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Systematic review of the neotropical shovelnose catfish genus *Sorubim* Cuvier (Siluriformes: Pimelodidae)

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Abstract

The genus *Sorubim* Cuvier, 1829, and two species, *S. lima* (Bloch & Schneider 1801) and *S. trigonocephalus* Miranda-Ribeiro, 1920, are redescribed based on the examination of type material and about 400 non-type specimens from ichthyological collections in Europe and North and South America. The five species of the genus are, in addition to *S. lima* and *S. trigonocephalus*, *S. elongatus* Littmann, Burr, Schmidt and Isern 2001, found in the Essequibo, Orinoco, and Amazon basins; *S. cuspicaudus* Littmann, Burr and Nass 2000, occurring in the Sinu, Cauca, and Magdalena rivers of Colombia and the Lago Maracaibo basin of Colombia and Venezuela; and *S. maniradii* Littmann, Burr and Buitrago-Suarez 2001, known from the upper and middle Amazon basin. *Sorubim lima* is the widest-ranging species, occurring in most of the major drainage basins of South America. *Sorubim trigonocephalus* is extremely rare in natural history collections and is currently known from only two major tributaries of the Amazon basin. Three species (*S. maniradii*, *S. elongatus*, and *S. lima*) occur syntopically. Species of *Sorubim* are diagnosed on the basis of body and head shape, differences in fin ray and gill-raker numbers, mental barbel position, and degree of pigmentation of the lateral stripe. At least two of the species (*S. lima* and *S elongatus*) make up part of the ornamental fish trade and are sold for food in local fish markets in South America. A key to adults of the five species is included.

Key words: Pimelodidae, South America, taxonomy

Introduction

Sorubim, a small genus of pimelodid catfishes with five recognized species, is characterized by its shovel-like projecting upper jaw exposing a large premaxillary tooth patch, eyes set laterally on a depressed head, and a distinct black horizontal stripe running the entire length of the fish. Species are distributed throughout most of the major freshwater drainage systems in South America including the Amazon, Essequibo, Orinoco, Maracaibo, Magdalena and Paraná. Specimens have been collected in 10 countries spanning much of the continent. One species reportedly reaches nearly 80 centimeters in total length, and all five species probably provide an important source of subsistence protein, being sold in many local fish markets throughout South America. Additionally, species of *Sorubim* are recognized by ornamental fishers, and are known to aquarium traders and hobbyists as shovelnose catfishes.

Mainly lowland inhabitants and locally abundant throughout their ranges, the species occur in both lotic and lentic systems including lakes adjacent to rivers, bays and coves, large rivers and the lower reaches of smaller tributaries. They are usually collected over substrates of mud, sand, and clay, often associated with vegetation (i.e., root masses, tall reeds, grasses).

The objectives of this study are to redescribe *S. lima* and *S. trigonocephalus* and update information on their geographic distributions. The additional three species of *Sorubim*, all described since 2000 (Littmann *et al.* 2000; 2001a; 2001b), are diagnosed and illustrated with photographs. A key to the five recognized species is provided.

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Methods

Institutional abbreviations are from Leviton *et al.* (1985) except for AUM (Auburn University Museum) and MUSM (Museo de Historia Natural-Lima). Meristic and mensural data were taken from over 400 specimens using the methods of Hubbs and Lagler (1974) unless defined otherwise. Straight-line measurements were made manually with standard dial calipers and recorded to the nearest 0.01 mm following the methods outlined in Littmann *et al.* (2000). Distances between fins were taken from landmarks using the terms "origin" as the anterior and "insertion" as the posterior points of contact between fin rays or membranes and the body (Cailliet *et al.* 1996). Gill raker, brachiostegal ray, and vertebral counts were made on cleared and stained specimens, dry skeletons, and radiographs following Lundberg *et al.* (1991). Vertebral counts for *Sorubim cuspicaudus* and *S. maniradii* originate from a separate study in preparation with J. G. Lundberg and L. Kellogg. All measurements were made on the left side of the fish when possible. Measurements on smaller specimens were made using a WILD M5A dissecting microscope at 6X and 12X. Considerable effort was made to examine specimens from the entire known geographic range of the genus. Staining techniques were modified from those used in Pothoff (1984) and Taylor and Van Dyke (1985). All material examined is listed in Appendix A.

Genus *Sorubim* Cuvier, 1829

Platystoma Spix and Agassiz, 1829: 23. Type species: *Silurus lima* Bloch and Schneider, 1801. Type by subsequent designation by Jordan (1917: 131). Gender: neuter. Preoccupied by *Playtstoma* Meigen, 1803 in Diptera.

Sorubim Cuvier, 1829: 293. Type Species: *Silurus lima* Bloch and Schneider, 1801. Type by subsequent designation. Gender: masculine.

Sorubim Spix and Agassiz, 1829: 24. Type Species: *Silurus lima* Bloch and Schneider, 1801. Type by subsequent designation by Bleeker (1862). Gender: masculine. First appeared in synonomy in Spix and Agassiz as above, but made available back to that authorship and date because of use as a valid name by Bleeker (1862: 10).

Abron Gistel, 1848: X. Type species: *Silurus lima* Bloch and Schneider, 1801. Type by being a replacement name. Gender: neuter. Replacement for *Platystoma* Valenciennes [Spix and Agassiz, 1829].

Diagnosis: A genus of catfishes distinguished from other genera of Pimelodidae by a combination of the following characters: (1) very depressed head; (2) long upper jaw greatly projecting over lower jaw; (3) premaxillary tooth patch covered by minute, villiform teeth and exposed ventrally; (4) eyes positioned laterally, usually visible from below; (5) black lateral stripe of highly variable width from snout to distal tip of median rays on caudal fin.

Description: Dorsal fin formula II6, the first spine a spinelet, the second pungent and serrated posteriorly, followed by six branched rays; anal fin with 18–25 total rays (17–20 pterygiophores), usually 14–18 branched, the two most posterior rays often joined at base represented by one anal pterygiophore; adipose fin present, triangular in shape, posterior edge usually rounded, position of origin even with or slightly posterior to anal fin origin; pectoral fin with single, pungent spine, serrated on the distal end anteriorly, throughout posteriorly, supported by 7–10 branched rays; pelvic fin supported by one unbranched and five branched rays, its origin at mid-body, well behind insertion of dorsal fin; caudal fin supported by 16–21 principal branched rays, upper lobe always with eight, lower lobe variable with 8–13 usually larger than upper-lobe; caudal fin forked, lower lobe with slightly rounded edges or deeply forked and pointed. Thread-like filaments often present on second dorsal spine or first branched fin-ray, pectoral spine, first pelvic ray, and upper- and lower-most principal caudal rays. Filaments are longest on middle caudal rays of both inferior and superior lobes. Juveniles often exhibit extremely long filaments, often longer than length of body; this trait is common among several pimelodid species (i.e., *Brachyplatystoma* spp., *Platysilurus*, *Platystomatichthys*)**.** Vertebrae 50–58, gill rakers 13–37, and brachiostegal rays 12–15.

Members of the genus *Sorubim* are elongate, medium to large-sized catfishes (to ~800 mm SL). Body shape ranges from thin, elongate and round in cross-section, to stout and slightly compressed laterally, body tapering from its widest point near cleithral process to caudal peduncle. Dorsal fin situated about mid-way between tip of snout and adipose fin origin. Lateral-line complete and stitched in appearance, slightly arched above pectoral fin, anterior section ossified and covered by ossicles; ossicles large and thin, small and ovate, or joined to form a single, continuous and smooth plate. Ossicles located at distal points of lateral-line pores, often enlarged in many adults forming plates of variable size and shape. Head densely ossified, length greater than three times its width; bones of skull roof ornamented with small pit-like striations radiating from center, covered by thin layer of skin (preservation may leave skull bones visible through skin); skull dorsoventrally flattened; anterior fontanelle long and wide, between frontal bones; posterior fontanelle small and tear-drop shaped, sometimes extending posteriorly as thin groove on supraoccipital bone. Neurocranium and nape scattered with dendritic arrangement of ampullary organs (see Gelinek 1978).

One pair of maxillary barbels, two pairs of mental barbels; fleshy, oval or flat in cross-section. Maxillary barbel length variable; in some species reaching only to pectoral insertion, in others to pelvic fin origin and beyond. Outer mental barbels extend just beyond pectoral origin; inner mental barbels do not extend posterior to bony operculum.

Arrangement of teeth on palate forming four patches, two on vomer, one elongated patch on each metapterygoid (fig. 4, Littmann *et al.* 2000). All tooth patches have numerous minute and villiform teeth.

Pigmentation: Pigmentation intraspecifically variable. In alcohol, dorsal surface dark to light brown or gray; ventral surface completely white or cream-colored; black lateral stripe extends from tip of snout to inferior edge of lower caudal lobe. Lateral stripe variable in width, occasionally running through entire width of eye, other times barely touching its dorsal edge; not extending below lateral line. Dark dorsal surface and lateral stripe sometimes separated by light lateral band, usually white or gray, sometimes light brown. Dorsal pigment may shift color shade quickly in conjunction with background change (personal observation).

Fins hyaline with pigment confined to rays on live and freshly preserved specimens; posterior rays of anal fin often speckled with chromatophores. Preserved specimens often with lemon-yellow pigment at bases of pelvic, anal, and caudal fins; sometimes chromatophores present on all fin rays. Juvenile fins generally exhibit more pigment than adults. Color pattern distinct from other genera of Pimelodidae (no other pimelodid species possesses horizontal stripe stretching entire length of head and body). Bloch and Schneider (1801) described paired and anal fins as being red or rose-colored (this may describe hemorrhaging of blood vessels caused by handling stress). I have not observed red pigment on any specimens in the field or laboratory. No sexual dimorphism in any species of *Sorubim* has been identified or reported. However, median lengths observed at first sexual maturity for *S. cuspicaudus* in the Magdalena River basin were 533 mm and 425 mm for females and males, respectively, indicating the possibility of sexual size differences (Escobar *et al.* 1983).

Etymology: The name *Sorubim* probably originates from a native language. In a brief discussion of subfamilial relationships among the Pimelodidae, Silfvergrip (1996) mentioned that Swainson (1838) considered Spix and Agassiz's (1829) use of *Sorubim* to be a misspelling of Sorubium. Swainson gives no explanation for this comment, but Silfvergrip and others note that the common vernacular name for many large pimelodids in South America is Sorubí, a common usage for related shovelnose catfishes (i.e., *Pseudoplatystoma* spp.). Likewise, Robins *et al.* (1991) used the name *Sorubim* as a common name applied to several large pimelodids in the genus *Pseudoplatystoma* (*Pseudoplatystoma tigrinum* = Tiger Sorubim, *P. fasciatum* = Barred Sorubim, *P. corruscans* = Spotted Sorubim).

Distribution: Known to occur in the Amazon, Cauca, Essequibo, Lake Maracaibo, Magdalena, Orinoco, Paraná, Sinu basins and in at least one Atlantic Ocean drainage in northeastern Brazil, the rio Parnaíba.

Remarks: The tremendously rich ichthyofaunas in river systems of tropical South America present formidable opportunities to ecologists (Ibarra & Stewart 1989). Little is known about the reproductive biology and natural history of species of *Sorubim*. The turbid white-water rivers inhabited by *Sorubim* make direct

observation of these fishes nearly impossible. Most natural history information on *Sorubim* stems from observations of captive fish in aquaria.

Burgess (1989) reported one instance of two adult *Sorubim* excavating a small pit for a nest. Both fish were guarding freshly hatched young, although none survived. The curious behavior of vertical posturing amidst the elongate stems of submerged grass and reeds has been observed in aquaria by Reid (1986) and Burgess (1989) who interpreted this as a cryptic behavior used to hide from predators and/or to stalk prey utilizing a lie-and-wait strategy. *Sorubim* catfishes eat crustaceans and other invertebrates as well as fish (Ringuelet *et al.* 1967; Reid 1986; Burgess 1989; pers. obs.). Adult *Sorubim* species maintain a protein-rich, piscivorous diet as do many of their pimelodid relatives.

Near Iquitos, Peru, I observed juvenile *Sorubim* among branches, sticks, root masses and reed-like grasses in small caños, tributary streams, and backwaters of large river channels. The darker fin pigmentation and longer fin-ray filaments of juveniles may provide camouflage while hiding in grasses and leaf detritus. Larger adults living in more open-water habitats lose these cryptic features (Reid 1986). I have collected *Sorubim* mainly in turbid small streams and large rivers with aquatic vegetation and little or no flow, but only occasionally in clearer black water or over a strictly sand or mud-bottomed substrate. Bag and straight seines are best for collecting juveniles or sub-adults less than 150 mm SL, whereas gill nets and cast-nets work well for larger adults.

Taxonomic history: *Sorubim* is at once recognized by its distinctive shovel-like projecting upper jaw, depressed snout, laterally placed eyes and black horizontal stripe extending along body from snout tip to posterior margin of caudal fin (Bloch & Schneider 1801; Cuvier 1829; Spix & Agassiz 1829; Bleeker 1862-1863; Günther 1864; Weyenbergh 1877; Eigenmann & Eigenmann 1890; Miranda-Ribeiro 1920; Ringuelet *et al.* 1967; Burgess 1989). Several osteological characters demonstrate the monophyly of the genus. A detailed analysis of these characters will be presented elsewhere.

