

Revision of the neotropical catfish genus *Hoplosternum* (Ostariophysi: Siluriformes: Callichthyidae), with the description of two new genera and three new species

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Species of *Hoplosternum* sensu lato are taxonomically revised. The species of the former *H. littorale* group constitute the genus *Hoplosternum* sensu stricto. The species of the former *H. thoracatum* group are placed in *Megalechis*, new genus, and the species of the former *H. pectorale* group in *Lepthoplosternum*, new genus. Three new species of *Lepthoplosternum* are described: *L. altamazonicus* from the upper reaches of the Río Amazonas in Peru, *L. beni* from the Río Madeira system in Bolivia, and *L. tordilho* from the laguna dos Patos system in southern Brazil. Lectotypes are designated for *Callichthys melampterus* and *C. sulcatus*. *Callichthys melampterus*, *Cascadura maculocephala*, *H. littorale* *daillyi* and *H. thoracatum cayennae* are junior synonyms of *H. littorale*. *Hoplosternum thoracatum surinamensis* and *C. exaratus* are junior synonyms of *M. personata*. *Callichthys pictus*, *C. sulcatus* and *H. orinocoi* are junior synonyms of *M. thoracata*. A key to genera of subfamily Callichthyinae as well keys to species of *Hoplosternum*, *Megalechis* and *Lepthoplosternum* are provided.

As espécies de *Hoplosternum* sensu lato são revisadas taxonomicamente. As espécies de *Hoplosternum* grupo *littorale* permanecem no gênero *Hoplosternum* sensu stricto. As espécies de *Hoplosternum* grupo *thoracatum* são transferidas para *Megalechis* gênero novo e as espécies de *Hoplosternum* grupo *pectorale* para *Lepthoplosternum* gênero novo. Três novas espécies de *Lepthoplosternum* são descritas: *L. altamazonicus* do alto rio Amazonas, no Peru; *L. beni* do sistema do rio Madeira, na Bolívia; e *L. tordilho* do sistema da laguna dos Patos no sul do Brasil. Lectótipos são designados para *Callichthys melampterus* e *C. sulcatus*. *Callichthys melampterus*, *Cascadura maculocephala*, *H. littorale* *daillyi* e *H. thoracatum cayennae* são sinônimos juniores de *H. littorale*. *Hoplosternum thoracatum surinamensis* e *C. exaratus* são sinônimos juniores de *M. personata*. *Callichthys pictus*, *C. sulcatus* e *H. orinocoi* são sinônimos juniores de *M. thoracata*. Chaves para os gêneros da subfamília Callichthyinae bem como para as espécies de *Hoplosternum*, *Megalechis* e *Lepthoplosternum* são fornecidas.

Introduction

The species of catfishes traditionally assigned to the genus *Hoplosternum* Gill, 1858 are of small to moderate size (40-160 mm SL) and distributed in South America north of Buenos Aires, on both

sides of the Andes. These species are usually found in lowland, slow-flowing streams with a muddy bottom, sometimes in swamps or marshes, often where dense vegetation is present. In those quiet habitats the species of *Hoplosternum* exhibit the very interesting behavior of building

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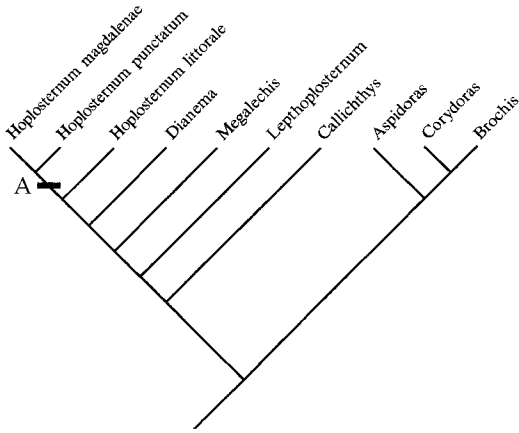


Fig. 1. Cladogram of the family Callichthyidae. A, color pattern formed by many minute darker dots on dorsal surface of body and, especially, on unpaired fins. See Reis (in press) for a discussion of characters supporting each branch.

