

Systematics of the Neotropical  
Characiform Genus *Psectrogaster*  
Eigenmann and Eigenmann  
(Pisces: Characiformes)

RICHARD P. VARI

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## ABSTRACT

Vari, Richard P. Systematics of the Neotropical Characiform Genus *Psectrogaster* Eigenmann and Eigenmann (Pisces: Characiformes). *Smithsonian Contributions to Zoology*, number 481, 43 pages, 23 figures, 2 tables, 1989.—The genus *Psectrogaster* Eigenmann and Eigenmann is shown to constitute a monophyletic subunit of the family Curimatidae. A number of shared derived characters of the first to fourth epibranchials, fifth upper pharyngeal tooth-plate, and first infrapharyngobranchial unite these species as a natural lineage within the family Curimatidae. Modifications of various gill-arch components, body form, squamation, body pigmentation and anal-fin ray numbers delimit monophyletic subunits of the genus.

Eight species are recognized in the genus: *Psectrogaster ciliatus* (Müller and Troschel, 1845) which occurs in the Essequibo River, the Río Orinoco and the Rio Amazonas system; *P. rutiloides* (Kner, 1859a) widely distributed in the Rio Amazonas basin; *P. essequibensis* (Günther, 1864) found in the Essequibo River and the Rio Amazonas basins; *P. rhomboides* Eigenmann and Eigenmann (1889a) limited to the Rio Parnaíba and Rio Jaguariba of northeastern Brazil; *P. amazonica* Eigenmann and Eigenmann (1889a) widely distributed in the Rio Amazonas drainage basin; *P. falcata* (Eigenmann and Eigenmann, 1889b) of the Rio Amazonas system; *P. curviventris* Eigenmann and Kennedy (1907) known from the Río Paraguay and southern portions of the Rio Madeira system; and *P. saguiru* (Fowler, 1941) from the rivers of northeastern Brazil.

*Psectrogaster essequibensis* (Günther) considered a synonym of *P. ciliatus* (Müller and Troschel) by Eigenmann (1912) and subsequent authors is recognized as a distinct species. *Curimatus isognathus* Eigenmann and Eigenmann (1889b) and *Psectrogaster auratus* Gill (1895) are synonymized under *P. rutiloides* (Kner). *Curimata pearsoni* Myers (1929) is tentatively placed as a synonym of *Psectrogaster curviventris* Eigenmann and Kennedy. *Psectrogaster rhomboides australe* Risso and Sanchez (1964) is considered a synonym of *P. curviventris*. The genera *Pseudopsectrogaster*, *Hamatichthys*, and *Semelcarinata*, all proposed by Fernández-Yépez (1948) are placed as synonyms of *Psectrogaster* Eigenmann and Eigenmann (1889a).

Citations of the presence of *Psectrogaster rutiloides* in the Río Paraguay basin by authors commencing with Boulenger (1896) were found to be based on misidentifications of *Psectrogaster curviventris*. Perugia's report of *Curimatus ciliatus* from the Río Paraná system was similarly a consequence of an incorrect identification of *Psectrogaster curviventris*.

The historical zoogeography of the species of *Psectrogaster* is discussed. A significant degree of post-vicariance dispersal is obvious at more inclusive phylogenetic levels, but is less pronounced between sister species. A pattern of repeated sister-species relationships between the rivers of northeastern Brazil and the Amazon basin is noted.

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# Systematics of the Neotropical Characiform Genus *Psectrogaster* Eigenmann and Eigenmann (Pisces, Characiformes)

*Richard P. Vari*

## Introduction

The genus *Psectrogaster* is a relatively morphologically diverse lineage of the Neotropical Characiform family Curimatidae distributed in streams, rivers, and still waters throughout the drainage basins of the Río Orinoco, Essequibo River, Río Amazonas, Río Paraguay-Paraná, and some of the rivers of northeastern Brazil. No member of the genus is known to occur in the remaining Atlantic drainages of Venezuela, the Guianas, Brazil, and Uruguay. In trans-Andean South America *Psectrogaster* is absent in all the rivers draining into the Caribbean Sea and Pacific Ocean that are inhabited by other genera of the Curimatidae. Although a few species of *Psectrogaster* are rare in systematic collections, most members of the lineage occur in large, geographically widespread populations that constitute an important component of the fish biomass in some river systems. Indeed certain of the larger, more common members of the group are exploited in both commercial and subsistence fisheries in the eastern and central portions of the Río Amazonas basin (Smith, 1981:141; Goulding, 1981:60, 105; Santos et al., 1984:28). The apparent rarity of the remaining species of the genus in systematic collections is probably not representative of the actual scarcity of the species in the rivers of that region. Rather it is more likely an artifact of the limited degree to which appropriate collecting efforts have been carried out to date in most river systems of the Neotropics.

The relatively extensive taxonomic literature that deals with

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at least some species of *Psectrogaster* extends back nearly a century and one-half, with the majority of the nominal species having been described in the nineteenth century. Although a diversity of authors have published on at least some of the species of the genus as defined in this study, a multitude of questions on species recognizability and geographic distribution pervade the taxonomic treatments of the lineage. This uncertainty was an outgrowth of a number of factors, with perhaps the most significant being the lack of detailed information in the often brief original species descriptions published by some authors. The sparse data in those accounts complicated subsequent recognition of many valid species, and magnified the uncertainties involved in evaluating the validity of the different nominal species. The restriction of many systematic studies involving species of *Psectrogaster* along political or arbitrary geographical limits also hindered in-depth analyses of species-level questions in many of the geographically widespread forms. As a consequence of these and other factors, the previous taxonomic treatments of *Psectrogaster* failed to satisfactorily delimit the recognizable species in the lineage, determine their distinguishing morphological characters, or lead to an understanding of the geographic distribution of each nominal species.

The suprageneric classification of the species included in *Psectrogaster* in this study has also been the subject of numerous alternative schemes. Many species in the group were originally described in the broadly defined genus *Curimata* Bosc, which has included the majority of the nominal species in the Curimatidae at various times. Eigenmann and Eigenmann (1889a,b) were the first researchers to segregate some of the species under discussion from the previously nearly totally encompassing genus *Curimata*. Those authors proposed *Psectrogaster* for a distinctive subgroup of species character-

ized by a serrate postpelvic median keel. The proliferation of genera to contain the nominal species under discussion in the present paper continued with Fernández-Yépez (1948) who divided *Psectrogaster*, as defined by Eigenmann and Eigenmann, into *Psectrogaster* (sensu stricto), and two genera, *Hemicurimata* and *Pseudopsectrogaster*, which were proposed in that publication. He concurrently apportioned the other nominal species in the lineage under consideration among *Hamatichthys*, *Lambepiedra*, *Semelcarinata*, and *Camposella*, all of which were similarly first advanced in that paper. Reference to the "key" to the genera of the Curimatidae presented by Fernández-Yépez (1948) indicates that few of the cited taxa were demarcated by readily distinguishable characters. Rather many of the defining characters for the proposed genera were minor morphological differences that proved to be difficult if not impossible to quantify and recognize non-arbitrarily (see Böhlke, 1958:108). Above and beyond the problems of generic recognizability, available data on phylogenetic interrelationships within the Curimatidae (Vari, 1989) furthermore indicates that a number of the generic definitions advanced in Fernández-Yépez' study failed to circumscribe natural, let alone easily recognizable, groupings.

Such deficiencies were hardly unique to the classification advanced by Fernández-Yépez. Previous taxonomic treatments of the Curimatidae and its major components were commonly proposed without a discussion of the concepts, phenetic or phylogenetic, that formed the basis for specific and supraspecific groupings within the family. Neither were there evaluations of the degree to which the characters that purportedly discriminated such assemblages represented innovative features. Indeed, the "Phylogenetic Tree" of the Curimatidae presented by Fernández-Yépez (1948, fig. 2) was the only previous explicit scheme of evidently phylogenetic relationships within the family, albeit without any exact statement on its basis in phylogeny versus overall similarity, and with a resolution of the tree only to the generic level. The hypothesis of phylogenetic relationships arrived at in the present study and that advanced by Vari (1989), both based on shared derived characters, indicate that Fernández-Yépez's scheme of relationships did not delimit lineages. The Potamorhini of Fernández-Yépez serves well as an illustration of the lack of congruence between the classifications of that author and the evident sublineages in the Curimatidae. According to Fernández-Yépez that tribe consists of four genera, *Hamatichthys*, *Pseudopsectrogaster*, *Psectrogaster*, and *Potamorhina*. Vari (1984a) noted that *Potamorhina*, in the sense of Fernández-Yépez, was more closely related to taxa placed by the latter author in the Curimatini (*Gasterotomus* Fernández-Yépez, *Suprasinelepicthys* Fernández-Yépez) rather than to the remaining members of the Potamorhini. Vari (1989), in turn, proposes a phylogenetic hypothesis based on numerous derived features in a variety of body systems that indicates that *Hamatichthys*, *Pseudopsectrogaster*, and *Psectrogaster* are part of a evolutionary lineage including taxa that Fernández-Yépez placed as

more closely related to other elements in his tribe Curimatini rather than the Potamorhini. These inconsistencies raise questions about the utility of the classificatory scheme proposed by Fernández-Yépez as an appropriate system to convey concepts of the evolutionary history of the group. This uncertainty is compounded by the problems of generic recognizability noted by authors such as Böhlke (1958). In order to determine the usefulness of previous classifications as indicators of the evolution within *Psectrogaster*, the phylogenetic relationships within the genus (sensu lato) are reevaluated in this study.

This paper is the thirteenth of a series that deals with aspects of the phylogeny, taxonomy, and historical biogeography of curimatid characiforms (see Vari, 1982a,b, 1983, 1984a,b, 1987, 1988, in press a,b; Vari and Castro, 1988; Vari and Géry, 1985; Vari and Nijssen, 1986; Vari and Vari, 1989). Vari (1989) advanced a hypothesis of generic level phylogenetic relationships within the Curimatidae. That analysis and the phylogenetically more encompassing scheme of familial relationships previously put forward by Vari (1983) provide the framework for the outgroup analyses and polarity determinations of those characters that demonstrate discrete variability within *Psectrogaster*.

The present study has three primary objectives: first, to analyze the morphological variation within *Psectrogaster* and put forward a hypothesis of the phylogenetic relationships within the genus; second, to determine the recognizable species in the group and their distinguishing characters; and third, to delimit the known geographic distributions of the recognizable forms and propose a hypothesis of the historical biogeography of the genus.

The hypothesis of the evolutionary relationships within *Psectrogaster* is derived following the principles of Phylogenetic Systematics, first proposed in English by Hennig (1966), and since discussed and refined by a variety of authors (see Wiley, 1981 for a summary). In that system (alternatively termed Cladism or Cladistics), recognized taxa must be monophyletic in that they include all descendants of a hypothesized common ancestor, and only descendants of that ancestor (the holophyletic of some authors). Monophyletic groups are defined on the basis of the most parsimonious hypothesis of relationships derivable from the distribution of shared derived (synapomorphous) characters. In keeping with the general scientific principle of parsimony, the hypothesis of the history of the group that necessitates the fewest ad hoc assumptions about character transformations is preferred. This does not assume that evolutionary mechanisms are always parsimonious, but only that parsimony (simplicity) is the best available working principle (Beatty and Fink, 1979; Wiley, 1981). Hypotheses of relationship derived from the common possession of primitive characters (symplesiomorphies) and phylogenetic speculations based on concepts of overall phenetic similarity or degrees of difference are useless as criteria to evaluate alternative phylogenetic hypotheses or are



incongruent with the aims of this study: the proposal of a hypothesis of the phylogenetic history of the taxa under consideration. Detailed discussions of these methodologies and their application can be found in Wiley (1981).

**METHODS AND MATERIALS.**—Measurements were made with dial calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of specimens whenever possible. Counts of total vertebrae were taken from radiographs, with the fused  $PU_1+U_1$  considered a single bone, and the vertebrae incorporated into the Weberian Apparatus counted as four elements. The numbers in parentheses that follow a particular vertebral count are the numbers of radiographed specimens with that count. In the species descriptions, subunits of the head are presented as proportions of head length (HL). Head length itself and measurements of body parts are given as proportions of standard length (SL). In the counts of median and pelvic fins unbranched fin rays are indicated by lower case roman numerals, and branched fin rays are indicated by arabic numerals. The observed range in the values of each count and measurement is presented first, followed by the value of the holotype or lectotype for a particular count or measurement, when available, in square brackets. In the cases of *Psectrogaster rutiloides* and *P. curviventris*, which have junior synonyms, the data in brackets are for the lectotype of the senior synonym. The morphometric and meristic data for all nominal species in those instances is presented in tabular form.

The "Material Examined" section of each species account is arranged in the following sequence: number of specimens of the species examined (in parentheses the number of specimens forming the basis for the presented meristic and morphometric data and the range of standard lengths (in mm) for these specimens), collection locality of specimens, institutional abbreviation, catalog number, number of specimens in the lot (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 those individuals). Geographic descriptors are first country (capitalized) then state, province, department or district (in italics), followed by more specific locality data. The names of localities from which at least some of the examined specimens were previously cited in the literature are first given as originally presented, followed by the modern or correct name, in parentheses, if that differs.

The common names presented are those found in the literature, although such terminology is not necessarily standardized across the entire range of the species. In the synonymies for each species, localities are presented as in the original citation, followed by the modern equivalent, in parentheses, if that differs. Osteological preparations were cleared and counterstained for cartilage and bone.

**ABBREVIATIONS.**—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-SU	Stanford University (collections now at CAS)
CU	Cornell University, Ithaca
FMNH	Field Museum of Natural History, Chicago
GC	Jacques Géry, personal collection (no register numbers)
INPA	Instituto Nacional de Pesquisas da Amazonia, Manaus
IU	Former Indiana University collections, now dispersed to various repositories.
LACM	Los Angeles County Museum of Natural History, Los Angeles
MBUCV	Museo de Biología, Instituto de Zoología Tropical, Universidad Central de Venezuela, Caracas
MCZ	Museum of Comparative Zoology, Cambridge
MNRJ	Museu Nacional, Rio de Janeiro
MSNG	Museo Civico di Storia Naturale "Giacomo Doria", Genoa
MZUSP	Museu de Zoologia da Universidade de São Paulo
NMNH	National Museum of Natural History, Smithsonian Institution, Washington, D.C.
NMW	Naturhistorisches Museum Wien, Vienna
NRM	Naturhistoriska Riksmuseet, Stockholm
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor
USNM	Former United States National Museum, collections in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.
ZUEC	Zoologia, Universidade Estadual de Campinas, Campinas, Brazil
ZMA	Zoologisch Museum, Amsterdam
ZMB	Zoologisches Museum, Humboldt University, Berlin

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#### Character Description and Analysis

As defined in this study, the genus *Psectrogaster* Eigenmann and Eigenmann (1889a) has three junior synonyms, *Pseudopsectrogaster*, *Hamatichthys*, and *Semelcarinata*, all described by Fernández-Yépez (1948). Five other genera (*Camposella* Fernández-Yépez, *Curimatopsis* Cope, *Hemicurimata* Myers, *Lambepeidra* Fernández-Yépez, and *Suprasinelepichthys* Fernández-Yépez) have also been used in association with some of the species recognized as valid in this paper, or their junior synonyms. The multiplicity of applied genera is noteworthy and puzzling because it involved only eight species recognized as distinct in the present study, some of which can only be distinguished by subtle differences in body pigmentation patterns and morphology. Interestingly, three generic names (*Psectrogaster*, *Pseudopsectrogaster*, and *Hamatichthys*) are available for a sublineage of the genus whose contained species are very similar morphologically, and which have often been incorrectly identified as other species of the clade. Alternatively the clade, consisting of *Psectrogaster falcata* and *P. essequibensis*, was not recognized at the generic level, although it is characterized by a distinctive flattened prepelvic region delimited laterally by nearly right angles in the body wall. This condition contrasts with the transversely rounded prepelvic region of other species of *Psectrogaster*. Those inconsistencies in the generic classification of this groups of species arose both from the lack of a broad overview of the clade in particular, and of the family as a whole. Those methodological problems were compounded by the fact that the uncritical phenetic classificatory schemes were often based on a few, evidently plastic characters, that have in subsequent

analysis been found to demonstrate high levels of homoplasy.

A comparison of the results of this study and the previous phylogenetic analysis of the family Curimatidae (Vari, 1989) with the "Phylogenetic Tree" advanced by Fernández-Yépez (1948) shows that the species of *Psectrogaster* as herein defined were subdivided among the subtribes Potamorhini, Curimatini, and Curimatopsini in Fernández-Yépez's phylogenetic scheme. Most often the species of *Psectrogaster* of the present study were aligned by Fernández-Yépez with species that are not hypothesized to be components of that monophyletic lineage by Vari (1989). A number of derived characters support the hypothesis of the monophyly of *Psectrogaster*. Similarly a series of synapomorphies in various body systems serve to define subunits of the genus as natural assemblages. In light of that evidence, Fernández-Yépez's classification is considered to poorly reflect the lineages either in the Curimatidae as a whole, or in *Psectrogaster* in particular.

Shared derived characters that define *Psectrogaster* as a monophyletic lineage were discussed by Vari (1989:57). In a few instances that study also detailed synapomorphies at the subgeneric level. Characters discussed in detail in that publication will only be briefly redescribed herein, and the reader is referred to that previous study for additional information on the characters, the condition of homologs in outgroups, and polarity hypotheses. Characters pertinent to questions of suprageneric relationships within the Curimatidae are not discussed unless they represent homoplasies within the family that are common to *Psectrogaster* or one of its subunits, and an outgroup in the Curimatidae. Such characters are discussed in greater detail in Vari (1989). The discussion of morphological systems and synapomorphies for and within *Psectrogaster* in the present paper follows the arrangement in Vari (1989) in order to simplify comparisons and cross-references to that publication.

#### GILL ARCHES

The majority of the characters used by Vari (1989:12-30) to define subunits of the Curimatidae involved modifications of components of the gill arches. Shared derived branchial basket characters similarly unite the species of *Psectrogaster* as a monophyletic unit and delimit subunits of the genus.

#### Fourth Epibranchial (E<sub>4</sub>)

The fourth epibranchial of all curimatids other than the species of *Curimatopsis* Steindachner has on its medial surface a distinct posteroventrally slanted bony spur (MBS). That bony spur is unique to that assemblage among examined characters and was hypothesized by Vari (1989:15) to be a synapomorphy for the clade consisting of *Potamorhina*, *Curimata*, *Psectrogaster*, *Pseudocurimata* Fernández-Yépez, *Curimatella* Eigenmann and Eigenmann, *Steindachnerina* Fowler, and *Cyphocharax* Fowler. The spur in all species of *Psectrogaster* is unique among the curimatid genera just cited

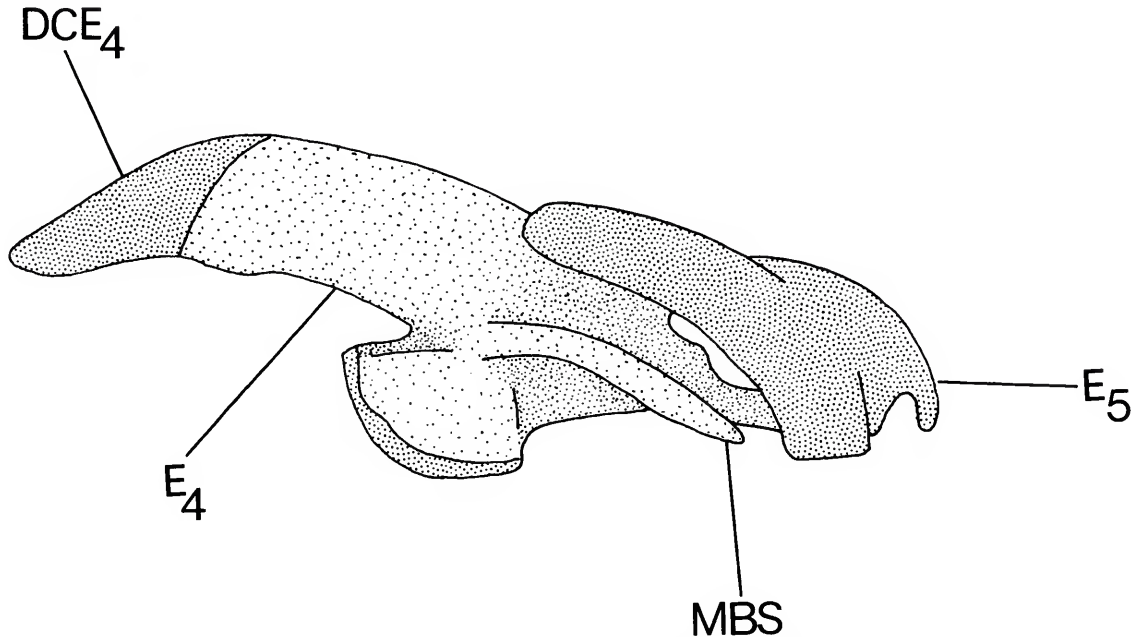


FIGURE 1.—*Psectrogaster curviventris*, USNM 243221, fourth and fifth epibranchials, right side, medial view (dense patterned stippling represents cartilage; DCE<sub>4</sub>, distal cartilage of fourth epibranchial; E<sub>4</sub>, fourth epibranchial; E<sub>5</sub>, fifth epibranchial; MBS, medial bony spur of fourth epibranchial).

in its pronounced development posteriorly. As a consequence of this elongation, the medial spur on the fourth epibranchial in the species of *Psectrogaster* is an elongate shaft extending nearly to the base of the cartilaginous fifth epibranchial (E<sub>5</sub>). That cartilaginous body, in turn, is the posterior terminus of the dorsal portion of the gill arch in most curimatids (Figure 1). Such a pronounced posterior elongation of the medial spur of E<sub>4</sub> is not approximated elsewhere in the family, and is thus considered to be synapomorphic for the members of *Psectrogaster* (SYNAPOMORPHY 1). (See Vari, 1989:15, for a further discussion on the median bony spur on the fourth epibranchial in curimatids.)

Fifth Upper Pharyngeal Toothplate (UP<sub>5</sub>)

The fifth upper pharyngeal toothplate of species of *Psectrogaster* is notable both within the Curimatidae and relative to other characiforms for its pronounced horizontal elongation. In all species of *Psectrogaster*, the fifth upper pharyngeal toothplate has a long posterior shaft that flares distally into a broad, dorsoventrally flattened paddle-shaped plate (Figure 2). In this genus UP<sub>5</sub> also terminates posteriorly beyond the transverse plane through the posterior limit of the ossified portion of the gill arches. Both this pronounced elongation of UP<sub>5</sub> and the overall form of the ossification are unique to and synapomorphic for the members of *Psectrogaster* (SYNAPOMORPHY 2). (See Vari, 1989:20–21, for a

comparative discussion of the variation in the form of the fifth upper pharyngeal toothplate among curimatids.)

Third Epibranchial (E<sub>3</sub>)

The possession of a longitudinal ridge extending along the ventral surface of the third epibranchial is characteristic of all species of the Curimatidae. The species of *Psectrogaster* are

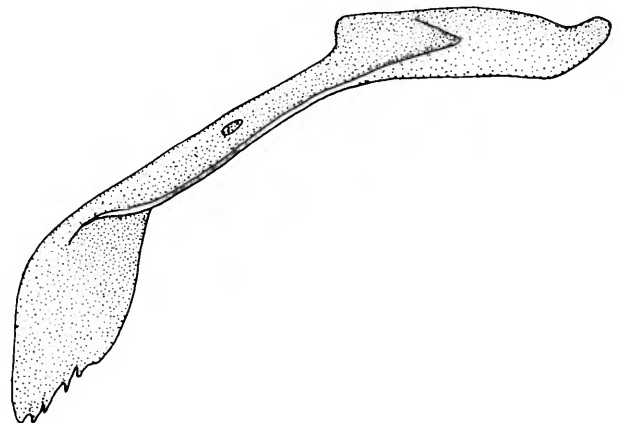


FIGURE 2.—*Psectrogaster rhomboides*, USNM 267473, fifth upper pharyngeal tooth-plate, right side, ventral view (anterior to right, medial at top; small residual teeth on anterior portion of tooth-plate not shown).



distinguished within the family in having this ventral process on  $E_3$  elaborated into a very strong keel extending nearly the length of the bone. That elaboration of the longitudinal ridge of  $E_3$  is hypothesized to be a synapomorphy for the genus in light of its unique nature in the family (SYNAPOMORPHY 3). (See Vari, 1989:22–23, for a comparative discussion of this ridge on the third epibranchial in curimatids.)

#### Second Epibranchial ( $E_2$ )

As in the case of the third epibranchial, species of *Psectrogaster* have the moderately developed longitudinal ridge on the ventral surface of  $E_2$  common to other curimatids further elaborated into a pronounced ventral keel. This elaboration of the second epibranchial is similarly considered to represent a synapomorphy for the species of *Psectrogaster* (SYNAPOMORPHY 4). (See Vari, 1989:25, for a comparative discussion of this structure in curimatids.)