The taxonomic history of *Sorubim* is somewhat convoluted (see Littmann *et al.* 2000, Table 1). *Silurus lima* was described by Bloch and Schneider (1801) based on a specimen from Brazil, and later became the type species of *Sorubim* by monotypy. In 1829, Agassiz and Cuvier each used the generic name *Sorubim* almost simultaneously. Authorship of *Sorubim* was long attributed to Agassiz, in Spix and Agassiz (1829), but Kottelat (1988) and Whitehead and Myers (1971) identified Cuvier (1829) as the first author of the name. According to Kottelat (1988) and Whitehead and Myers (1971), Cuvier's manuscript was in print by March 1829; the print date for Spix and Agassiz's "Brazilian fishes" could not have been earlier than May 1829. Thus, Cuvier's description has two months priority over Agassiz's (Boeseman 1962). For a detailed discussion on the dates, authorships, and status of Spix and Agassiz's Brazilian fishes including *Sorubim* and other South American genera, see Boeseman (1962), Whitehead and Myers (1971), and Kottelat (1988).

TABLE 1. Measurements of the head as percentages of standard length for 45 specimens of *S. lima*.

Measurement	Mean	Range	SD
Standard length	253.7	127.00–423.0	80.09
Left anterior nostril to right anterior nostril	0.090	0.072–0.108	0.003
Left posterior nostril to right posterior nostril	0.078	0.067–0.097	0.003
Left anterior nostril to right posterior nostril	0.090	0.076–0.111	0.003
Left anterior nostril to posterior right eye	0.198	0.175–0.245	0.008
Left anterior nostril to left posterior nostril	0.034	0.027–0.040	0.003
Left posterior nostril to posterior left eye	0.129	0.110–0.169	0.007
Posterior left eye to posterior right eye	0.141	0.110–0.184	0.008
Posterior left eye to right pectoral origin	0.196	0.167–0.253	0.009
Posterior left eye to left pectoral origin	0.129	0.111–0.160	0.011
Left pectoral origin to right pectoral origin	0.144	0.108–0.194	0.009

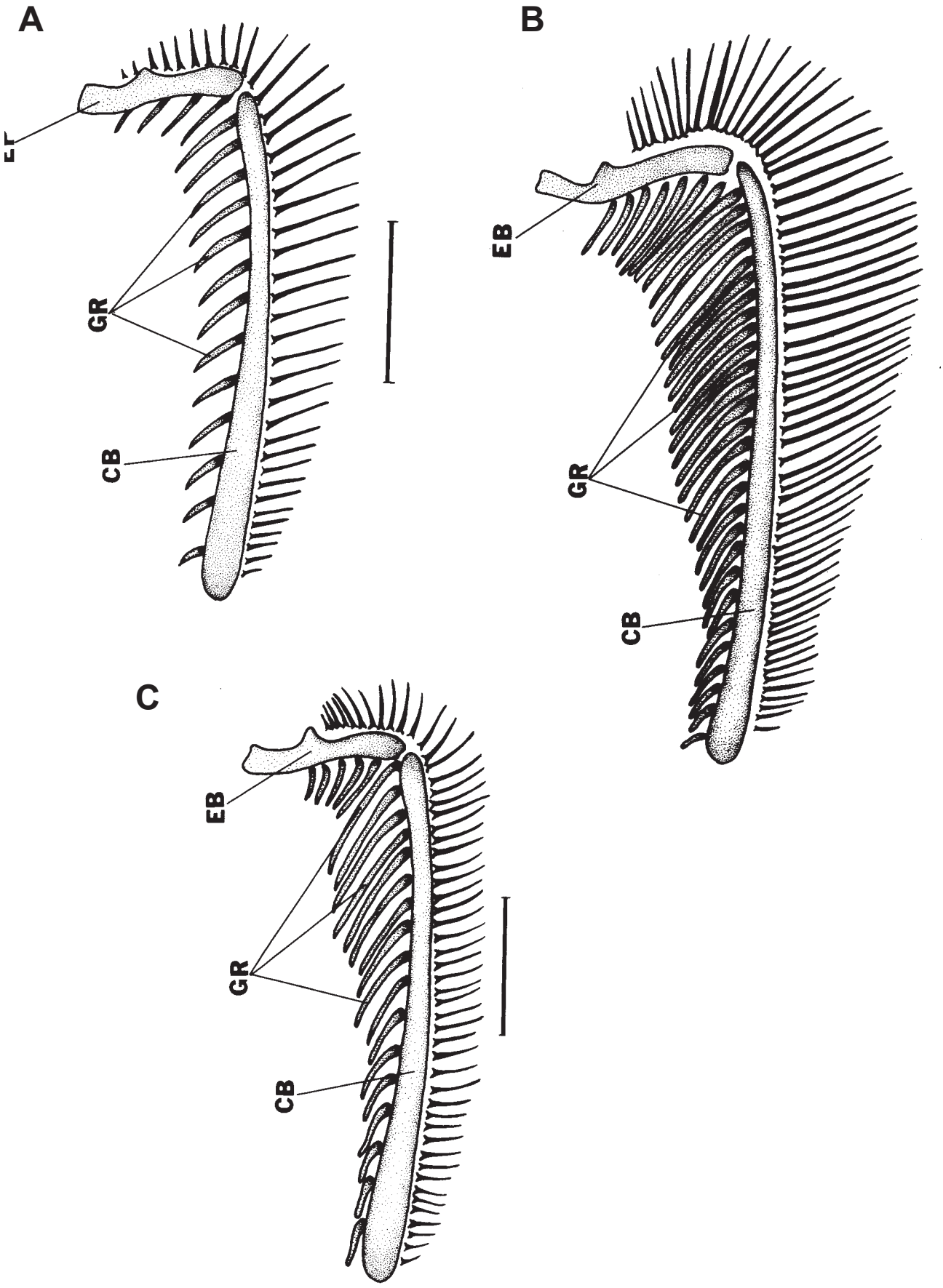

FIGURE 1. First, left-side gill arch and gill rakers of A) *Sorubim lima*, B) *Sorubim maniradii*, and C) *Sorubim elongatus*. Abbreviations: CB, ceratobranchial; GR, gill raker; EB, epibranchial. Scale bars = 5 mm.

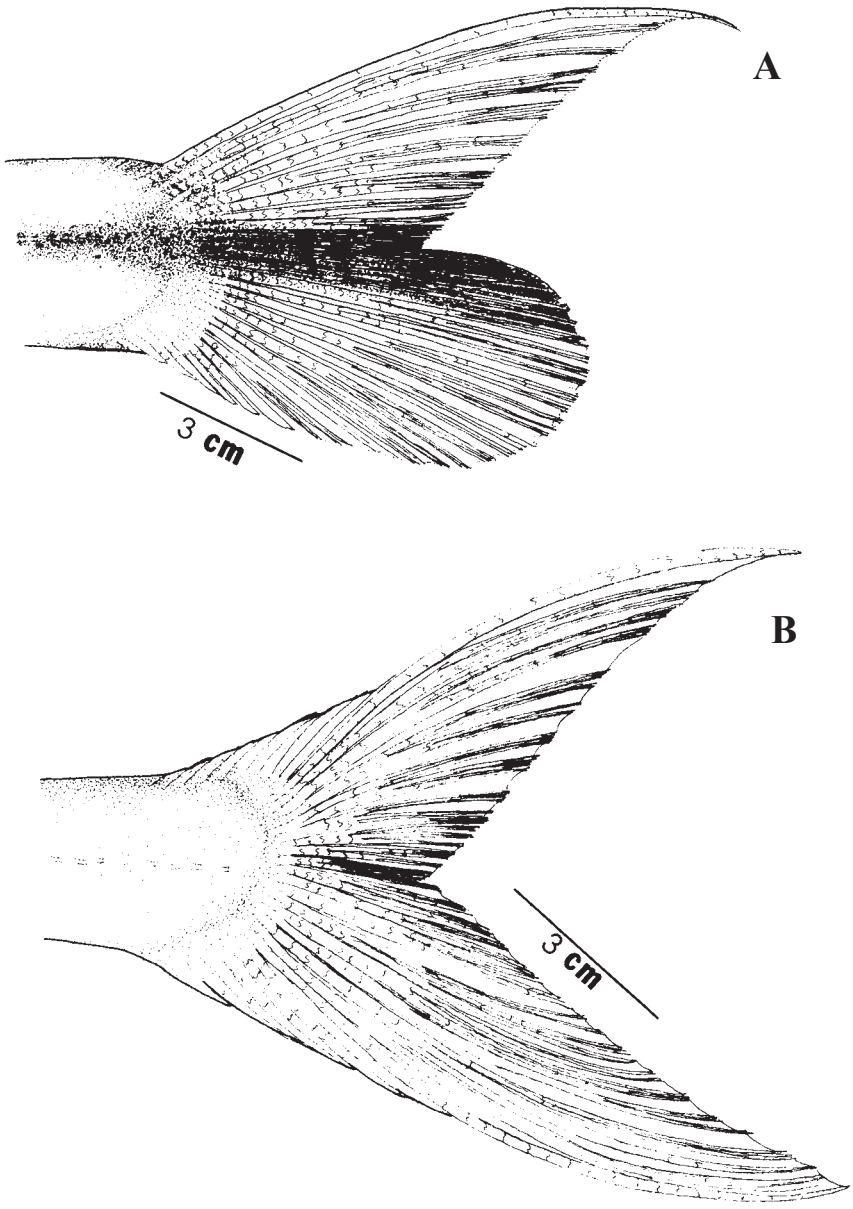

FIGURE 2. Schematic illustration of the caudal fin of: A) all species of *Sorubim* except *S. cuspicaudus*, B) *S. cuspicaudus*. Illustrations by U. A. Buitrago-Suarez.

In Spix and Agassiz's (1829) well-known "Brazilian fishes," Agassiz used the name *Platystoma* to describe several species now placed in three different genera (*Pseudoplatystoma*, *Sorubim*, and *Sorubimichthys*). Eigenmann and Eigenmann (1890) found that *Platystoma* Agassiz 1829 was preoccupied by *Platystoma* Meigen 1803, a genus of insects. Most of the species listed in combination with *Sorubim* were published as junior synonyms (i.e., *S. carapary* as a synonym of *Platystoma corruscans; S. infraoculare* as a synonym of *Platystoma lima*; *S. jandia* as a synonym of *Platystoma spatula*; and *S. pirauaca* as a synonym of *P. planiceps*). Interestingly, the names originally read in combination with *Sorubim* were provided by Spix, who was responsible for drawing the plates; thus, *Sorubim* appears with several specific epithets on Spix's figure plates thought to represent the same fishes described in Agassiz's text. The only Agassiz name appearing with a plate and not published as a synonym is *S. truncatum,* now recognized as a synonym of *Pseudoplatystoma tigrinum* (see Lundberg & Littmann 2003).

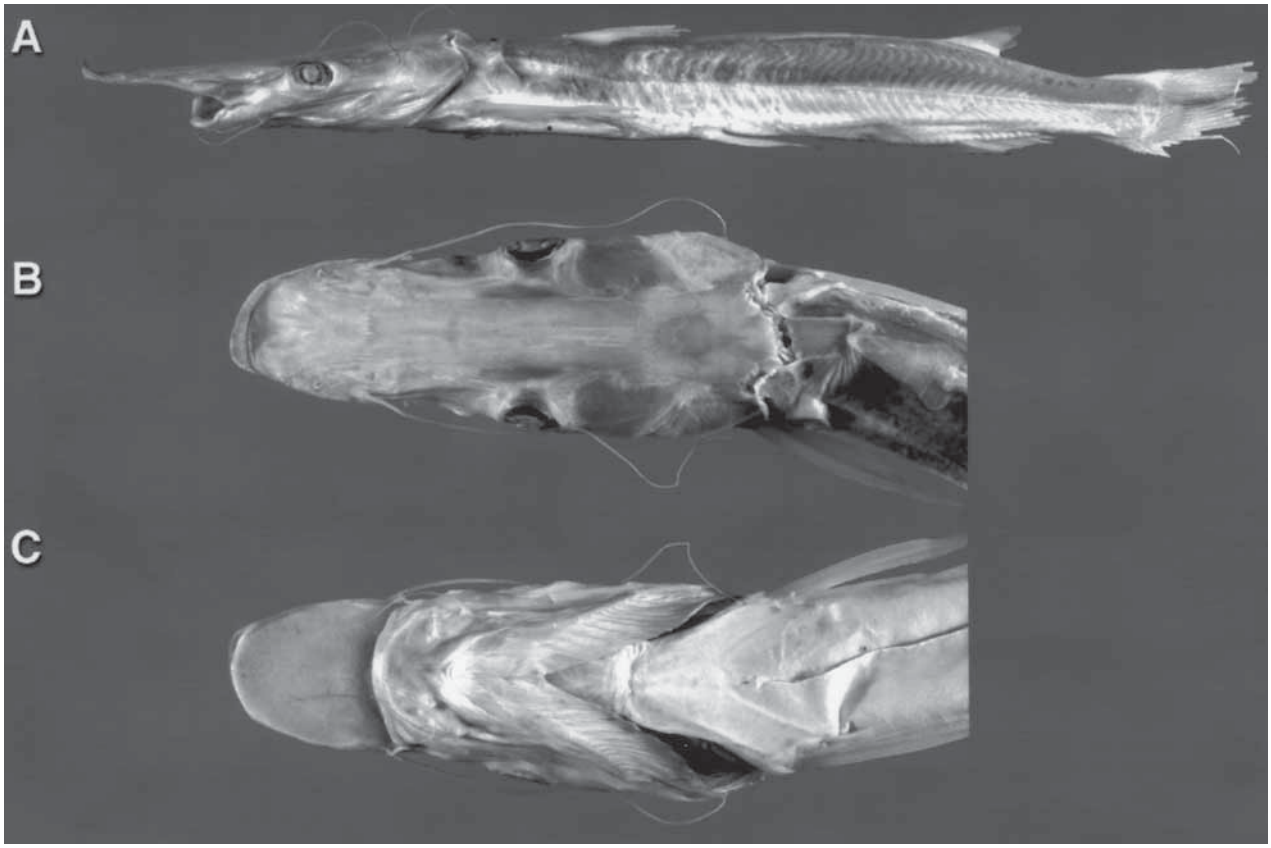

FIGURE 3. *Sorubim trigonocephalus*, holotype, MNRJ 882, 317 mm SL.