a floating nest composed of foam and vegetal debris for spawning (Machado-Allison & Zaret, 1984; Mol, 1993). The species of *Hoplosternum*, as all callichthyids, are air-breathers. Air is collected at the water surface and swallowed, passed to the intestine, their 'accessory respiratory organ', and is eventually expelled through the anus. Swallowed air plays a more important role in the maintenance of the hydrostatic balance than in the respiration itself, contributing about 75 % of the necessary air to attain neutral buoyancy (Gee, 1976; Gee & Graham, 1978). The larger species of *Hoplosternum* are used as food in many places in the flood-plains of Brazil and other countries, being so common in some areas that they are fished commercially as food fishes.

Gosline (1940) distinguished *Hoplosternum* from other callichthyids based on 12 characters, none of which, however, was found to be apomorphic by Reis (in press). The characters Gosline used are: head depressed [plesiomorphic for Callichthyidae]; lower lip reverted to form a pair of fleshy flaps [plesiomorphic for Callichthyidae]; rectal barbel reaching to midway between pectoral and pelvic bases [plesiomorphic for *Hoplosternum*]; eye more or less superiorly placed [ambiguous]; suborbital naked [plesiomorphic for Callichthyidae]; fontanel rounded or elongate [ambiguous]; supraoccipital not forming a backward extension [plesiomorphic for Siluroidei]; nuchal plates fusing along the midline between the supraoccipital and dorsal [incorrect]; abdo-

men between pectoral fins enclosed wholly or in part by expansions of the coracoids [ambiguous, also shared by *Dianema*]; azygous predorsal plate lacking [incorrect]; dorsal I,7 or I,8 [plesiomorphic for Siluroidei]; and caudal rounded or emarginate [ambiguous]. Definitions and identification keys since Gosline (1940) are largely adapted from his work and include no additional derived features. The traditional difficulty that systematists had in adequately defining *Hoplosternum*, as well as the other genera of Callichthyinae, is mainly due to two factors: absence of detailed comparative anatomical studies and the consequent lack of information on characters other than external morphology, and the inadequacy of the systematic methods employed.

In a study of the phylogenetic relationships of the genera and species-groups of the Callichthyidae, Reis (in press) showed that the species included in *Hoplosternum* do not form a monophyletic assemblage, as some of them are more closely related to *Dianema* than to other *Hoplosternum*. Within the subfamily Callichthyinae, however, Reis (in press) identified monophyletic groups, which can be given generic rank to maintain monophyly (Fig. 1).

In the taxonomic revision below, two new genera are described to accommodate the species referred by Reis (in press) to the *H. thoracatum* and the *H. pectorale* groups, with three new species belonging to the later. The generic name *Hoplosternum* remains valid and includes the species *H. littorale*, *H. magdalenae* and *H. punctatum*.

Methods

Specimens examined in this study belong to several institutions, which are listed by Leviton et al. (1985). Menezes & Weitzman (1990) are followed in using all geographic entities (such as rivers or creeks) and locality names (except countries) in the language of the country of origin. Countries are in English because there is an English name available for all the various countries. The aim of this practice is to avoid transferring English style and grammar onto South American locality names. Accordingly, geographic descriptors (not capitalized according to Portuguese grammar) and names of Brazilian localities are mentioned in Portuguese (e.g. rio Uruguai, arroio Morena or serra do Espinhaço). Those geographic descriptors (capitalized in Spanish) and localities of Span-

ish speaking countries are cited in Spanish (e.g. Río Uruguay, Arroyo Coibara or Sierra de Abibe).

