USNM 228354, 3 (43.8–45.4); BMNH 1926.10.27:208-227, 22 (21.0–43.1). Para, Belem, Lagoa da Providencia, N. Menezes, Jul 1965, MCZ 46201, 1 (23.8). Para, Santarem, Uruara Brook into Rio Tapajos, USNM 226883, 4 (33.4–36.3); MZUSP 15976-77, 2 (32.9–33.5). Middle Rio Negro, Praya Mofulu on Rio Itu, M. Brittan, Apr 1964, USNM 226884, 3 (30.6–34.2). Brazilian-Bolivian border region near Guajara-Mirim, 1970, von Graeve, USNM 226885, 1. GUYANA: Maduni, C. Eigenmann, MCZ 30048, 2 (28.5–36.6). Lama Stop-Off, C. Eigenmann, AMNH 45094, 2 (37.3–38.1). Rockstone, C. Eigenmann, AMNH 45095, 2 (26.0–27.6) (see Eigenmann, 1912, pl. 83, for map of his collecting localities). Manari River, C. Hopkins, MCZ 57638, 1 (27.9).

The following nonparatype material of *Curimatopsis crypticus* was examined but not used as a basis for the meristics and morphometrics of the above description. GUYANA: Rupununi River, NMW 67112, 1. SURINAM: Republik, GC, 2. FRENCH GUIANA: Orapu River, Criqeue Gabrielle, GC, 23. BRAZIL: Rio Caures off Rio Negro, GC, 2.

Curimatopsis evelynae Géry

FIGURES 19–21

Curimatopsis evelynae Géry, 1964a:47, figs. 13, 14 [type-locality: upper Rio Meta, Colombia]; 1977:239 [listed].

DIAGNOSIS.—A somewhat slender-bodied *Curimatopsis* species that reaches 40 mm SL. This species is distinguishable from its nearest relative, *C. crypticus*, by having a round posterior nostril separated from the anterior opening by a distance equal to or greater than the diameter of the anterior aperture. In *C. crypticus* the posterior nostril is crescent-shaped and separated from the anterior nostril by a distance less than the diameter of the latter aperture. In *C. evelynae* a caudal peduncle spot is variably present and centered below the lateral midline. *Curimatopsis crypticus*, in contrast, has the spot always present and centered on the lateral midline. Larger specimens of these species can be readily distinguished by the relatively shallower body of *C. evelynae* (see Figure 17). *Curimatopsis evelynae* is readily distinguishable from *C. microlepis* by its lower number of scales in a longitudinal series from the supracleithrum to the hypural joint (24 to 28 in contrast to 57 to 63). *Curimatopsis evelynae* can be separated from *C. macrolepis* by its relatively shorter postorbital portion of the head (0.39–0.43 versus 0.45–0.53 of

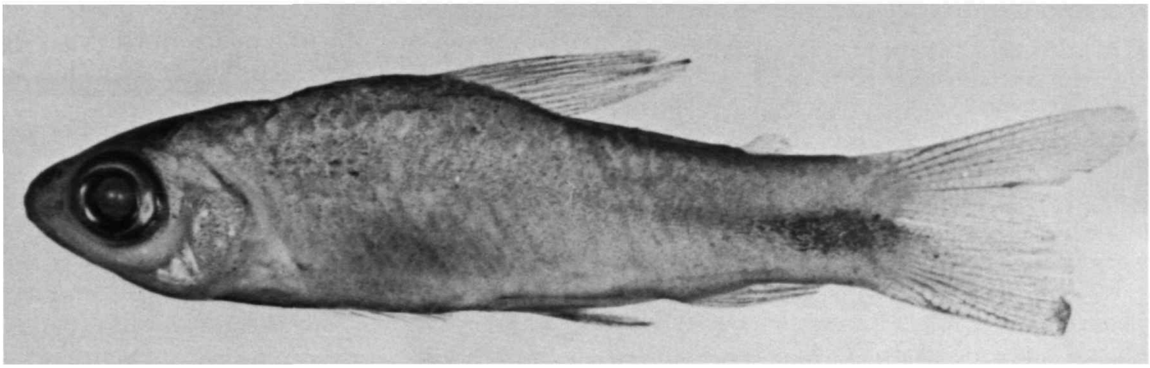

FIGURE 19.—*Curimatopsis evelynae*, male, USNM 214794.