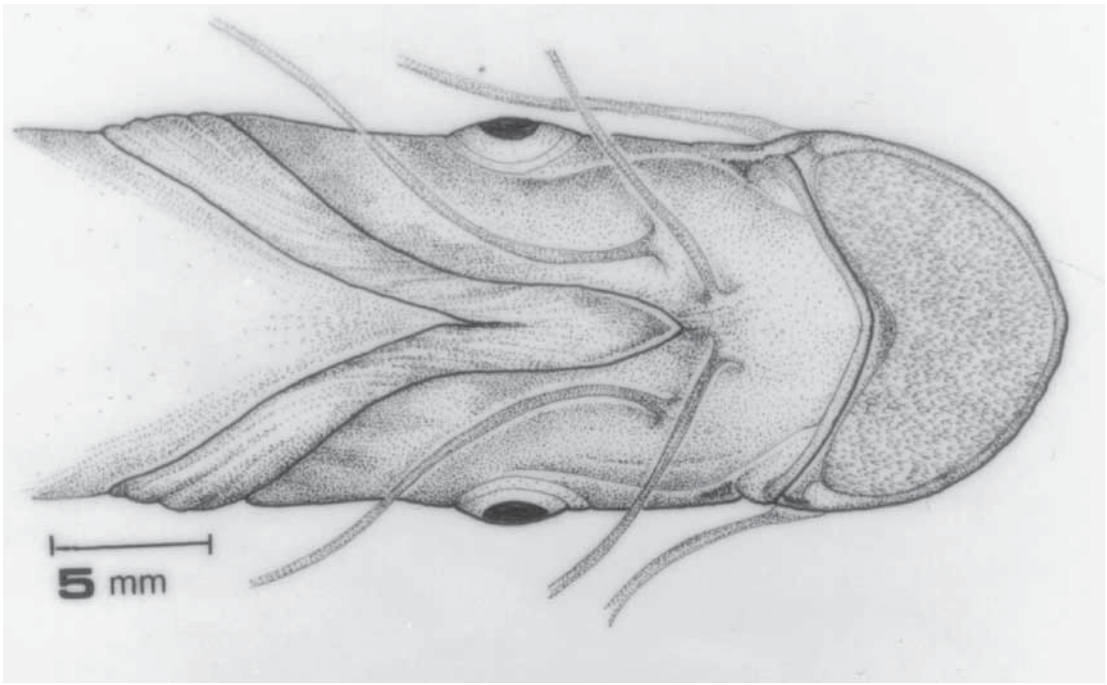

FIGURE 4. *Sorubim lima*, ventral head view, SIUC 33081, illustration by U. A. Buitrago-Suárez, first published in Littmann et al., 2001b (fig. 4, p.10).

The genus *Sorubim*, as currently delimited, contains five valid species; *S. lima* (Bloch & Schneider 1801), *S. trigonocephalus* Miranda-Ribeiro 1920, *S. cuspicaudus* Littmann, Burr and Nass 2000, *S. elongatus* Littmann, Burr, Schmidt and Isern 2001, and *S. maniradii* Littmann, Buitrago and Burr 2001. The current status of each specific epithet published in combination with *Sorubim* is listed in Lundberg and Littmann (2003).

Key to species of the pimelodid genus *Sorubim*

1 Gill rakers 31–37 (Fig. 1B).....*S. maniradii*
- Gill rakers 13–23 (Fig.1A, 1C)..... 2
2 Pectoral fin-rays 8; gill rakers on first arch modally 21; tooth patches on vomer not connected (Littmann *et al.* 2001b, fig. 3b); insertion point of inner mental barbels even with or posterior to gular apex; head and body elongate, body ovate in cross-section; eye diameter into interorbital distance 2–3 times; gape width into head length more than 3.6 times.....*S. elongatus*
- Pectoral fin-rays 9, rarely 8 or 10; gill rakers on first arch 18 or fewer; tooth patches on vomer fused (Littmann *et al.* 2000, figs. 4a and 4c,); insertion point of inner mental barbels anterior to gular apex; head and body stout, body moderately compressed laterally; eye diameter into interorbital distance 3 times or more; gape width into head length approximately 3..... 3
3 Caudal fin with rounded lobes, distal caudal rays on upper and lower lobes curved (Fig. 2A); distributed east of the Andes Cordillera 4
- Caudal fin deeply forked and elongate, distal caudal rays on upper and lower lobes nearly straight and pointed (Fig. 2B); restricted to the Lake Maracaibo, Sinu and Magdalena River basins.....*S. cuspicaudus*
4 Premaxillary tooth patch greatly exposed, exposed tooth patch length about equal to width (Fig. 3C); head triangular and spear-shaped (Fig. 3B)..... *S. trigonocephalus*
- Premaxillary tooth patch moderately exposed, exposed tooth patch length contained 1.5 to 2.5 times in width (Fig. 4); head oblong, not triangular..... *S. lima*

***Sorubim lima* (Bloch & Schneider 1801)**
Chiripira, Chucharón, Pico de pato, Lima Shovelnose, Duckbill Catfish
Fig. 5 (Holotype), Fig. 6

Silurus lima Bloch and Schneider 1801, p. 384. Type locality: in flumine Maranham Brasiliae (Brazil). Holotype: ZMB 3185 (stuffed).
Sorubim infraoculare Spix in Spix and Agassiz, 1829: 24, pl. 15. Type locality: Brazil. Not available, first published in the synonomy of *Platystoma lima* (Bloch & Schneider 1801).
Silurus gerupensis Natterer in Kner, 1858: 399. Type locality: stemmen von Rio Guaporé, Rio Branco und Rio Negro. Holotype: whereabouts unknown. Not available, first published in synonomy under *Platystoma lima*.
Platystoma luceri Weyenbergh, 1877: 10, pl. 3 (figs. 1–3). Type locality: Argentina, Santa Fe. Holotype: whereabouts unknown. Junior subjective synonym (herein).
Sorubim latirostris Miranda-Ribeiro, 1920: 14, pl. 12. Type locality: Amazonas (Brazil). Holotype: MNRJ 631. Junior subjective synonym (herein).

Diagnosis: A species of *Sorubim* distinguished from *S. elongatus* by having modally nine pectoral rays; 21 anal-fin rays; 16 gill rakers; large vomerine tooth patches, almost always fused (Littmann *et al.* 2000, fig. 4a); a more robust, deeper head and body; body somewhat compressed laterally; mental barbels equal or anterior to gular apex (Littmann *et al.* 2001b, fig. 4a). Differs from *S. cuspicaudus* in having rounded caudal fin lobes and more robust body. Distinguished from *S. trigonocephalus* by premaxillary tooth patch length being 1.5 to 2.5 times its width. Trenchantly differs from *S. maniradii* having only 13–18 gill rakers. Additional characteristics distinguishing *S. lima* from congeners include pelvic fins that contact or nearly reach anal fin origin

when depressed and presence of thin plates or ossicles (highly variable in shape) extending vertically on anterior lateral line in most large adults.

Description: Mensural and meristic data are given in Tables 1–5. Largest individual 505 mm SL (BMNH 1895.5.17.16, Río Paraguay). Dorsal-fin rays II,6 (n=196); pectoral-fin rays I,9 (8–10); anal fin rays 21 (19–22); pelvic-fin rays 6, 1 unbranched and 5 branched (n=196); principal caudal rays on upper lobe always 8, lower rays variable, 8–13; gill rakers on first pharyngeal arch 16 (13–18), 3–4 (usually 4) on epibranchial. Body-shape and form shown in Figs. 5, 6. Head, body, and caudal peduncle deeper than in other species of *Sorubim*. This is based on unpublished data from my graduate thesis that included a sheared principal components analysis (PCA) of *S. lima vs.* congeners. A sheared PCA used to compare head and body shape of *S. lima* vs. *S. elongatus* can be found in Littmann *et al.* (2001b).

Head length approximately 3 times gape width (n=80, range 2.61–3.65, mean 3.00), interorbital distance 3 times or more than eye diameter (n=81, range 2.34–5.42, mean 3.58), anal- fin length 1.75–2.25 times adipose fin length (n=46, range 1.59–2.63, mean 2.08), premaxillary tooth patch width approximately 2 times its length (n=58, range 1.44–2.79, mean 2.06). Eyes positioned laterally on the head, visible ventrally. Three pairs fleshy barbels on head, ovate or flat in cross-section. Maxillary barbels long, sometimes reaching beyond pelvic-fin origin. Outer mental barbels extend beyond posterior cleithral process. Inner mental barbel insertion anterior to or even with gular apex (Littmann 2001b, fig. 4,) and short, not reaching beyond bony operculum.

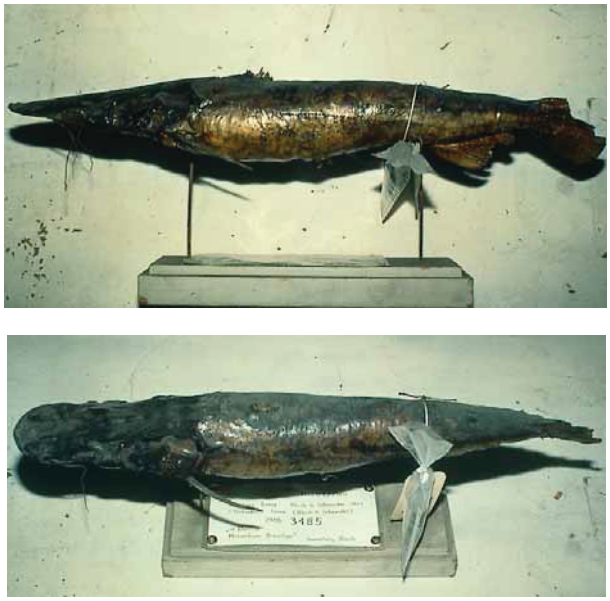

FIGURE 5. *Sorubim lima*, holotype, ZMB 3185, 430 mm SL.

Color in alcohol: Dorsal surface on freshly preserved specimens dark black or brown above, black or dark brown lateral stripe originating from area proximal to or completely through eye and reaching posterior tip of lower lobe of caudal fin on inferior margin. Area between darkened dorsum and lateral stripe intersected by a lighter area of white, gray, light tan or brown. In live specimens, lighter areas may appear golden or slate gray, often appearing iridescent. Some individuals may also display dark blotches or spots on dorsal part of body. Ventral part of body white or cream colored. Preserved specimens usually light brown or gold above, tan below.

Juveniles more heavily pigmented than adults. Posterior-most rays on dorsal, anal, and pelvic fins heavily speckled with chromatophores, speckling reduced in adults. Some individuals exhibit dark chromatophores on all fin-rays. During development, relative length and amount of pigmentation is reduced on lower caudal lobe until specimen reaches ~100 mm SL (Reid 1986). The degree of barbel pigment is highly variable. Maxillary barbels black, outer mental barbels black, clear or white. Inner mental barbels clear, white, or cream colored. Fin-rays in live specimens transparent, lemon yellow in preserved specimens.

Etymology: The name *lima*, meaning a file in Latin, refers to the ventrally exposed premaxillary tooth patch.

Distribution: *Sorubim lima* is widely distributed throughout most of South America east of the Andes mountain range (Fig. 7), including the Amazon, Orinoco, Paraná and Parnaíba river drainages. It is syntopic with *S. elongatus* in the Orinoco basin and with *S. elongatus* and *S. maniradii* in the upper Amazon drainage of Brazil, Ecuador, Peru, and Bolivia.

FIGURE 6. *Sorubim lima* (subadult). ANSP 179842, 124 mm SL (photo by M. H. Sabaj).

FIGURE 7. Collection record stations of *Sorubim lima* in South America. Some symbols represent more than one lot or locality.

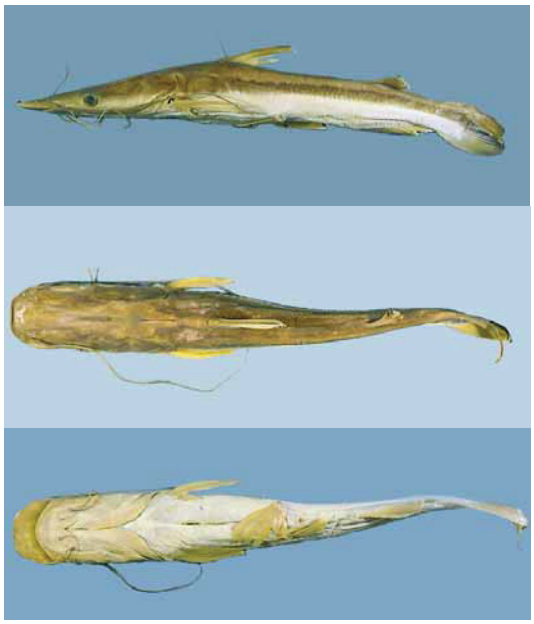

FIGURE 8. *Sorubim cuspicaudus*, holotype, FMNH 56223, 327 mm SL (photos by K.S. Cummings).