Following measurements and counts were made for each specimen: 1) standard length, 2) depth of body at dorsal-fin origin, 3) predorsal distance, 4) prepelvic distance, 5) preanal distance, 6) preadipose distance, 7) length of dorsal-fin spine (the ossified portion, except in the species of the *Leptoplosternum*, where the limit of the ossified portion may not be clear - the whole ray was measured instead), 8) length of anal-fin spine, 9) length of adipose-fin spine, 10) least depth of caudal peduncle, 11) distance between end of dorsal-fin base and origin of adipose-fin spine, 12) length of dorsal-fin base, 13) maximum cleithral width, 14) head length (to the end of supraoccipital posterior process), 15) length of longer barbel, 16) head depth (at the level of the posterior end of the supraoccipital process), 17) least interorbital distance, 18) horizontal orbit diameter, 19) snout length, 20) least internarial distance, 21) number of lateral scutes in upper series (not counting the small scutelets on the base of caudal-fin rays), 22) number of lateral scutes in lower series (not counting the small scutelets on the base of caudal-fin rays), 23) number of azygous plates between dorsal-fin base and the adipose fin, 24) number of lateral scutes along dorsal-fin base, 25) number of lateral scutes between adipose-fin spine and the caudal-fin base, 26) number of dorsal-fin rays, 27) number of caudal-fin rays, 28) number of anal-fin rays, 29) number of pelvic-fin rays, and 30) number of pectoral-fin rays. All measurements are straight lines taken directly on the specimens with a Fowler-Sylvac Ultra-Cal II electronic caliper.

In the Diagnosis of genera and species the first paragraph contains uniquely derived features that phylogenetically diagnose each taxon, when they were found, along with other derived, but not unique, characters. A second paragraph includes additional features useful to distinguish the taxon.

In the list of non-type specimens examined for each species, only catalogue number and number of specimens are given, listed by river drainage or geographic area. A complete list of localities can be obtained with the author. Complete locality, collectors and date of collection are provided only for new species. The geographic distribution presented for each taxon is based on specimens actually examined.

Key to the genera of the subfamily Callichthyinae

1. - Infraorbital bones covered with skin; head very depressed, less than 75 % of cleithral width; coracoids not exposed ventrally.
..... *Callichthys*
- Infraorbital bones exposed; head moderately depressed, more than 75 % of cleithral width; coracoids exposed ventrally.
..... 2
2. - Caudal fin forked or concave.
..... 3
- Caudal fin truncate or convex.
..... 4
3. - First infraorbital bone not articulated to the lateral ethmoid; dorsal-fin spine as long as the first branched rays.
..... *Dianema*
- First infraorbital bone articulated to the lateral ethmoid; dorsal-fin spine about half the length of the first branched rays.
..... *Hoplosternum*
4. - Dorsal fin with one spine, one simple and 7-8 branched rays; anal fin with two simple and 5-6 branched rays; mature males with very elongated pectoral-fin spine.
..... *Megalechis*
- Dorsal fin with one spine and 7 branched rays; anal fin with one simple and 5 branched rays; mature males with pectoral-fin spine thickened but not elongated.
..... *Leptoplosternum*

Hoplosternum Gill

Hoplosternum Gill, 1858: 395-396 (type-species by original designation *Callichthys laevigatus* Valenciennes)

Cascadura Ellis, 1913: 387 (type-species by monotypy *C. maculocephala* Ellis, 1913)

Cataphractops Fowler, 1915: 231 (type-species by original designation *Callichthys melampterus* Cope, 1872)

Ellisichthys Ribeiro, 1920: 11 (unnecessary replacement name for *Cascadura*)

Diagnosis. No uniquely derived features were found to diagnose *Hoplosternum*. Posterior ex

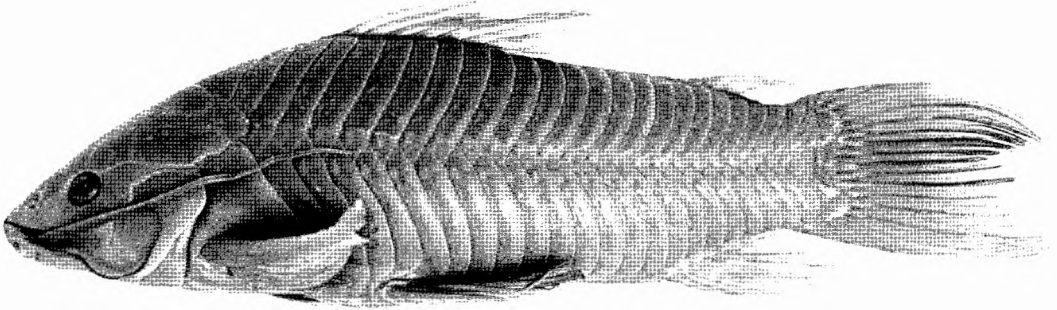


Fig. 2. *Hoplosternum littorale*, ROM 22096, 105.4 mm SL; Guiana: Georgetown.

pantion of the second infraorbital toward the pterotic-supracleithrum is the only derived feature found in *Hoplosternum* (but also shared with *Brochis*).