#### Second Infrapharyngobranchial ( $PB_2$ )

The second infrapharyngobranchial of all species of *Psectrogaster* has a vertical shelf-like process that arises from the medial surface of the bone, and which overlies the proximate anteromedial surface of the third infrapharyngobranchial. The possession of such a process by all species of *Psectrogaster* contrasts with the unelaborated condition of that element in the Prochilodontidae and most members of the Curimatidae. As such it is considered a synapomorphy for the genus (SYNAPOMORPHY 5). The somewhat comparable process of the second infrapharyngobranchial in the curimatid genus *Steindachnerina* is hypothesized to be homoplasious within the context of the overall most parsimonious hypothesis of intrafamilial relationships (see Vari, 1989:25, for a discussion of these characters in curimatids).

#### First Epibranchial ( $E_1$ )

The first epibranchial in all species of *Psectrogaster* is comparable to the second and third epibranchials in having a pronounced development of the longitudinal ridge along the ventral surface of the bone. This greater development of the ridge of  $E_1$  relative to the condition in outgroups is considered a synapomorphy for the members of the genus (SYNAPOMORPHY 6). A similar process on the first epibranchial of two species of the curimatid genus *Curimata*, is considered to be homoplasious within the context of the most parsimonious hypothesis of relationships within the Curimatidae (Vari, 1989), and *Curimata* (Vari, in press b).

*Psectrogaster* species also have in common the presence of a distinct triangular flange on the posteromedial margin of the first epibranchial above the main body of the uncinat process. That process lies posterior to and extends dorsal of the level of the uncinat process of  $E_1$ . Although the structure in *Psectrogaster* is somewhat similar in overall form to a

comparably positioned flange in all members of *Potamorhina*, the species of *Psectrogaster* lack the distal cartilage cap on the process found in *Potamorhina* and the flanges differ somewhat in overall morphology. A hypothesis of the non-homology of the flanges on the first epibranchial in *Psectrogaster* (SYNAPOMORPHY 7), on the one hand, and *Potamorhina*, on the other, based on differences in overall morphology, is also congruent with the overall most parsimonious hypothesis of intrafamilial relationships. (See Vari, 1989:25–26, for a further discussion of this modification).

#### First Infrapharyngobranchial ( $PB_1$ )

The typical form of the first infrapharyngobranchial in the Curimatidae and characiform outgroups is a rod-shaped or conical ossification tapering distally to a blunt point that ligamentously articulates dorsally with the ventral surface of the neurocranium. Several variations on that morphology either delimit *Psectrogaster* as a whole or demarcate subunits of the genus. In all species of *Psectrogaster*, the first infrapharyngobranchial is curved to varying degrees rather than retaining the straight condition found in outgroups in the Curimatidae. The restructuring of the overall form of the element is thus considered a synapomorphy for the members of the genus (SYNAPOMORPHY 8).

The curved  $PB_1$  characteristic of *Psectrogaster* demonstrates two less universal derived conditions within the genus. The condition least modified relative to the state in curimatid outgroups is common to *P. ciliata*, *P. essequibensis*, and *P. falcata*. In those species the first infrapharyngobranchial is somewhat crescent shaped with the dorsal surface concave, but with the overall form of the bone not modified further relative to the condition in characiform outgroups. The first infrapharyngobranchial in *P. saguiru* and *P. rutiloides* is further altered from the smoothly curved bone found in the three species just cited into a distinctly angled ossification. That more pronounced angle in the first infrapharyngobranchial is hypothesized synapomorphous for *P. rutiloides* and *P. saguiru* (SYNAPOMORPHY 15).

Three species in *Psectrogaster*, *P. amazonica*, *P. curviventris*, and *P. rhomboides*, although retaining the gentle curvature of  $PB_1$  hypothesized plesiomorphous within the genus, have the primitively cylindrical distal portion of the ossification flattened and expanded into a paddle shaped structure. That configuration of the distal portions of  $PB_1$  in *P. amazonica*, *P. curviventris*, and *P. rhomboides* is unique to these taxa in the family and is thus considered synapomorphous for the three species (SYNAPOMORPHY 18).

#### First Hypobranchial ( $H_1$ )

The first hypobranchial in the Curimatidae typically has a single broad articular surface along its anteromedial surface. The anteromedial cartilage surface of  $H_1$  articulates with the anterolateral margins of the second basibranchial posterdor-

sally and the contralateral first hypobranchial anteriorly. Within *Psectrogaster* the hypothesized plesiomorphous condition just described is limited to *P. falcata* and *P. essequibensis*. The remaining species in the genus (*rutiloides*, *ciliata*, *saguiru*, *curviventris*, *amazonica*, *rhomboides*), alternatively, have the anterior cartilaginous articular surface of  $H_1$  divided into two components (Figure 3). The smaller posteromedial process of the first hypobranchial articulates with the anteroventral margin of the second basibranchial ( $BB_2$ ). The proportionally larger anterior articular surface of the first hypobranchial in these five species has a limited contact medially with its counterpart of the opposite side of the gill arches and a more extensive articular surface anteriorly that contacts the inner surface of the hyoid arch. This distinctive subdivision of the articular surface of  $H_1$  is hypothesized to be a synapomorphy for the clade consisting of *P. rutiloides*, *P. saguiru*, *P. ciliata*, *P. amazonica*, *P. rhomboides*, and *P. curviventris* in light of its unique nature (SYNAPOMORPHY 14).

#### Third Ceratobranchial ( $C_3$ )

The third ceratobranchial of characiform outgroups in the Curimatidae, including the Prochilodontidae, has its dorsal margin transversely rounded or with a slight middorsal ridge extending along the longitudinal axis of the bone. A well-developed longitudinal ridge along the dorsal surface of that element characterizes all species of *Psectrogaster*, a hypothesized derived condition (SYNAPOMORPHY 9). A comparable ridge on the third ceratobranchial also occurs in some members of the curimatid genus *Curimata*, but is hypothesized to represent a homoplasious occurrence of that structure. (See Vari, 1989:29; in press b, for a discussion of the  $C_3$  ridges in the Curimatidae).

#### Fourth Ceratobranchial ( $C_4$ )

The fourth ceratobranchial among curimatids typically has a horizontal ridge extending along the ventromedial margin of the element. That ridge divides the medial surface of the element from the large ventral process on that bone. Such a ridge is universal in the Curimatidae with the exception of *P. essequibensis* and *P. falcata* in which that portion of the fourth ceratobranchial is unelaborated. The loss of the process on the fourth ceratobranchial is consequently considered a synapomorphy for the two species (SYNAPOMORPHY 10).

#### BODY FORM AND SQUAMATION

Members of the Curimatidae demonstrate a number of derived modifications of overall body form, with the most notable occurring in the prepelvic region. Two discrete conditions of that portion of the body occur within *Psectrogaster*. The majority of the members of the genus (*rutiloides*, *saguiru*, *ciliata*, *rhomboides*, *amazonica*, and *curviventris*) have a transversely rounded prepelvic region. *Psectrogaster*

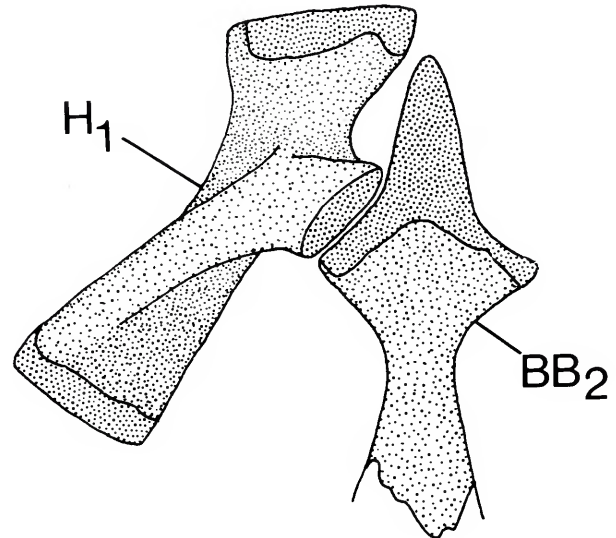


FIGURE 3.—*Psectrogaster ciliata*, USNM 269990, first hypobranchial, left side and second basibranchial, dorsal view (dense patterned stippling represents cartilage;  $H_1$  first hypobranchial;  $BB_2$  second basibranchial).

*essequibensis* and *P. falcata*, in contrast, have a distinctly flattened prepelvic region of the body bordered laterally by distinct, nearly right, angles in the body wall. Such lateral angles in the body wall are not known in the Prochilodontidae, which is the sister group to the Curimatidae, or in the majority of curimatids, and thus are judged to represent a derived character. Within the Curimatidae such flattened prepelvic regions and the associated angles in the ventrolateral body wall occur within *Psectrogaster*, *Curimata*, and *Curimatella*, with the transversely concave prepelvic region of *Potamorhina pristigaster* (Cope) possibly homologous with the conditions in those genera. The overall hypothesis of relationships within the Curimatidae (Vari, 1989), *Potamorhina* (Vari, 1984b), *Curimata* (Vari, in press b) and that proposed for *Psectrogaster* in this study indicate, however, that the derived flattened form of the prepelvic region arose independently in each of the genera. The flattened prepelvic region, with distinct lateral angles in the body wall, is consequently considered a synapomorphy for *Psectrogaster essequibensis* and *P. falcata* (SYNAPOMORPHY 11) albeit homoplasiously present in some outgroups within the Curimatidae.

Associated with the presence of a flattened preventral region in most species of *Psectrogaster* is a marked increase in the relative size of the scales on that area in proportion to the scales on the rest of the body. The species of *Psectrogaster* with a flattened prepelvic region have a single midventral series of enlarged scales flanked on each side by a series of similar sized scales. Each scale in the lateral series has a distinct longitudinal angle that conforms to the underlying nearly right angles of the body wall. The relative enlargement of the scales in these three



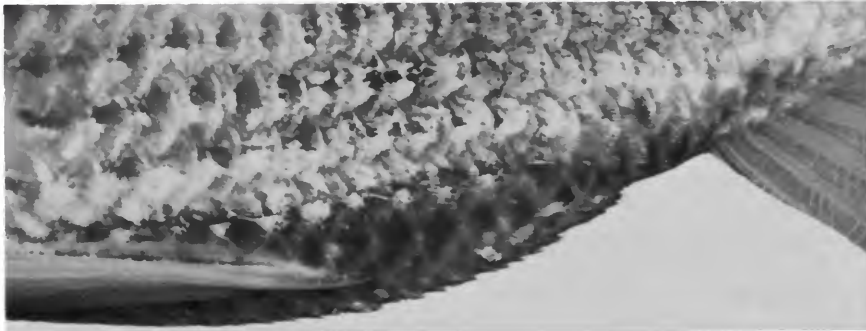


FIGURE 4.—*Psectrogaster amazonica*, USNM 229205; Brazil, Amazonas, Ilha de Marchantaria; postpelvic region, left side, lateral view showing midventral postpelvic serrae.

longitudinal series of scales and the reconfiguration of the lateral scale series of each side are considered derived relative to the conditions in outgroups in which the scales on the prepelvic region are neither enlarged nor are the lateral series angled. Enlarged prepelvic scales with angled lateral series on each side of the body also occur elsewhere in the Curimatidae in a subunit of *Curimata* and in *Curimatella* (the transversely convex prepelvic region in *Potamorhina pristigaster* does not have enlarged scales; see Steindachner, 1876, pl. 6b). Once again it is most parsimonious within the context of the overall intrafamilial phylogeny (Vari, 1989) and the simplest scheme of relationships in *Curimata* (Vari, in press, b) to hypothesize that although the presence of these adaptations in *Psectrogaster* is derived, their occurrence in the other cited genera within the Curimatidae is homoplasious. Given the lack enlarged scales on the transversely concave prepelvic region of *Potamorhina pristigaster*, I consider the flattening of that portion of the body and the enlargement of the scales in that region to be separate characters within the Curimatidae. The enlarged and modified scales of *P. falcata* and *P. essequibensis* are thus considered synapomorphous for that two species clade (SYNAPOMORPHY 12).

The midventral portion of the postpelvic region of the body also demonstrates a degree of supraspecific variation across the Curimatidae in general and within *Psectrogaster* in particular. The form of that region ranges from obtusely rounded to acutely keeled within the family, with all species of *Psectrogaster* having a moderate postpelvic median keel, the most widespread condition among curimatids. In most members of *Psectrogaster* this postpelvic keel has a smooth ventral margin uninterrupted by any distinct processes. In three species in the genus (*curviventris*, *amazonica*, and *rhomboides*) the margins of the scale along the midventral line of the body are expanded with distinctly serrate edges. As a result the entire postpelvic keel in those species has a serrate margin (Figure 4). A serrate midventral postpelvic keel is unknown in the Prochilodontidae, the sister group to the Curimatidae, and other

than for a single species is absent in the Curimatidae outside of *Psectrogaster*. That exception involves *Potamorhina pristigaster*, which has a serrate postpelvic keel. As noted by Vari (1984a:11) the serrations in that species differ structurally from those in *Psectrogaster*. A hypothesis of the non-homology of the serrations within the two genera based on structural differences is also congruent with the overall most parsimonious hypothesis of relationships within the Curimatidae (Vari, 1989), *Potamorhina* (Vari, 1984a) and that proposed in this paper for *Psectrogaster*. The postpelvic serrations are thus considered a synapomorphy unique to the clade consisting of *P. curviventris*, *P. amazonica*, and *P. rhomboides* within the Curimatidae (SYNAPOMORPHY 20).

#### MISCELLANEOUS

Several other derived features in various body systems characterize subunits of *Psectrogaster*. Pigmentation patterns of the head and body are not particularly variable within the Curimatidae, a generalization that applies equally well to most species of *Psectrogaster*. Three species within the genus (*curviventris*, *amazonica*, and *rhomboides*), however, have a distinct patch of dark pigmentation at the base of the middle caudal-fin rays. Such a pigmentation pattern is unique to these taxa within the family and is consequently hypothesized to be a synapomorphy for the three cited species (SYNAPOMORPHY 19).

*Psectrogaster rutiloides*, in turn, has in the vast majority of individuals, although not invariably, a distinct patch of dark pigmentation on the lateral surface of the lower lobe of the caudal fin about three-fifths of the distance along the length of the lobe (see Figures 16, 17). That pigmentation pattern is autapomorphous for the species within the family (SYNAPOMORPHY 16).

Two *Psectrogaster* species, *essequibensis* and *falcata*, have eight to ten (very rarely eight) branched anal-fin rays. This contrasts with the seven, rarely eight, rays found in the

remainder of the genus. The lower branched anal-fin ray count widespread in *Psectrogaster* is typical for prochilodontids and most, although not all, groups of curimatids. The higher number of branched anal-fin rays in *P. essequibensis* and *P. falcata* is consequently hypothesized to be derived for that species pair (SYNAPOMORPHY 13).

Adults of four species within *Psectrogaster* (*ciliata*, *amazonica*, *curviventris*, and *rhomboides*) have notably deeper bodies relative to their standard lengths than do the remaining members of the genus, or most curimatids. This increased body depth is tentatively hypothesized to be a derived feature for that clade in light of the cited outgroup conditions (SYNAPOMORPHY 17).

### Synapomorphy List and Phylogenetic Reconstruction

The preceding section of the discussion detailed the series of shared derived characters in different structures that are common to the members of *Psectrogaster* or to subsets of the genus. Vari (1989) has discussed the phylogenetic placement of *Psectrogaster* within the Curimatidae. The reader is referred to that study for further details on, and analysis of, the various character systems that contained information useful for the phylogenetic delimitation of *Psectrogaster*, and in the position of the genus within an overall phylogeny of the Curimatidae.

In the following discussion the shared derived characters congruent with a hypothesis of the monophyly of the genus *Psectrogaster* will only be listed in brief because those synapomorphies were discussed in greater detail in Vari (1989). The enumeration of the shared derived characters defining *Psectrogaster* is followed by a listing of the less universal apomorphies that characterize the clades and species within the genus.

Various authors have proposed diverse schemes as vehicles for conveying information on phylogenetic hypotheses within a classification. A subset of these methodologies involve the proposal of a name for each clade defined by shared derived characters. Formal nomenclatural recognition in this study is rather given only to the genus and the contained species. The latter nomenclatural system is used because the formal recognition of supraspecific taxa for all the clades within *Psectrogaster* consisting of two or more species would necessitate the proposal and utilization of a series of five additional taxa within the genus, with six names necessary if the remaining trichotomy in the present hypothesis of relationships were resolved by future studies. The resultant proliferation of subgeneric taxa in *Psectrogaster* would, at best, only marginally clarify the following discussion, and indeed would more likely obfuscate the presentation. Such subgeneric taxa are thus not utilized. Although the hypothesis of intrageneric relationships cannot as a consequence be directly retrieved from the proposed classification, that phylogenetic hypothesis is discussed in detail in the following section, and is presented visually in Figure 5.

Subsequent to the reconstruction of the most parsimonious hypothesis of phylogenetic relationships within *Psectrogaster* there is a discussion of the homoplasious characters within the genus, that is those derived attributes that have a phylogenetic distribution incongruent with the proposed most parsimonious hypothesis of relationships. These characters are all homoplasies between a subunit of *Psectrogaster* and another species or supraspecific clade in the Curimatidae. The discussion of the homoplasies in conjunction with the phylogenetic reconstruction provides the basis for the evaluation of the efficacy of previous classificatory schemes as indicators of the phylogenetic history of *Psectrogaster*, its suprageneric groupings and contained species.

The most parsimonious phylogenetic hypothesis for *Psectrogaster* incorporating the synapomorphies described above is presented in Figure 5. The apomorphous characters defining the genus *Psectrogaster*, the supraspecific clades, and species within the genus are numbered sequentially. The numbering of characters in the following text and the immediately preceding section on "Character Description and Analysis" corresponds to the numbered synapomorphies of Figure 5. That numbering procedure is utilized to simplify the visualization of the distribution of characters at all phylogenetic levels. It furthermore readily permits cross-reference of the preceding character descriptions and analyses with the phylogenetic reconstruction in this section.

Vari (1989) listed seven characters as synapomorphies for the members of *Psectrogaster*. Those characters are listed below and were discussed briefly under "Character Description and Analysis." The reader is referred to the earlier publication for further information on the characters, the condition(s) in the examined outgroups and the phylogenetic distribution of the different characters. In addition two other synapomorphies for the clade were discovered during this study.

The discovered synapomorphies described by Vari (1989) and in this paper for the members of the genus *Psectrogaster* are:

1. The posterior elongation of the medial spur arising from the medial surface of the main body of the fourth epibranchial ( $E_4$ ).
2. The posterior elongation and twisting, and distal flattening of the fifth upper pharyngeal tooth plate ( $UP_5$ ).
3. The well-developed longitudinal ridge on the ventral surface of the third epibranchial ( $E_3$ ).
4. The well-developed longitudinal ridge on the ventral surface of the second epibranchial ( $E_2$ ).
5. The distinct flange on the dorsal surface of the second infrapharyngobranchial ( $PB_2$ ) that overlies the anteromedial portion of the third infrapharyngobranchial ( $PB_3$ ).
6. The distinct longitudinal ridge on the ventral surface of the first epibranchial ( $E_1$ ).
7. The triangular flange on the posteromedial margin of the first epibranchial ( $E_1$ ) posterior to the uncinuate process

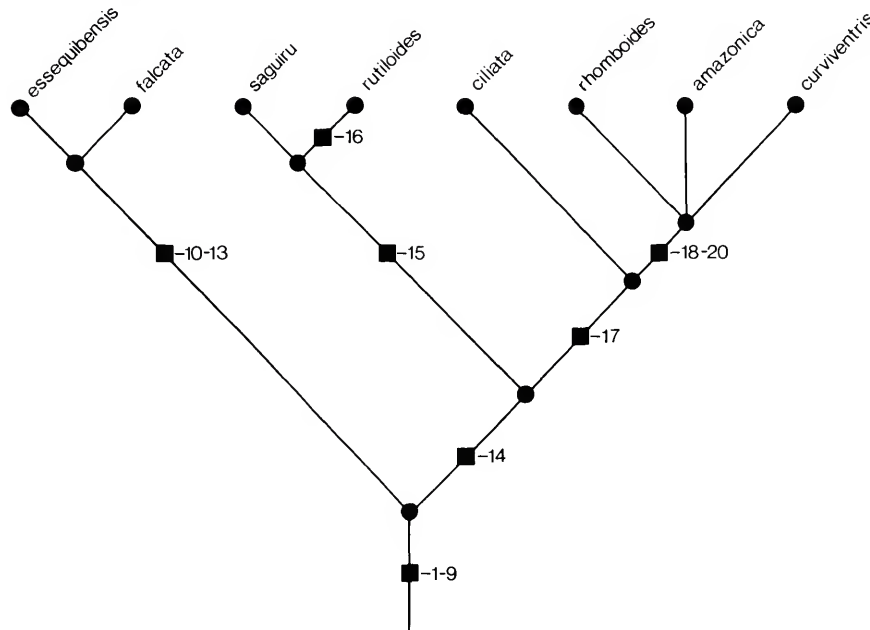


FIGURE 5.—Cladogram of the most parsimonious hypothesis of phylogenetic relationships within the genus *Psectrogaster*. The numbered synapomorphies correspond to those of the text.

on that element.

8. The curvature to some degree of the plesiomorphously straight first infrapharyngobranchial ( $PB_1$ ).
9. The longitudinal ridge on the dorsal surface of the third ceratobranchial ( $C_3$ ).

Vari (1989:33–35) noted that the elongation of the urohyal past the point of lateral divergence of the branchiostegal rays found in *Psectrogaster* is hypothesized to be derived within the Curimatidae. The phylogenetic distribution of that attribute within the family is such that two alternative equally parsimonious hypotheses exist as explanations of the evolutionary history of the character relative to *Psectrogaster*. Only one of these has the presence of the feature derived at the level of the genus. As a consequence I prefer not to use that equivocal character as an additional synapomorphy for *Psectrogaster* at this time.

Characters one to nine unite two clades, the first consisting of the *P. falcata* and *P. essequibensis*, and the second of the other six species in the genus. The clade consisting of *P. falcata* and *P. essequibensis* is delimited by the following synapomorphies:

10. The loss of the horizontal ridge on the ventromedial region of the fourth ceratobranchial ( $C_4$ ).
11. The transversely flattened prepelvic region of the body delimited laterally by distinct, nearly right angles in the body wall.
12. The enlarged midventral series of prepelvic scales flanked on each side by a series of enlarged scales that conform

in shape to the lateral angles in the body wall.

13. The possession of 8 to 10 branched anal-fin rays.

No autapomorphies for either *P. falcata* or *P. essequibensis* have been discovered during the present study.

The sister clade to the lineage delimited by characters 9 through 12 consists of *P. rutiloides*, *P. saguiru*, *P. ciliata*, *P. curviventris*, *P. amazonica*, and *P. rhomboides*. These six species share a single known synapomorphous feature:

14. The subdivision of the anterior articular surface of the first hypobranchial ( $H_1$ ) into anterior and anteromedial subunits.

Character 14 unites two clades consisting of two and four species respectively. The first of these, that formed by *P. rutiloides* and *P. saguiru*, is defined by the following synapomorphy:

15. The distinctly angled form of the first infrapharyngobranchial ( $PB_1$ ).

*Psectrogaster rutiloides*, a species widely distributed in the Amazon basin, is characterized by a single pigmentary autapomorphy:

16. The presence of a dark patch of pigmentation located on the lateral surface of the lower lobe of the caudal fin in most individuals of the species.

No autapomorphies for *P. saguiru* have been discovered during the present study.

The remaining four species of *Psectrogaster* (*ciliata*,



*amazonica*, *curviventris*, and *rhomboides*) are tentatively united on the basis of a single feature:

17. The increase in the relative depth of the body compared to the condition in congenierics.

Within the clade characterized by this feature are two less inclusive lineages, the first consisting of *P. ciliata*, and the other of *P. curviventris*, *P. amazonica*, and *P. rhomboides*.

No autapomorphies for *P. ciliata* were discovered during this study.

*Psectrogaster curviventris*, *P. amazonica*, and *P. rhomboides* are united in a unresolved trichotomy by several synapomorphies. The derived features common to these three species are:

18. The paddle-shaped distal portion of the first infrapharyngobranchial (PB<sub>1</sub>).  
 19. The diffuse spot of dark pigmentation at the base of the middle rays of the caudal fin.  
 20. The presence of distinct serrae along the postpelvic midventral keel.

No autapomorphies for *P. curviventris*, *P. amazonica*, or *P. rhomboides* have been uncovered to date.