Remarks: Bleeker (1862) designated *Silurus lima* Bloch and Schneider 1801 as the type species of *Sorubim*, subsequently fixing "Maranham Brasiliae," as the type locality. Weyenbergh (1877) described *Platystoma luceri* from a single specimen taken from the waters of Sante Fe, Argentina (Río Paraná drainage). The illustration of this type is an accurate depiction of the genus, however it only serves as a representative and could not be identified further. The description also does not differ substantially from Bloch and Schneider's (1801) original description of *Silurus lima*. Eschmeyer (1998) reported the possibility that syntypes of *S. luceri* belonging to the Weyenbergh collection were originally housed in Santa Fe, Argentina, and were subsequently transferred to MSNG, Genova, Italy. I was unable to locate these specimens or find any other information confirming this. After a careful inspection of Weyenbergh's description (1877), Eigenmann and Eigenmann (1890), Gosline (1945), and Fowler (1951), *S. luceri* is treated herein as a junior subjective synonym of *S. lima*. Whitehead and Myers (1971) also judged *S. infraoculare* to be a junior subjective synonym of *S. lima*.

The name *S. lima* has long been confused with *S. latirostris* Miranda-Ribeiro 1920. Miranda-Ribeiro (1920) described *S. latirostris* and *S. trigonocephalus* from single specimens from the Brazilian Amazon and the Río Madeira drainage, respectively. His paper included the first published key to *Sorubim*. Gosline (1945) recognized three nominal species of *Sorubim*: *S. lima*, *S. trigonocephalus*, and *S. latirostris,* listing *S. infraoculare* and *S. luceri* as junior synonyms of *S. lima*, but provided no justification for this action. Fowler (1951) recognized *S. lima*, *S. latirostris*, and *S. trigonocephalus* as valid and listed *S. gerupensis* Natterer in Kner (1858) to be a synonym of *S. lima* (Nass 1988).

Littmann *et al.* (2000) concluded that *S. latirostris* was a junior synonym of *S. lima* for several reasons. Color transparencies of the holotype of *S. lima* (Fig. 5) show a stout-shaped *Sorubim* with inner mental barbels inserted anterior to the gular apex at the isthmus. In addition, measurements made on the head of the holotype of *S. lima* fall within the ranges given in the description of *S. latirostris*. Miranda-Ribeiro (1920) examined little material (only two specimens of *S. lima*), and diagnosed *S. latirostris* from only a few unreliable characters (i.e., ratios of head and body measurements). Proportional measurements made on the head are extremely variable. Furthermore, he did not provide any diagnostic characters to distinguish it from *S. lima*. There is insufficient evidence to support recognizing *S. latirostris* as distinct from *S. lima*.

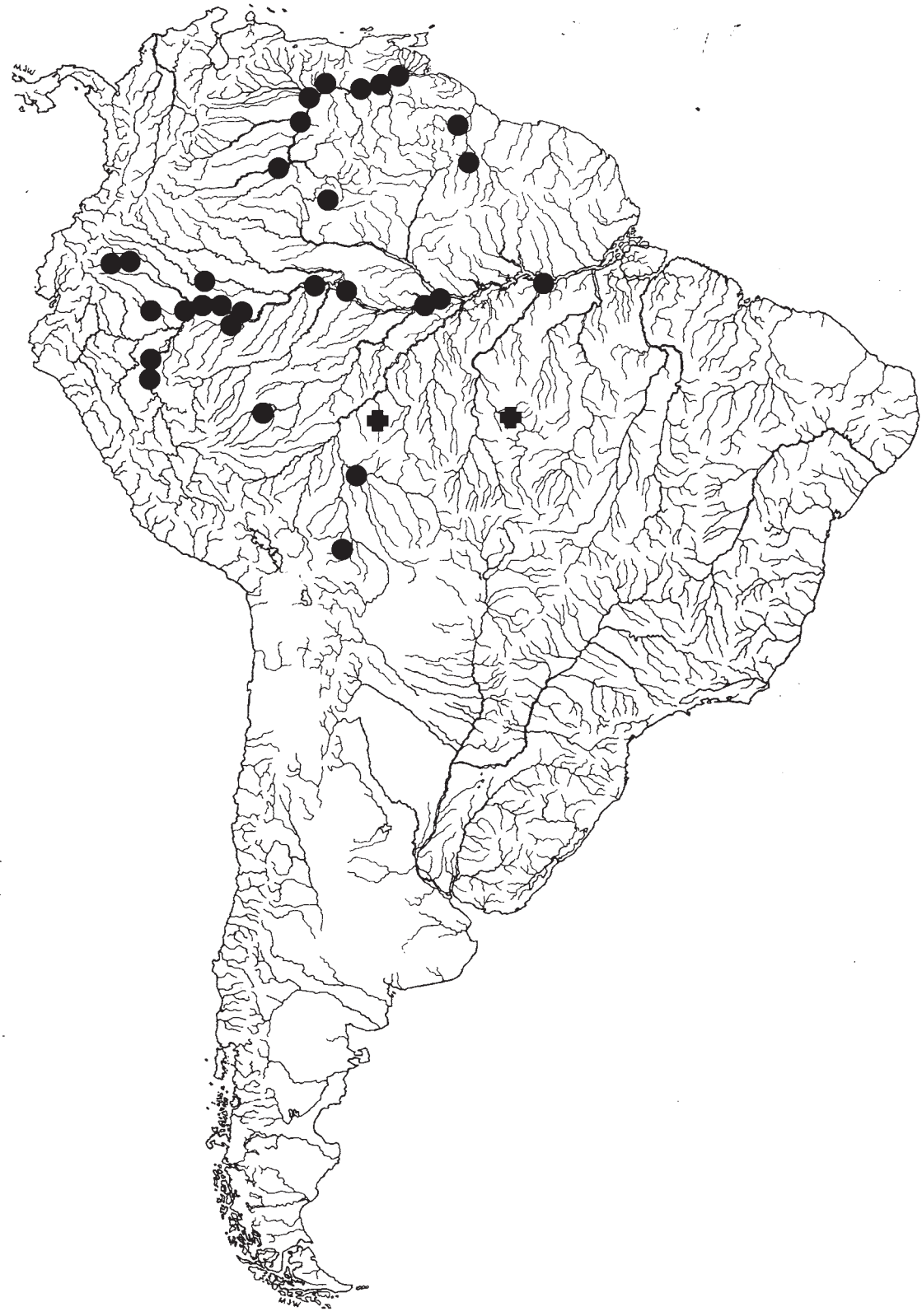

FIGURE 9. Collection record stations of *Sorubim elongatus* (circles) and *S. trigonocephalus* (crosses) in South America. Some symbols represent more than one lot or locality.

Similar species: Although superficially similar to all congeners, the head shape of *Sorubim lima* is most similar in physical appearance to *S. cuspicaudus*. It differs from *S. cuspicaudus* in the following ways (*S. cuspicaudus* in parentheses): lower lobe of caudal fin rounded (pointed and straight); body short and stout (elon-

gated), no posterior fontanelle groove on the supraoccipital bone (groove present) (Fig. 5B vs. Fig. 8B). Results of a sheared PCA showed that *S. lima* has a slightly shorter head and much stouter body (Littmann *et al.* 2000) compared to *S. cuspicaudus*. The two species are allopatric.

FIGURE 10. Collection record stations of *Sorubim cuspicaudus* (triangles) and *S. maniradii* (circles) in South America. Some symbols represent more than one lot or locality.

TABLE 2. Measurements of the body as percentages of standard length for 19 specimens of *S. lima*.

Measurement	Mean	Range	SD
Standard length	222.7	127.0–257.0	80.73
Snout length	0.196	0.173–0.232	0.018
Head length	0.371	0.346–0.453	0.024
Snout tip to dorsal origin	0.461	0.428–0.551	0.027
Snout tip to pectoral origin	0.344	0.300–0.406	0.023
Pectoral length at base	0.029	0.023–0.032	0.003
Dorsal length at base	0.066	0.059–0.079	0.005
Dorsal spine length	0.149	0.108–0.181	0.014
Pectoral origin to dorsal origin	0.166	0.155–0.206	0.011
Pectoral origin to dorsal insertion	0.214	0.204–0.261	0.013
Pectoral insertion to dorsal origin	0.153	0.135–0.187	0.012
Pectoral insertion to dorsal insertion	0.194	0.177–0.241	0.013
Posterior margin bony operculum to pelvic origin	0.221	0.206–0.250	0.010
Posterior margin bony operculum to pelvic insertion	0.247	0.228–0.281	0.011
Pelvic length at base	0.031	0.026–0.040	0.004
Pelvic origin to dorsal origin	0.179	0.159–0.222	0.014
Pelvic origin to dorsal insertion	0.133	0.107–0.168	0.015
Pelvic insertion to dorsal insertion	0.142	0.117–0.178	0.015
Pelvic insertion to adipose origin	0.206	0.146–0.260	0.022
Pelvic insertion to adipose insertion	0.268	0.196–0.338	0.025
Dorsal insertion to anal origin	0.262	0.238–0.315	0.019
Dorsal insertion to adipose origin	0.251	0.143–0.312	0.032
Pelvic insertion to anal origin	0.151	0.117–0.177	0.014
Anal origin to adipose origin	0.126	0.107–0.153	0.011
Anal origin to adipose insertion	0.150	0.137–0.189	0.012
Anal insertion to adipose origin	0.157	0.145–0.177	0.009
Anal insertion to adipose insertion	0.091	0.079–0.107	0.006
Anal length at base	0.159	0.146–0.191	0.010
Adipose length at base	0.078	0.060–0.098	0.009
Adipose insertion to anterior caudal base	0.167	0.156–0.199	0.010
Anal insertion to anterior caudal base	0.108	0.096–0.132	0.009

TABLE 3. Frequency distributions of pectoral and anal-fin ray counts in species of *Sorubim*.

	Pectoral rays							Anal Rays										
Species	7	8	9	10	N	Mean	SD	18	19	20	21	22	23	24	25	N	Mean	SD
Sorubim lima		4	146	10	160	9.038	0.294		18	63	66	13				160	20.46	0.800
S. elongatus	7	112	3		122	7.967	0.288			5	35	47	25	8	1	121	21.96	1.004
S. cuspicaudus		1	19		20	8.950	0.223	1	9	7	2	1				20	19.65	0.933
S. trigonocephalus			3	1	3	9.000	0.000		1			2				3	21.00	1.732
S. maniradii		6	16	1	23	8.667	0.485			1	2	4	8	7	4	26	23.15	1.317

TABLE 4. Frequency distribution of gill raker counts on first pharyngeal arch in species of *Sorubim*.

Species	13	14	15	16	17	18	19	20	21	22	23	31	32	33	34	35	36	37	n	mean	SD
Sorubim lima	3	27	35	72	22	1													160	15.54	1.008
S. elongatus			3	7	15	20	12	25	32	5	3								122	19.27	1.881
S. cuspicaudus			6	4	7	4													21	16.43	1.146
S. trigonocephalus	3																		3	13.00	0.000
S. maniradii												1	1	7	10	4	4	2	29	34.21	1.424

TABLE 5. Frequency distribution of vertebral counts for species of *Sorubim*.

Species	48	49	50	51	52	53	54	58	n	Mean	SD
Sorubim lima			1	6	17	11	1		36	52.14	0.590
S. elongatus			2	11	15	4	1		33	51.72	0.835
S. cuspicaudus			2	5	6	2	1		16	51.69	0.447
S. trigonocephalus								1	1	58.00	0.000
S. maniradii	2	12	3						17	49.06	1.070

***Sorubim trigonocephalus* Miranda-Ribeiro 1920**
Arrowhead Shovelnose Fig. 3

Sorubim trigonocephalus Miranda-Ribeiro, 1920: 12 (original description), pls. 10-11. Holotype: MNRJ 882 (317 mm SL). Brazil, Mato Grosso, Porto Velho, rio Madeira; Geraldo Kuhlmann, 1914.

Diagnosis: Distinguished from all other species of *Sorubim* by the following combination of characters: snout very elongated, triangular or arrowhead shaped in dorsal and ventral view; exposed portion of premaxillary tooth patch as long as wide (Fig. 3C).

Description: Mensural and meristic data are given in Tables 3–7. Largest individual 507 mm SL (USNM 194403). Dorsal-fin rays II,6 (n=3); anal-fin rays 19–22 (n=3); pectoral-fin rays I,9 (n=3); pelvic-fin rays 6, 1 unbranched and 5 branched (n=3); principal caudal rays variable, as with congenerics; gill rakers on first pharyngeal arch 13 (n=3), 3 on epibranchial. Body shape and form shown in Fig. 3. Head very elongate; distance between anterior and posterior nostrils longer than other congeners. Head length variable, 3.55–4.25 times gape width (n=3, range 3.55–4.25, mean 3.90); interorbital distance 3 times or less than eye diameter (n=3, range 2.37–3.07, mean 2.79); anal fin length 2 times or greater than adipose fin length (n=3, range 2.12–2.64, mean 2.36); premaxillary tooth patch width equal to its length (n=3, range 1.03–1.09, mean 1.06). Eyes lateral, barely visible from ventral view, if at all. Inner mental barbels just anterior to or even with gular apex (Fig. 3C). Maxillary barbels extend to pelvic fins.