Hoplosternum is further distinguished from other Callichthyinae by its forked caudal fin. This character is shared with *Dianema*, from which it is distinguished by having the first infraorbital strongly articulated with the lateral ethmoid.

Phylogenetic relationships. Additional evidence of phylogenetic relationships within *Hoplosternum*, not referred to by Reis (in press), place *H. punctatum* as the sister-species to *H. magdalenae*, with *H. littorale* being the sister-group to them (Fig. 1). Both *H. punctatus* and *H. magdalenae* share a particular color pattern formed by many minute dark dots on the dorsal body surface and, especially, on the unpaired fins. This color pattern is not present in *H. littorale* or in any other Callichthyinae.

Key to the species of *Hoplosternum*

- 1. - Second infraorbital bone narrow, not articulating with the pterotic-supracleithrum and leaving a naked area of skin between eye and opercle; coracoids strongly developed in fully mature males, contacting and sometimes overlapping ventrally; only fourth scute of upper lateral series with lateral line perforation. 2
- Second infraorbital bone highly developed, articulating with the pterotic-supracleithrum and covering the entire area between eye and opercle; coracoids not in contact in the midline even in fully mature males; 4-6

scutes of upper lateral series with lateral line perforations (South America east of the Andes).

..... *H. littorale*

- 2. - Interopercle exposed in a small roundish area ventral to the opercle; caudal peduncle deeper (17.4-19.5 % SL in specimens larger than 55.0 mm SL) (Lago Maracaibo, Río Magdalenae and Río Sinu drainages).

..... *H. magdalenae*

- Interopercle covered by skin, not visible externally; caudal peduncle shallower (14.3-17.2 % SL in specimens larger than 55.0 mm SL) (Río Atrato basin and Pacific coastal drainages in Panamá).

..... *H. punctatum*

***Hoplosternum littorale* (Hancock)**
(Figs. 2-3)

Callichthys littoralis Hancock, 1828: 244-246 (British Guiana, Demerara)
Callichthys subulatus Valenciennes, in Cuvier & Valenciennes, 1840: 311 (French Guiana, Cayenne)
Callichthys laevigatus Valenciennes, in Cuvier & Valenciennes, 1840: 314 (Argentina, Corrientes)
Callichthys albidus Valenciennes, in Cuvier & Valenciennes, 1840: 316 (French Guiana, Cayenne)
Callichthys chiquitos Castelnau, 1855: 38 (Bolivia, Chiquitos)
Hoplosternum stevardii Gill, 1858: 401 (Trinidad)
Callichthys melampterus Cope, 1872: 275 (Peru, Río Ampyiacu)
Hoplosternum schreineri Ribeiro, 1911: 150 (Brazil, Pará)

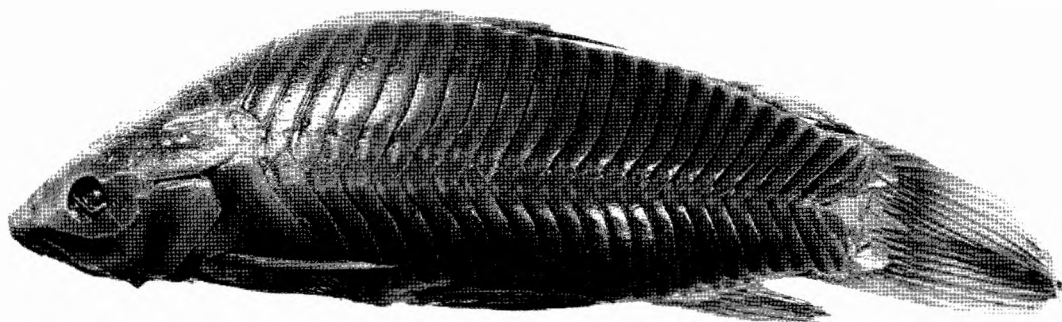


Fig. 3. *Hoplosternum littorale*, BMNH 1996.7.11:1, 82.6 mm SL, holotype of *Callichthys littoralis*; British Guiana: Demerara (photograph G. Howes).