#### Convergent Characters

The synapomorphous features delimiting both *Psectrogaster* and subunits of the genus are largely innovative (sensu Weitzman and Fink, 1985), and in large measure do not have homoplasious distributions within the Curimatidae. Three exceptions to that generalization involve the well-developed longitudinal ridges along the ventral surface of the first, second, and third epibranchials that are common to all species of *Psectrogaster*. Comparable elaborations of these elements are also found in components of *Curimata*, albeit at differing levels of universality within the latter genus. As a result of the lack of congruence in the phyletic distribution of the ridges in *Curimata*, those features provide equivocal data on alternative schemes of relationships between *Psectrogaster* and the involved subunits of *Curimata*. The common occurrence of these evidently identical features in these groups is furthermore considered to be homoplasious within the context of the most parsimonious hypothesis of relationships within the family (Vari, 1989) and *Curimata* (Vari, in press b). The common occurrence of a distinct flange on the anterodorsal surface of the second infrapharyngobranchial in *Psectrogaster* and a component of *Steindachnerina* is similarly considered homoplasious under that same generic level phylogenetic hypothesis (Vari, 1989).

#### Comparisons with Previous Classifications

The generic nomenclature of the nominal species united within *Psectrogaster* in this study was relatively stable in

treatments of components of the genus in the period from 1845 to 1948. With the exception of *P. ciliata*, described by Müller and Troschel in *Anodus* Spix, a genus not available in the Curimatidae (see Vari, 1989), the nominal species of the lineage were either originally assigned to *Psectrogaster* (four species) or *Curimata* (seven species). Fernández-Yépez (1948), who drastically restructured the taxonomy of the entire Curimatidae, apportioned the species of *Psectrogaster*, of this paper, among *Psectrogaster*, *Pseudopsectrogaster*, *Hamatichthys*, *Lambepiedra*, *Semelcarinata*, *Hemicurimata*, and *Camposella*. That highly subdivided classificatory scheme was not utilized by many subsequent authors who instead continued to apply the traditional nomenclature to the groups, and used *Curimata* and *Psectrogaster* for the contained species. Fowler (1975:375), however, additionally applied *Suprasinelepicthys* to one nominal species of the clade without explanation. The classification and "phylogenetic tree" proposed by Fernández-Yépez are, however, the only previous, somewhat comprehensive, treatments of the family and thus the most appropriate basis for comparisons with the results of this study.

The thirteen nominal species herein united in *Psectrogaster* were assigned by Fernández-Yépez to seven different genera. One of these genera (*Hemicurimata*) was placed in a lineage recognized as the Curimatopsini by that author, three (*Camposella*, *Lambepiedra*, *Semelcarinata*) in his Curimatini and three (*Hamatichthys*, *Psectrogaster*, *Pseudopsectrogaster*) in his Potamorhini. Each of these groups included other nominal species considered by Vari (1989) to be members of other, often not closely related, genera. Although the lack of an explicit statement of how Fernández-Yépez arrived at his tree precludes a discussion of the comparative utility of the methods used to arrive at the two alternative hypotheses of relationships, it is apparent that Fernández-Yépez's scheme is derived from his dichotomous key, which, in turn, depended on a few external morphological characters. The problems with using the characters proposed by Fernández-Yépez to discriminate the taxa of his classification were noted by Böhlke (1958:108), Ringuet et al. (1967:198), Britski (1969:203), and Vari (1982a:12, 1984a:11, 1989, in press b) who reclassified various species at the generic level. Reference to the key and tree advanced by Fernández-Yépez shows that the differences between his results and those of Vari (1989) were primarily a consequence of the former authors dependence on a few characters having homoplasious distributions within the Curimatidae. This problem was compounded by his incorrect homology of postpelvic serrations in two lineages of curimatids, and a failure to take into account the ontogenetic variation in the degree of development of the laterosensory canal system on the body within the Curimatidae (see below).

The major dichotomies in the key put forward by Fernández-Yépez involved the transverse profile of the portions of the dorsal and ventral body surfaces among curimatids. The presence of serrations on the postpelvic midventral line that delimited the Potamorhini according to Fernández-Yépez represents non-homologous modifications

of that region (see discussion in Vari, 1984a:11). Furthermore the most parsimonious overall hypothesis of relationships within the family based on multiple character states indicates the the nominal genera *Hamatichthys*, *Pseudopsectrogaster*, and *Psectrogaster* (all = *Psectrogaster* in this study) and *Potamorhina*, which together constitute the Potamorhini of Fernández-Yépez, are not a natural assemblage (Vari, 1989). Some of the nominal *Psectrogaster* species of this study (*falcata* and *essequibensis*) were united by Fernández-Yépez with curimatids of various lineages sharing a flattened prepelvic region of the body. Vari (1989:64) found that a flattened prepelvic region is homoplasiously distributed within the family when examined in the context of a greater number of internal and external derived features.

Finally, the single contained species in *Hemicurimata* (*Curimata pearsoni* = *Psectrogaster curiviventris*) was placed by Fernández-Yépez in his Curimatopsini on the basis of the incompletely pored laterosensory canal system on the body. Reexamination of the holotype, the only known specimen, reveals that it is a juvenile of *Psectrogaster curiviventris* in which the lateral line is not completely developed posteriorly. *Curimata pearsoni* demonstrates the externally obvious derived features common to the species of *Psectrogaster* but which are absent in *Curimatopsis*. That genus furthermore lacks the numerous derived features common to the other members of the Curimatopsini of Fernández-Yépez that were united in a redefined *Curimatopsis* by Vari (1982a:10–12).

#### Genus *Psectrogaster* Eigenmann and Eigenmann, 1889

*Psectrogaster* Eigenmann and Eigenmann, 1889a:7 [type species: *Psectrogaster rhomboides* Eigenmann and Eigenmann, 1889a, by original designation].

*Pseudopsectrogaster* Fernández-Yépez, 1948:31 [type species: *Psectrogaster curiviventris* Eigenmann and Kennedy, 1903, by original designation].

*Hamatichthys* Fernández-Yépez, 1948:33 [type species: *Anodus ciliatus* Müller and Troschel, 1845, by original designation].

*Semelcarinata* Fernández-Yépez, 1948:59 [type species: *Curimatus isognathus* Eigenmann and Eigenmann, 1889b (= *Curimatus rutiloides* Kner, 1859a), by original designation].

**DIAGNOSIS.**—*Psectrogaster* is a morphologically diverse lineage of the family Curimatidae. *Psectrogaster* species typically are of moderate body size (maximum known standard length for the species ranging from 129 to 178 mm SL). The genus is characterized by a series of derived modifications of the first to fourth epibranchials, fifth upper pharyngeal tooth-plate, first and second infrapharyngobranchials and third

ceratobranchial (see characters 1 to 9 in “Phylogenetic Reconstruction”).

Dorsal-fin rays ii,8–10 or iii,9; anal-fin rays ii,7–10 or iii,7–8; pectoral-fin rays 13 to 17; pelvic-fin rays i,7–9; adipose fin always present. Pored lateral line scales from supracleithrum to hypural joint range from 39 to 61; sensory canals in lateral line scales straight; scale margins range from smooth to distinctly ctenoid; ctenii more developed on ventral portions of body; postpelvic median keel of some species with a serrate margin. Number of scales in a transverse series from origin of rayed dorsal fin to lateral line 10 to 17; number of scales in a transverse series from origin of anal fin to lateral line 6 to 13. Preventral region flattened or rounded transversely, with or without enlarged scales. Postpelvic region with median keel; keel serrate in some species. Total vertebrae typically 30, rarely 29 or 31.

**REMARKS.**—Three additional generic names (*Pseudopsectrogaster*, *Hamatichthys*, and *Semelcarinata*), all proposed by Fernández-Yépez in a single publication (1948), are available for species placed in *Psectrogaster* in this study. Within the confines of the requirement that all recognized taxa must be monophyletic, it is possible to recognize one to eight genera within the clade consisting of the eight species placed in *Psectrogaster* in this study. The phylogenetic distribution of the type species (*curiviventris*, *rhomboides*, *ciliata*, and *rutiloides*) of the four nominal genera available in the genus is such that if we were to recognize all nominal genera, it would be minimally necessary to propose another genus for the clade consisting of *Psectrogaster essequibensis* and *P. falcata*, in order that all recognized genera be monophyletic. Such a proliferation of genera in the absence of a nested series of subgeneric taxa would, however, still not provide a sense of the hypothesized scheme of relationships within the genus presented in Figure 5. The representation of the subgeneric phylogeny via the classification would, in turn, require the proposal of five additional names. Such a system would be unwieldy in practice. We could alternatively recognize a single all inclusive genus and a series of five taxa between the generic and specific levels that would reflect the hypothesized supra-specific phylogeny within the genus. Although less complex than the previous alternative, such a system would be still be cumbersome. The taxonomically simpler system of a single genus with eight contained species is consequentially judged preferable and is the procedure followed herein, with the hypothesis of intrageneric relationships set forward explicitly in Figure 5.

#### Key to the Species of *Psectrogaster*

1. Prepelvic region distinctly flattened transversely from area ventral to origin of pectoral fin posteriorly to origin of pelvic fin; flattened area delimited laterally by distinct, nearly right, angles in body wall. A distinct series of enlarged midventral scales on prepelvic region; enlarged median scale series of prepelvic area flanked on each side by a row of enlarged scales that conform in shape to lateral angles of body. Usually 9 branched pelvic-fin rays (rarely 8) . . . . . 2



- Prepelvic region transversely rounded or with median keel. Midventral series of scales on prelevic region irregularly arranged and not enlarged; no distinct angle laterally on prepelvic region of body. 7 or 8 branched pelvic-fin rays . . . . . 3
2. Pored lateral line scales to hypural joint 44 to 49; scales in a transverse series from lateral line to origin of anal fin 7 to 9 . . . . . *P. essequibensis*  
(Essequibo River, Rio Amazonas)
- Pored lateral line scales to hypural joint 54 to 62; scales in a transverse series from lateral line to origin of anal fin 10 to 13 . . . . . *P. falcata*  
(eastern portions of Rio Amazonas basin)
3. Margin of postpelvic median keel smooth, without posteriorly or posteroventrally directed serrae on scales forming margin of keel. No patch of dark pigmentation at base of middle rays of caudal fin . . . . . 4
- Postpelvic median keel with posteriorly or posteroventrally directed serrae on scales forming margin of keel [Figure 4]. A distinct patch of dark pigmentation at base of middle rays of caudal fin . . . . . 6
4. Greatest body depth 0.42–0.54 of SL. Lower lobe of caudal fin without blotch of dark pigmentation approximately four-fifths of distance from base; no longitudinal striping along body . . . . . *P. ciliata*  
(Essequibo River, Río Orinoco, Rio Branco, and Rio Negro drainage basins)
- Greatest body depth 0.35–0.42 of SL. Either a blotch of dark pigmentation approximately four-fifths of distance from base of lower lobe of caudal fin, or longitudinal striping along body . . . . . 5
5. Pored lateral line scales to hypural joint 41 to 47. Lower lobe of caudal fin plain. 10 to 13 prominent longitudinal stripes typically present along scale rows of lateral and ventral portions of body . . . . . *P. saguiri*  
(Rivers of Northeastern Brazil)
- Pored lateral line scales to hypural joint 45 to 51. Lower lobe of caudal fin with a diffuse blotch of coloration approximately four-fifths of distance from base of fin (sometimes absent), longitudinal striping along body rarely present . *P. rutiloides*  
(Rio Amazonas drainage basin)
6. Prepelvic region with a distinct median ridge, median prepelvic ridge continuous with midventral postpelvic keel. Origin of pelvic fin distinctly dorsal of ventral margin of body . . . . . *P. curviventris*  
(Río Paraguay-Paraná system and upper Rio Madeira)
- Prepelvic region transversely rounded, postpelvic median keel not continued anteriorly between origin of pelvic fins as a median prepelvic keel. Origin of pelvic fin at level of midventral margin of body . . . . . 7
7. Attenuate posterior portion of posterior chamber of swimbladder extends posteriorly to lateral surface of posteriormost basal pterygiophores of anal fin. Distance from snout to origin of rayed dorsal fin equal to or slightly longer than distance from origin of rayed dorsal fin to tip of adipose fin . . . . . *P. amazonica*  
(Rio Amazonas system)
- Attenuate posterior portion of posterior chamber of swimbladder extends posteriorly to lateral surface of anterior basal pterygiophores of anal fin. Distance from snout to origin of rayed dorsal fin equal to or slightly shorter than distance from origin of rayed dorsal fin to posterodorsal limit of caudal peduncle . . . *P. rhomboides*  
(Northeastern Brazil: Rio Parnaíba and Rio Jaguaribe systems)

***Psectrogaster essequibensis* (Günther)**

FIGURES 6, 7

*Curimatus ciliatus*.—Kner, 1859a:143 [in part; Río Guaporé].—Eigenmann,

1912:268 [*Curimatus essequibensis* Günther, 1864, placed into synonymy of *Anodus ciliatus* Müller and Troschel, 1845; references in part, only *C. essequibensis* citations; all listed specimens, British Guiana (= Guyana): Rupununi, Rockstone, Crab Falls, Warraputa, Konawaruk].

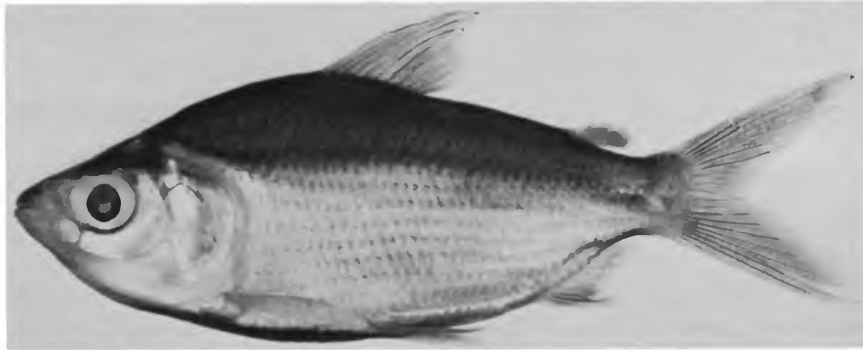


FIGURE 6.—*Psectrogaster essequibensis*, USNM 267339, 73.3 mm SL; Peru, Loreto, Rio Amazonas, Santa Rosa across from Tabatinga, Amazonas, Brazil.

*Curimatus essequibensis* Günther, 1864:291 [type locality: Essequibo].—Eigenmann 1910:422 [reference]; 1912:268 [placed as a synonym of *Anodus ciliatus* Müller and Troschel, 1845].—Fernández-Yépez, 1948:73 [as probable synonym of *Anodus* (= *Hamatichthys*) *ciliatus*].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Psectrogaster ciliata*.—Eigenmann and Eigenmann, 1889b:413 [references in part, Kner, 1859a citation].

*Curimata essequibensis*.—Géry, 1977:230 [as possible synonym of *Curimata ciliata*].

*Psectrogaster essequibensis*.—Ortega and Vari, 1986:11 [Peru, Amazon basin; common name].

**DIAGNOSIS.**—The possession of a transversely flattened prepelvic region with enlarged scales distinguishes *Psectrogaster essequibensis* from all other members of the genus with the exception of *P. falcata*. *Psectrogaster essequibensis* can be separated from that species in having 39 to 49 lateral line scales to the hypural joint in contrast to 54 to 62 in *P. falcata*. Similarly the presence of 7 to 10 scales below the lateral line to the origin of the anal fin in *P. essequibensis* separates that species from *P. falcata*, which has 10 to 13 scales in that series.

**DESCRIPTION.**—Body moderately elongate, somewhat compressed, slightly convex from rear of head to origin of rayed dorsal fin, convexity more pronounced in larger specimens; profile of body straight and posteroventrally slanted at base of rayed dorsal fin, gently convex from base of last dorsal-fin ray to caudal peduncle. Dorsal surface of body with an indistinct median keel anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle. Prepelvic region flattened, bordered laterally by distinct, nearly right, angle in body wall; angle extends approximately from vertical through origin of pectoral fin to origin of pelvic fin. Flattened prepelvic region with distinct median series of enlarged scales, scales immediately lateral to median series similarly enlarged and conform in shape to lateral angles of prepelvic body wall. Distinct median keel extends from origin of pelvic fin to anus. Secondary obtuse flexure in postpelvic body wall located approximately 2 scale rows dorsal of ventral midline on each side of body.

Greatest body depth at origin of rayed dorsal fin, depth 0.39–0.49 [0.44]; snout tip to origin of rayed dorsal fin 0.48–0.54 [0.51]; snout tip to origin of anal fin 0.79–0.85 [0.82]; snout tip to origin of pelvic fin 0.55–0.61 [0.56]; snout tip to anus 0.76–0.83 [0.77]; origin of rayed dorsal fin to hypural joint 0.54–0.60 [0.58]. Rayed dorsal fin pointed, first branched ray longest, anteriormost rays 2.5–3.5 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.18–0.22 [0.19], extends two-thirds distance to vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.18–0.23, reaches three-quarters of distance to origin of anal fin. Caudal fin forked. Adipose fin well developed. Anal fin emarginate, anterior branched rays over twice length of ultimate ray. Caudal peduncle depth 0.11–0.13 [0.12].

Head profile distinctly pointed, head length 0.31–0.36 [0.33]; jaws equal, mouth terminal; snout length 0.26–0.32 [0.28]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.26–0.33 [0.28]; adipose eyelid moderately developed, with a vertically ovate opening over center of eye; length of postorbital portion of head 0.41–0.48 [0.46]; gape width 0.28–0.34 [0.33]; interorbital width 0.42–0.49 [0.47].

Pored lateral line scales from supracleithrum to hypural joint 39 to 49 [49]; all scales of lateral line pored, canals in lateral line scales straight; 3 to 7 series of scales extend beyond hypural joint onto caudal fin base; 10 to 15 [13] scales in a transverse series from origin of rayed dorsal fin to lateral line, 7 to 10 [9] scales in a transverse series from the lateral line to origin of anal fin; scales very weakly ctenoid.

Dorsal-fin rays ii,9 [ii,9]; anal-fin rays ii,8–10 [ii,10]; pectoral-fin rays 14 to 16 [15]; pelvic-fin rays i,8–10 [i,9].

Total vertebrae 30 (19).

**COLOR IN ALCOHOL.**—Specimens that retain guanine on scales golden or silvery golden, overall pigmentation more intense on dorsal portions of head and body. Specimens lacking guanine on scales tan or brownish. No notable pigmentation pattern on head, body or fins. Series of small chromatophores

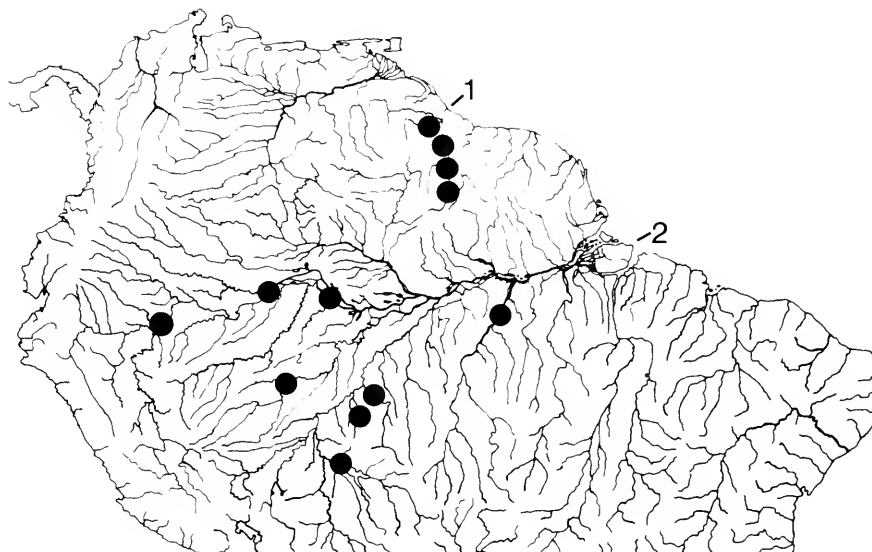


FIGURE 7.—Geographic distribution of *Psectrogaster essequibensis* (some of the symbols represents more than one locality or lot of specimens). Locations: 1 = Essequibo River; and 2 = Rio Amazonas.

outline fin rays, most notably along distal portions and margins of caudal, anal, and rayed dorsal fins.

**DISTRIBUTION.**—Essequibo River of Guyana and Rio Amazonas drainage systems (Figure 7).

**REMARKS.**—Günther (1864:291) in his original description of *Curimatus essequibensis* listed two syntypic specimens from the Essequibo River. The larger 101.1 mm SL individual, which is in better condition (BMNH 1864.1.21:61), is designated as the lectotype of the species. The second specimen (BMNH 1864.1.21:62) becomes a paralectotype.

Kner (1859a:143) cited *Curimatus ciliatus* as an element of the Río Guaporé ichthyofauna. The specimen that was the basis, at least in part, for that record (NMW 16371) is actually an individual of *Curimata essequibensis*.

Eigenmann (1912:268) placed *Curimata essequibensis* as a synonym of *Anodus ciliatus* Müller and Troschel. That synonymy was tentatively accepted by Fernández-Yépez (1948:73) and Géry (1977:230). Examination of the type series of each nominal species has revealed numerous differences in body form, meristics, and other characters (see “Key,” and “Diagnosis” for each species). The most noteworthy of these differences are the flattened prepelvic region of the body and markedly enlarged prepelvic scales in *Psectrogaster essequibensis*, which contrast with the transversely rounded prepelvic region and moderately sized scales of *P. ciliata*. Thus, contrary to Eigenmann, *C. essequibensis* is considered to represent a distinct species. All examined specimens reported on by Eigenmann (1912:268) from British Guiana (= Guyana) as *Curimatus ciliatus* are rather *Psectrogaster essequibensis*.

**MATERIAL EXAMINED.**—91 specimens (53, 52.9–169.0).

**GUYANA.** Essequibo River, BMNH 1864.1.21:61, 1

(101.1, lectotype of *Curimatus essequibensis*); BMNH 1864.1.21:62, 1 (91.8, paralectotype of *Curimatus essequibensis*). Essequibo: Konawaruk, CAS-IU 12272, 4 (45.7–61.3); MCZ 29923, 1 (54.5); BMNH 1911.10.31:196, 1. Rockstone, USNM 66145, 1 (69.5); ZMA 110.608, 1. Mazaruni River near Karatabo, AMNH 51636, 2.

**BRAZIL.** *Pará:* Ilha de Barreirinha, Rio Tapajós near São Luís, MZUSP 22101, 26 (14, 104.9–117.0); USNM 267334, 3 (112.5–116.3, 1 specimen cleared and counterstained for cartilage and bone). Rio Tapajós, Itaituba, USNM 268902, 3. *Amazonas:* Rio Tefé, Lago do Jacaré, USNM 268040, 4 (133.4–174.0). *Acre:* Rio Purus, NMW 67017, 1 (134.7). *Rondonia:* Rio Machado, USNM 220346, 3 (2, 143.1–150.2). Río Guaporé 15 km above Costa Marques, INPA POLO-59, 2; INPA POLO-69, 11 (5, 143.6–169.0); USNM 268087, 2 (142.3–157.4). Rio Canaã, 10 km above Ariquemes, INPA POLO-175, 9 (3, 119.8–148.0).

**PERU.** *Loreto:* Río Amazonas, Santa Rosa across from Tabatinga, USNM 267339, 1 (73.3). Río Apayacu, vicinity of Pebas, USNM 175872, 1 (156.0).

**BOLIVIA.** *Beni:* Río Guaporé, NMW 16371, 1. Río Baures 6 miles SW of Costa Marques, AMNH 37715, 9 (78.9–114.2). Río Blanco, USNM 278584, 3; Río Itenez at confluence with Río Machupo, USNM 278557, 1.

#### *Psectrogaster falcata* (Eigenmann and Eigenmann)

FIGURES 8, 9

*Curimatus falcatus* Eigenmann and Eigenmann, 1889b:430 [type locality: Brazil: Rio Xingu, Gurupa]; 1891:48 [reference].—Eigenmann, 1910:422 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Composella falcata*.—Fernández-Yépez, 1948:61 [assignment to *Camposella*].—Fowler, 1975:367 [reference].



FIGURE 8.—*Psectrogaster falcata*, USNM 268402, 123.5 mm SL; Brazil, Pará, Rio Tapajós, Itaituba.

*Curimata falcata*.—Fowler, 1950:284 [reference].—Géry, 1977:230 [reference].—Smith, 1981:141 [Brazil, Itacoatiara, market fish].—Géry, 1977:230 [as a member of *Curimata cyprinoides* complex].

**DIAGNOSIS.**—The presence of a transversely flattened preventral region bearing enlarged scales distinguishes *Psectrogaster falcata* from all other species of the genus with the exception of *P. essequibensis*. The possession of 54 to 62 pored lateral line scales to the hypural joint separates *P. falcata* from *P. essequibensis*, which has 44 to 49 scales in that series. Similarly the 10 to 13 scales in a transverse series from the lateral line to the anal fin distinguishes *P. falcata* from *P. essequibensis*, which has 7 to 10 in that series.