Color in alcohol: Pigmentation and color as in other species of *Sorubim*.

Etymology: The name *trigonocephalus*, comes from Latin, in reference to the triangular ("trigono-") shape of the head ("-cephalus") in dorsal or ventral view.

Distribution: Specimens of *S. trigonocephalus* are extremely rare in natural history collections. The three specimens examined are from two Amazon tributaries, rios Madeira and Tapajos, Brazil (Fig. 9).

Remarks: In order to better assess the taxonomic status of *S. trigonocephalus*, it will be necessary to examine more material when and if it becomes available.

Similar species: *Sorubim trigonocephalus* most closely resembles *S. lima* but only in body shape, having a similarly deep caudal peduncle and nine branched pectoral-fin rays. The length of the exposed premaxillary tooth patch in this species is extraordinary, facilitating quick identification in the field or laboratory.

TABLE 6. Measurements of the head as percentages of standard length for three specimens of *S. trigonocephalus*.

Measurement	Mean	Range	SD
Standard length	387.7	317.00–507.0	103.9
Left anterior nostril to right anterior nostril	0.070	0.069–0.073	0.003
Left posterior nostril to right posterior nostril	0.060	0.057–0.063	0.003
Left anterior nostril to right posterior nostril	0.073	0.071–0.074	0.001
Left anterior nostril to posterior right eye	0.184	0.174–0.200	0.014
Left anterior nostril to left posterior nostril	0.032	0.030–0.033	0.001
Right anterior nostril to posterior left eye	0.181	0.173–0.198	0.015
Left posterior nostril to posterior left eye	0.123	0.119–0.129	0.005
Posterior left eye to posterior right eye	0.111	0.106–0.117	0.005
Posterior left eye to right pectoral origin	0.166	0.157–0.172	0.008
Posterior left eye to left pectoral origin	0.124	0.119–0.130	0.005
Left pectoral origin to right pectoral origin	0.115	0.111–0.119	0.004

***Sorubim cuspicaudus* Littmann, Burr and Nass 2000**

Trans-Andean Shovelnose Catfish (English); Antioqueno, Bagre blanco, Blanco pobre, Blanquillo, Cucharo, Gallego, hocico de paleton (Spanish)

Fig. 8 (Holotype)

Holotype: FMNH 56223 (327 mm SL). Colombia, Depto. de Tolima, Río Magdalena drainage, at Puerto Soplaviento, 11 Jan 1912, C. H. Eigenmann.

Diagnosis: Distinguished from all congeners by the following characters: caudal fin deeply forked; outer, unbranched principal rays of upper and lower lobes longest in each lobe and about equal in length (Littmann *et al.* 2000, fig. 2); posterior fontanelle elongate, forming conspicuous groove on supraoccipital bone, skin pigmented black in groove; other congeners without elongate posterior fontanelle, supraoccipital groove, or black pigment; unique in having combination of elongate body and broad-shaped head; other *Sorubim* species have either elongate body and head, or stout body with broad head.

Etymology: the specific epithet cuspi- (from cuspis), Latin for pointed, and –caudus, Latin for tail, refers to the diagnostic pointed caudal-fin lobes. The first part of the English common name "Trans-Andean" describes the general distribution of the fish; the remainder of the name (shovelnose catfish) is familiar to enthusiasts of the aquarium hobby, and differs from that recommended for *S. lima* (i.e., Duckbill catfish) by Robins *et al.* (1991).

Distribution: *Sorubim cuspicaudus* occurs west of the Andean Cordillera Oriental, and is endemic to three major drainage basins in northwestern South America: Lago Maracaibo, Ríos Magdalena and Sinu (Fig. 10). Miles (1947) reported that *Sorubim* (referred to as *S. lima*) was not found in the upper reaches of the Río Cauca in northern Colombia. The cis/trans-Andean distribution pattern exhibited by *Sorubim* is repeated by some other lowland fish groups that have been critically examined in recent years (see references in Vari (1988) and Harold & Vari (1994).

Remarks: *Sorubim infraoculare* Spix and Agassiz 1829 was listed as a junior subjective synonym of *S. lima* above. Eigenmann and Eigenmann (1890) also listed *S. infraoculare* as such in their revision of the South American Nematognathi. Although justification for their conclusion was not included, this well-known revision included one of the first records of *Sorubim* reported from the Río Magdalena drainage, Colombia.

TABLE 7. Measurements of the body expressed as percentages of standard length for three specimens of *S. trigonocephalus*.

Measurement	Mean	Range	SD
Standard length	387.7	317.0–507.0	103.9
Snout length	0.197	0.193–0.201	0.002
Head length	0.355	0.352–0.362	0.006
Snout tip to dorsal origin	0.461	0.457–0.468	0.006
Snout tip to pectoral origin	0.336	0.330–0.341	0.006
Pectoral length at base	0.029	0.026–0.032	0.003
Dorsal length at base	0.062	0.058–0.065	0.004
Dorsal spine length	0.167	0.158–0.181	0.013
Pectoral origin to dorsal origin	0.175	0.167–0.187	0.010
Pectoral origin to dorsal insertion	0.221	0.217–0.229	0.007
Pectoral insertion to dorsal origin	0.162	0.150–0.177	0.014
Pectoral insertion to dorsal insertion	0.198	0.185–0.213	0.014
Posterior margin bony operculum to pelvic origin	0.229	0.221–0.236	0.008
Posterior margin bony operculum to pelvic insertion	0.254	0.243–0.260	0.010
Pelvic length at base	0.030	0.027–0.033	0.003
Pelvic origin to dorsal origin	0.176	0.163–0.187	0.013
Pelvic origin to dorsal insertion	0.137	0.126–0.145	0.010
Pelvic insertion to dorsal insertion	0.151	0.140–0.158	0.009
Pelvic insertion to adipose origin	0.219	0.214–0.223	0.004
Pelvic insertion to adipose insertion	0.276	0.273–0.280	0.004
Dorsal insertion to anal origin	0.269	0.259–0.276	0.009
Dorsal insertion to adipose origin	0.263	0.252–0.269	0.009
Pelvic insertion to anal origin	0.156	0.142–0.170	0.014
Anal origin to adipose origin	0.145	0.132–0.152	0.012
Anal origin to adipose insertion	0.163	0.154–0.169	0.008
Anal insertion to adipose origin	0.163	0.154–0.168	0.008
Anal insertion to adipose insertion	0.095	0.089–0.100	0.006
Anal length at base	0.165	0.163–0.167	0.002
Adipose length at base	0.083	0.079–0.086	0.004
Adipose insertion to anterior of caudal base	0.156	0.143–0.167	0.012
Anal insertion to anterior of caudal base	0.107	0.090–0.116	0.014

***Sorubim elongatus* Littmann, Burr, Schmidt and Isern 2001**
Slender Shovelnose Catfish (English)
paleta delgada (Spanish)
Fig. 11 (Holotype), Fig. 12

Holotype: SIUC 30303 (123 mm SL). Peru: Departamento Loreto, Maynas Province, Ullpa Caño, 50 m upstream of confluence with Moena Caño, Río Itaya drainage, Río Amazonas basin (approx. 3°46’20”S 73°14’17”W); 14 Aug 1997, M. W. Littmann & R. E. Weitzell, Jr.

Diagnosis: Species of *Sorubim* distinguished from all congeners by the following combination of characters: modally 8 branched pectoral-fin rays; 22 anal-fin rays; 19 gill rakers on first pharyngeal arch; small patches of vomerine teeth not joined (Littmann *et al.* 2001b, fig. 3b) in adults; elongated head and body cylindrical in cross-section; depressed pelvic fins reaching approximately halfway from anus to anal fin origin; mental barbels inserted even with or posterior to gular apex (Littmann *et al.* 2001b, fig. 4b,); eye diameter of adults going 2.2–3.3 times into interorbital width.

Etymology: The name *elongatus*, an adjective, is Latin, meaning prolonged and refers to the extremely elongated shape of the head and body. Likewise, the first part of the English common name describes the general body shape of the fish (slender); the remainder of the name (shovelnose catfish) is familiar to enthusiasts of the aquarium hobby, and differs from that recommended for *S. lima* (i.e., Duckbill catfish) by Robins *et al.* (1991).

Distribution: Most records of *Sorubim elongatus* are from the mainstems and lower reaches of the Amazon, Essequibo, and Orinoco River basins (Fig. 9). *Sorubim elongatus* is the only species of *Sorubim* known from the Essequibo River, as represented by twelve specimens in the material examined. One disjunct record in the Río Mamore system of Bolivia is based on four specimens captured by J. D. Haseman in 1909 and three specimens taken in the same system in 1982 by L. Lauzanne and G. Loubens, deposited at FMNH and MNHN, respectively.

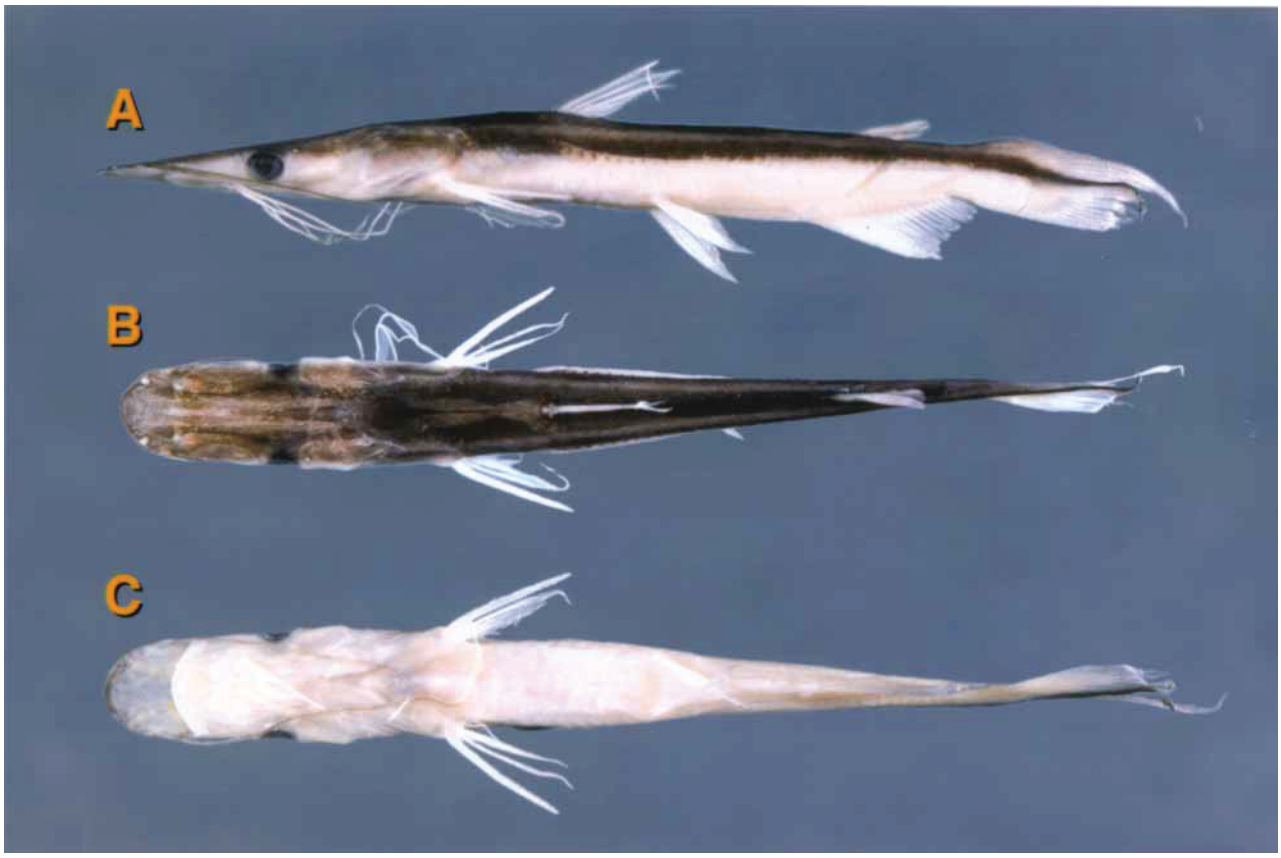

FIGURE 11. *Sorubim elongatus*, holotype, SIUC 30303, 123 mm SL (photo by K.S. Cummings).

***Sorubim maniradii* Littmann, Burr, and Buitrago Suárez 2001**
Fig. 13 (Holotype), Fig. 14

Holotype. FMNH 108814 (252 mm SL). Ecuador, Napo State, Río Yasuni, Río Napo drainage, 0° 59'06"S, 75° 25'36" W. 24 October 1981, D. Stewart *et al.*

FIGURE 12. *Sorubim elongatus*, live, ANSP 180120, 176 mm SL (photo by M. H. Sabaj).

Diagnosis: Distinguished from all other species of *Sorubim* by an extremely high gill raker count (31–37, Fig. 1B) and a diffuse lateral-line stripe (Fig. 13).

Etymology: The name *maniradii*; "mani," Latin for many or multiple and "radii," Latin for rakers, in reference to the high number of gill rakers on first pharyngeal arch found in members of this species relative to congeners.

Distribution: Known primarily from tributaries along the upper Amazon basin (Ríos Napo, Marañon, Ucayali, Mamore, Madeira, Javari), with at least one specimen collected in the mainstem Amazon near Manaus (Fig. 10). This species probably occurs in Colombian tributaries of the Amazon.