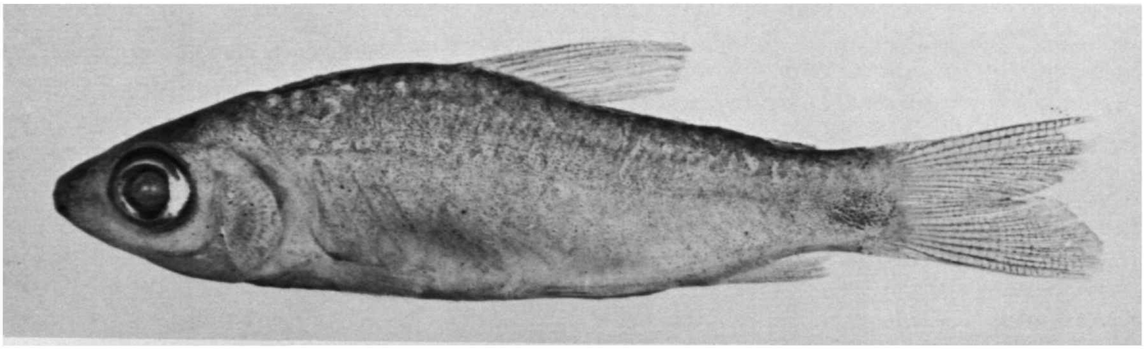

FIGURE 20.—*Curimatopsis evelynae*, female, USNM 214794.

HL), the lack in *C. evelynae* of the overlap of the anterior portion of the upper lip by the lengthened lower jaw that is characteristic of *C. macrolepis*, along with numerous internal characters (see "Phylogenetic Analysis").

DESCRIPTION.—Body moderately elongate and compressed. Dorsal profile of head straight or slightly convex. Dorsal profile of body posterior of head slightly convex to origin of rayed dorsal fin, straight or gently concave from there to base of ultimate ray and nearly straight from rear of dorsal fin to dorsal portion of caudal peduncle. Dorsal surface of body anterior to rayed dorsal fin somewhat flattened but without definite longitudinal ridges laterally. Dorsal body surface posterior to rayed dorsal fin transversely curved. Ventral body profile gently curved from tip of lower jaw to vertical through pectoral fin insertion, nearly straight from that point to anus in males and unripe females, convex in ripe females. Ventral region of body anterior to pelvic fin insertion slightly flattened but without longitudinal lateral keels. Ventral surface of body posterior to insertion of pelvic fin transversely rounded. Body deepest at origin of rayed dorsal fin, greatest body depth 0.27–0.33 [0.33]; snout tip to origin of rayed dorsal fin 0.49–0.54 [0.54]; snout tip to origin of anal fin 0.76–0.82 [0.82]; snout tip to insertion of pelvic fin 0.55–0.62 [0.58] (0.55–0.59 in females, 0.58–0.62 in males); snout tip to anus 0.74–0.80 [0.78]; origin of rayed dorsal fin to hypural joint 0.52–0.57 [0.58]. Rayed dorsal

FIGURE 21.—Geographic distribution of *Curimatopsis evelynae*. (Square = type-locality; some symbols represent more than one collecting locality or lot of specimens.)

fin moderately pointed, anterior rays about twice length of ultimate elements. Pectoral fins pointed, pectoral fin length 0.14–0.24 [0.22] (0.14–0.20 in females, 0.20–0.24 in males); pelvic fins pointed, pelvic fin length 0.21–0.23 [0.21], reaching or falling slightly short of origin of anal fin. Caudal peduncle depth highly sexually dimorphic, 0.12–0.13 in females, 0.16–0.18 [0.18] in males. Caudal fin scaled only at base. Caudal fin form sexually dimorphic, bifid in females; middle rays of caudal fin slightly lengthened in males, fin trifid with upper lobe longest.

Head pointed, head length 0.27–0.34 [0.32] (0.27–0.31 in females, 0.30–0.34 in males); lower jaw as long as upper, not overlapping the tip of upper jaw; snout rounded, snout length 0.24–0.29 [0.24]; nostrils separated by a distance greater than diameter of anterior opening, anterior and posterior nostrils rounded, latter rarely somewhat expanded transversely; orbital diameter 0.31–0.36 [0.36]; postorbital portion of head 0.39– 0.43 [0.39]; gape width 0.19–0.24 [0.24]; interorbital width 0.39–0.43 [0.39].

Twenty-four to 28 [26] scales in a longitudinal series from supracleithrum to hypural joint; 3 or 4 pored lateral line scales, lateral line canals straight; 2 or 3 series of scales extending beyond hypural joint onto base of caudal fin; 11 or 12 [11] scales in a transverse series extending posteriorly from the origin of the rayed dorsal fin.

Dorsal fin rays ii,8,i or ii,9 [ii,8,i]; anal fin rays ii,7; pectoral fin rays 12 to 14 [13]; pelvic fin rays i,7,i.

Total vertebrae 28(5), 29(25), 30(2) [29].