**DESCRIPTION.**—Body moderately elongate, less so in ripe females, compressed. Dorsal profile of head straight. Dorsal profile of body convex from rear of head to origin of rayed dorsal fin, convexity more pronounced anteriorly, particularly in larger specimens; profile straight and posteroventrally slanted along base of rayed dorsal fin, gently convex from base of last dorsal-fin ray to caudal peduncle, convexity more pronounced in larger specimens. Dorsal surface of body with an indistinct median keel anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to vertical through origin of pectoral fin, somewhat flattened from that point to anus, and then gently convex to caudal peduncle, more convex overall in ripe females. Prepelvic region distinctly flattened, bordered laterally by distinct, nearly right, angles in body wall; angles extend from ventral of origin of pectoral fins to origin of pelvic fins. Flattened prepelvic region with distinct series of enlarged median scales. Scales immediately lateral to median series similarly enlarged and conform in shape to lateral angles of prepelvic body wall. A distinct median keel extends from posterior of origin of pelvic fin to anus, a secondary obtuse flexure in postpelvic body wall located approximately two scale rows dorsal of ventral midline on either side of body.

Greatest body depth at origin of rayed dorsal fin, depth

0.40–0.47 [0.40]; snout tip to origin of rayed dorsal fin 0.48–0.54 [0.51]; snout tip to origin of anal fin 0.78–0.86 [0.83]; snout tip to origin of pelvic fin 0.52–0.59 [0.56]; snout tip to anus 0.76–0.84 [0.77]; origin of rayed dorsal fin to hypural joint 0.55–0.61 [0.60]. Rayed dorsal fin pointed, margin concave, first branched ray longest, 3.5–4.2 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.17–0.22 [0.18], extends two-thirds to three-quarters distance to vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.19–0.23 [0.21], reaches one-half to two-thirds distance to origin of anal fin. Caudal fin forked. Adipose fin well developed. Anal fin emarginate, anteriormost branched rays twice length of ultimate ray. Caudal peduncle depth 0.11–0.14 [0.12].

Head profile distinctly pointed, head length 0.28–0.33 [0.31]; jaws equal, mouth terminal; snout length 0.27–0.33 [0.29]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.24–0.30 [0.26]; adipose eyelid well developed, with a vertically ovoid opening over middle of eye; length of postorbital portion of head 0.42–0.51 [0.51]; gape width 0.24–0.30 [0.25]; interorbital width 0.41–0.46 [0.44].

Pored lateral line scales from supracleithrum to hypural joint 54 to 62 [58]; all scales of lateral line pored, canals in lateral line scales straight; 5 to 7 series of scales extend beyond hypural joint onto caudal fin base; 13 to 17 [14] scales in a transverse series from origin of rayed dorsal fin to lateral line, 10 to 13 [11] scales in a transverse series from the lateral line to origin of anal fin; scales ctenoid, ctenii most developed on ventral portions of body.

Dorsal-fin rays ii,9 or iii,9 [ii,9]; anal-fin rays ii,8–10, iii,9 [ii,9]; pectoral-fin rays 14 to 17 [15]; pelvic-fin rays i,9–10 [i,9].

Total vertebrae 30 (18).

**COLOR IN ALCOHOL.**—Overall coloration in specimens that



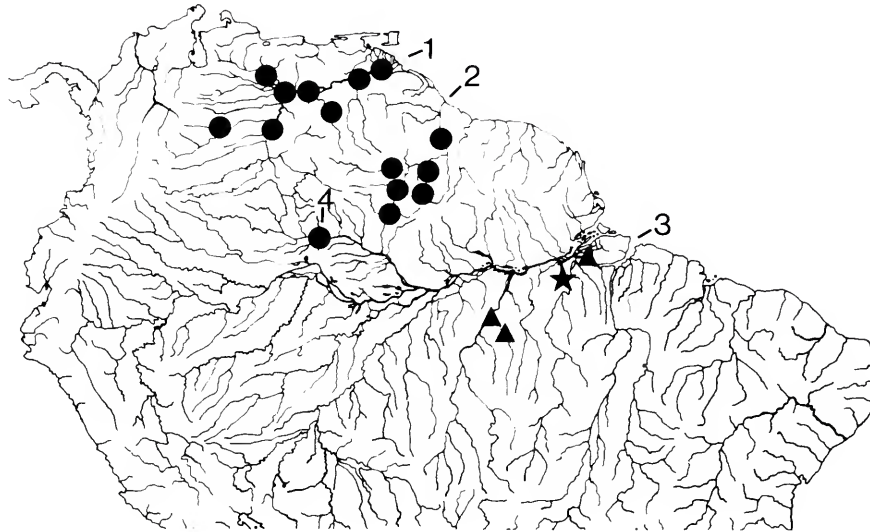


FIGURE 9.—Geographic distribution of *Psectrogaster falcata* (star = lectotype locality, triangles = sites of other collections), and *Psectrogaster ciliata* (dots) (some of the symbols represent more than one locality or lot of specimens). Locations: 1 = Río Orinoco; 2 = Essequibo River; and 3 = Río Amazonas.

lack guanine on scales yellowish to brown, body pigmentation more intense on dorsal portions of head and body. Overall coloration of specimens retaining guanine on scales silvery, darker on dorsal portions of head and body. No pronounced pigmentation pattern on head or body. Anterior margin and distal portion of rayed dorsal fin dusky. Adipose fin margined by dark chromatophores. Anteriormost rays of anal fin and lateral rays of pelvic fin dusky. Rays of caudal fin outlined by a series of small dark chromatophores.

**DISTRIBUTION.**—Eastern portions of Rio Amazonas drainage basin (Figure 9).

**REMARKS.**—Four specimens served as the basis for the original description of *Curimatus falcatus* by Eigenmann and Eigenmann (1889b:430). One of the three specimens from the Rio Xingu that is in the best overall condition of all of the syntypes (MCZ 20340, 167.5 mm SL) is designated as the lectotype of the species. The remaining syntypic specimens (MCZ 60393 and 20189) thus become paralectotypes.

Géry (1977:230) aligned *Curimata* (= *Psectrogaster*) *falcata* with the *Curimata cyprinoides* species complex. Although he did not explicitly state the reasons for this association, it presumably was based on the common possession of a transversely flattened prepelvic region in the involved species. Data on phylogenetic relationships within the Curimatidae derived from a variety of body systems ("Phylogenetic Reconstruction" and Vari, 1989) indicate that the common possession of such a form of prepelvic region is homoplasious, and that the species with that feature do not constitute a natural lineage.

**MATERIAL EXAMINED.**—852 specimens (63, 83.0–167.5).

**BRAZIL. Pará:** Rio Xingu, MCZ 20340, 1 (167.5, lectotype of *Curimatus falcatus*); MCZ 60393, 2 (138.5–139.5, paralectotypes of *Curimatus falcatus*, out of MCZ 20340). Rio Xingu, Belo Monte, edge of river, USNM 268043, 29 (10, 122.2–144.0); AMNH 55628, 3 (127.2–137.2); MCZ 61405, 3 (132.8–138.4); MZUSP 32280, 483. Gurupa, MCZ 20189, 1 (135.0, paralectotype of *Curimatus falcatus*). Rio Jamanxim above Bebal, MZUSP 25474, 1 (126.0). Rio Tapajós, Maloquinha, MZUSP 21399, 1 (126.7). Rio Tapajós, Maloquinha near Itaituba, MZUSP 21899, 5 (99.2–118.3, 1 specimen cleared and counterstained for cartilage and bone). Rio Tapajós, Barreirinha, MZUSP 21409, 1 (125.8). Rio Tapajós, Itaituba, edge of river channel, USNM 268402, 25 (10, 115.3–141.3); USNM 268401, 50 (10, 83.0–101.6); MCZ 61404, 5 (93.8–111.8); AMNH 55627, 5 (91.7–100.1); BMNH 1984.11.8:1–5, 5 (96.2–103.0); MZUSP 32278, 226. Rio Tapajós, São Luís, MZUSP 32279, 6.

### *Psectrogaster ciliata* (Müller and Troschel)

FIGURES 9–13

*Anodus ciliatus* Müller and Troschel, 1845:25, pl. 4, fig. 4 [type locality: British Guiana (= Guyana), Essequibo River]; 1848:633 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Curimatus ciliatus*.—? Valenciennes (in Cuvier and Valenciennes), 1849:15 [Rio Amazon].—? Castelnau, 1855:58 [Amazon].—Günther, 1864:292 [copied].—Eigenmann, 1912:268 [British Guiana (= Guyana); references in part, not *C. essequibensis*, *C. cyprinoides*, or *C. rutiloides* citations; not Río Paraná or Río Paraguay citations; none of listed specimens.] [Not Perugia, 1891:639.]

*Psectrogaster ciliata*.—Eigenmann and Eigenmann, 1889b:413 [reference in



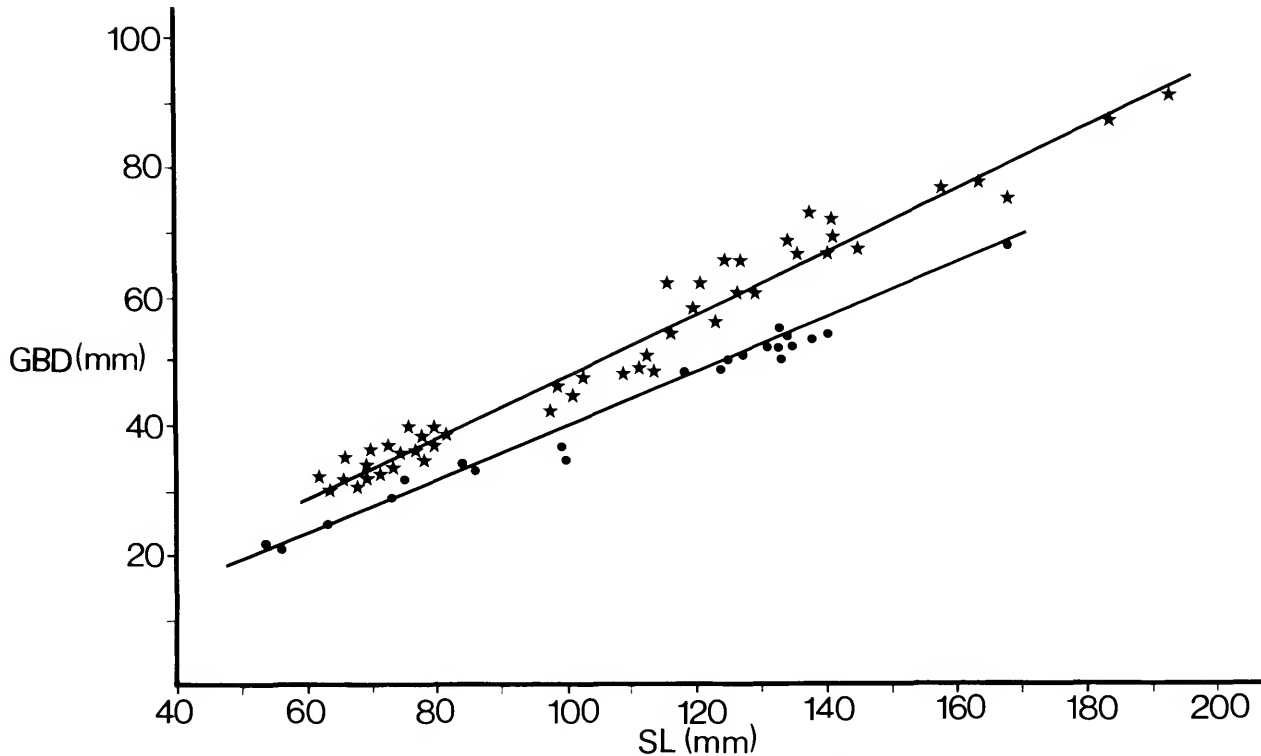


FIGURE 10.—Plot of greatest body depth (GBD) against standard length (SL), both in millimeters, for *Psectrogaster ciliata* (stars) and *Psectrogaster saguiru* (dots) with regression lines for each species (some symbols represent more than one data point).

part, not Kner 1859 citation; not specimens from Coary (= Coari).—1891:46 [reference].

*Psectrogaster ciliatus*.—Eigenmann, 1910:420 [reference].—Cockerell, 1914:94 [scale anatomy]. [Not Fowler, 1906:305; Bertoni, 1914:10; 1939:54.]

*Curimata ciliata*.—Eigenmann and Allen, 1942:295 [references in part, not Fowler, 1940a citation].—Fowler, 1942:207 [references in part, only *Anodus ciliatus* citation]; 1945:115 [in part, as Fowler, 1942]; 1950:279 [references in part, not *C. ciliata* or *C. ciliatus* citations, not figure 339].—Géry, 1977:230 [in key; in part, not synonymy of *Curimata essequibensis* (Müller and Troschel) or *C. isognatha* Eigenmann and Eigenmann]. [Not Fowler, 1940a; Ringuelet and Aramburu, 1961:36.]

*Hamatichthys ciliatus*.—Fernández-Yépez, 1948:33, fig. 13 [designation as type species of *Hamatichthys*].—Ringuelet, Aramburu, and Aramburu, 1967:197 [reference in part, Amazon records].—Ringuelet, 1975:61 [in part, Amazonia].—Fowler, 1975:377 [reference]. [Not Lopez, et al., 1987:20.]

**DIAGNOSIS.**—*Psectrogaster ciliata* is a moderate sized member of the genus achieving 130 mm SL. The transversely rounded prepelvic region with moderate sized scales distinguishes *P. ciliata* from *P. essequibensis* and *P. falcata* in which that area is distinctly flattened and bears enlarged scales. Similarly the unpigmented base of the middle rays of the caudal fin, and the possession of a non-serrate margin on the postpelvic median keel in *Psectrogaster ciliata* separates that species from *P. rhomboides*, *P. amazonica*, and *P. curviventris*, which are characterized by a patch of pigmentation at the base

of the middle rays of the caudal fin and a distinctly serrate postpelvic median keel. The absence of either a distinct pigmentation blotch on the lower lobe of the caudal fin, or a series of narrow stripes on the body separates *P. ciliata* from *P. rutiloides*, which possesses such a spot, and from *P. saguiru*, which has faint dark longitudinal striping on the body. The body depth of 0.42–0.54 of SL in *P. ciliata* further distinguishes that species from both *P. saguiru* (0.37–0.42) (Figure 10) and *P. rutiloides* (0.35–0.42) (Figure 11).

**DESCRIPTION.**—Body relatively deep, compressed. Dorsal profile of head straight. Dorsal profile of body smoothly convex from rear of head to origin of rayed dorsal fin; slightly convex and posteroventrally slanted at base of rayed dorsal fin, gently convex from base of last dorsal-fin ray to caudal peduncle. Dorsal body surface with an indistinct median keel anterior to rayed dorsal fin, smoothly rounded posterior to fin. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle. Prepelvic region transversely rounded, with very slight indication of lateral angles in body wall immediately anterior to origin of pelvic fins. A distinct median keel posterior to origin of pelvic fin.

Greatest body depth at origin of rayed dorsal fin, depth 0.42–0.54 [0.46]; snout tip to origin of rayed dorsal fin

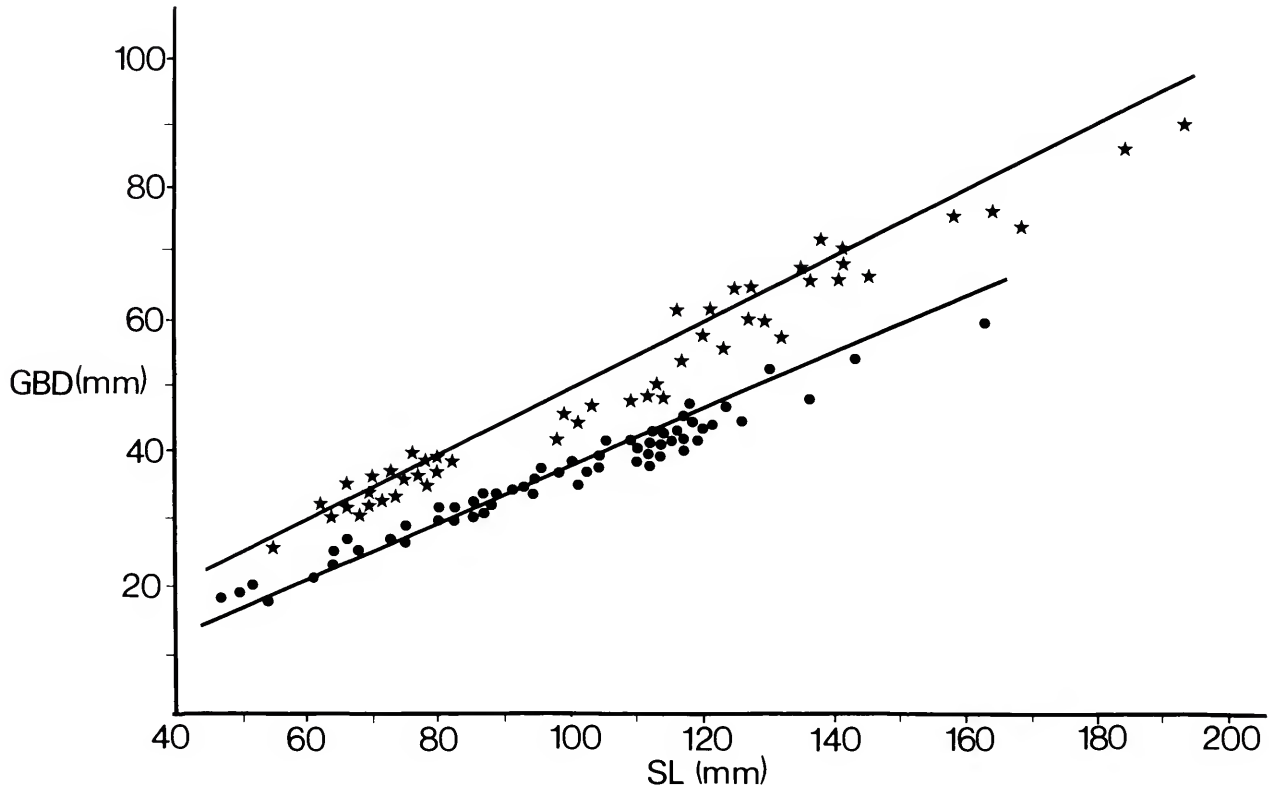


FIGURE 11.—Plot of greatest body depth (GBD) against standard length (SL), both in millimeters, for *Psectrogaster ciliata* (stars) and *Psectrogaster rutiloides* (dots) with regression lines for each species (some symbols represent more than one data point).

0.50–0.57 [0.52]; snout tip to origin of anal fin 0.82–0.88 [0.82]; snout tip to origin of pelvic fin 0.54–0.60 [0.55]; snout tip to anus 0.78–0.85 [0.80]; origin of rayed dorsal fin to hypural joint 0.54–0.60 [0.59]. Rayed dorsal fin pointed, anteriormost branched rays 2.5–3.3 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.19–0.24 [0.21], extends three-quarters of distance to vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.18–0.24 [0.19], reaches two-thirds to three-quarters of distance to origin of anal fin. Caudal fin forked. Adipose fin well developed. Anal fin emarginate, anteriormost branched rays approximately twice length of ultimate ray. Caudal peduncle depth 0.12–0.14 [0.12].

Head profile distinctly pointed, head length 0.30–0.37 [0.32]; jaws equal, mouth terminal; snout length 0.26–0.32 [0.28]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.26–0.34 [0.28]; adipose eyelid moderately developed, with a ovoid, vertically aligned opening over middle of eye; length of postorbital portion of head 0.41–0.47 [0.46]; gape width 0.28–0.33 [0.31]; interorbital width 0.43–0.48 [0.44].

Pored lateral line scales from supracleithrum to hypural joint 42 to 50 [49]; all scales of lateral line pored, canals in lateral line scales straight; 4 to 8 series of scales extend beyond hypural joint onto caudal fin base; 12 to 16 [14] scales in a transverse series from origin of rayed dorsal fin to lateral line; 8 to 11 [10] scales in a transverse series from the lateral line to origin of anal fin.

Dorsal-fin rays ii,9–10 or iii,9 [ii,9]; anal-fin rays ii,7–8 or iii,7–8 [ii,7]; pectoral-fin rays 13 to 16 [15]; pelvic-fin rays i,8 [i,8].

Total vertebrae 30 (39), 31 (1).

**COLOR IN LIFE.**—Overall life coloration of specimens from Río Orinoco (pers. observ.) bright silver, somewhat darker on dorsal portions of head and body. Fins hyaline.

**COLOR IN ALCOHOL.**—Specimens that retain guanine on scales with an overall golden coloration. Specimens that lack guanine on scales tan or brownish. No pronounced pigmentation pattern on head, body, or fins; overall head and body pigmentation more intense on dorsal portions of head and body. Dark chromatophores more developed along scale margins, particularly dorsal of lateral line. Fin rays outlined by series of dark chromatophores.

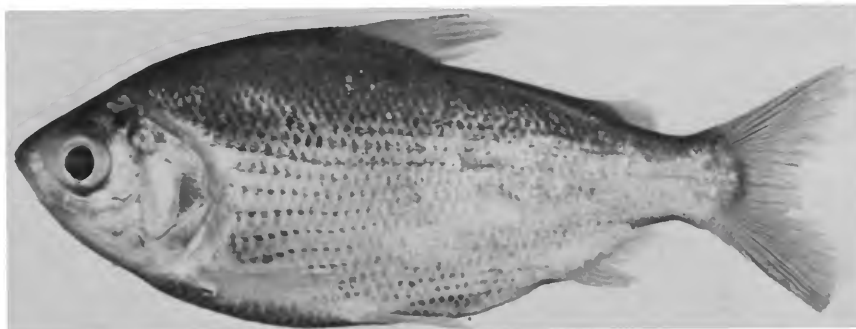


FIGURE 12.—*Psectrogaster ciliata*, USNM 268038, 132.0 mm SL; Brazil, Roraima, Rio Uraricoera, Ilha de Maraca, Igarapé do Cujubim.

**DISTRIBUTION.**—Essequibo River of Guyana, Río Orinoco drainage basin, Rio Branco, central portion of Rio Amazonas system (Figure 9).

**REMARKS.**—Subsequent to its original description by Müller and Troschel based on material from the Essequibo River of Guyana, *Psectrogaster ciliata* has been cited from numerous localities in the Rio Amazonas and Río Paraguay-Paraná drainage systems. On the basis of examined material, the confirmable distribution of the species is more restricted than reported in the literature, including only the Essequibo River system of Guyana, the eastern portion of the Río Orinoco drainage basin, and the Rio Branco and Rio Negro systems in the Amazon basin. Records from other areas of South America are based on misidentifications or are otherwise questionable.

Eigenmann (1912:268) in his discussion of the curimatids of British Guiana (= Guyana), placed *Curimatus essequibensis* Günther (1864) into the synonymy of *Curimatus ciliatus*, and cited the latter species from various localities in Guyana. Fernández-Yépez (1948:73) and Géry (1977:230) tentatively followed Eigenmann in considering the two species to be conspecific. As discussed in the “Character Description and Analysis” and the “Remarks” section under *Psectrogaster essequibensis*, the two species are readily distinguishable in a number of internal and external characters and are recognized herein as distinct. Although *P. ciliata* occurs in the Essequibo River system, all of the specimens reported on by Eigenmann (1912:268) from Guyana examined during the present study are *Psectrogaster essequibensis* rather than *P. ciliatus* as cited by Eigenmann. Géry (1977:230) in his key to the species that he considered closely related to *Curimata cyprinoides* (Linnaeus) placed *Curimata isognatha* Eigenmann and Eigenmann as a synonym of *Curimata* (= *Psectrogaster*) *ciliata*. The species differ in various features of body form, pigmentation patterns and internal anatomy, with *Curimata isognatha* being instead considered a synonym of *Psectrogaster rutiloides* in the present study.

Kner (1859a:143) reported *Curimatus ciliatus* from Ypanema and the Río Guaporé in Brazil on the basis of specimens

collected by Natterer. The Río Guaporé material examined by Kner (NMW 16371) has proved to be *P. essequibensis*, whereas the material he cited from Ypanema could not be located in the holdings of the Naturhistorisches Museum, Wien. Eigenmann and Eigenmann (1889b:413) cited *Psectrogaster ciliata* from Coary (= Coari) Brazil. The specimens examined by those authors (MCZ 21084, 20262) are actually *P. amazonica*.

Perugia (1891:639) reported *Curimatus ciliatus* from the upper Río Paraná drainage basin. That record was presumably the basis for the subsequent citations by Berg (1897:278), Bertoni (1914:10; 1939:54), Ringuet and Aramburu (1961:36), Ringuet, Aramburu, and Aramburu (1967:36), Ringuet (1975:197), and Lopez et al. (1987:20) of *Psectrogaster ciliata* (in various genera) from the LaPlata drainage basin. A re-examination of one of the two specimens reported on by Perugia (MSNG 43819) has revealed that it is *P. curviventris*. None of the authors subsequent to Perugia give any indication that their records were based on additional specimens. Therefore, it would appear that all citations of *P. ciliata* from the Paraguay-Paraná system were derived from that original misidentification by Perugia.