Discussion

Burgess (1989: 249) recognized three species of *Sorubim*: *S. lima*, *S. latirostris*, and *S. trigonocephalus*, and reported *S. lima* as "occasionally seen" in the aquarium hobby. Herein, and in earlier publications describing species (Littmann *et al.* 2000; 2001a; 2001b), I conclude that five species of *Sorubim* can be diagnosed from morphological characters, and that at least three of the species, *S. lima*, *S. elongatus* and *S. maniradii* are syntopic. *Sorubim lima* and *S. elongatus* are commonly seen in the aquarium trade. These taxonomic conclusions have significant implications for both the ornamental and commercial fishing industries in South America, especially because catch data have not recognized multiple species and consequently have confused the potential differential impact of ornamental, commercial, and subsistence fishing.

Commercial fishing within South America is severely limited in that several populations are under-fished (see Littmann *et al.* 2000) and potential harvests are seemingly unlimited. In addition, there is a need to identify harvested fishes (such as *Sorubim*), which are not as popular as some of the other food fishes more frequently reported on throughout the Amazon region (*Colossoma*, *Brachyplatystoma*, and *Arapaima*). For example, *Sorubim cuspicaudus* occurred in over 40% of the collections at 29 sampling sites in the Magdalena River floodplain system (Kapetsky *et al.* 1977). Other authors refer to *S. lima* as a highly significant component of the fishery in the La Plata system (Quiros & Cuch 1989) as well. Overfishing of popular fish species (e.g., *Pseudoplatystoma fasciatum*) continues at seemingly alarming rates (see Kapetsky *et al.*1977, Littmann

et al. 2000). Perhaps in the future, regulations put on fisherman and their harvests may cause a trickle-down effect, forcing them to target less frequently captured species, such as species of *Sorubim* and other underutilized, fisheries taxa. For this reason, life history and population ecology studies of *Sorubim* are urgently needed.

FIGURE 13. *Sorubim maniradii*, holotype, FMNH 108814, 252 mm SL.

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FIGURE 14. *Sorubim maniradii*, live, ANSP 182288 (photo by M. H. Sabaj).

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Appendix A. The following specimens were examined in this study. Asterisk denotes specimen(s) used in morphometric analysis.

Sorubim lima: Paraná drainage: Argentina: BMNH 1935.9.9:11-12 (2:43-84 mm SL), Santa Fe, Arnold; BMNH 1908.12.5.12 (1:81 mm SL), La Plata, Arnold; CAS 131577 (1 of 2:98 mm SL), Buenos Aires, San Pedro Río de la Plata, 220 km N of Buenos Aires, June 1934, A. W. Herre; USNM 101289 (1:111 mm SL), Buenos Aires, San Pedro, Río de La Plata, 220 km N of Buenos Aires, June 1934, A. W. Herre. Bolivia: FMNH 58035 (1:385 mm SL), Est. Santa Cruz, Puerto Suarez, 19º S, 58º W, 6 May 1909, J. D. Haseman. Brazil: USNM 326356 (1:165 mm SL*), Est. Mato Grosso, Em Cacerese Arredores, Caceres, 11 August 1991, R. Reis *et al.* Paraguay: MSNG 39264 (1:181 mm SL), Río Parana, Espedrado, 1890, A. Capurro; UMMZ 206141 (1:405 mm SL*), Depto Itapua, Río Paraná, along N shore on property of Florida Peach Co. ca 11.9 km E of Puerto San Rafael, 23 June 1979, R. M. Bailey, *et al.*; FMNH 57813 (4:123-130 mm SL), Est. Rio Grande do Sul, Río Uraguai, Uruguayana; BMNH 1895.5.17.16 (1:505 mm SL), Dr. E Ternetz; BMNH 1934.8.20.112 (1:176 mm SL), Depto Central, Asuncíon, Schouten; MSNG 14539 (2:138-141 mm SL), Depto Central, Asuncíon, 1919, A. Barbero; NRM 15867 (2:355-420 mm SL*), Depto Central, Asuncíon, 25º16'S, 57º 39'W, 6 February 1992, S. O. Kullander and D. Mandelburger; NRM 16148 (1:323 mm SL), Depto Central, fish market in Asuncíon and San Lorenzo, 4 February 1992, S. O. Kullander, *et al.*;Uruguay: MCZ 23704 (1:267 mm SL), Río de La Plata or Río Paraná near Rosario, across La Plata from Buenos Aires, August 1859, Capt. S. G. Brooks; USNM 181598 (1:197 mm SL) Depto Central, Asuncíon Bay, Asuncíon, 15 January 1957, C. J. D. Brown; UMMZ 207423 (1:375 mm SL*), Depto Central, Río Salado, W shore of Lago Ypacarai at lakeside park in Aregua, 23 August 1979, J. N. Taylor, et al; USNM 052609 (1:174 mm SL), probably Río Paraguay, 25 May, 1905, T. J. Page; FMNH 57811 (1:45 mm SL), Depto Presidente Villa Hayes, 11 April 1909, J. D. Haseman. Atlantic Ocean drainage: Brazil: ANSP 87881 (2:230-277 mm SL), Est. Piaui, rio Parnahyba, at Teresina, 1936, Dr. Rodolpho von Ihering; MCZ 7248 (4:181-278 mm SL*), Est. Piaui, rio Poti, at Teresina, 5º 5'S, 42º 49'W, December 1865, O. St John. Tocantins: Brazil: USNM 191592 (1:79 mm SL), Est. Goiás, near Aruana, 14º 58'S, 51º 24'W, 1960, H. R. Axelrod. rio Amazonas: Para State: BMNH 1926.10.27.287 (1:104 mm SL), Monte Alegre, C. Ternetz ; CAS 76745 (1:236 mm SL), Santarem market, September 1924, C. Ternetz; FMNH 97581 (2:106-125 mm SL), Santarem, 9 December 1909, J. D. Haseman; MCZ 7249 (2:162-178 mm SL), Obidos, 1º 52'S, 55º 30'W, November 1865, Col. Bentos. Rio Amazonas: Brazil: Amazonas State: NRM 15437 (1:147 mm SL), November 1928, K. Lako; MNRJ 681 (1:172 mm SL), Amazonas, (holotype of *S. latirostris*), 1908, A. Mirando Ribeiro; MCZ 7246 (3:145-220 mm SL), Lago Grande de Manacapuru, 3º 06'S, 61º 30'W, 27 November 1865, W. James; MNHN 1899 0196 (1:171 mm SL), near Manaus, 1899, Anthony; MNHN A.1954 (2 of 4:100-186 mm SL), Caldeirão, 3º 11'S, 60º 17'W, 1879, Jobert. Rio Javari: Brazil: NRM 16057 (1:234 mm SL), Sand playa opposite civil village of Colonia Angamos, 5 August 1984, S. O. Kullander, *et al.* Rio Negro: Brazil: USNM 306908 (2:33-38 mm SL), Lago Terra Perta Janauari, 27 April 1978, P. Bayley. Rio Solimões: Brazil: MCZ 7252 (2:247-253 mm SL*), Sao Paulo de Olivenca, 3º 34'S, 68º 55'W, 7 September 1865, W. James, *et al.*; MCZ 7242 (3:220-345 mm SL), Fonte Boa, 2º 33'S, 65º 59'W, 15 September 1865, L. Agassiz; MCZ 7245 (4 of 5:199-312 mm SL*), Tabatinga, (Sapurara), 4º 14'S, 69º 44'W, September 1965, D. Bourget; USNM 306917 (1:29 mm SL), Parana de Janauaca Entrada do Lago do Castanho, 10 May 1978, P. Bayley; USNM 306933 (1:50 mm SL), Lago Murumuru, Perto do Coral de Inpa, Janauaca, 8 June 1977, P. Bayley. Río Amazonas: Colombia: FMNH 85943 (1:133 mm SL), Depto Amazonas, 2-3 miles upstream from Leticia, 13 November 1973, Navarro, Thomerson, *et al.*; FMNH 85944 (7:93-118 mm SL), Dept. Amazonas, 1 mile upstream from Leticia, 11 November 1973, Thomerson, *et al.*; ANSP 120652 (1:297 mm SL), Depto Amazonas, Leticia market, 8 July 1968, Hugghins; USNM 079235 (1:145 mm SL), Depto Guaviare, Calamar, (near Río Utilla, trib of Río Vaupes), date cat. 30 August 1917, C. H. Eigenmann. Peru: ANSP 113926 (1:92 mm SL), near Iquitos, 12 September, 1954, L. R. Rivas; ANSP 139053 (1: 227 mm SL), near Iquitos (within one mile of central station), October 1955, Catherwood expedition; ANSP 139054 (8 of 9:136-166 mm SL), Isla Iquitos & Isla Lapuna, near Isla Lapuna shore, 9 October 1955, R. Patrick and C. C. G. Chaplin; INHS 36959 (2:88-89 mm SL), Depto Loreto, N edge of Iquitos, W bank near mud and barges, 29 July 1995, M. H. Sabaj and J. W. Armbruster; INHS 39291 (1 of 33:145 mm SL), Depto Loreto, Mayurana Cocha, Río Orosa drainage, 3º 35'25"S, 72º 13'05"W, 13 August 1996, J. W. Armbruster and M. H. Sabaj, *et al.*; INHS 39868 (1:153 mm SL), Depto Loreto, Near Pueblo Gallito, 3º 49'15"S, 73º 09'43"W, 21 August 1996, J. W. Armbruster and M. H. Sabaj, *et al.*; INHS 43669 (8:114-136 mm SL), Depto Loreto, Río Itaya, Ullpa Caño and Moena Caño near Belem, Iquitos, 3º 46'20"S, 73º 14'17"W, M.H. Sabaj and J. W. Armbruster; SIUC 26938 (3:149-181 mm SL*), Depto Loreto, Pueblo Gallito, up river from Iquitos, 3º 48'S, 73º 09'W, 11 July 1995, B. M. Burr, *et al.*; SIUC 29416 (6:108-161 mm SL), Depto Loreto, Maynas, Ushpa Caño, 100 yds. upsrtm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; SIUC 29805 (2:146-157 mm SL), Depto Loreto,Iquitos, mouth of caño 400 m from main boulevard (sewage canal exiting city), 9 August 1997, M. W. Littmann; SIUC 30055 (1:136 mm SL*), Loreto Depto, Río Itaya and Quebrada Mazana, 11 km (39º bearing) from Iquitos center, 3º 49'47.6"S, 73º 18'02.9"W, 28 July 1997, R. E. Weitzell, *et al.*; SIUC 30158 (1:153 mm SL), Depto Loreto, across