Cascadura maculocephala Ellis, 1913: 387 (Brazil, Rio Grande do Sul, Uruguiana, rio Uruguai)

Hoplosternum shirui Fowler, 1940: 232 (Peru, Río Ucayali)

Hoplosternum littoralis daillyi Hoedeman, 1952: 7-8 (Surinam, near Paramaribo)

Hoplosternum thoracatum cayennae Hoedeman, 1961: 130 (French Guiana, Ile de Cayenne)

Material examined. Type-specimens: ANSP 8318, lectotype of *Callichthys melampterus* (present designation); ANSP 8319-8328 (9+1 c&s), paralectotypes; Peru: Rio Ampyacu. - FMNH 54878, holotype of *Cascadura maculocephala*; Brazil: Rio Grande do Sul: Uruguiana. - ZMA 102238a, holotype of *Hoplosternum thoracatum cayennae*; ZMA 102238b (1), paratype; French Guiana: Cayenne. - USNM 5944, holotype of *Hoplosternum stevardii*; Trinidad. - ZMA 100277, holotype of *Hoplosternum littorale daillyi*; ZMA 100277b (1), 100281 (1), 100282 (1), 100285 (1); Suriname: Paramaribo. - ZMA 100261 (1), 100283 (1), 100284 (1), paratypes of *H. l. daillyi*; Suriname.

Other specimens: Trinidad: CAS-SU 59110 (1+1 c&s), ANSP 77119 (3), 8312 (5), CAS 76535 (1), ROM 61644 (1), AMNH 13702 (1), ROM 41512 (2).

Río Orinoco: ANSP 133888 (6), 128726 (3), 165191 (3), 165304 (1), NRM 15418 (2), 15415 (1), UMMZ 214744 (11), 217076 (2), 214767 (2), CAS-SU 59429 (1), 47800 (2), CAS 6484 (1), 64324 (1), 65010 (2), MCZ 78102 (5), USNM 163180 (1), 260204 (1), 258177 (1), MZUSP 27959 (6).

Coastal streams of the Guianas: AMNH 4406 (1), 8859 (2), 16399 (1), ROM 22096 (2), 5364 (1), CAS 55547 (1), 76521 (1), 76524 (1), NMW 46239 (1), CAS-SU 21869 (1), ZMB 5236 (1), NRM 15453 (8), MHNG 1223.33-34 (2).

Rio Amazonas drainage: CAS-SU 33280 (1), 33279 (1), 63594 (2), CAS 76523 (1), 6522 (2), MZUSP 26128 (3), 6348 (25), 5972 (2), 6477 (3), 5921 (1), 24916 (5), 13557-13560 (4), 23756 (2), 24658 (1), 33264 (29), 3604 (6), 5039 (7), 22888 (9), 22899 (6), 22901 (1), 33253 (71), NRM 15416 (4), 15413 (1), MCZ 8241 (6), 78104 (5), ANSP 124176 (3), USNM 94672 (1), 308077 (1), NMW 46230 (2), 46231 (1), 46232 (4).

Rio Madeira drainage: MNHN 142 (3), 468 (2), 466 (7), UMMZ 66309 (6), 66308 (1), CAS 76522 (3), USNM 86824 (3), 305467 (1).

Rio São Francisco drainage: MCP 16715 (8).

Rio Iguazu drainage: MCP 13966 (6).

Upper rio Paraná drainage: MZUSP 40336 (5).