Cope (1872:291) cited *Curimatus cyprinoides* (Linnaeus) from the Rio Solimões; an identification changed by Fowler (1906:305) to *Psectrogaster ciliatus*. The specimens in question (ANSP 8208-9) are actually *P. amazonica*. More recently Fowler (1940a:253) cited *Curimata ciliata* from the Río Ucayali of Peru. The specimens involved (ANSP 73180) are also *Psectrogaster amazonica*.

Valenciennes (in Cuvier and Valenciennes, 1849:15) reported *Curimatus ciliatus* from the “Amazon” based on material collected by Castelnau. Those specimens subsequently served as the basis for Castelnau’s citation (1855:58) of the species from that region. I have been unable to locate the cited specimens, but the record is possibly correct within the context of our present knowledge of the distribution of the species.

Specimens of *Psectrogaster ciliata*, particularly males, from the Río Orinoco system typically have a shallower body than



FIGURE 13.—*Psectrogaster ciliata*, USNM 269990, 84.7 mm SL; Venezuela, Estado Bolivar, small caño connecting with Río Orinoco, immediately south of El Burro.

individuals of the species from the Essequibo River and the Rio Amazonas. Those populations also differ somewhat in overall appearance (Figures 12, 13). The body depths overlap significantly between the two regions and no other significant differences were noted between these populations. Further research based on more extensive series of specimens, including individuals from intervening regions, is necessary to determine the extent and possible significance of the geographic variation.

MATERIAL EXAMINED.—330 specimens (77, 57.1–129.2).

BRAZIL. *Amazonas*: Rio Marauíá, MZUSP 25716, 18 (13, 123.3–193.0). *Roraima*: Marara, MZUSP 25717, 15 (7, 61.5–138.2); USNM 242130, 5 (105.2–124.6); USNM 261310, 4 (68.0–74.5); USNM 243236, 4. Lago Jaunuari, USNM 229193, 3. Rio Mucajai, Boa Vista, MBUCV-V 1997, 1 (140.5). Rio Branco, Cachoeira do Bem Querer, USNM 268307, 20; MZUSP 32275, 24; MZUSP 29577, 55; NMW 67008, 1; NMW 67009, 7; NMW 67010, 4; NMW 67018, 1. Rio Branco, Boa Vista, NMW 67013, 2. Rio Branco, Conceição, NMW 68853, 3; NMW 67012, 4. Rio Uraricoera, Ilha de Maraca, USNM 268038, 10; MZUSP 32274, 22.

GUYANA. No specific locality, AMNH uncat., 2 (117.6–136.3). Essequibo River, ZMB 3828, 1 (129.2, holotype of *Anodus ciliatus*). Rupununi River, ANSP 39776–8, 6 (99.3–125.6), USNM 261308, 1, (121.0); NMW 67015, 5 (2, 77.5–82.5); NMW 67014, 1. Rupununi River, Dadanawa Wichabai, BMNH 1972.7.27:401–406, 6 (4, 75.7–127.0). *Rupununi*: Sandcreek, BMNH 1972.7.27:400, 1 (116.2).

VENEZUELA. *Terretorio Federal Delta Amacuro*: Río Orinoco, USNM 235412, 1 (72.6); USNM 235413, 1 (71.0); USNM 235411, 2 (57.1–67.5); USNM 235410, 2 (69.2–79.7); USNM 235414, 7 (64.5–79.0); MBUCV V-13124, 1 (72.9). *Bolivar*: Río Caura, vicinity of Jabillal, ANSP 13562, 8 (98.0–117.5); 1 (102.8). Laguna de Frances y Laguna del Medio, Ciudad Bolivar, MBUCV V-1578, 1. Laguna del Medio, Ciudad Bolivar, MBUCV V-1539, 1 (69.9); MBUCV V-1560 (66.0). *Terretorio Federal Amazonas*: Río Orinoco,

Raudales de Ature, MBUCV V-12820, 4 (116.1–140.5). *Guarico*: Río Portuguesa near Camaguan, MBUCV V-8802, 1 (75.1). Río Manapire, Santa Rita, MBUCV V-5727, 2. *Apure*: Río Apure Viejo near San Fernando de Apure, MBUCV V-11165, 66; USNM 258200, 1. Río Apure at San Fernando de Apure, USNM 261309, 3.

COLOMBIA. *Meta*: Río Guaviare, USNM 181362, 1.

### *Psectrogaster saguiru* (Fowler)

FIGURES 10, 14, 15

*Curimata saguiru* Fowler, 1941:164, fig. 77 [type locality: Brazil: Rio Grande de Norte, Lago Papari].—Fernández-Yépez, 1948:73 [reference].—Fowler, 1950:292, fig. 350 [citation]; 1975:369 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Curimata cyprinoides*.—Fowler, 1941:166 [in part, specimens from Brazil: Ceará, Rio Jaguaribe].

DIAGNOSIS.—The transversely rounded prepelvic region without enlarged scales distinguishes *P. saguiru* from *P. falcata* and *P. essequibensis*, in which that region of the body is distinctly flattened and bears scales that are significantly larger than those on the sides of the body. The absence of distinct serrations on the postpelvic median keel, and the lack of the patch of dark pigmentation at the base of the middle rays of the caudal fin separates *P. saguiru* from *P. amazonica*, *P. rhomboides*, and *P. curviventris*, which have such serrae and pigmentation. The absence of any pronounced caudal fin pigmentation pattern on the lower lobe of the caudal fin, the presence of 10 to 13 faint longitudinal stripes on the body, and 41 to 47 pored lateral line scales to the hypural joint discriminates *P. saguiru* from *P. rutiloides*, which has a distinct dark blotch on the lower lobe of the caudal fin, lacks longitudinal body striping, and has 45 to 51 lateral line scales to the hypural joint. The greatest body depth 0.37–0.42 of SL in *P. saguiru* and the longitudinal body striping in that species separate it from *P. ciliata*, in which the body depth is 0.42–0.54 of SL (Figure 10) and the body lacks such striping.



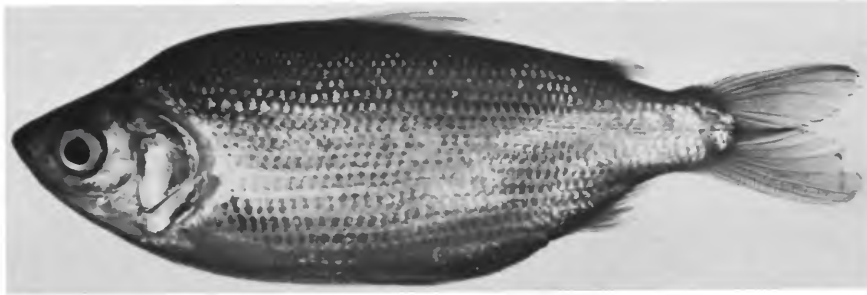


FIGURE 14.—*Psectrogaster saguiru*, USNM 181977, 129.0 mm SL; Brazil, Paraiba, Rio Piranhas basin, Acude Piranhas.

DESCRIPTION.—Body moderately elongate, relatively robust, more so in specimens over 100 mm SL, particularly females. Dorsal profile of head straight or slightly convex. Dorsal profile of body distinctly convex from rear of head to origin of rayed dorsal fin, convexity more pronounced in larger individuals; straight and posteroventrally slanted at base of dorsal fin; gently convex from base of last dorsal-fin ray to caudal peduncle. Dorsal surface of body with an indistinct median keel anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to vertical through origin of pectoral fin, relatively straight from that point to vertical through posterior tip of pelvic fin, then gently convex to caudal peduncle. Prepelvic region transversely rounded ventral to

origin of pectoral fin, with indistinct, longitudinally-aligned lateral angles in body wall proximate to origin of pelvic fin. Median postpelvic keel extends from slightly posterior of origin of pelvic fin to anus.

Greatest body depth at origin of rayed dorsal fin, depth 0.37–0.42 [0.37]; snout tip to origin of rayed dorsal fin 0.51–0.55 [0.53]; snout tip to origin of anal fin 0.80–0.85 [0.85]; snout tip to origin of pelvic fin 0.52–0.57 [0.53]; snout tip to anus 0.77–0.83 [0.81]; origin of rayed dorsal fin to hypural joint 0.53–0.58 [0.53]. Rayed dorsal fin pointed, less so with increasing age, distal margin nearly straight; anterior-most rays 2.5–3.5 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.19–0.22 [0.19], fin extends approximately three-quarters of distance to vertical through

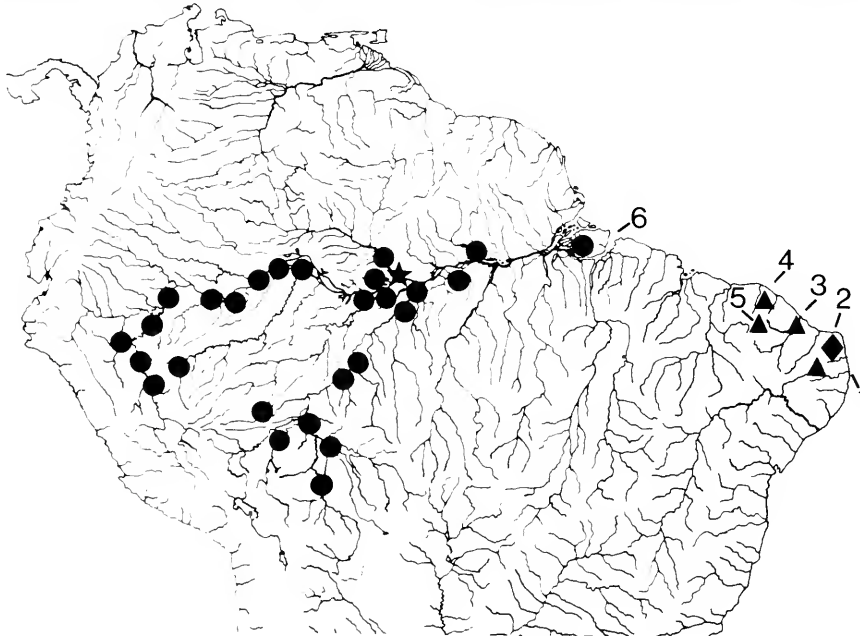


FIGURE 15.—Geographic distribution of *Psectrogaster saguiru* (diamond = type locality, triangles = sites of other collections), and *Psectrogaster rutiloides* (star = lectotype locality, dots = sites of other collections) (some of the symbols represent more than one locality or lot of specimens). Locations: 1 = Rio Paraiba; 2 = Lago Papari; 3 = Rio Jaguaribe; 4 = Rio Curu; 5 = Acude Araras; and 6 = Rio Amazonas.



origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.18–0.21 [0.21], fin reaches two-thirds distance to origin of anal fin. Caudal fin forked. Adipose fin well developed, with low sheath of scales at base. Anal fin emarginate, anteriormost branched rays 2.0–2.5 times length of ultimate ray. Caudal peduncle depth 0.11–0.13 [0.12].

Head profile distinctly pointed, head length 0.29–0.33 [0.31]; jaws equal, mouth terminal; snout length 0.25–0.29 [0.26]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.25–0.31 [0.30]; adipose eyelid well developed, with a vertically ovate opening over center of eye; length of postorbital portion of head 0.42–0.48 [0.48]; gape width 0.29–0.32 [0.29]; interorbital width 0.45–0.49 [0.45].

Pored lateral line scales from supracleithrum to hypural joint 41 to 47 [44]; all scales of lateral line pored, canals in scales straight, 4 to 6 series of scales extend beyond hypural joint onto caudal fin base; 12 to 16 [12] scales in a transverse series from origin of rayed dorsal fin to lateral line; 8 to 10 [8] scales in a transverse series from the lateral line to origin of anal fin. Scales with ctenii poorly developed.

Dorsal-fin rays ii,8–9 (ii,8 rare) [ii,9]; anal-fin rays ii,7–8 (ii–8 rare) [ii,7]; pectoral-fin rays 13 to 15 [14]; pelvic-fin rays i,8 [i,8].

Total vertebrae 30 (11).

COLOR IN ALCOHOL.—Specimens that retain guanine on scales golden or silvery, body and particularly head pigmentation more intense on dorsal portions of head and body. Golden coloration more intense on centers of scales, forming 10 to 13 faint longitudinal stripes; stripes less apparent on dorsal portion of body. Specimens that lack guanine on scales tan to brownish, with a patch of darker pigmentation on center of body of scales. More deeply pigmented area of each scale corresponds to region of more intense golden coloration in specimens that retain guanine on scales. Darkly pigmented areas of scales longitudinally aligned to form narrow brown stripes; stripes apparent on all scale rows, narrowest dorsally. Fins, particularly caudal, with small dark chromatophores outlining rays. Caudal fin otherwise plain.

DISTRIBUTION.—Rivers of northeastern Brazil (Figure 15).

REMARKS.—Fowler (1941:166) cited *Curimata cyprinoides* from the Rio Jaguaribe, Russas, State of Ceará, Brazil, a region from which that species is otherwise unknown. Examination of the specimens cited (ANSP 85590, 81935) has shown that they are actually *Psectrogaster saguuru*.

MATERIAL EXAMINED.—86 specimens (28, 45.7–164.2).

BRAZIL. Ceará: No specific locality, USNM 268601, 1 (cleared and counterstained for cartilage and bone). Acude Pentecostes, Rio Curu system, USNM 220005, 5 (131.2–137.5); USNM 220008, 1 (164.2); USNM 220009, 5 (118.3–132.8). Acude Araras, MCZ 46800, 7 (45.7–75.4); USNM 267318, 1. Rio Jaguaribe, ANSP 81935, 1. Rio Jaguaribe, Russas, ANSP 88590, 55. *Rio Grande Do Norte*:

Lago Papari, ANSP 69461, 1 (99.3, holotype of *Curimata saguuru*); ANSP 69462 and 69482, 2 (83.7–85.5, paratypes of *Curimata saguuru*). Paraíba: Rio Piranhas basin, Acude Piranhas, USNM 181977, 4 (127.1–140.56); MNRJ 9147, 3 (135.3–142.0).

### *Psectrogaster rutiloides* (Kner)

FIGURES 11, 15–17

*Curimatus rutiloides* Kner, 1859a:141, pl. 1, fig. 2 [type locality: Brazil: Mato Grosso and mouth of the Rio Negro]; 1859b:76 [reference].—Günther, 1864:290 [copied].—Steindachner, 1882:135 [Brazil: Tefé (= Tefé), mouth of the Rio Negro, Matogrosso (= Mato Grosso), Jatuarana].—Eigenmann and Eigenmann, 1889b:426 [reference]; 1891:47 [reference].—Eigenmann, 1910:422 [reference in part, not Río Paraguay citation].—Géry 1964:37 [Peruvian Amazon].—Vari, 1989, tables 2, 3 [phylogenetic relationships]. [Not Cope, 1872:258; Boulenger, 1896:34; Bertoni, 1914:9, 1939:54; Pearson, 1937:109; Ringuelet, 1975:73.]

*Curimatus asper*.—Günther, 1868:243 [in part, one syntype from Río Huallaga].

*Curimatus cyprinoides*.—Cope, 1872:258 [Ecuador: Río Ambiyacu].—Fowler, 1906:300 [on Cope, 1872 specimens].

*Curimatus isognathus* Eigenmann and Eigenmann, 1889b:428 [type locality: Brazil: Lago Alexo, Iça, Manacapuru, San Paolo (= São Paulo de Olivença)]; 1891:47 [reference].—Ulrey, 1895:259 [Brazil: Pará, Ilha de Marajo, Rio Tocantins].—Eigenmann, 1910:422 [reference].—Starks, 1916:18 [sesamoid articular]; 1926:168 [ethmoid].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Psectrogaster auratus* Gill, 1895:199 [type locality: Bolivia].—Eigenmann and Ogle, 1907:3 [reference].—Eigenmann, 1910:420 [reference].—Fernández-Yépez, 1948:30 [reference].—Fowler, 1950:301 [reference]; 1975:378 [reference].—Terrasas-Urquidí, 1970:30 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Curimata ciliatus*.—Eigenmann, 1912:268 [reference in part, *Curimatus cyprinoides*, Cope, 1872 citation].

*Curimata cyprinoides*.—Fowler, 1940a:253 [in part, Peru: Río Ucayali].

*Curimata rutiloides*.—Eigenmann and Allen, 1942:294 [reference].—Fowler, 1942:208 [reference]; 1945:116 [as Fowler, 1942]; 1950:291, fig. 349 [reference].—Terrasas-Urquidí, 1970:30 [reference].—Géry, 1977:230 [in key].

*Psectrogaster amazonica*.—Eigenmann and Allen, 1942:289 [in part, "males"; Peru: Lago Sanango, Río Parapapura, Río Nanay, Lago Cashiboya, Río Ucayali, Iquitos].

*Lambepiedra rutiloides*.—Fernández-Yépez, 1948:63 [assignment to *Lambepiedra*].—Fowler, 1975:371 [reference].

*Semelcarinata isognatha*.—Fernández-Yépez, 1948:59, fig. 31 [designation as type species of *Semelcarinata*].—Fowler, 1975:374 [reference].

*Curimata isognatha*.—Fowler, 1950:286 [reference].—Géry, 1977:230 [as synonym of *Curimatus ciliatus* (Müller and Troschel)].

*Curimata (Semelcarinata) isognatha*.—Géry, 1964b:66, fig. 18 [region of Iquitos, Peru].

*Psectrogaster rutiloides*.—Ortega and Vari, 1986:11 [Peru; common name].

DIAGNOSIS.—The presence of a distinct blotch of pigmentation on the distal portion of the lower caudal fin is unique to *Psectrogaster rutiloides* within the genus. *Psectrogaster rutiloides* can further be distinguished from *P. amazonica*, *P. rhomboides*, and *P. curviventris* in its lack of the serrate margin on the median postpelvic keel that is characteristic of those species, and by the absence of a patch of dark pigmentation at the base of the middle rays of the caudal fin, which is similarly

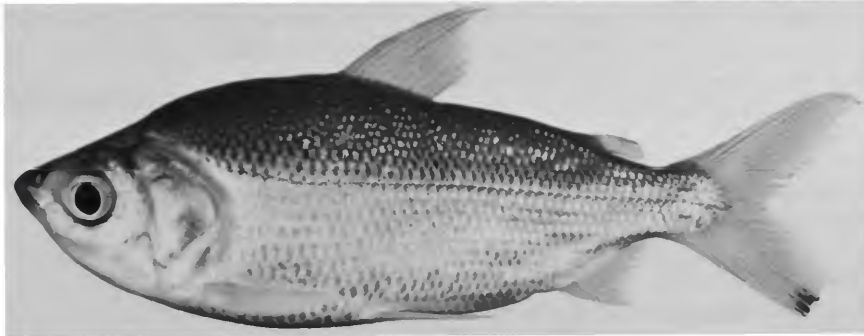


FIGURE 16.—*Psectrogaster rutiloides*, NRM SOK/1986333.4710, 103.8 mm SL; Peru, Loreto, Río Samiria system.

unique to those taxa in the genus. The possession of a transversely rounded prepelvic region without enlarged scales arranged in distinct longitudinal rows separates *P. rutiloides* from *P. falcata* and *P. essequibensis*, in which the prepelvic region is distinctly flattened and has such enlarged scales. The greatest body depth of *P. rutiloides* (0.35–0.42 of SL) further distinguishes it from *P. ciliata* (greatest body depth 0.42–0.54 of SL) (Figure 11). The 46 to 51 pored lateral line scales to the hypural joint, and the absence of longitudinal body stripes separates *P. rutiloides* from *P. saguiru*, which has 41 to 47 pored lateral line scales to the hypural joint, and 10 to 13 narrow body stripes.

**DESCRIPTION.**—Body moderately elongate, relatively robust, more so in specimens over 75 mm SL, particularly ripe females. Dorsal profile of head straight or very slightly convex. Dorsal profile of body smoothly convex from rear of head to origin of rayed dorsal fin; straight and posteroventrally slanted at base of rayed dorsal fin, straight or gently convex from base of last dorsal-fin ray to caudal peduncle. Dorsal surface of body with indistinct median keel anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle. Ventral surface of body transversely rounded anteriorly, with indistinct, longitudinally aligned lateral keels proximate to origin of pelvic fins. Midventral keel extends from slightly behind origin of pelvic fin to anus.

Greatest body depth at origin of rayed dorsal fin, depth 0.35–0.42 [0.35], body depth greatest in ripe females; snout tip to origin of rayed dorsal fin 0.49–0.54 [0.51]; snout tip to origin of anal fin 0.80–0.86 [0.80]; snout tip to origin of pelvic fin 0.54–0.60 [0.55]; snout tip to anus 0.76–0.81 [0.78]; origin of rayed dorsal fin to hypural joint 0.53–0.57 [0.54]. Rayed dorsal fin pointed, distal margin relatively straight, anteriormost rays 2.5–3.2 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.19–0.23, fin extends three-quarters of distance to vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.18–0.22 [0.19], fin reaches two-thirds of distance to origin of anal fin. Caudal

fin forked. Adipose fin well developed, base with a low sheath of small scales. Anal fin somewhat emarginate, anteriormost branched rays twice length of ultimate ray. Caudal peduncle depth 0.10–0.12 [0.10].

Head profile obtusely pointed, head length 0.31–0.37 [0.36]; jaws equal, mouth terminal; snout length 0.26–0.31 [0.27]; nostrils of each side of head very close, anterior circular, posterior crescent shaped, with aperture closed by thin flap of skin that separates nares; orbital diameter 0.25–0.30 [0.27]; adipose eyelid well developed, with a vertically aligned ovoid opening over middle of eye; length of postorbital portion of head 0.45–0.51 [0.45]; gape width 0.28–0.32 [0.28]; interorbital width 0.42–0.48 [0.45].

Pored lateral line scales from supracleithrum to hypural joint 45 to 51 [50]; all scales of lateral line pored, canals in scales straight, 4 to 7 series of scales extend beyond hypural joint onto caudal fin base; 12 to 15 [13] scales in a transverse series from origin of rayed dorsal fin to lateral line; 8 to 11 [9] scales in a transverse series from the lateral line to origin of anal fin. Scales notably ctenoid, ctenii most developed on ventral body surface anterior of origin of pelvic fin.

Dorsal-fin rays ii,8–9, iii,9 [ii,9]; anal-fin rays ii,7–8 or iii,7–8 [ii,7]; pectoral-fin rays 13 to 16 [14]; pelvic-fin rays i,8 [i,8].

Total vertebrae 30 (21).

**COLOR IN LIFE.**—Overall life coloration of specimens from the Río Ucayali (pers. observ.) bright silver, somewhat darker dorsally. Fins hyaline; dorsal fin with slight rosy tint. Dark pigmentation as in preserved specimens.

**COLOR IN ALCOHOL.**—Alcohol preserved specimens that retain guanine on scales golden or silvery, overall head and body pigmentation somewhat darker dorsal of lateral line. Specimens that lack guanine on scales tan to brownish. Head and body with scattered small dark chromatophores; chromatophores more concentrated along margin of scales, particularly dorsal of lateral line. Some specimens with a dusky stripe that runs above lateral line on posterior portion of body. All fins with series of small dark chromatophores that outline fin rays;



FIGURE 17.—*Psectrogaster rutiloides*, USNM 268044, 133.8 mm SL; Brazil, Rondonia, Rio Madeira, Calama; fin rays bearing spot of dark pigmentation on upper lobe of caudal fin damaged.

pigmentation most pronounced on caudal fin. Caudal fin usually with a distinctive dark spot of irregular shape four-fifths of distance along fin rays of lower lobe (Figures 16, 17); pigmentation patch very faint or rarely absent in some individuals. A comparable spot of pigmentation occurs on dorsal lobe of caudal fin in some specimens (Figure 17).

DISTRIBUTION.—Rio Amazonas drainage basin (Figure 15).

COMMON NAME.—Peru: Chio-chio (Ortega and Vari, 1986:11).

REMARKS.—Alcohol preserved and dried mounted specimens from the Mato Grosso and the mouth of the Rio Negro were listed by Kner (1859a:141) in his original description of *Curimatus rutiloides*. Three alcohol preserved specimens out of the syntypic series of originally unspecified size were located in the Naturhistorisches Museum Wien (NMW 75980.1–2, NMW 75981.1). A 113.0 mm SL syntype of *Curimatus rutiloides*, from the mouth of the Rio Negro, which is evidently the specimen illustrated by Kner (NMW 75980.2), is designated as the lectotype of the species. The remaining specimens from the same locality (NMW 75980.1 and NMW 75981.1) thus become paralectotypes. The portion of the syntypic series of *C. rutiloides* collected in the Mato Grosso reported on by Kner was not located in the NMW collections.

Eigenmann and Eigenmann (1889b:415–417) distinguished *Curimatus rutiloides* Kner from their nominal species *C. isognathus* on the basis of the degree of development of the midventral keel that extends from the area of insertion of the pelvic fins to the anus. The third major couplet in their key characterizes *C. isognathus* as having a trenchant postventral region whereas *C. rutiloides* is noted as having “an obtuse median keel.” The latter description was evidently derived from the original description of *C. rutiloides* by Kner (1859a:141) who stated that “behind them [the pelvic fins] it [the body] is simply keeled” (my translation). That description was presumably taken by Eigenmann and Eigenmann as indicative of a condition different from what they characterized as the “trenchant” postpelvic keel of their nominal species *Curimatus isognathus*. An examination of the type series of each of the species shows, however, that both species have the identical

form of median keel behind the insertion of the pelvic fins. Neither can any other basis can be found for the continued recognition of *Curimatus isognathus* as distinct from *Psectrogaster rutiloides* (Table 1). *Curimatus isognathus* is consequently placed in the synonymy of *Psectrogaster rutiloides*.