from Pueblo Gallito, 11.5 km (132º bearing) from Iquitos center, 3º 48'49.9"S, 73º 09'41.5"W, 5 August 1997, M. W. Littmann, *et al.*; CAS 76748 (1 of 3:143 mm SL), Iquitos, July 1922?, P. S. Morris; CAS 76752 (1:128 mm SL), Río Pacaya, at Bretana, 2-9 September 1920, W. R. Allen; CAS 133409 (1:97 mm SL), Río Ampiyacu, Pebas, 12 August 1937, W. G. Scherer; NRM 16055 (1:104 mm SL), Depto Loreto, Sacarita del Tuyé, opposite Pebas, floating meadow, Río Ampiyacu drainage, 12 August 1981, S. O. Kullander, *et al.*; UMMZ 56132 (1:141 mm SL), Pebas, Beal and Steere; USNM 284782 (1:123 mm SL), Loreto Depto, Río Itaya, main channel and lower portions of caños, 5 to 20 km upstream of Belen (Iquitos), 03º 51'S, 73º 12'W, 20 August 1986, R. P. Vari, et al; MNHN 5203 (1:248 mm SL),1868, Baraquin. Río Napo: Equador: FMNH 97584 (1:221 mm SL*), Napo Depto. Anangu, 0º 31'36"S, 76º 23'12"W, 10 October 1981, D. Stewart, *et al.*; FMNH 97586 (1:248 mm SL*), Río Coca, 0º 06'00"S, 77º 12'30"W, 28 October 1981, D. Stewart, *et al.*; FMNH 103391 (3:230-284 mm SL*), Río Tiputini, upstream from bridge, 00º 44'3"S, 76º 53'00"W, 3 November 1981, D. Stewart, *et al.* Peru: INHS 36625 (7:90-165 mm SL*), Depto Loreto, mouth of Río Mazan, 20 July 1995, L. M. Page, *et al.*; INHS 43623 (9:90-122 mm SL), Depto Loreto, Río Napo and Quebrada in Mazan, 33.3 km NE Iquitos, bearing 34º, 3º 29'32.5"S, 73º 5'11.9"W, 2 August 1997, M. H. Sabaj and J. W. Armbruster; INHS 43623 (3:75-94 mm SL), Depto Loreto, Río Napo and Quebrada in Mazan, 33.3 km NE Iquitos, bearing 34º, 3º 29'32.5"S, 73º 5'11.9"W, 3 August 1997, M. H. Sabaj and J. W. Armbruster; SIUC 27964 (1:110 mm SL), Depto Loreto, Maynas, Mazan, 3º 47.5'S, 73º 14.9'W, 19 July 1995, B. M. Burr, *et al.*; SIUC 28106 (16:74-146 mm SL), confluence with Río Mazan, ca. 2-3 km N (town of) Mazan, 3º 28.97'S, 73º 5.32'W, 20 July 1995, B. M. Burr, *et al.*; SIUC 29312 (17:83-117 mm SL), Depto Loreto, Mazan, 33.3 km (34º bearing) from center of Iquitos, 3º 29'32.5"S, 73º 05'11.9"W, 1 August 1997, M. W. Littmann, *et al.*; SIUC 29395 (3:82-100 mm SL), Depto Loreto, confluence of Río Napo and Quebrada at Mazan, 33.3 km (34º bearing) from center of Iquitos, 3º 29'32.5"S, 73º 05'11.9"W, 3 August 1997, M. W. Littmann, *et al.* Río Ucayali: Peru: ANSP 162321 (2:182-240 mm SL), Contamana, July 1937, W. C. Morrow; BMNH 1913.7.30.23 (1:175 mm SL), Rosenberg; CAS 76753 (2:118-125 mm SL), Lago Cashiboya, cutoff lake of Río Ucayali, near Contamana, 03-04 August 1920, W. R. Allen; UMMZ 72638 (1:124 mm SL), Cashiboya, 1920, W. R. Allen; SIUC 26894 (2:218-267 mm SL), Depto Loreto, Prov Maynas, Mercado Nauta, captured 20 km E of Nauta, old channel of Río Ucayali, near confluence with new channel, 13 July 1994, B. M. Burr *et al.*; NRM 16129 (2:120-123 mm SL), Depto Ucayali, Yarina cocha N shore, La Cabanaí boat landing, 15 August 1981, S. O. Kullander *et al.*; USNM 284786 (1:214 mm SL*), Depto Ucayali, Provincia Coronel Portillo, main channel and side pools, 10 km upstream from Pacullpa, 8º 31' S, 74º 22' W, 25 August 1986, R. P. Vari, *et al.* Río Huallaga: Peru: CAS 78409 (1:421 mm SL*), Yurimaguas, November 1920, W. R. Allen; CAS 78410 (1:423 mm SL*), Yurimaguas, November 1920, W. R. Allen. Río Madre de Dios: Peru: ANSP 142604 (1:281 mm SL*), Río Manu, beach at Gomero, 10 August 1977, R. Horwitz; ANSP 142544 (1:366 mm SL*), Río Manu, Gomero, 12º 11'S, 70º 58'W, 10 August 1977, R. Horwitz; ANSP 142546 (1:339 mm SL*); Río Manu, Gomero, 12º 11'S, 70º 58'W; 10 August 1977, R. Horwitz; FMNH 70155 (2:156-197 mm SL*), Río Colorado, at mouth, 2 October 1958, E. R. Blake; FMNH 84151 (1:282 mm SL*), Río San Alejandro. Río Madeira drainage: Bolivia: CAS 13186 (1:279 mm SL*), Depto Beni, Río Beni, Rurrenabaque, elev. 1500', October 1921, N. E. Pearson; UMMZ 66345 (1:329 mm SL*), Lago Rogoagua, October 1921, N. E. Pearson (Mulford Expedition); UMMZ 205086 (3:151-197 mm SL*), Depto Beni, Río Mamore at Cachuela, just below Guayaramerin, 10º 48'24"S, 65º 24'36"W, 21 October 1964, R. M. Bailey; USNM 305515 (1:208 mm SL), Depto Beni, Ballivia Prov., Río Matos below Road x-ing, 48 km E San Borja, 14º 55'S, 66º 17'W, 28 August 1987, W. C. Starnes, *et al.*; MNHN 1988 0900 (1 of 3:116 mm SL*), Depto Cochabamba, Río Mamore, Río Chapare, 1982, L. Lauzanne and G. Loubens. Rio Jurua: Brazil: USNM 094630 (1:219 mm SL*), Río Embira, near mouth, 7º 30'S, 67º 15' W, 1934, B. A. Krukoff. Rio Purus: Brazil: USNM 094650 (1:156 mm SL), rio Macauhan, near mouth, 09º 20'S, 69º 00'W, 1934, B. A. Krukoff; USNM 320429 (1:129 mm SL), 1963, H. R. Axelrod. Orinoco River drainage: Colombia: CAS 162441 (1 of 2:274 mm SL*), Depto Meta, Río Guaviare, near San Fernando de Atabapo, Venezuela, 5 July 1925, C. Ternetz. Venezuela: UMMZ 229496 (1:300+ mm SL*), Est. Amazonas, market at Puerto Ayacucho, 04 January 1994, DiBenedetto and Albert; INHS 33959 (1: 245 mm SL*), Est. Anzoatequi, Laguna el Venado, 8º 10'30"N, 63º 37'35"W, 28 April 1988, M. A. Rodriguez; INHS 35756 (1:193 mm SL), Est. Anzoatequi, Laguna Tineo, 8º 11'25"N, 63º 28'20"W, 8 March 1988, M. A. Rodriguez; INHS 35868 (2:212-228 mm SL*), Est. Anzoatequi, Laguna Aguilera, 08º 11'30"N, 63º 26'15"W, 28 May 1987, M. A. Rodriguez; ANSP 166560 (2:198-218 mm SL*), Est. Anzoatequi, Lago Tineo, Soledad, 08º 11'25"N, 63º 28'20"W, 26 January 1988, M. Rodriguez; MNHN 1898 0028 (1:201 mm SL), Río Apure, 1898, Geay; FNMH 105291 (1:172 mm SL*), Est. Barinas, Río Anaro, Río Suripa drainage, 10 January 1991, A. Mochado, *et al.*; FMNH 105293 (1:127 mm SL*), Est. Barinas, Río Suripa, 13 January 1991, A.Mochado, *et al.*; ANSP 160371 (1:115 mm SL), Est. Bolivar, confluence of Río Orinoco and Río Caura (las piedras), 07º 38'36"N, 64º 50'00"W, 23 November1985, W. Saul, *et al.*; ANSP 166494 (7:139-191 mm SL), Est. Bolivar, Laguna Castillero, near Caicara, 07º 38'20"N, 66º 09'00"W, 11 January 1987, M. Rodriguez and S. Richardson; ANSP 166495 (2:225-241 mm SL), Est. Bolivar, Lago Merecure, Ciudad Bolivar, 08º 12'55"N, 63º 17'25"W, 17 January 1987, M. Rodriguez and S. Richardson; INHS 35411 (2:169-178 mm SL), Est. Guarico, Laguna Largo Ii, 7º 38'55"N, 66º 13'40"W, 19 May 1987, M. A. Rodriguez and S. Richardson; USNM 233832 (6:144-373 mm SL*), Est. Monagas, Caño Guarguapo, 8º 29'24"N, 62º 14'00" W, 11 November 1979, J. Baskin, *et*

al.; USNM 233923 (1:384 mm SL*), Est. Monagas, secondary caño of Cano Guarguapo, 8º39'24"N, 62º 14'00"W, 11 November 1979, J. Baskin, *et al.*; INHS 31990 (1:130 mm SL*), Est. Portuguesa, Río Guanare, Río Apure drainage, near Guanarito, 3 January 1994, K. S. Cummings, *et al.*; TNHC 11837 (1:260 mm SL), Est. Portuguesa, Río Tucupido near bridge, between Guanare and Barinas, Río Apure drainage, 2 November 1984, K. Winemiller; TNHC 17261 (1:304 mm SL), Est. Portuguesa, Río Tucupido near bridge, Río Apure drainage, 2 November 1984, K. Winemiller.

Sorubim trigonocephalus: Brazil: MNRJ 882 (1:317 mm SL*), holotype, Mato Grosso, Porto Velho, rio Madiera, A. Mirando-Ribeiro; MNRJ 852 (1:339 mm SL*), Mato Grosso, Paranatinga, Mirando-Ribeiro, 1909, A. Mirando-Ribeiro; USNM 194403 (1:507 mm SL*), Mato Grosso, rio Tapajos, 1962, Schultz.

Sorubim elongatus: Rio Amazonas: Brazil: MCZ 78094 (2:84-85 mm SL), Lago Jacaretinga, near Menaus, 22 August 1979, T. J. Zaret *et al.*; MCZ 78095 (1:31 mm SL), Lago Jacaretinga, near Menaus, 7 June 1979, T. J. Zaret *et al.*; MCZ 78096 (1:31 mm SL), Lago Jacaretinga, near Menaus, 21 June 1979, T. J. Zaret *et al.*; MNHN 2000-5781 (1:138 mm SL), Caldeirão, 1879, Jobert; INHS 72714 (1:134 mm SL*), Lago Marchantaria, ca. 12 km S of Manaus, 11 October1977, P. Bayley; INHS 73013 (1:136 mm SL*), Lago Janauaca, 42 km SW Manaus, 14 September 1977, P. Bayley; USNM 179651 (1:123 mm SL), rio Uruba, H. R. Axelrod; MCZ 9831 (2:82-118 mm SL), Tefe, 3º 24'S, 64º 45'W, October 1865, L. Agassiz *et al.*; MCZ 22844 (1:247 mm SL*), Tefe, 3º 24'S, 64º 45'W, October 1865, L. Agassiz *et al.*; MNHN 1994 0173 (1:206 mm SL*), 1993, Benchimol and Jegu. Rio Negro: BMNH 1909.8.24.4 (1:180 mm SL), E. Stanley Sutton Esq.; FMNH 57814 (2:143-153 mm SL*), Santarem, 9 December 1909, J. D. Haseman; CAS 65897 (2:155-190 mm SL*), 4 July 1958, J. D. Conners. Colombia: MCZ 51695 (3:69-105 mm SL*), isolated pool at Isla Santa Sofia, about 30km upstream from Leticia, 4º 00'S, 70º 00'W, July 1972, R. A. Mittermier. Peru: ANSP 177851 (3:109-129 mm SL), paratypes, Depto Loreto, Mayaruna Cocha, Río Orosa drainage, (approx. 3º 35'25"S 72º 13'05"W), 13 Aug 1996, J. W. Armbruster *et al.*: ANSP 21527 (3:107-177 mm SL), Peruvian Amazon, 1877, Prof. James Orton; AUM 29743 (3:90-157 mm SL), paratypes, Depto Loreto, Mayaruna Cocha, Río Orosa drainage, (approx. 3º 35'25"S 72º 13'05"W), 13 Aug 1996, J. W. Armbruster *et al.*; BMNH 1869.5.21.6 (1:156 mm SL), upper Amazon, W. E. Bartlett; CAS 168716 (1:48.2 mm SL), Caño del Chancho, near Pebas, 28 August 1937, W. G. Scherer; CAS 202084 (5:99-113 mm SL), paratopotypes, Depto Loreto, Maynas, Ullpa Caño, 100 yds. upstrm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; FMNH 107493 (5:101-118 mm SL), paratopotypes, Depto Loreto, Maynas, Ullpa Caño, 100 yds. upstrm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; INHS 36737 (2:138-139 mm SL), Depto Loreto, Río Nanay, Santa Clara, W of Iquitos, 22 July 1995, L. M. Page *et al.*; INHS 39291 (5 of 33:129-158 mm SL), paratypes, Depto Loreto, Mayaruna Cocha, Río Orosa drainage, 3º 35'25"S, 72º 13'05"W, 13 August 1996, J. W. Armbruster, *et al.*; INHS 40250 (2:223-226 mm SL*), paratypes, Depto Loreto, near Yanashi, 3º 47'26"S, 73º 14'50"W, 14 August 1996, J. W. Armbruster, *et al.*; INHS 44037 (1:137 mm SL), Depto Loreto, Río Nanay, Pampa Chica, 4.54 km W center of Iquitos, bearing 269º, 3º 45'26"S, 73º 17'0.1"W, 22 July 1997, M. H. Sabaj and J. W. Armbruster; INHS 46300 (5:102-109 mm SL), paratopotypes, Depto Loreto, Maynas, Ullpa Caño, 100 yds. upstrm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; MBUCV-V-29370 (3:110-140 mm SL), paratypes, Depto Loreto, Mayaruna Cocha, Río Orosa drainage, Río Amazonas basin (approx. 3º 35'25"S 72º 13'05"W), 13 Aug 1996, J. W. Armbruster *et al.*; MHNJP 16158 (2:110-120 mm SL), paratypes, Depto Loreto, Mayaruna Cocha, Río Orosa drainage, Río Amazonas basin (approx. 3º 35'25"S 72º 13'05"W), 13 Aug 1996, J. W. Armbruster *et al.*; SIUC 27732 (1:139 mm SL), Depto Loreto, Maynas, Río Nanay, at Santa Clara, 22 July 1995, B. M. Burr, *et al.*; SIUC 30071 (1:113 mm SL), Depto Loreto, Río Itaya and Quebrada Mazana, 11 km (39º bearing) from Iquitos center, 3º 49'47.6"S, 73º 18'02.9"W, 28 July 1997, R. E. Weitzell, *et al.*; SIUC 30302 (2:281-289 mm SL*), Depto Loreto, Maynas Prov. Lago Quistococha, UNAP, 1994; SIUC 30303 (1:123 mm SL), holotype. Depto Loreto, Maynas, Ullpa Caño, 100 yds. upsrtm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; SIUC 31946 (6:94-126 mm SL), paratopotypes, Depto Loreto, Maynas, Ullpa Caño, 100 yds. upsrtm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell; USNM 349717 (5:102-177 mm SL), paratopotypes, Depto Loreto, Maynas, Ullpa Caño, 100 yds. upstrm of confluence with Moena Caño, Río Itaya drainage, 3º 46'20"S, 73º 14'17"W, 14 August 1997, M. W. Littmann and R. E. Weitzell. Rio Javari/Río Yavarí: Brazil/Peru: ANSP 8379 (1:139 mm SL), Hyavary, Collectors MCZ; NRM 15355 (1:90 mm SL), Lago Piranha, Atalaia do Norte area, 4º 12'S, 70º 17'W, 08 September 1971, T. Hongslo, *et al.*; MCZ 7243 (1:192 mm SL), at Brazil-Peruvian border, 4º 21'S, 70º 2'W, 19 October 1865, D. Bourget; MCZ 7244 (5 of 17:105-127 mm SL), at Brazil-Peruvian border, 4º 21'S, 70º 2'W, 19 October 1865, D. Bourget; MNHN 1889 0234 (1:111 mm SL), 1889, M. Cambridge Inconnu (MCZ); MNHN 1889 0235 (1:115 mm SL), 1889, M. Cambridge Inconnu (MCZ); FMNH 71269 (1:138 mm SL*), San Fernando, 100 m elev. 20 July 1957, C. Kalinowski. Rio Jutai: MCZ 7254 (1:241 mm SL*), rio Jutai, 2º 43'S, 66º 57'W, September 1865, W. James *et al.* Río Putumayo: Peru: NRM 16050 (1:263 mm SL), Loreto, right bank at El Estrecho, 18 July 1986, S. O. Kullander, *et al.* Río Napo: Equador: FMNH