Rio Paraguay and lower rio Paraná: MCP 10701 (5), MZUSP 38178 (5), 25094 (2), 4006 (1), 36747 (1), 19250 (1), NRM 15419 (1), 15411 (6), 15417 (2), 15412 (5), NRM 15414 (1), UMMZ 205962 (1), 207380 (2), 205917 (3), 207403 (15), 206975 (3), 207195 (6), 207376 (6), 207895 (1), 207287 (3), USNM 232285 (1), 232284 (1), 176011 (3), MHNG 2353.21 (2), 2080.43-46 (4), 2486.70 (1), 2407.84 (5), 2486.69 (1), 2119.71-72 (2), 2166.97 (1), 2526.98 (2), 2166.96 (3), 2407.85 (3), 2206.12 (1), 2485.78 (1), 2486.67-68 (6), 2166.95 (2), 1554.33 (1), 2095.1-2 (2), 2486.67 (3), 2526.97 (1), 2166.98 (1), NMW 46236 (3), AMNH 12269 (1), CAS 76525 (1), 76519 (1), 76520 (1), CAS-SU 31584 (5).

Rio Uruguai drainage: MCP 6945 (1), 15129 (3), 9368 (1), 10337 (2).

Laguna dos Patos drainage: MCP 13686 (4), 11507 (2 c&s), 11002 (4), 13493 (1), 7027 (1 c&s), 14601 (25+1 c&s), 13507 (3), 10556 (1), 13901 (1), 9713 (2), 13962 (4), 15065 (1), 13686 (4), 10012 (1), 8337 (1), 9393 (5), 9535 (1), 10724 (1), 9765 (1), 6888 (1), 14179 (1), 10541 (2), 10203 (1), 10011 (17), 9800 (9), 9435 (14).

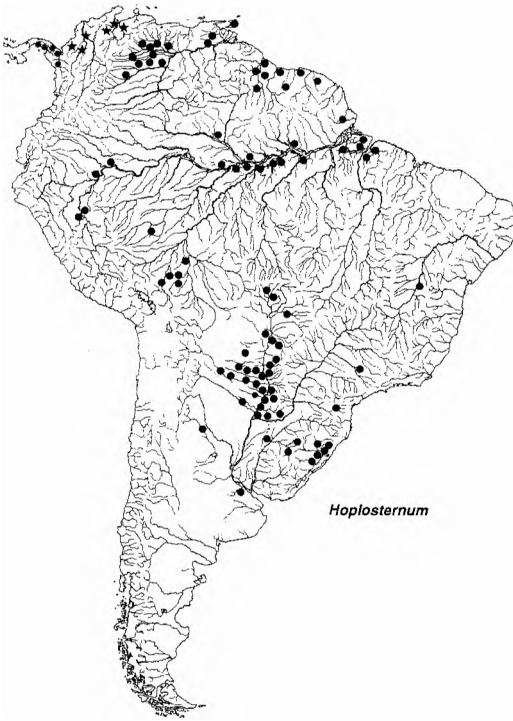


Fig. 4. Geographic distribution of the species of *Hoplosternum*. Dots: *H. littorale*; stars: *H. magdalenae*; and asterisks: *H. punctatum* (some symbols represent more than one collecting locality).

Diagnosis. Lateral line with 4-6 perforated plates; second infraorbital highly developed, articulating with the pterotic-supracleithrum and covering the entire area between the eye and the opercle; tip of pectoral-fin spine of fully developed nuptial males bent dorsally, forming a distal hook.

Coracoids exposed but not in contact in the midline ventrally is also a derived condition in this species, which represents a reversal shared by various *Corydoras* species as well as by *Lepthoplosternum*.

Description. Morphometric data summarized in Tables 1 and 2. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed toward caudal fin. Body profile between snout and dorsal-fin origin straight or slightly convex. Largest recorded size 157.7 mm SL.

Head depressed; snout rounded in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch; upper barbel reaching

base of pectoral fin; lower barbel reaching base of pelvic fin. Opercle partially exposed; interopercle covered by skin. Eyes small, laterally placed; infraorbital bones large, second usually equal to or wider than eye diameter.