Géry (1977:230) considered *Curimata isognatha* to be a synonym of *Curimata* (= *Psectrogaster*) *ciliata*. The nominal forms are distinguishable in a number of morphological and pigmentary characters, and as just discussed *Curimatus isognathus* Eigenmann and Eigenmann is rather considered a synonym of *Psectrogaster rutiloides*.

Eigenmann and Eigenmann (1889b:428) based their original description of *Curimatus isognathus* on five specimens from four localities in the Rio Amazonas drainage basin. The single specimen of *Curimatus isognathus* from Lago Alexo that is in the best overall condition of all the syntypes (MCZ 20314, 142.5 mm SL) is designated as the lectotype of the species. The remaining syntypes of the species (MCZ 20214, 20208, 20224, 20225) consequently become paralectotypes.

Gill (1895:199) described *Psectrogaster auratus* from a single specimen with an inexact type locality of “Bolivia.” The type appears to have been originally preserved in a highly concentrated alcohol solution that resulted in the scales margins being uplifted, a condition noted by Gill. The uplifted scales at the margin of the postpelvic keel created an artificially serrate edge that Gill equated with the naturally serrate postpelvic keel diagnostic of the genus *Psectrogaster* as defined at that time (*P. amazonica* and *P. rhomboides*). A closer examination of the holotype of *P. auratus* and material of those *Psectrogaster* species with serrate postpelvic keels shows that the conditions are not comparable. The holotype of *Psectrogaster auratus* agrees in all features with *Psectrogaster rutiloides* (Table 1) and is considered a synonym of that species.

*Psectrogaster rutiloides* has also been the subject of numerous misidentifications. In his original description of *Curimatus asper* (= *Curimata aspera*), Günther (1868:243) listed four syntypic specimens. The smallest of those syntypes



TABLE 1.—Morphometrics and meristics of (A) lectotype of *Curimata rutiloides*, NMW 75980.1, (B) paralectotypes of *C. rutiloides*, NMW 75980.2, 75981.1, (C) lectotype of *Curimatus isognathus*, MCZ 20314, (D) paralectotypes of *C. isognathus*, MCZ 20208, 20214, 20224, 20225, (E) holotype of *Psectrogaster auratus*, USNM 5878, and (F) all specimens of *Curimata rutiloides* from which counts and measurements were taken. Standard length is expressed in mm; measurements 1 to 10 are proportions of standard length; 11 to 14 are proportions of head length.

	A	B	C	D	E	F
	Morphometrics					
Standard length	113.0	108.9–109.9	142.5	109.8–142.5	108.1	44.2–142.5
1. Greatest body depth	0.35	0.35–0.39	0.38	0.36–0.41	0.36	0.35–0.42
2. Snout to dorsal-fin origin	0.51	0.51–0.52	0.51	0.51–0.53	0.53	0.49–0.54
3. Snout to anal-fin origin	0.80	0.80–0.83	0.85	0.82–0.83	0.83	0.80–0.86
4. Snout to pelvic-fin origin	0.55	0.55–0.58	0.55	0.54–0.56	0.56	0.54–0.60
5. Snout to anus	0.78	0.75–0.78	0.81	0.78–0.80	0.80	0.76–0.81
6. Origin of rayed dorsal fin to hypural joint	0.54	0.54–0.55	0.56	0.54–0.57	0.52	0.53–0.57
7. Pectoral fin length	–	0.19–0.20	0.22	0.21–0.22	0.20	0.19–0.23
8. Pelvic fin length	0.19	0.18–0.20	0.21	0.19	0.19	0.18–0.22
9. Caudal peduncle depth	0.10	0.11	0.11	0.11–0.12	0.11	0.11–0.12
10. Head length	0.36	0.32	0.32	0.32–0.33	0.33	0.31–0.37
11. Snout length	0.27	0.26	0.29	0.28–0.30	0.29	0.26–0.31
12. Orbital diameter	0.27	0.27	0.25	0.25–0.26	0.25	0.25–0.30
13. Postorbital length	0.45	0.46–0.48	0.51	0.50–0.51	0.48	0.40–0.51
14. Interorbital length	0.45	0.46	0.47	0.40–0.46	0.44	0.42–0.48
	Meristics					
Lateral line scales	50	49–50	47	47–49	48	48–50
Scale rows between dorsal-fin origin and lateral line	13	14–15	12	12–13	13	12–15
Scale rows between anal-fin origin and lateral line	9	9–10	10	8–9	9	8–11
Branched dorsal-fin rays	9	9	9	9	9	8–9
Branched anal-fin rays	7	7	8	7–8	8	7–8
Total pectoral-fin rays	14	14–15	15	14–15	15	13–16
Branched pelvic-fin rays	8	8	8	8	8	8
Vertebrae	30	30	30	30	30	30

(BMNH 1867.6.13:85) is an individual of *P. rutiloides*. The eleven specimens that Cope (1872:258), followed by Fowler (1906:300), identified as *Curimata cyprinoides* (Linnaeus) (ANSP 8210–20) are actually *Psectrogaster rutiloides*. Cope (1872:258) also listed a series of specimens from the Río Ambiyacu as *Curimatus rutiloides*. Fowler (1906:305) followed by Eigenmann (1910:420) alternatively identified the specimens as *Psectrogaster ciliatus*. An examination of the material in question (ANSP 8202–6) has shown that the individuals are rather *Psectrogaster amazonica*.

Fowler (1940:253) cited a series of specimens from the Río Ucayali as *Curimata cyprinoides*. The individuals (ANSP 88600) are instead a mixture of *Psectrogaster rutiloides* and a species of the *Curimata cyprinoides* species complex.

Eigenmann and Allen (1942:289) in their discussion of Peruvian material that they identified as *Psectrogaster amazonica*, commented on what they perceived to be the pronounced sexual dimorphism in greatest body depth in the available sample, and noted that the sexual dimorphism also extended to the presence or absence of discrete patches of pigmentation on the lower lobe of the caudal fin. Examination

of the involved specimens has shown that the series they identified as *P. amazonica* consists rather of two species. The deep bodied individuals with plain caudal fins (the females of Eigenmann and Allen) are specimens of *Psectrogaster amazonica*, and the shallower bodied specimens with the distinctive pigment patches on the lower lobe of the caudal fin (the males of Eigenmann and Allen) are *Psectrogaster rutiloides* (USNM 167804).

Ulrey (1895:295) in his report on the Hartt collection from the lower reaches of the Rio Amazonas, identified some of the curimatids as *Curimatus isognathus*. The still available specimens from those localities (USNM 163760, 163789, 163827) are in very poor condition, but are tentatively identified as *Psectrogaster rutiloides*. Confirmation of the presence of that species in the lower reaches of the Rio Amazonas system must await the availability of better material from the region.

Boulenger (1896:34) followed by Eigenmann (1910:422), Bertoni (1914:9; 1939:54), Pearson (1937:109), and Ringuelet (1975:73) list *Curimatus rutiloides* from Paraguay. The specimens that were the basis of the original Boulenger citation



(BMNH 1895.5.17:138–9) are actually individuals of *Psectrogaster curviventris*. None of the subsequent authors note additional specimens as the basis of their records, and their citations are presumably simply reiterations of the original Boulenger report. All citations of *Psectrogaster rutiloides* from the La Plata drainage basin are thus considered erroneous.

MATERIAL EXAMINED.—258 specimens (83, 44.2–142.5).

BRAZIL. No specific locality, probably lower Amazon, USNM 163827 (formerly CU 3235), 1 (81.0). *Pará*: No specific locality, USNM 163760 (formerly CU 3230), 1 (93.6). Ilha de Marajo, USNM 163789 (formerly CU 3229), 1 (88.1). Rio Trombetas, Oriximiná, MZUSP 5417, 3 (117.0–127.5). *Amazonas*: Rio Negro, NMW 75980.1, 1 (113.0, lectotype of *Curimatus rutiloides*); NMW 75980.2, 1 (109.9, paralectotype of *Curimatus rutiloides*); NMW 75981.1, 1 (108.9, paralectotype of *Curimatus rutiloides*). Lago Alexo, MCZ 20314, 1 (142.5, lectotype of *Curimatus isognathus*). Iça, MCZ 20214, 1 (123.1, paralectotype of *Curimatus isognathus*). Manacupuru, MCZ 20208, 1 (118.9, paralectotype of *Curimatus isognathus*). San Paolo (= São Paulo de Olivença), MCZ 20224, 1 (129.8, paralectotype of *Curimatus isognathus*); MCZ 20225, 1 (109.8, paralectotype of *Curimatus isognathus*). Vicinity of Manaus, MZUSP 19290, 1. Lago Terra da Preta, Januari, USNM 229199, 3 (2, 49.8–50.0); USNM 229198, 1 (84.5). Lago Januari, MZUSP 6860, 23 (5, 88.0–126.3). Ilha de Marchantaria, USNM 229197, 1 (118.3). Rio Iaco into Rio Purus, USNM 94660, 3 (104.3–105.0); AMNH 12568, 2 (94.7–105.0); AMNH 49378, 8. Mouth of Rio Purus, MZUSP 5950, 7 (3, 117.5–117.9). Porto Velho, ANSP 12346 (formerly UMMZ 56779), 2. Lago Janaucá, MZUSP 21544, 3 (67.5–162.9); MZUSP 21694, 6. Igarapé Manduaçu, Paraná de Iupia, NW of Fonte Boa, MZUSP 20954, 3 (102.0–115.3). Rio Preto da Eva near Manaus, MZUSP 6072, 1. Paraná de Uruará, MZUSP 7509, 1; MZUSP 20909, 1. Benjamin Constant, MZUSP 20725, 2. Rio Solimões near Ilha Baruruá, above mouth of Rio Jutai, MZUSP 20992, 1. Rio Madeira, 25 km from Nova Olinda, MZUSP 6952, 10. Paraná do Mocambo, near Parintins, MZUSP 7585, 3. ACRE. Rio Jurua, Município Cruziero do Sul, ZUEC 416–417, 2. *Rondônia*: Mouth of Rio Guaporé, INPA POLO-184, 14; INPA POLO-243, 10. Rio Madeira, Calama, USNM 268044, 2; MZUSP 32281, 5.

PERU. *Loreto*: Supayacocha, Requeña, USNM 261516, 15; MZUSP 26445, 3. Rio Potemoes, GC, 1. Iquitos, GC, 3. Rio Ucayali, Genaro Herrera, USNM 261484, 2; USNM 261515, 9. Lago Cashiboya, USNM 167804 (formerly IU 17846), 10 (63.5–100.1). Rio Pacaya, Cocha Yanayacu, Bretaña, MZUSP 15244, 1 (111.9). Rio Pacaya, MZUSP 4504, 1. Rio Huallaga, BMNH 1867.6.13.85, 1 (paralectotype of *Curimatus asper*). Rio Ampiyacu, near Pevas, MNRJ 4097, 1. *Ucayali*: Rio Ucayali, Cocha Lobo, AMNH 55733, 4 (2, 44.2–47.4). Rio Ucayali, Pucallpa, USNM 261393, 4. Rio Ucayali, Masisea, USNM 261509, 4. Rio Ucayali, Garinacocha, AMNH 55734, 1 (66.0). Masisea, Iamiriacochoa, MZUSP 26457, 1. Rio Ucayali, Bagazan, MZUSP 26173, 11 (3, 63.5–74.6); MZUSP

26172, 1. Pucallpa, Yarinacocha, MZUSP 26255, 4 (2, 87.8–103.7); MZUSP 26257, 4; MZUSP 26256, 4. Lago Yauricocha, MZUSP uncat., 1. Rio Otocoro, BMNH 1977.3.10:166, 1 (98.7). *Huanuco*: Rio Pachitea, Tournavista, USNM 261416, 1.

BOLIVIA. No specific locality, USNM 5878, 1 (108.1, holotype of *Psectrogaster auratus*). *Beni*: Boca del Rio Ibarre, AMNH 55729, 4 (2, 60.9–64.2). Rio Mamoré, ~5 km SE of Limoquiye, AMNH 55730, 2 (85.4–87.3). Rio Mamoré, ~23 km W of San Javier, AMNH 55731, 7 (4, 80.0–100.8). Rio Mamoré, ~15 km S of Limoquiye, AMNH 55732, 6 (80.3–98.1). Rio Guaporé, AMNH 37723, 3 (116.2–120.5). Rio Baures at mouth of Rio Itenez, AMNH 37709, 1 (112.0). Rio Itenez, 10 km SW of Costa Marques, AMNH 37711, 3 (104.3–117.4). Rio Itenez, 9 km SE of Costa Marques, AMNH 37707, 2 (113.2–118.5). Mouth of Rio Baures, AMNH 37704, 1 (117.5). Rio Baures, 2 km above mouth, AMNH 37721, 1 (119.1). *Santa Cruz*: Rio Chapare below Villa Tunari, MZUSP 27833, 2. Rio Chapare near Chipiriri, GC, 1. Rio Itenez, Londra, USNM 278564, 3. Rio Secure, Laguna El Pato, USNM 278572, 1. Rio Mocovi, USNM 278589, 2.

COLOMBIA. No specific locality, “Upper Amazon,” BMNH 1866.2.15.21, 1.

### *Psectrogaster curviventris* Eigenmann and Kennedy

FIGURES 18–20

- Curimatus ciliatus*.—Perugia, 1891:639 [upper Rio Paraná].  
*Curimatus rutiloides*.—Boulenger, 1896:34 [Paraguay].—Eigenmann, 1910:422 [reference in part, Paraguay citation; ? after Boulenger].—Bertoni, 1914:9 [Paraguay; ? after Boulenger]; 1939:54 [Paraguay; ? after Boulenger].—Pearson, 1937:110 [Rio Paraguay system; ? after Boulenger].  
*Plectrogaster ciliata*.—Berg, 1897:278 [incorrect spelling; Argentina, Rio Paraguay near Desclavados].  
*Psectrogaster curviventris* Eigenmann and Kennedy, 1903:509 [type locality: Paraguay: Asunción, Rio Paraguay].—Eigenmann, McAtee, and Ward, 1907:124 [Paraguay].—Eigenmann, 1910:420 [reference].—Cockerell, 1914:94 [scale anatomy].—Bertoni, 1914:10 [Paraguay]; 1939:54 [Paraguay].—Fowler, 1950:301 [reference].—Ringuelet and Aramburu, 1961:36 [Argentina].—Géry et al., 1987:429, fig. 44 [Paraguay: Rio Ypané; Rio Paraguay at Asuncion; Rio Tibicuary-mi; Rio Aguaray-Guazu; Rio Negro near Chaco-i].—Vari, 1989, tables 2, 3 [phylogenetic relationships]. [Not Eigenmann and Ogle, 1907:3.]  
*Psectrogaster ciliatus*.—Bertoni, 1914:10 [Paraguay]; 1939:54 [Paraguay].  
*Curimatopsis microlepis*.—Pearson, 1924:26 [Bolivia, Cachuella Esperanza].  
*Curimata pearsoni* Myers, 1929:621 [type locality: Bolivia, Cachuella Esperanza].—Pearson, 1937:109 [Rio Beni drainage system].—Fowler 1940b:98 [reference]; 1950:290 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].  
*Pseudopsectrogaster curviventris*.—Fernández-Yépez, 1948:31, fig. 11 [designation as type species of *Pseudopsectrogaster*].—Aramburu, Aramburu, and Ringuelet, 1962:226 [Argentina].—Ringuelet, Aramburu, and Aramburu, 1967:201 [Argentina].—Fowler, 1975:378 [reference].—Pignalberi de Hassan and Cordiviola de Yuan, 1985:21 [Argentina; middle Rio Paraná, Corrientes and Santa Fe regions].—Lopez et al., 1987:20 [Argentina].  
*Hemicurimata pearsoni*.—Fernández-Yépez, 1948:70, fig. 37 [assignment to *Hemicurimata*].  
*Curimata ciliata*.—Ringuelet and Aramburu, 1961:36 [Argentina].  
*Psectrogaster rhomboides australe* Risso and Sanchez, 1964:6 [type locality:



FIGURE 18.—*Psectrogaster curviventris*, USNM 181710, 93.4 mm SL; Paraguay, Central, Río Paraguay, Asunción.

Argentina, region of Resistencia].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Hamatichthys ciliatus*.—Ringuélet, Aramburu, and Aramburu, 1967:197 [in part, Río Paraguay and Río Paraná; on Perugia, 1891].—Ringuélet, 1975:61 [in part, Río Paraguay and Río Paraná basins].—Lopez et al., 1987:20 [Argentina].

*Suprasinelepicthys pearsoni*.—Fowler, 1975:375 [reference].

*Curimata ruiloides*.—Ringuélet, 1975:73 [upper Río Paraguay basin, ? after Boulenger, 1896].

*Pseudoseptogaster curviventris*.—Ringuélet, 1975:73 [incorrect spelling; upper and lower portions of Río Paraguay drainage].

*Curimata rhomboides*.—Lauzanne and Loubens, 1985:48, fig. 33 [Bolivia: Río Mamoré; fisheries potential; common name].

**DIAGNOSIS.**—*Psectrogaster curviventris* is one of the larger sized members of the genus, achieving 170 mm SL. The presence in *P. curviventris* of a distinctly serrate postpelvic median keel and a patch of dark pigmentation at the base of the middle rays of the caudal fin distinguishes that species from all *Psectrogaster* species with the exception of *P. rhomboides* and *P. amazonica*. The greatest body depth of 0.47–0.59 of SL in *P. curviventris* separates that species from *P. rhomboides* in which that value is 0.40–0.47 of SL. The relatively

prominent preopercular median keel in *P. curviventris* distinguishes it from *P. rhomboides* and *P. amazonica*, in which the keel is absent. Similarly the origin of the pelvic fin distinctly dorsal of the ventral margin of the body discriminates *P. curviventris* from both *P. amazonica* and *P. rhomboides*, in which the fin arises along the ventral profile of the body.

**DESCRIPTION.**—Body moderately elongate, relatively robust, more so in larger specimens. Dorsal profile of head straight or very slightly convex. Dorsal profile of body slightly convex from rear of head to origin of rayed dorsal fin; straight and posteroventrally slanted at base of dorsal fin, distinctly convex from base of last dorsal-fin ray to caudal peduncle. Dorsal surface of body with an indistinct median keel anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle. Preopercular region transversely rounded anteriorly, with distinct median keel posteriorly; keel extends 10 to 16 scales anteriorly from between origin of pelvic fins. Pronounced median keel posterior to origin of pelvic fin. Scales that form margin of postpelvic keel with well-developed posteriorly and posteroventrally oriented ctenii that form a



FIGURE 19.—*Psectrogaster curviventris*, USNM 278558, 113.7 mm SL; Bolivia, Beni, Río Itenez (Guaporé), at confluence of Río Itenez and Río Machupo.

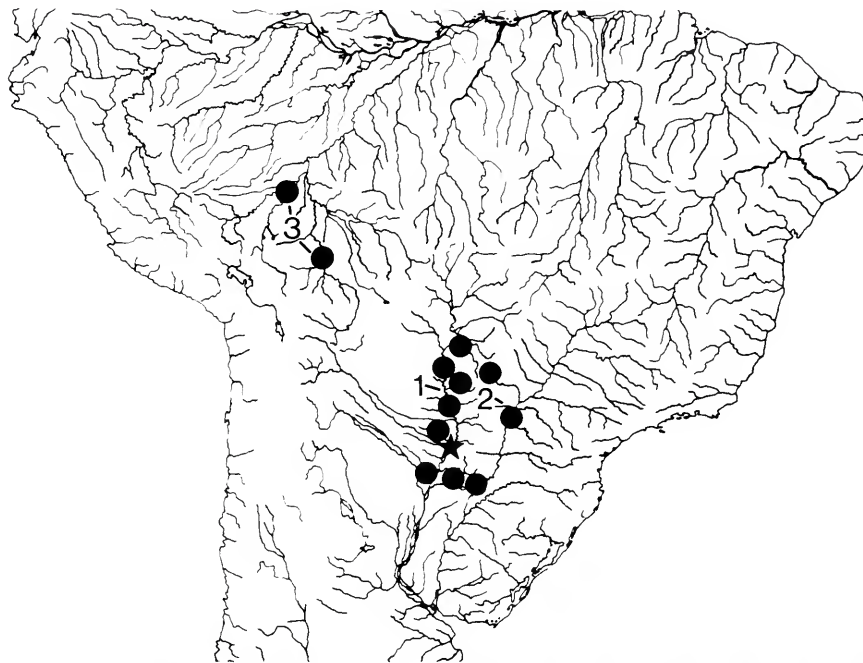


FIGURE 20.—Geographic distribution of *Psectrogaster curviventris* (star = holotype locality, dots = sites of other collections) (some of the symbols represent more than one locality or lot of specimens). Locations: 1 = Río Paraguay; 2 = Río Paraná; and 3 = upper Río Madeira.

distinctly serrate margin to keel. Pre- and postpelvic midventral keels continuous in region of origin of pelvic fin.

Greatest body depth at origin of rayed dorsal fin, depth 0.47–0.59 [0.53]; snout tip to origin of rayed dorsal fin 0.51–0.57 [0.53]; snout tip to origin of anal fin 0.83–0.88 [0.85]; snout tip to origin of pelvic fin 0.52–0.61 [0.57]; snout tip to anus 0.80–0.88 [0.82]; origin of rayed dorsal fin to hypural joint 0.54–0.59 [0.58]. Rayed dorsal fin pointed, less so with increasing age; anteriormost rays 2.7–3.1 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.20–0.25 [0.21], extends to or falls slightly short of vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.18–0.23 [0.22], reaches approximately three-fifth distance to origin of anal fin. Origin of pelvic fin distinctly dorsal of ventral profile of body. Caudal fin forked. Adipose fin well developed. Anal fin emarginate, anteriormost branched rays twice length of ultimate ray. Caudal peduncle depth 0.12–0.14 [0.14].

Head profile obtusely pointed, head length 0.32–0.38 [0.32]; jaws equal, mouth terminal; snout length 0.27–0.33 [0.28]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.28–0.36 [0.28]; adipose eyelid present, well developed with a vertically ovate opening over middle of eye; length of postorbital portion of head 0.40–0.51 [0.51]; gape width 0.25–0.32 [0.30]; interorbi-

tal width 0.47–0.52 [0.51].

Pored lateral line scales from supracleithrum to hypural joint 41 to 49 [46]; all scales of lateral line pored, canals in scales straight; 3 to 7 series of scales extend beyond hypural joint onto caudal fin base; 13 to 17 [15] scales in a transverse series from origin of rayed dorsal fin to lateral line, 9 to 12 [10] scales in a transverse series from the lateral line to origin of anal fin.

Dorsal-fin rays ii,8–10, or iii,9 [ii,9]; anal-fin rays ii,7–8 or iii,7–8 [ii,7]; pectoral-fin rays 14 to 16 [15]; pelvic-fin rays i,7 or 8 [i,8].

Total vertebrae 30 (22), 31 (3).

COLOR IN ALCOHOL.—Specimens that retain guanine on scales golden or golden-silvery, overall pigmentation more intense on dorsal portions of head and body; specimens that lack guanine on scales brownish, darker dorsally. No pronounced pigmentation pattern on either head or body. Margins of scales dorsal of lateral line darker. Well-developed but somewhat diffuse patch of dark chromatophores at base of middle rays of caudal fin (Figures 18, 19). Median rayed fins with series of small dark chromatophores that outline fin rays; adipose fin dusky, with a dark margin in some individuals.

DISTRIBUTION.—Río Paraguay drainage basin and southern portions of the Río Madeira system (Figure 20).

COMMON NAME.—Bolivia: Sabalina (Lauzanne and Loubens, 1985:48).

TABLE 2.—Morphometrics and meristics of (A) holotype of *Psectrogaster curviventris*, CAS 57146, formerly IU 9919, (B) holotype of *Curimata pearsoni*, CAS 57147, formerly IU 17282, (C) holotype of *Psectrogaster rhomboides australe* (data from original description by Risso and Sanchez, 1964; lateral line counts of holotype and paratypes combined), and (D) all specimens of *Psectrogaster curviventris* from which counts and measurements were taken. Standard length is expressed in mm; measurements 1 to 10 are proportions of standard length; 11 to 14 are proportions of head length.