Color in Alcohol: Head pigmentation most pronounced dorsally in postorbital portion of head, with scattered chromatophores over remaining portions of head especially opercle. Body darker dorsal to midlateral line, no definite pigmentation pattern other than for some increased density of chromatophores along scale edges. A progressively widening lateral body stripe runs along lateral midside from under rayed dorsal-fin to midlateral surface of caudal peduncle. An elongate patch of chromatophores on midlateral portion of caudal peduncle of most specimens, sometimes absent. Pigmented area continuous with midlateral body stripe. Caudal peduncle spot centered below lateral midline, often quite faint. Pigmented patch terminating on base of middle caudal rays in females, continuous with a band of scattered chromatophores on middle caudal rays in males. Latter pigmentation sometimes lacking in some males. Median and paired fins with melanophores outlining fin rays. Adipose fin with scattered chromatophores along margins.

Life Coloration: "Back chocolate, body with rosy, yellow and green longitudinal iridescences, base of caudal salmon red, and dorsal fin orange" (Géry, 1964a).

DISTRIBUTION.—Upper Orinoco River, Rio Negro downstream to Manaus (see Figure 21).

MATERIAL EXAMINED.—Approximately 190 specimens (27, 22.0–40.1). COLOMBIA: Rio Manacasis, USNM 198644, 1 (22.3, holotype of *Curimatopsis evelynae*); USNM 198638, 1 (paratype of *Curimatopsis evelynae*); GC, 26 (paratypes of *C. evelynae*). BRAZIL: Igarape Grande do Manacapuru, USNM 226898, 2 (33.3–33.6). Rio Caures, GC, 25. Rio Arirara, USNM 226897, 2 (1, 35.6). Rio Urubaxi, USNM 226892, 2 (27.1–33.0); USNM 226894, 3; MZUSP 15987-88, 2; USNM 226896, 3 (1, 32.5). Rio Negro, Ilha de Tamaguare, USNM 226893, 4. Rio Negro 64 km northwest of junction with Rio Branco, USNM 214794, ~ 50 (19, 25.1–40.4). Abaixo do Daraá, MZUSP 15984-85, 2. Ilha de Buiu-acu, MZUSP 15986, 1.

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Taxonomic keys in natural history papers should use the alined-couplet form in the zoology and paleobiology series and the multi-level indent form in the botany series. If cross-referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa with their corresponding heads in the text.

Synonymy in the zoology and paleobiology series must use the short form (taxon, author, year:page), with a full reference at the end of the paper under "Literature Cited." For the botany series, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in the "Literature Cited") is optional.

Footnotes, when few in number, whether annotative or bibliographic, should be typed at the bottom of the text page on which the reference occurs. Extensive notes must appear at the end of the text in a notes section. If bibliographic footnotes are required, use the short form (author/brief title/page) with the full reference in the bibliography.

Text-reference system (author/year/page within the text, with the full reference in a "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all scientific series and is strongly recommended in the history and technology series: "(Jones, 1910:122)" or ". . . Jones (1910:122)."

Bibliography, depending upon use, is termed "References," "Selected References," or "Literature Cited." Spell out book, journal, and article titles, using initial caps in all major words. For capitalization of titles in foreign languages, follow the national practice of each language. Underline (for italics) book and journal titles. Use the colon-parentheses system for volume/number/page citations: "10(2):5–9." For alinement and arrangement of elements, follow the format of the series for which the manuscript is intended.

Legends for illustrations must not be attached to the art nor included within the text but must be submitted at the end of the manuscript—with as many legends typed, double-spaced, to a page as convenient.

Illustrations must not be included within the manuscript but must be submitted separately as original art (not copies). All illustrations (photographs, line drawings, maps, etc.) can be intermixed throughout the printed text. They should be termed **Figures** and should be numbered consecutively. If several "figures" are treated as components of a single larger figure, they should be designated by lowercase italic letters (underlined in copy) on the illustration, in the legend, and in text references: "Figure 9b." If illustrations are intended to be printed separately on coated stock following the text, they should be termed **Plates** and any components should be lettered as in figures: "Plate 9b." Keys to any symbols within an illustration should appear on the art and not in the legend.

A few points of style: (1) Do not use periods after such abbreviations as "mm, ft, yds, USNM, NNE, AM, BC." (2) Use hyphens in spelled-out fractions: "two-thirds." (3) Spell out numbers "one" through "nine" in expository text, but use numerals in all other cases if possible. (4) Use the metric system of measurement, where possible, instead of the English system. (5) Use the decimal system, where possible, in place of fractions. (6) Use day/month/year sequence for dates: "9 April 1976." (7) For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc.

Arrange and paginate sequentially EVERY sheet of manuscript—including ALL front matter and ALL legends, etc., at the back of the text—in the following order: (1) title page, (2) abstract, (3) table of contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes, (8) glossary, (9) bibliography, (10) index, (11) legends.