Coracoids widely exposed on ventral surface, covered by skin antero-medially. Upper lateral series with 25-27 scutes, 22-24 in lower series. Five to 15 azygous plates between dorsal and adipose fins. Lateral line sensory canal comprising 4-6 anterior scutes of upper lateral series.

Dorsal fin with strong spine, approximately half length of longest branched ray; spine followed by one unbranched and seven branched rays. Pectoral fin with pungent spine and 9-10 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of fully developed nuptial males very elongated, passing first half of pelvic fin and with distal tip turned dorsally. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray unbranched, about two thirds length of longest ray, followed by five branched rays. Mature females with small skin fold on external face of leading pelvic ray. Anal fin with two unbranched rays, well ossified but not pungent, and six branched rays. Adipose fin with pungent, depressible spine. Caudal fin forked or strongly concave.

Color in alcohol. Head, trunk and fins uniformly light brown or grayish, lighter ventrally. Snout, lips, barbels and fins sometimes strongly pigmented. Small darker dots on head, flanks and caudal peduncle may be present, especially on smaller individuals. Young specimens (about 20 mm SL) light brown in ground color, with four or five dark transversal bands between dorsal-fin origin and caudal fin. With about 30 mm SL transversal bands are already reduced to small dark punctuations on head and trunk, which end up disappearing during further growth.

Comments. *Hoplosternum littorale* is the callichthyid species with the widest distribution. It is present in all of South America east of the Andes and north of Buenos Aires, including the Río Orinoco, Trinidad, coastal rivers of the Guianas, Río Amazonas drainage, Río Paraguay, lower Río Paraná and coastal systems in southern Brazil (Fig. 4). A single lot each is known from the upper rio Paraná (MZUSP 40336) and from the rio São Francisco drainage (MCP 16715). Oliveira

(1991) suggested that these occurrences may represent introduced populations.

Samples of populations from the above hydrographic systems were morphometrically analyzed separately (Table 2), and statistical comparisons failed to suggest the presence of more than one species.

I was unable to examine directly the holotype of *H. littorale* (BMNH 1996.7.11:1), but a photograph of that specimen (Fig. 3) allowed a precise identification. The lot ZMA 102238b contains three paratypes of *H. thoracatum cayennae*, the largest of this being *Hoplosternum littorale* and the two smaller being *Megalichthys personata*.

Hoplosternum magdalenae Eigenmann

(Fig. 5)

Hoplosternum magdalenae Eigenmann, in Ellis, 1913: 412 (Colombia: Soplaviento and Ca-lamar Cienega)

Material examined. CAS-SU 47807 (3), 47808 (1),

USNM 121119 (4), 88324 (2), MHNG 1066.12 (1), MCP 17307 (4, formerly CAS 76516), 17298 (1), NRM 13016 (1), 15409 (1), 15410 (1).

Diagnosis. Interopercle exposed on the ventral surface of head as a small roundish plate below the opercle.

This species is further distinguished from *H. littorale* by having the coracoids extremely developed on the ventral surface; and from *H. punctatum* by possessing a deeper caudal peduncle (17.4-19.5 % SL, vs. 14.3-17.2, in specimens larger than 55.0 mm SL).

Description. Morphometric data summarized in Table 3. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin slightly convex. Largest recorded size 95.8 mm SL.

Head depressed; snout rounded in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch; upper barbel passing base of pectoral fin; lower barbel reaching base of

Table 1. Biometric data of *Hoplosternum littorale*.