	A	B	C	D
	Morphometrics			
Standard Length	134.0	24.3	97.0	24.3–171.0
1. Greatest body depth	0.53	—	0.50	0.47–0.59
2. Snout to dorsal-fin origin	0.53	0.53	0.55	0.51–0.57
3. Snout to anal-fin origin	0.85	0.83	0.85	0.83–0.88
4. Snout to pelvic-fin origin	0.57	0.59	—	0.52–0.61
5. Snout to anus	0.82	0.81	—	0.82–0.88
6. Origin of rayed dorsal fin to hypural joint	0.58	0.55	—	0.54–0.59
7. Pectoral fin length	0.21	—	0.25	0.20–0.25
8. Pelvic fin length	0.22	0.20	0.23	0.18–0.23
9. Caudal peduncle depth	0.14	0.13	0.13	0.12–0.14
10. Head length	0.32	0.36	0.38	0.32–0.38
11. Snout length	0.28	0.27	0.25	0.27–0.33
12. Orbital diameter	0.28	0.29	0.33	0.28–0.36
13. Postorbital length	0.51	0.46	—	0.40–0.51
14. Interorbital length	0.51	—	—	0.47–0.52
	Meristics			
Lateral line scales	46	45	45–48	41–49
Scale rows between dorsal-fin origin and lateral line	15	14?	—	13–17
Scale rows between anal-fin origin and lateral line	10	10?	—	9–12
Branched dorsal-fin rays	9	9	—	8–10
Branched anal-fin rays	7	7	—	7–8
Total pectoral-fin rays	15	—	—	14–16
Branched pelvic-fin rays	8	8	—	7–8
Vertebrae	30	30	—8	30–31

REMARKS.—Myers (1929:621) described *Curimata pearsoni* from a single specimen from the Amazon drainages of Bolivia that was previously reported on by Pearson (1924:26) as *Curimatopsis microlepis*. A re-examination of the holotype shows that it is a juvenile of the genus *Psectrogaster*, in which the sensory pores have only developed on the anteriormost scales of the lateral line (see also Vari, 1982a:10). This ontogenetically transient condition in *Psectrogaster* is not equivalent to the incompletely pored lateral line of *Curimatopsis* (sensu Vari, 1982a; 1989) that is retained in specimens of over 90 mm SL. The poor condition of the holotype of *Curimata pearsoni* renders a definitive identification to the species level impossible, but the relatively deep body of the specimen indicates that it is a member of the clade consisting of *Psectrogaster ciliata*, *P. amazonica*, *P. rhomboides*, and *P. curviventris*. *Curimata pearsoni* is tentatively placed as a synonym of *Psectrogaster curviventris* because the latter species is the only member of that sublineage of the genus known to occur in the upper portions of the Rio Madeira system, the region of the type locality of *Curimata pearsoni*.

Risso and Sanchez (1964:6) described a subspecies, *Psectrogaster rhomboides australe* from the region of Resistencia, Argentina. As discussed in detail subsequently (see "Remarks" under *P. rhomboides*) that subspecies is considered synonymous with *P. curviventris* in the present paper.

Eigenmann and Ogle (1907:3) cited *Psectrogaster curviventris* from Paraguay based on specimens (USNM 2106) that have proved to be *Potamorhina squamoralevis* (see Vari, 1984a:26). Boulenger (1896:34) reported *Curimatus* (= *Psectrogaster*) *rutiloides* from Paraguay, a region not within the known range of that species. An examination of the specimens that were the basis for that record (BMNH 1895.5.17:138–139) has revealed them to be *Psectrogaster curviventris*. Subsequent authors (Bertoni, 1914:9, 1939:54; Eigenmann, 1910:422; Pearson, 1937:109; Ringuet, 1975:73) have evidently followed that citation of *Psectrogaster rutiloides* in the Rio Paraguay basin without comment, and evidently without examining further specimens. In the absence of any confirmable record of *P. rutiloides* from the Rio Paraguay system, all of the Paraguay citations of the species commencing with, and



subsequent to, Boulenger (1896) are considered to refer to *Psectrogaster curviventris*.

Perugia (1891:639) reported *Curimatus ciliatus* from the Río Paraná system. Perugia's material has on re-examination proved to be *Psectrogaster curviventris*, and no material of *P. ciliatus* from the Paraguay-Parana system has been uncovered during this study. The cited presence of *P. ciliatus* in that river system is unsubstantiated and presumed to represent misidentifications of *P. curviventris*.

The occurrence of *Psectrogaster curviventris* in both the Río Paraguay system and the southern portions of the Rio Madeira system has not been found in any other curimatid groups examined in detail (Vari, 1982a, 1984a, in press b; pers. obser.), but parallels the distribution pattern reported on by Collette (1982:738) for the freshwater needlefish *Potamorhaphis eigenmanni* Miranda Ribeiro, and Kullander (1986:37) for the cichlids *Mesonauta festivus* (Heckel) and *Astronotus crassipinnis* (Heckel).

MATERIAL EXAMINED.—119 specimens (79, 24.3–171.3).

BRAZIL. *Paraná*: Rio Paraná below Sete Quedas, MZUSP 21093, 6 (3, 163.9–171.3). *Mato Grosso Do Sul*: Mouth of Rio Varadouro, MZUSP 21666, 6 (109.0–124.3). Rio Miranda, Corumba, MZUSP 21675, 1 (114.3); MZUSP 21682, 1 (84.7). Baía Caranda Grande, MZUSP 21545, 3 (2, 126.3–131.4). Rio Paraguai, Baía Bela at Albuquerque, MZUSP 21534, 6 (2, 121.7–131.3). MATO GROSSO. Pocone, Campo do Jofre, MZUSP 21586, 3 (2 (100.2–120.4). Rio Cuiabá, Santo Antonio do Leverger, MZUSP 4385, 2. Rio Paraguai, Ilha de Taimá (Sema), MZUSP 21738, 4. Baía do Buritizal, USNM 243221, 3. Rio Miranda, MNRJ 3503, 4.

PARAGUAY. *Central*: Asunción, Río Paraguay, CAS 57145, 1 (134.0, holotype of *Psectrogaster curviventris*, formerly IU 9919); CAS 57146, 2 (130.2–150.2, paratypes of *Psectrogaster curviventris*, formerly IU 9918 and IU 9920); FMNH 52576, 1 (104.2, paratype of *Psectrogaster curviventris*, formerly IU 9921); USNM 181713, 1 (33.6); USNM 181710, 21 (15, 79.8–92.2); USNM 181712, 3 (77.8–108.5); USNM 181706, 5 (77.0–90.5); USNM 181709, 7 (74.1–107.4); USNM 181704, 1 (94.9); USNM 181403, 1 (35.3); BMNH 1935.6.4:330–335, 6; BMNH 1895.5.17:138–139, 2. *Presidente Hayes*: West of Asunción, BMNH 1935.6.4:338–339, 2 (89.8–101.7). *Misiones*: Río Tebicuary near Villa Florida, USNM 181714, 3 (148.1–169.4). *Concepcion*: Puerto Max, CAS-IU 10273, 1 (114.5). *Olimpo*: Bahía Negra, CAS-IU 10274, 1 (84.9). Fuerte Olimpo (= Olimpo), AMNH 1228 (formerly IU 9936), 1 (118.8, paratype of *Psectrogaster curviventris*); AMNH 1455 (formerly IU 9937), 1 (112.3, paratype of *Psectrogaster curviventris*); CAS-IU 9922, 1 (77.5).

BOLIVIA. No specific locality, NMW 68851, 1. *Beni*: Río Mamoré, Puerto Siles, AMNH 48869, 2 (1, 60.0; 1 specimen cleared and counterstained for cartilage and bone). Río Baures, near mouth, AMNH 37713, 2 (113.7–118.0). Río Itenez, 4 km SW of Costa Marques, AMNH 37701, 2 (111.0–117.5).

Laguna 4 km SW of Costa Marques, AMNH 37708, 1 (118.1). Arroyo Grande, 4 km W of Guayaramerin, AMNH 37720, 2 (107.3–114.2). Boca del Río Ibarre, AMNH 48870, 2 (57.7–54.3; 1 specimen cleared and counterstained for cartilage and bone). Cachuela Esperanza, CAS 57147, 1 (24.3, holotype of *Curimata pearsoni*, formerly IU 17282). Río Itenez (Guaporé) at confluence of Río Itenez and Río Machupo, USNM 278558, 1 (113.7).

ARGENTINA. No specific locality, GC, 1. *Chaco*: Río Quia, Las Palmas, USNM 84199, 2 (83.5–84.5). *Misiones*: Candelaria, upper Río Paraná, MSNG 43819, 1 (153.0).

### *Psectrogaster amazonica* Eigenmann and Eigenmann

FIGURES 4, 21, 22

*Psectrogaster amazonica* Eigenmann and Eigenmann, 1889a:7 [type locality: Brazil: Tefé (= Tefé), Iça, Tabatinga, Obidos, Fonteboa (= Fonte Boa), Lago Alexo, Jutahy (= Rio Jutai), Tonantins, Sautarem (= Santarem), Hyavary (= Rio Javari), Cumpira (= Lago Curupira); specific name misspelled].

*Psectrogaster amazonica*.—Eigenmann and Eigenmann, 1889b:413 [based on Eigenmann and Eigenmann 1889a; Brazil: Tefé (= Tefé), Iça, Tabatinga, Obidos, Fonteboa (= Fonte Boa), Lago Alexo, Jutahy (= Rio Jutai), Tonantins, Santarem, Hyavary (= Rio Javari), Curupira (= Lago Curupira); misspelling of specific name corrected]; 1891:46 [reference].—Eigenmann and Allen, 1942:289 [in part, "females"]; Peru: Lago Sanango, Río Parapapura, Río Nanay, Lago Cashiboya, Río Ucayali, Iquitos].—Fernández-Yépez, 1948:30 [reference].—Fowler, 1950:301 [reference]; 1975:377 [reference].—Ortega and Vari, 1986:11 [Peru; common name].—Vari, 1989, tables 2, 3 [phylogenetic relationships]. [Not Saul, 1975:113.]

*Psectrogaster ciliata*.—Eigenmann and Eigenmann, 1889b:413 [specimens from Brazil: Coary (= Coari)].

*Curimatus rutiloides*.—Cope 1872:258 [Ecuador: Río Ambyacu].

*Curimatus cyprinoides*.—Cope 1872:291 [between mouth of Río Negro and Río Ucayali].—Fowler, 1913:517 [Rio Madeira, 20 miles north of Porto Velho]; 1913:518 [?, juveniles; Brazil: Río Madeira].

*Psectrogaster ciliatus*.—Fowler, 1906:305 [Río Ambyacu; Río Solimões between mouth of Río Negro and Río Ucayali; on Cope 1872:258 and 291 citations].

*Curimata ciliata*.—Fowler, 1940a:253, fig. 53 [Peru: Contamana].

*Psectrogaster cisandinus*.—Allen, in Eigenmann and Allen, 1942:290 [in part, one specimen from Peru: Iquitos].

*Psectrogaster amazonicus*.—Fernández-Yépez, 1948:30 [reference].

*Curimatus (Psectrogaster) amazonicus*.—Géry, 1964a:37 [Peruvian Amazon].

*Curimata amazonica*.—Goulding, 1981:39, 60, 105, fig. 37 [migration, fisheries, common names (cascudinha, chico duro)].

*Curimata* cf. *rutiloides*.—Géry and Mahnert, 1984:172, fig. 2 [Peruvian Amazon].

*Curimata amazonica*.—Santos et al., 1984:28 [Brazil, Rio Tocantins; common name; life history].

DIAGNOSIS.—*Psectrogaster amazonica* is one of the larger species in the genus achieving 170 mm SL. The presence in *P. amazonica* of a distinctly serrate postpelvic median keel and a patch of dark pigmentation at the base of the middle rays of the caudal fin distinguishes the species from all other species of *Psectrogaster* with the exception of *P. rhomboides* and *P. curviventris*. The transversely rounded preentral region distinguishes *P. amazonica* from *P. curviventris*, which has a distinct postpelvic midventral keel. The shorter posterior

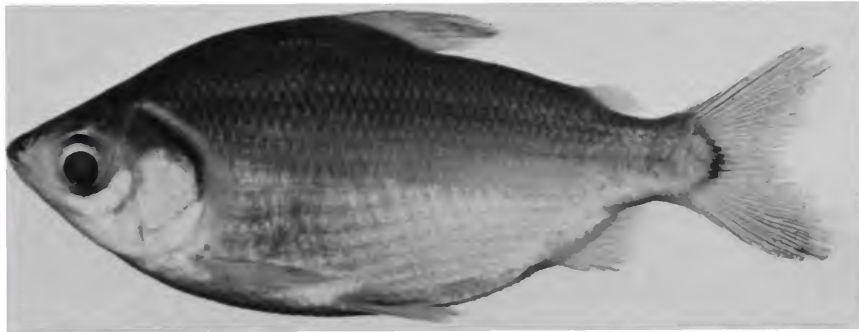


FIGURE 21.—*Psectrogaster amazonica*, USNM 261519, 95.7 mm SL, Peru. Ucayali, Coronel Portillo, Río Ucayali, Masisea.

chamber of the swimbladder, the proportionally shorter snout to origin of the rayed dorsal fin distance, and overall body form of *P. amazonica* discriminate that species from *P. rhomboides* (Figures 21, 23).

**DESCRIPTION.**—Body moderately elongate, relatively robust, more so in specimens over 100 mm SL. Dorsal profile of head straight or very slightly convex. Dorsal profile of body distinctly convex from rear of head to origin of rayed dorsal fin; straight and posteroventrally slanted at base of dorsal fin, notably convex from base of last dorsal-fin ray to caudal peduncle. Dorsal surface of body with a short, indistinct median keel immediately anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to region of vertical through middle of pectoral fin; somewhat flattened from that point to under pelvic fin, then convex to caudal peduncle. Prepelvic region transversely rounded anteriorly, slightly flattened with obtuse lateral angles in body wall approximate to origin of pelvic fin in largest specimens examined. A well-developed midventral keel extends from posterior of origin of pelvic fin to anus. Scales that form margin of postpelvic keel with well-developed posteriorly and posteroventrally oriented ctenii that form a distinctly serrate margin to keel. Pre- and post pelvic median keels barely continuous.

Greatest body depth at origin of rayed dorsal fin, depth 0.44–0.50 [0.45]; snout tip to origin of rayed dorsal fin 0.50–0.55 [0.50]; snout tip to origin of anal fin 0.82–0.87 [0.83]; snout tip to origin of pelvic fin 0.53–0.59 [0.54]; snout tip to anus 0.79–0.83 [0.79]; origin of rayed dorsal fin to hypural joint 0.55–0.60 [0.58]. Rayed dorsal fin pointed, less so with increasing age; anteriormost rays 2.3–2.8 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.20–0.24 [0.23], extends to or nearly to vertical through origin of pelvic fin; somewhat shorter in larger specimens. Pelvic fin pointed, length of pelvic fin 0.19–0.23 [0.20], reaches one-half of distance to origin of anal fin. Pelvic fin origin level with midventral line. Caudal fin forked. Adipose fin well developed.

Anal fin emarginate, anteriormost branched rays approximately twice length of ultimate ray. Caudal peduncle depth 0.11–0.14 [0.12].

Head profile distinctly pointed, head length 0.31–0.36 [0.32]; jaws equal, mouth terminal; snout length 0.26–0.32 [0.26]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.26–0.31 [0.30]; adipose eyelid present, with a vertically aligned ovoid opening over middle of eye; length of postorbital portion of head 0.44–0.50 [0.50]; gape width 0.29–0.34 [0.31]; interorbital width 0.43–0.50 [0.48].

Pored lateral line scales from supracleithrum to hypural joint 43 to 50 [46]; all scales of lateral line pored, canals in scales straight; 4 to 7 series of scales extend beyond hypural joint onto caudal fin base; 13 to 16 [13] scales in a transverse series from origin of rayed dorsal fin to lateral line, 8 to 11 [9] scales in a transverse series from the lateral line to origin of anal fin; scales distinctly ctenoid, more so ventrally, particularly along margin of postpelvic keel.

Dorsal-fin rays ii or iii, 9 [ii, 9]; anal-fin rays i, 8 or ii, 7–8 or iii, 7–8 [iii, 7]; pectoral-fin rays 13 to 16 [14]; pelvic-fin rays i, 7 or 8 [i, 8].

Total vertebrae 29 (1), 30 (19).

**COLOR IN ALCOHOL.**—Specimens that retain guanine on scales golden or golden silvery, overall head and body pigmentation more intense on dorsal portions of head and body. Specimens that lack guanine on scales yellowish tan or brownish, overall head and body pigmentation more intense dorsal of lateral line. An obscure midlateral band present along posterior portion of body in some individuals. No discrete pigmentation pattern on head or body. Well-developed but somewhat diffuse patch of dark chromatophores at base of middle rays of caudal fin (Figure 21). Median fins with series of small dark chromatophores outlining rays. Dorsal margin of adipose fin edged with dark chromatophores.

**DISTRIBUTION.**—Widely distributed in the Rio Amazonas drainage basin (Figure 22).

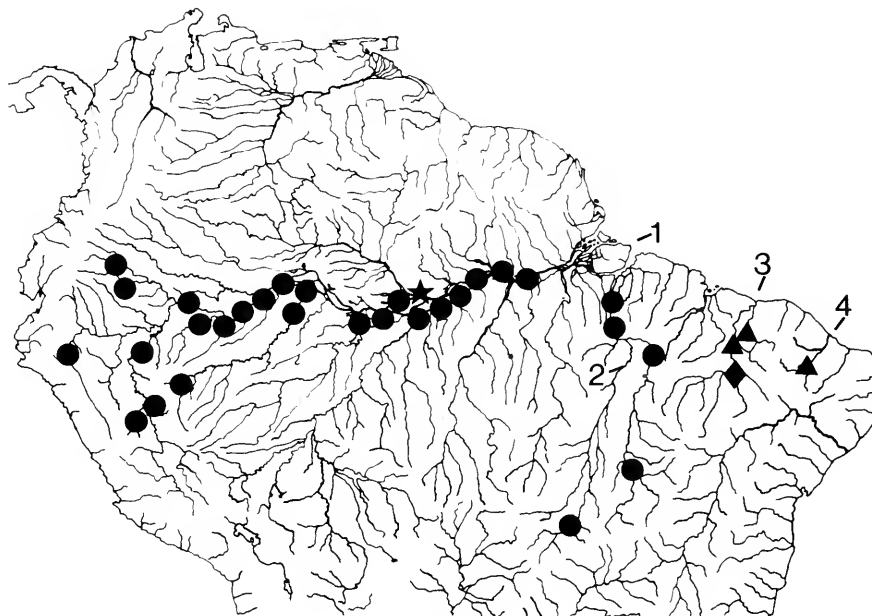


FIGURE 22.—Geographic distribution of *Psectrogaster amazonica* (star = lectotype locality, dots = sites of other collections), and *Psectrogaster rhomboides* (diamond = type locality, triangles = sites of other collections) (some of the symbols represent more than one locality or lot of specimens). Locations: 1 = Rio Amazonas; 2 = Rio Tocantins; 3 = Rio Parnaíba and Rio Poti; and 4 = Rio Curu.

COMMON NAME.—Brazil, Rio Madeira: cascudinha, chico duro (Goulding, 1981); Rio Tocantins: branquinha comum (Santos et al., 1984:28). Peru: Chio-chio (Ortega and Vari, 1986:11).

LIFE HISTORY.—Santos et al. (1984:28) report that *Psectrogaster amazonica* is one of the most common and abundant along the Rio Tocantins of eastern Brazil. It was reported by those authors as eating organic detritus, benthic organisms, and periphyton. Sexual maturity is achieved at 15 cm and breeding occurs between November and January. The species is the basis of an intensive fishery in the Rio Tocantins.

REMARKS.—The original description of this species in the first of the two papers on curimatids published by Eigenmann and Eigenmann in 1889 (1889a) cites this species as *Psectrogaster amozonica*. The specific name is considered a typographical error for *amazonica*, comparable to the series of similar mistakes on the same page of the species description (e.g., nour for none, sf. nov. instead of sp. nov., and numerous misspellings of locality names). Eigenmann and Eigenmann rectified this error in the subsequent paper (1889b). In that later publication they list the species as “sp. nov.?” without discussion of their questions as to the validity of the species, or their shift from the preceding publication in which no such uncertainty was indicated. The results of the present study support the recognition of *Psectrogaster amazonica* as distinct.

Contrary to their standard procedure, Eigenmann and

Eigenmann did not provide the Museum of Comparative Zoology (MCZ) register numbers of the type series of *Psectrogaster amazonica* in either of their co-authored publications dealing with curimatids (1889a,b), but rather simply listed the collection localities of the examined specimens. No Thayer expedition specimens identified as the types of *Psectrogaster amazonica* were found in the collections of the Museum of Comparative Zoology. A series of *Psectrogaster* specimens from localities that largely correspond to those listed by Eigenmann and Eigenmann were found in the holdings of that institution, although identified as *Curimatus rutiloides* Kner and *C. cyprinoides* (Linnaeus). Those specimens (see “Material Examined”) apparently represent the originally unspecified syntypic series of *Psectrogaster amazonica*. The lots in question are the only portion of the Thayer collection *Psectrogaster* material not cited in Eigenmann and Eigenmann’s revision of the family. These lots also correspond to the collection sites listed by Eigenmann and Eigenmann other than for the absence of the one lot of specimens from Santarem. Eigenmann and Eigenmann also do not list any Thayer expedition specimens of either *Curimatus rutiloides* or *C. cyprinoides* under their treatments of those species, despite the identifications in the jars, a lapse congruent with the hypothesis that they considered these MCZ specimens to be instead the type series of *Psectrogaster amazonica*. The specimens are all in relatively poor condition,



and the missing lot from Santarem may have been discarded at some point.

A 128.9 mm SL syntype from Lago Alexo that is in the best overall condition (MCZ 20312) is designated as the lectotype of *Psectrogaster amazonica*. The remaining syntypes (see "Material Examined") therefore become paralectotypes of the species.

Eigenmann and Eigenmann (1889b:413) cited *Psectrogaster ciliata* from Coary (= Coari), distinguishing what they believed to be that species from *P. amazonica* largely on the basis of body depth. The individuals in question (MCZ 21084, 20262) are actually large, evidently ripe, females of *P. amazonica* in which the depth of the body relative to the standard length is increased.

Fowler (1906:305) reidentified specimens that Cope (1872:258) believed to be *Curimatus rutiloides* from the Ambyiacu River, Ecuador (now Peru) as *Psectrogaster ciliatus*. Fowler also applied the latter name to specimens that Cope (1872:291) had identified as *Curimatus cyprinoides*. In each case the material (ANSP 8202-6, 8208-9) is rather *Psectrogaster amazonica*. Subsequently, Fowler (1913:517-518) reported on two lots of what he considered to be *Curimatus cyprinoides* from the Rio Madeira. The two cited individuals that form one lot (ANSP 39551-52) have on re-examination proved to be *Psectrogaster amazonica*. The second lot that Fowler (1913:518) equated with *Curimata cyprinoides* consisted of 18 *Psectrogaster* juveniles in poor condition (ANSP 39353-70). These are tentatively identified as *P. amazonica*. Finally Fowler (1940a:253) identified six specimens (ANSP 73180) from the Rio Ucayali as *Curimata ciliata*, whereas examination of the specimens has found them to be *Psectrogaster amazonica*.

Eigenmann and Allen (1942:289-290) commented on the apparent sexual dimorphism in body depth and caudal pigmentation in material they identified as *Psectrogaster amazonica* from various localities in the Peruvian Amazon. A reexamination of the specimens has shown that the deeper bodied individuals with plain caudal fins, their presumed females, are indeed *P. amazonica*, but that the shallower bodied, supposed males, with pigmentation patches on the lower lobe of the caudal fin, are rather *P. rutiloides*. In that same publication Allen (page 290) described a new species, *Psectrogaster cisandinus* (= *Curimata cisandina* (Vari, 1989, in press b)). One of the specimens in the paratypic series of *P. cisandinus* from Iquitos, Peru (USNM 268199, formerly IU 17850) is *P. amazonica*.

Saul (1975:113) reported *Psectrogaster amazonica* from Santa Cecilia, Ecuador. The involved specimens (ANSP 130464) are *Curimata aspera* Günther.

MATERIAL EXAMINED.—471 specimens (100, 24.3-166.7).