97576 (1:277 mm SL), Quebrada Zancudococha, 1km upstream from mouth of Río Aguarico, 1981, D. Stewart, *et al.*; FMNH 103263 (1 of 2:197 mm SL*), Río Yasuni, 0º 59’06”S, 75º 25’36”W, 24 October 1981, D. Stewart, *et al.*; FMNH 97577 (2:206-244 mm SL*), Luguna Jatunacocha, at outflow, 0º 59’42”S, 75º 27’12”W, 23 October 1981, D. Stewart, *et al.* Río Tigre: Peru: NRM 16054 (2:84-103 mm SL), Loreto, Río Corrientes, Teniente Lopéz, pools on right bank opposite OXY camp, 30 July 1986, S. O. Kullander, *et al.* Río Ucayali: Peru: CAS 76754 (2:228-249 mm SL*), near Orellana, 22-23 August 1920, W. R. Allen; ANSP 86719 (1:246 mm SL), Cantamana, July 1937, W. C. Morrow. Río Madeira: Bolivia: FMNH 97571 (1 of 2:198 mm SL*), San Joaquin, 3º 11’S, 60º 17’W, 5 September 1909, J. D. Haseman; FMNH 97572 (1:190 mm SL*), San Joaquin, 3º 11’S, 60º 17’W, 5 September 1909, J. D. Haseman; FMNH 58312 (1:203 mm SL*), San Joaquin 3º 11’S, 60º 17’W, 5 September 1909, J. D. Haseman, MNHN 1988 0900 (2 of 3:192-218 mm SL*), Depto Cochabamba, Río Mamore, Río Chapare, 1982, L. Lauzanne and G. Loubens. Brazil: MZUSP 7012 (40 of 66; 118-200 mm SL), paratypes, Amazonas, Nova Olinda, rio Madeira, 25 m above Nova Olinda; 27 Sept 1969. Essequibo River: British Guyana: ANSP 39818 (1:234 mm SL*), Río Rupununi, 1911, J. Ogilvie; BMNH 1971.7.29. 79-87 (9:193-300 mm SL), Río Rupununi, 15-16 December 1957, R. H. Lowe-McConnell; NYSM 49400 (2:102-116 mm SL), North bank of Mazaruni River, ca. 1 mile E of confluence with Cuyuni R., Jailman Creek, between Skull Point and Penal Colony, 22 August 1996, R.E. Schmidt. Orinoco River: Venezuela: USNM 276855 (2:120-125 mm SL), Est. Amazonas, Lago Terra Preta, Janauari, 13 October 1977, P. Bayley; ANSP 160627 (1:245 mm SL), Est. Amazonas, Río Cataniapo, Puerto Auapucho, 5º 32’ N, 67º 31’ W, 11 November 1985, B. Chernoff *et al.*; FMNH 85861 (1:149 mm SL*), Est. Amazonas, ponds 0.3 km S of Pto. Nuevo, near Pto. Ayacucho, 14 January 1975, J. E. Thomerson, D. C. Hicks, H. Lopez, D. E. Taphorn; INHS 29162 (2:259-264 mm SL*), Est. Amazonas, Río Mavaca, just upstream of confluence of Caño Maraquita, 2º 11’30”N, 65º 05’45”W, 9 February 1991, L. Nico and F. Marillo; INHS 35210 (2:154-160 mm SL*), Est. Anzoatequi, Lago Osinera, 8º 9’25”N, 63º 34’25”W, 11 April 1988, M. A. Rodriguez; INHS 29351 (2:234-283 mm SL*), Est. Anzoatequi, Laguna Aguilera, 8º 11’30”N, 63º 26’45”W, 25 April 1988, M. A. Rodriguez; INHS 35610 (1:238 mm SL*), Est. Anzoatequi, Laguna Aguilera, 8º 11’30”N, 63º 26’45”W, 20 January 1988, M. A. Rodriguez; INHS 35867 (1:223 mm SL*), Est. Anzoatequi, Laguna Aguilera, 8º 11’30”N, 63º 26’45”W, 28 May 1987, M. A. Rodriguez; INHS 35845 (2:140-170 mm SL), Est. Anzoatequi, Laguna Aguilera, 8º 11’30”N, 63º 26’25”W, 22 January 1987, M. A. Rodriguez; INHS 35771 (1:135 mm SL), Est. Anzoatequi, Laguna Tineo, 8º 11’25”N, 63º 28’20”W, 16 February 1988, M. A. Rodriguez; INHS 61518 (1:196 mm SL*), paratypes, Est. Apure, Caño San Miguel, Río Cinaruco, 6º 34’24”N, 67º 17’32”W, 20 January 1992, L. M. Page, *et al.*; USNM 260207 (1:115 mm SL), Est. Apure, San Fernando de Apure region, Río Apure main channel, 07º 53’N, 67º 29’W, 25 January 1983, Technicians of Apure Fisheries; ANSP 160536 (1:117 mm SL), Est. Bolivar, Río Caura, near Puerto Las Majadas, 07º 38’N, 64º 50’W, 21 November 1985, local fishermen; ANSP 166671 (3:137-207 mm SL*), Est. Bolivar, Laguna Castillero, near Caicara, 07º 38’20”N, 66º 09’00”W, 11 January 1987, M. Rodriguez and S. Richardson; ANSP 166672 (5:123-132 mm SL), Est. Bolivar, Laguna Castillero, near Caicara, 08º 09’30”N, 63º 35’55”W, 23 January 1987, M. Rodriguez and S. Richardson; INHS 33967 (1:183 mm SL), Est. Bolivar, Lago Merecure, 8º 12’55”N, 63º 17’25”W, 13 April 1988, M. A. Rodriguez; INHS 35079 (2:191-206 mm SL*), Est. Bolivar, Laguna Castillero, 7º 38’20”N, 66º 09’ W, 10 January 1988, M. A. Rodriguez; INHS 35236 (1:169 mm SL*), Est. Bolivar, Laguna Castillero, side of Río Orinoco, 7º 38’20”N, 66º 09’W, 19 April 1988, M. A. Rodriguez; INHS 35331 (3:131-161 mm SL), Est. Bolivar, Laguna Maldonado, 19 January 1988, M. A. Rodriguez; INHS 35744 (1:220 mm SL*), Est. Bolivar, Laguna Caño Largo, 8º 14’50”N, 63º 15’55”W, 14 April 1988, M. A. Rodriguez; INHS 35833 (1:166 mm SL), Est. Bolivar, Laguna Caño Largo, 8º 14’50”N, 63º 15’55”W, 16 April 1988, M. A. Rodriguez; USNM 270035 (2:107-131 mm SL); Est. Bolivar, small caño connecting with Río Orinoco, immediately S of El Burro, 06º 11’ N, 67º 25’ W, 9 December 1984, R. P. Vari, *et al.*; CAS 162441 (1 of 2:211 mm SL*), Depto Vichada, Río Guaviare, near San Fernando de Atabapo, Venezuela, 05 July 1925, C. Ternetz. FMNH 69509 (1:142 mm SL*). Orig. from John G. Shedd aquarium-Chicago.

Sorubim maniradii: Río Amazonas: Peru: ANSP 119864 (2:182-192), Iquitos, Rio Amazonas, market, 18 June 1968, Hugghins; ANSP 139064 (95 mm SL), paratype, Loreto, vicinity Iquitos, left bank Río Amazonas (Marañon) due S of Isla Iquitos, 17 October 1955, M. Hohn; ANSP 177772 (90 mm SL), paratype, Loreto, Río Amazonas (Marañon) between Isla Iquitos & Isla Lapuna, near Isla Lapuna shore, 09 October 1955, R. Patrick & C. C. G. Chaplin; CAS 133411 (1:203 mm SL), paratype, Depto Loreto, Río Ampiyacu, near Pebas, 15 August 1937, W. G. Scherer; CAS 133402 (1:120 mm SL), Depto Loreto, Pebas, Tuye Caño, 28 August 1936, W. G. Scherer; CAS 133404 (1:115 mm SL), Depto Loreto, Pebas, Tuye Caño, 28 August 1936, W. G. Scherer; CAS 133405 (1:117 mm SL), Depto Loreto, Pebas, Tuye Caño, 28 August 1936, W. G. Scherer; INHS 52009 (156 mm SL), paratype, Loreto, Río Orosa drainage, Mayaruna Cocha, ca. 30 min. by boat downstream of mouth of Tonche Caño, 71.7 mi E Iquitos, bearing 265°, 3° 35’25” S, 72° 13’05” W, 13 August 1996, M.H. Sabaj, J.W. Armbruster, M. Hardman, A. A. Lopez & N. Y. Pashanaste; INHS 52010 (129 mm SL), paratype, same as previous record; MUSM 17646 (140 mm SL), Depto Loreto, Mayaruna Cocha, Río Orosa drainage, (approx. 3º 35’25”S 72º 13’05”W), 13 Aug 1996, J. W. Armbruster *et al.* Brazil: MNHN 1899.0195 (185 mm SL), near Manaus,1899, Anthony. MNHN 2000-5780 (159 mm SL), Caldeirão, 3° 11’S, 60° 17’W, 1879, Jobert. Río Marañon and Río Ucayali: MCZ 7251 (180 mm SL), paratype, 1861, C. Sarkady. Río Ucayali: CAS 76748 (1 of 3:147 mm SL), near Cantamana or Iquitos, W.R. Allen and P.S. Morris; CAS 213567

(147 mm SL), Contamana, July 1920, W.R. Allen. Rio Javary, Brazil: CAS 76747 (1 of 2:96 mm SL), near Peru-Bolivian border, 19 October 1865, D. Bourget; Brasil: MNHN 0000.9975 (131 mm SL), Amazonas, rio Javari,1876, M. Inconnu, Cambridge MCZ. Rio Madeira: Brazil: MZUSP 7011 (6:111-186 mm SL), paratypes, Amazonas, Nova Olinda, 25 km abaixo de Nova Olinda. 27 November 1967, Expedição Permanente a Amazônia. Brazil/Bolivia: FMNH 57812 (2:62-80 mm SL), Río Mamore, 19 September 1909, J. D. Haseman. Bolivia: FMNH 108815 (165 mm SL), Río Guapore, Río Machupo, San Joaquin, 5 September 1909, J. D. Haseman.

Sorubim cuspicaudus: Río Magdelena drainage: Colombia: BMNH 1900.1.30.12-13 (2:299-353 mm SL), Baranquilla, Thomson; BMNH 1947.7.1.197 (1:157 mm SL), Baranquilla. Miles; CAS 149475 (1:175 mm SL*), Bolivar, Río San Jorge, San Marcos, June 1955, G. Dahl; CAS 150404 (1:420 mm SL*), Caldas, at or near junction of Ríos Samana La Miel, near La Dorada, 5º 29'N, 74º 40'W, 27 February 1957, T. D. White and J. N. Reynolds; CAS 150406 (1:386 mm SL*), paratypes, Caldas, at or near junction of Ríos Samana La Miel, near La Dorada, 5º 29'N, 74º 40'W, 27 February 1957, T. D. White and J. N. Reynolds; FMNS 56220 (1:367 mm SL*), Río Magdelena drainage, at Honda, 28 January 1912, C. H. Eigenmann; FMNH 56223 (1:327 mm SL*), holotype of *S. cuspicaudus*, at Soplaviento, 11 January 1912, C. H. Eigenmann; FMNH 107492 (2:264-314 mm SL*), paratopotypes, at Soplaviento, 11 January 1912, C. H. Eigenmann; FMNH 57701 (2:305-311 mm SL*), at Puerto Berrio, elevation 429', 24 January 1912, C. H. Eigenmann; FMNH 60305 (3:256-262 mm SL*), paratypes, at Calamar, C. H. Eigenmann; FMNH 88180 (3:257-355 mm SL*), at Soplaviento, C. H. Eigenmann; NRM 16254 (1:107 mm SL), Lower Río Magdalena drainage, Olsson, Ragnar, of Centro de Investigacion de Ciencias Marinas, Cartagena. Río Sinú: NRM 14812 (1:239 mm SL*), at Córdoba, Alto de Quimarí, 500 masl., April 1949, K. von Sneidern, *et al.* Lago Maracaibo: Venezuela: INHS 35428 (1:145 mm SL*), paratype, Zulia, Río Santa Ana Dr., bridge ca. 8 km SW Alturitas, 09º 41'30"N, 72º 25'47"W, 2 February 1995, L. M. Page *et al.*