BRAZIL. Rio Amazonas, no specific locality, MCZ 35064, 4 (78.0-129.3). Rio Amazonas between mouth of Rio Negro and Rio Ucayali, ANSP 8208-9, 2. *Pará*: Monte Alegre, BMNH 1926.10.27:178-181, 4 (2, 119.7-127.7). Obidos, MCZ 20328, 3 (62.7-85.7, paralectotypes of *Psectrogaster*

*amazonica*); MCZ 20327, 1 (118.3, paralectotype of *Psectrogaster amazonica*); MCZ 20336, 1 (88.7, paralectotype of *Psectrogaster amazonica*). Mouth of Rio Nhamundá, MZUSP 9534, 5 (2, 107.4-110.7). Rio Tocantins, Lagoa near Jatobal, MZUSP 21311, 5. Rio Tocantins, Igarapé Espirito Santo between Baiao and Tucuruí, MZUSP 21276, 15 (4, 88.1-137.7). Rio Tocantins, Lagoas near Tucuruí, MZUSP 21296, 12 (3, 97.3-113.4). Rio Tocantins, Laguinho near Tucuruí, MZUSP 21329, 11 (3, 97.2-108.7). Rio Tocantins, Igarapé Muru below Tucuruí, MZUSP 21284, 4. Rio Tocantins, Lago Trocará below Tucuruí, MZUSP 21337, 8. *Maranhão*: Rio Tocantins, Estreito, MZUSP 4976, 7 (4, 89.2-102.3). *Goiás*: Rio Araguaia, Aruaña, MZUSP 4846, 26 (7, 92.3-149.0). Rio Araguaia, Lago Rico near Cocalinha, MZUSP 21538, 3 (2, 125.7-154.9). *Mato Grosso*: Rio Araguaia, Santa Terezinha, MZUSP 20837, 7 (3, 72.5-80.7); USNM 243219, 2. *Amazonas*: Lago Alexo, MCZ 20312, 1 (128.9, lectotype of *Psectrogaster amazonica*); MCZ 58029, 2 (108.3-132.3, paralectotypes of *Psectrogaster amazonica*). Curupira (= Lago Curupira), MCZ 20275, 1 (82.7, paralectotype of *Psectrogaster amazonica*). Lago Hyanuáry (= Januari), MCZ 27403, 3. Manacapuru, BMNH 1925.10.28:59, 1 (134.0). Ilha de Marchantaria, USNM 229205, 1; USNM 229192, 1. Coary (= Coari), MCZ 20184, 1 (139.3); MCZ 20262, 5. Tefé (= Tefé), MCZ 20254, 11 (5, 121.3-126.2, paralectotypes of *Psectrogaster amazonica*); MCZ 20178, 1 (109.0, paralectotype of *Psectrogaster amazonica*); NMW 66908, 2; NMW 66909, 2. Fonteboa (= Fonte Boa), MCZ 20196, 2 (102.5-108.3, paralectotypes of *Psectrogaster amazonica*); MNRJ 2639, 2. Rio Tonantins, BMNH 1927.6.7:16, 2 (1, 115.0); MCZ 20191, 2 (59.5-63.3, paralectotypes of *Psectrogaster amazonica*); MCZ 20192, 1 (129.0, paralectotype of *Psectrogaster amazonica*). Iça, MCZ 20212, 3 (108.3-118.3, paralectotypes of *Psectrogaster amazonica*). San Paola (= São Paulo de Olivença), MCZ 20202, 2 (101.8-115.1). Tabatinga (= Sapurara), MCZ 20242, 2 (1, 109.0, paralectotypes of *Psectrogaster amazonica*). Hyavary (= Rio Javari), MCZ 20231, 1 (123.3, paralectotype of *Psectrogaster amazonica*). Rio Javari, Benjamin Constant, MNRJ 5952, 2. Rio Madeira, 25 km from Nova Olinda, MZUSP 6955, 4 (3, 60.1-116.3). Lago Janauacá, MZUSP 21561, 8 (4, 125.5-133.2); USNM 243220, 2. Mouth of Rio Pacia, MZUSP 21483, 2 (1, 111.5). Igarapé Manduaçu, Paraná de Iupia, NW of Fonte Boa, MZUSP 20962, 55 (5, 90.3-118.5). Igarapé em Jacare, near Fonte Boa, MZUSP 20522, 7. Rio Jurua, MZUSP 3301, 2. Rio Purus, MCZ 33535, 1. Lago Castro, mouth of Rio Purus, MZUSP 6308, 4 (2, 102.7-126.5). Mouth of Rio Purus, MZUSP 5954, 7; MZUSP 5949, 4. Benjamin Constant, MZUSP 20724, 1. Rio Negro, Igarapé Jaraqui, MZUSP 6181, 1. Parana de Urucará, MZUSP 7512, 2. Rio Solimões, Ilha Baruruá, above mouth of Rio Jutai, MZUSP 20984, 1. Lago Supia near Codajás, MZUSP 9663, 4. *Rondônia*: Rio Madeira, 20 miles north of Porto Velho, ANSP 39351-52, 2 (1, 96.1). Rio Machado, Lago do Paraíso, MZUSP 13909-14, 6. *Acre*:



Rio Iaco into Rio Purus, USNM 94676, 1 (88.0); MCZ 33535, 1. Rio Livramento, AMNH 12711, 1 (136.1). Rio Torua near Rio Purus, MCZ 33537, 2. Rio Jurua, Cruziero do Sul, ZUEC 409, 1. Mouth of Rio Moa, Cruziero do Sul, ZUEC 410, 1; ZUEC 420, 1.

PERU. *Loreto*: Río Yaquerana, near Colonia Angamos, NRM SOK/1984307.4062, 4. Lago Yarinacocha, BMNH 1977.3.10:170, 1 (96.7); BMNH 1977.3.10:171, 1 (96.4). Río Ucayali, Boca Chica, ANSP 73186, 6. Río Ampiyacu, USNM 229979, 1 (92.5); USNM 175844, 1 (102.5); USNM 176122, 1 (121.7); USNM 175916, 1 (130.5); USNM 175920, 1 (115.6); ANSP 8202-6, 5. Lago Cashiboyo, CAS-IU 17846, 26. Vicinity of Pebas, USNM 175955, 1 (100.7). Iquitos, USNM 163852, 1 (113.5); USNM 167834 (formerly IU 17850), 1 (91.5, paratype of *Psectrogaster cisandinus*). Iquitos, Moena Caño, MZUSP 15229, 1. Río Nanay, Pangacocha, MZUSP 21364, 1. Río Pacaya, Cocha Yanayacu, MZUSP 15243, 1. Río Ucayali, Bagazan, MZUSP uncat., 8. *Ucayali*: Río Ucayali, San Juan, AMNH 48872, 3 (53.4-61.5). Río Ucayali, Bethel, AMNH 48871, 1 (50.0). Río Ucayali, Pucallpa, USNM 243218, 2; USNM 261518, 34; USNM 261490, 1; USNM 261481, 2; USNM 261402, 2; MZUSP uncat., 9. Romainecocha, Pucallpa, MZUSP uncat., 4. Lobococha, Masisea, MZUSP uncat., 3; USNM 261519, 25; USNM 261511, 11. Río Ucayali, Shanahao, MZUSP uncat., 3. Río Neshuya, at Pucallpa-Huanuco Road, USNM 261411, 3; USNM 261418, 2. *Huanuco*: Río Pachitea, BMNH 1969.11.18.7, 1 (96.4). *Amazonas*: LaPoza, LACM 36325-3, 1.

ECUADOR. *Napo Pastaza*: Jatuncocha, BMNH 1970.4.3: 84-85, 2 (1, 115.7); ANSP 137617, 2. Río Napo near mouth of Río Pañayacu, ANSP 146152, 3. Río Curaray, Jesus Pitischa, ANSP 137616, 3 (2, 123.5-139.5).

### *Psectrogaster rhomboides* Eigenmann and Eigenmann

FIGURES 22, 23

*Curimatus cyprinoides*.—Steindachner, 1882:134 [Brazil, Rio Puty (= Poti)].

*Psectrogaster rhomboides* Eigenmann and Eigenmann, 1889a:7 [type locality: Brazil: Rio Puty (= Poti), San Gonçallo (= São Gonçalo)]; 1889b:412 [Brazil: Rio Puty (= Poti), San Gonçallo (= São Gonçalo)]; 1891:46 [reference].—Eigenmann, 1910:420 [reference].—Fernández-Yépez, 1948:29, fig. 10 [reference].—Fowler, 1950:301 [reference]; 1975:378 [reference].—Vari, 1989, tables 2, 3 [phylogenetic relationships].

*Curimata cyprinoides*.—Fowler, 1941:166 [in part, specimens from Brazil: Piahy (= Piauí); Therezina (= Teresina), Rio Parnahyba (= Parnaíba); Ceará: Fortaleza (= Fortaleza)].

DIAGNOSIS.—*Psectrogaster rhomboides* is one of the larger species in the genus, achieving 160 mm SL. The presence in *P. rhomboides* of a distinctly serrate postpelvic median keel, and a diffuse patch of dark pigmentation at the base of the middle rays of the caudal fin distinguishes that species from all other members of *Psectrogaster* with the exception of *P. amazonica* and *P. curviventris*. *Psectrogaster rhomboides* can be separated from *P. curviventris* by the absence of the distinct median prepelvic keel found in the latter species. The two

species also differ in the position of the origin of the pelvic fin, which is at the midventral margin of the body in *P. rhomboides*, whereas it is located distinctly dorsal of the ventral body margin in *P. curviventris*. *Psectrogaster rhomboides* can be distinguished from *P. amazonica* in overall body form (Figures 21, 23), the longer posterior chamber of the swimbladder, and a proportionally longer snout to origin of the rayed dorsal fin distance (see "Key").

DESCRIPTION.—Body moderately elongate, compressed. Dorsal profile of head straight. Dorsal profile of body distinctly convex from rear of head to origin of rayed dorsal fin, convexity more pronounced in larger specimens; straight and posteroventrally slanted at base of dorsal fin, noticeably convex from base of last dorsal-fin ray to caudal peduncle. Dorsal body surface with a short, indistinct medial keel immediately anterior to rayed dorsal fin, smoothly rounded transversely posterior to fin. Ventral profile of body gently curved from tip of lower jaw to caudal peduncle, somewhat more flattened in larger specimens. Prepelvic region transversely rounded. A well-developed median keel posterior to origin of pelvic fins. Scales that form margin of postpelvic keel with well-developed posteriorly and posteroventrally oriented ctenii that form a distinctly serrate margin to keel.

Greatest body depth at origin of rayed dorsal fin, depth 0.40-0.47 [0.41]; snout tip to origin of rayed dorsal fin 0.50-0.55 [0.50]; snout tip to origin of anal fin 0.80-0.86 [0.80]; snout tip to origin of pelvic fin 0.51-0.57 [0.52]; snout tip to anus 0.76-0.83 [0.77]; origin of rayed dorsal fin to hypural joint 0.52-0.57 [0.57]. Rayed dorsal fin pointed, less so with increasing age; anteriormost rays approximately 2.4-2.7 times length of ultimate ray. Pectoral fin pointed; length of pectoral fin 0.17-0.23 [0.22], extends to or falls slightly short of vertical through origin of pelvic fin. Pelvic fin pointed, length of pelvic fin 0.19-0.23 [0.21], reaches two-thirds to three-quarters of distance to origin of anal fin. Caudal fin forked. Adipose fin well developed, base scaled. Anal fin emarginate, anteriormost branched rays approximately twice length of ultimate ray. Caudal peduncle depth 0.12-0.13 [0.12].

Head profile obtusely pointed, head length 0.29-0.35 [0.32]; jaws equal, mouth terminal; snout length 0.25-0.30 [0.26]; nostrils of each side of head very close, anterior circular, posterior crescent shaped with aperture closed by thin flap of skin that separates nares; orbital diameter 0.25-0.31 [0.27]; adipose eyelid present, with vertically ovoid opening over center of eye; length of postorbital portion of head 0.45-0.50 [0.50]; gape width 0.26-0.31 [0.27]; interorbital width 0.44-0.50 [0.44].

Pored lateral line scales from supracleithrum to hypural joint 46 to 52 [48]; all scales of lateral line pored, canals in scales straight; 3 to 7 series of scales extend beyond hypural joint onto caudal fin base; 13 to 17 [16] scales in a transverse series from origin of rayed dorsal fin to lateral line, 9 to 11 [11] scales in a transverse series from the lateral line to origin of anal fin;

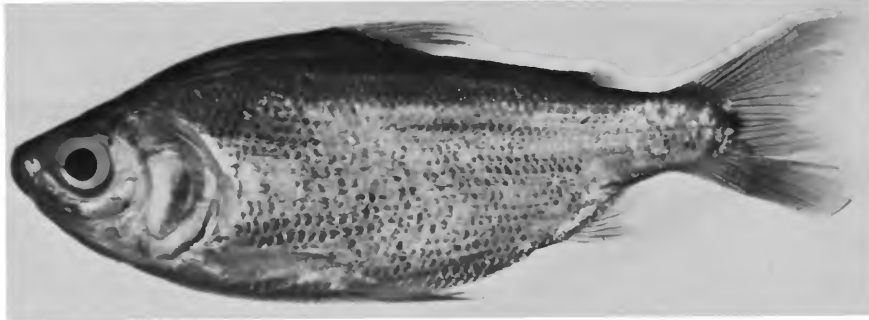


FIGURE 23.—*Psectrogaster rhomboides*, USNM 267347, 113.1 mm SL; Brazil, Piauí, Rio Parnaíba at Terezina.

scales distinctly ctenoid, more so ventrally, particularly along margin of postpelvic keel.

Dorsal-fin rays ii,8–10 [ii,9]; anal-fin rays ii,7–8 or iii,7 [ii,7]; pectoral-fin rays 13 to 15 [15]; pelvic-fin rays i,7–8 [i,8].

Total vertebrae 30 (24).

COLOR IN ALCOHOL.—Specimens that retain guanine on scales golden-silvery, darker dorsally; specimens that lack guanine on scales yellowish tan, overall head and body pigmentation more intense on dorsal portions of head and body. No discrete pigmentation pattern on head or body. Dorsal margin of adipose fin edged with chromatophores. Well-differentiated but somewhat diffuse patch of dark chromatophores at base of middle rays of caudal fin (Figure 23). Caudal fin rays outlined by series of small dark chromatophores, particularly in upper lobe.

DISTRIBUTION.—Rio Parnaíba and Rio Jaguaribe drainage basins (Figure 22).

REMARKS.—Eigenmann and Eigenmann published two papers pertaining to the Curimatidae in 1889, each of which list *Psectrogaster rhomboides* as new. The shorter preliminary description (1889a) appeared in the April number of the "West American Scientist" and evidently predates the second paper (1889b), which is noted as having been read at the May 13th 1889 meeting of the New York Academy of Sciences. The description of *Psectrogaster rhomboides* was based on a large series of specimens collected in the "Rio Putz" (misspelling of Puty = Poti) in the state of Piauí of northeastern Brazil (see "Material Examined"). A 127.8 mm SL specimen that is in the best overall condition within the syntypic series (MCZ 20306) is designated as the lectotype of the species, and the remaining syntypes thus become paralectotypes (see "Material Examined" for listing of specimens).

Risso and Sanchez (1964:6) described *Psectrogaster rhomboides australe* from several specimens collected in the vicinity of Resistencia Argentina. On the basis of the original Eigenmann and Eigenmann description of *P. rhomboides* and evidently in the absence of comparative material of that species, they considered their material to be intermediate between *P. rhomboides* and *P. curviventris*, the latter being originally described from the same region as *P. rhomboides*

*australis*. A comparison of the data in the original description of *P. rhomboides australe* and the accompanying figure with specimens of both *P. rhomboides* and *P. curviventris* shows that the morphometrics, meristics, and body form of *P. rhomboides australe* fall within the range of those of *P. curviventris* (Table 2). In contrast *P. rhomboides australe* differs from *P. rhomboides* in various meristic and morphometric values, and in the form of the prepelvic region (transversely rounded in *P. rhomboides*, keeled in *P. curviventris*, and shown by Risso and Sanchez as keeled in *P. rhomboides australe*). In light of these factors, *P. rhomboides australe* is considered distinct from *P. rhomboides*, and is placed into the synonymy of *Psectrogaster curviventris*.

Steindachner (1882:134) cites *Curimatus cyprinoides* (Linnaeus) from the Rio Puty (= Poti), evidently on the basis of Thayer expedition material he had selected during his studies at MCZ. Eigenmann and Eigenmann (1889a) questioned this identification, and in a subsequent paper (1889b) listed the record by Steindachner in the synonymy of *Psectrogaster rhomboides* without justification for their action. Examination of some of the specimens that were the basis for Steindachner's record of *Curimatus cyprinoides* (NMW 66885, 66938) has shown that they are indeed *Psectrogaster rhomboides*.

Recently Fowler (1941:166) similarly reported *Curimata cyprinoides* from a variety of locations in northeastern Brazil. Some of those specimens have on examination been found to be *Psectrogaster rhomboides* (ANSP 81892, 81934, 81936, 81937) and the others are *P. saguiru*.

MATERIAL EXAMINED.—149 specimens (55, 63.7–178.1).

BRAZIL. Piauí: Rio Puty (= Rio Poti) MCZ 20306, 1 (127.8, lectotype of *Psectrogaster rhomboides*); MCZ 60392, 42 (18, 98.1–125.0, paralectotypes of *Psectrogaster rhomboides*); USNM 120287, 4 (117.0–160.2, paralectotypes of *Psectrogaster rhomboides*; formerly MCZ 20303); MCZ 20303 and MCZ 20304, 9 (paralectotypes of *Psectrogaster rhomboides*; specimens intermingled in a single bottle); NMW 68905, 1 (106.3); NMW 66887, 2 (99.3–129.4); NMW 66884, 4 (115.3–129.3); NMW 66885, 1; NMW 66932, 2; NMW 56732, 8; NMW 56733, 1. San Gonçallo (= São Gonçalo), MCZ 20310, 1 (paralectotype of *Psectrogaster rhomboides*).

Rio Parnaíba at Salto do Longa, MCZ 46798, 2 (1, 63.7). Theresina (= Teresina), NMW 66889, 4 (113.4–134.3); MZUSP 5096, 7 (105.3–135.2); USNM 267347, 4 (102.4–121.0); NMW 66886, 4; NMW 66888, 4; NMW 66890, 4; NMW 66892, 4; NMW 66893, 4; NMW 66894, 4; NMW 66895, 4; NMW 66896, 4; NMW 66897, 4; NMW 66902, 4; ANSP 81892, 2; ANSP 81934, 1. Ceará: Fortaleza, ANSP 81936, 2. Rio Jaguaribe at Barra Alto, ANSP 39919–20, 2 (103.0–117.7); ANSP 81937, 1. Içó, Acude Mazarinho, MNRJ 5582, 7 (150.5–178.1). Acude Pentacostes, Rio Curu system, USNM 267348, 1.

### Phylogenetic Biogeography

The genus *Psectrogaster* occurs over a significant portion of the range of the family Curimatidae. Species of *Psectrogaster* are, however, absent in the trans-Andean rivers draining into the Pacific and Caribbean, and in many of the shorter Atlantic rivers of the Guianas, Brazil, and Uruguay, all of which are inhabited by one or more species of other curimatid genera. Phylogenetic and distributional information on the Curimatidae as a whole indicates that the common ancestor of the species of *Psectrogaster* evolved prior to the final uplift of the Andes (Vari, 1988, 1989). *Psectrogaster* itself is, however, uninformative on that point because it has a totally cis-Andean distribution. The generic distribution therefore cannot provide data on the possible occurrence of components of the clade in pre-Andean South America across areas now in the separate hydrographic systems on the two sides of the Andean Cordillera.

There is a significant degree of sister taxa sympatry at all levels within the genus, with such sympatry being the rule at more inclusive (higher) phylogenetic levels. For example, the geographic distribution of *P. essequibensis* and *P. falcata*, which together constitute a clade limited to Amazon and Essequibo River basins, is totally encompassed within the distribution of the sister group to that lineage that occupies both those river systems and others. This sympatry between sister taxa also extends down to the level of some sister species (*P. essequibensis* and *P. falcata*). As noted by Vari (1988) the ecological parameters of all members of the Curimatidae make an allopatric speciation model the most reasonable system of reference to apply to curimatids. Under such an allopatric speciation model the significant degree of sympatry at all phylogenetic levels within *Psectrogaster* is indicative of large-scale dispersal secondary to speciation made possible by vicariance events.

It is not possible at the present time to correlate with certainty any of the speciation events in *Psectrogaster* that are reflected in allopatric sister species or groups, with any known geomorphological events. We similarly lack the data to advance a more explicit hypothesis on how secondary sympatry was achieved within the genus, but one possible geomorphological event was likely to be involved in the process. Data discussed by Vari (1988) indicate that the cladogenesis between the common ancestor of all species of *Psectrogaster* and the sister clade to that taxon must have predated the final (late Miocene ?) uplift of the Andes. That geological event also resulted in a drastic reorganization of the hydrographic regime of the continent which, in turn, presumably resulted in the mixing of previously separate ichthyofaunas. Such an event may account, at least in part, for the sympatry at different phylogenetic levels within *Psectrogaster*. It should be noted that *P. rhomboides*, *P. amazonica*, and *P. curviventris*, which together form one of the major clades within the genus have, however, totally allopatric distributions.

*Psectrogaster* is unique at the generic level within the Curimatidae in having two species distributed in the rivers of northeastern Brazil, a region in which the curimatid fauna is notably depauperate relative to that of much of the rest of the continent. The results of Vari (in press b) indicate that the closest relatives of *Curimata macrops* Eigenmann and Eigenmann of northeastern Brazil live to the west of that area in the Amazon basin. One of the two species of *Psectrogaster* endemic to northeastern Brazil, *P. saguïru*, has its closest relative, *P. rutiloides*, widely distributed throughout the Amazon. That distributional pattern parallels that of *Curimata macrops* and its near relatives. The second species of *Psectrogaster* endemic to northeastern Brazil, *P. rhomboides*, is part of a trichotomy with two species, *P. amazonica* and *P. curviventris*, both of which are distributed solely, or at least in part, in the Amazon basin. Evidence has not been discovered in this study to resolve the question of the exact sister group to *P. rhomboides*. Nonetheless the occurrence of both possible sister species to *P. rhomboides* in the Amazon basin again indicates a pattern of sister group relationships between *P. rhomboides* of Northeastern Brazil and a species inhabiting the Amazon.

These repeated sister relationships of species in the northeast of Brazil with taxa to the west in the Amazon, in both *Psectrogaster* and *Curimata* presumably reflect a common, albeit presently undated, vicariance event within what was an originally continuous ichthyofauna across those regions.



## Resumo

O gênero *Psectrogaster* Eigenmann & Eigenmann é reconhecido como uma unidade monofilética da família Curimatidae. A posse em comum de caracteres derivados no primeiro e quarto epibrânquiais, na quinta placa dentígera faríngea superior e no primeiro infra-faringobrânquial une estas espécies numa linhagem natural dentro da família Curimatidae. Modificações em vários componentes dos arcos brânquiais, na forma do corpo, no tamanho e forma das escamas, na pigmentação e no número de raios da nadadeira anal delimitam subunidades monofiléticas no gênero.

Oito espécies são reconhecidas no gênero: *Psectrogaster ciliatus* (Müller & Trochel, 1845), que ocorre no rio Essequibo, rio Orinoco e no sistema do rio Amazonas; *P. rutiloides* (Kner, 1859a), amplamente distribuída na bacia do rio Amazonas; *P. essequibensis* (Günther, 1864), encontrada nas bacias dos rios Essequibo e Amazonas; *P. rhomboides* Eigenmann & Eigenmann (1889a), limitada aos rios Parnaíba e Jaguaribe do nordeste do Brasil; *P. amazonica* Eigenmann & Eigenmann (1899a), amplamente distribuída na bacia de drenagem do rio Amazonas; *P. curviventris* Eigenmann & Kennedy (1907), conhecida do rio Paraguai e porções meridionais do sistema do rio Madeira e *P. saguuru* (Fowler, 1941), dos rios do nordeste do Brasil.

*Psectrogaster essequibensis* (Günther), considerado como um sinônimo de *P. ciliatus* (Müller & Trochel) por Eigenmann (1912) e autores subsequentes, é reconhecida como uma espécie

distinta. *Curimatus isognathus* Eigenmann & Eigenmann (1889b) e *Psectrogaster auratus* Gill (1895) são considerados como sinônimos juniores de *P. rutiloides* (Kner). *Curimata pearsoni* Myers (1929) é experimentalmente colocado como um sinônimo de *Psectrogaster curviventris* Eigenmann & Kennedy. *Psectrogaster rhomboides australis* Risso & Sanchez (1964) é considerado um sinônimo de *P. curviventris*. Os gêneros *Pseudopsectrogaster*, *Hamatichthys* e *Semelcarinata*, todos propostos por Fernández-Yépez (1948), são colocados como sinônimos de *Psectrogaster* Eigenmann & Eigenmann (1889a).

Descobriu-se que as citações assinalando a presença de *Psectrogaster rutiloides* na bacia do rio Paraguai feitas por vários autores, começando por Boulenger (1896), foram baseadas em identificações errôneas de *Psectrogaster curviventris*. Como consequência de identificações errôneas de *Psectrogaster curviventris*, Perugia assinalou a presença de *Curimatus ciliatus* no sistema do Paraná.

A zoogeografia histórica das espécies de *Psectrogaster* é discutida. Um grau significativo de dispersão pós-vicariância é óbvio em níveis filogenéticos mais inclusivos, mas menos pronunciado entre espécies-irmãs. O fato de duas espécies da bacia Amazônica serem espécies-irmãs de duas outras espécies do gênero *Psectrogaster* dos rios do nordeste do Brasil, evidencia um padrão repetitivo de interrelações filogenéticas a nível específico entre as duas áreas citadas.



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