	n	range		mean	SD
		low	high		
Standard length (mm)	102	66.0	157.7	105.7	22.280
percent of standard length					
Depth of body	102	28.6	36.0	31.7	1.340
Predorsal distance	102	43.1	50.9	48.0	1.556
Prepelvic distance	102	45.6	54.6	50.5	1.511
Preanal distance	102	80.6	86.6	83.7	1.102
Preadipose distance	102	86.0	93.9	90.6	1.306
Length of dorsal-fin spine	97	8.8	14.3	11.1	1.355
Length of anal-fin spine	94	7.1	14.9	11.2	1.673
Length of adipose-fin spine	95	7.9	14.0	10.3	1.242
Depth of caudal peduncle	102	14.7	18.6	16.3	0.913
Dorsal to adipose distance	102	22.2	30.6	26.0	1.512
Length of dorsal-fin base	102	18.7	23.0	20.5	0.905
Maximum cleithral width	102	24.0	30.3	26.2	1.069
Head length	102	26.6	35.1	30.9	1.677
Length of longer barbel	84	31.1	68.2	46.8	7.335
percent of head length					
Head depth	102	76.8	89.3	83.3	2.755
Least interorbital distance	102	55.1	67.5	60.5	2.266
Horizontal orbit diameter	102	14.3	21.4	17.7	1.561
Snout length	102	43.4	52.8	46.9	1.681
Least internareal distance	102	34.6	40.1	37.3	1.246
counts					
Upper series lateral scutes	102	25.0	27.0	26.1	0.318
Lower series lateral scutes	102	22.0	24.0	23.0	0.172
Preadipose azygous plates	102	5.0	15.0	9.8	1.685
Scutes along dorsal-fin base	102	8.0	9.0	8.5	0.500
Scutes adipose-caudal fins	102	5.0	7.0	6.0	0.312

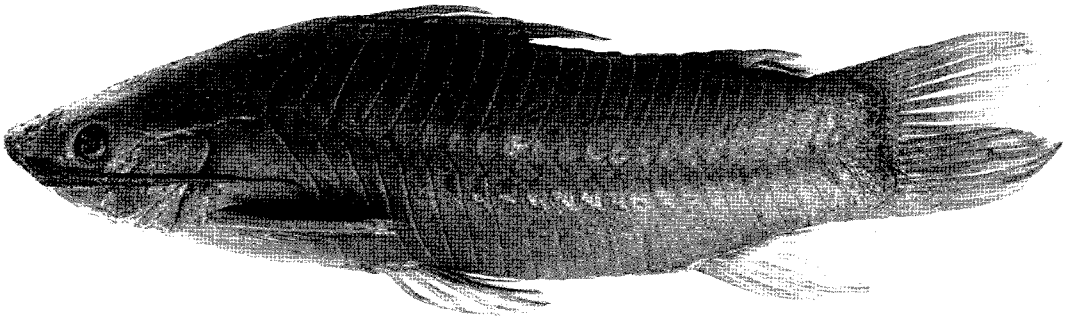


Fig. 5. *Hoplosternum magdalenae*, CAS 76516, 79.3 mm SL; Colombia: Soplaviento: Río Magdalena system.

pelvic fin. Opercle and interopercle partially exposed. Eyes small, laterally placed; infraorbital bones comparatively small.

Coracoids highly developed and exposed on ventral surface, usually overlapping in midline even in females. Upper lateral series with 26-27 scutes, 22-23 in lower series. Three to 7 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with strong spine, approximately half length of longest branched ray; spine followed by one unbranched and seven branched rays. Pectoral fin with pungent spine and 8-10 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of fully developed nuptial males very elongated, reaching anterior third of pelvic fin. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray un-

Table 2. Comparison of body proportions in the various populations of *Hoplosternum littorale*.

	Argentina			rio Uruguai			rio Jacui			rio Iguacu		
	n	low	high	n	low	high	n	low	high	n	low	high
Standard length (mm)	8	71.1	129.6	6	73.9	157.7	17	70.1	146.4	6	88.9	147.7
percent of standard length												
Depth of body	8	32.1	36.0	6	30.6	33.3	17	29.9	34.1	6	30.6	33.5
Predorsal distance	8	48.9	50.9	6	45.7	50.3	17	45.9	50.1	6	46.5	50.6
Prepelvic distance	8	48.7	52.2	6	47.4	51.6	17	49.7	52.8	6	49.6	52.5
Preal distance	8	82.9	85.5	6	81.0	85.0	17	82.5	85.9	6	83.5	85.2
Preadipose distance	8	89.3	92.3	6	90.2	92.6	17	88.9	92.2	6	90.8	93.9
Length of dorsal-fin spine	6	9.3	11.7	5	9.3	12.0	16	9.5	13.3	6	10.3	12.4
Length of anal-fin spine	7	10.2	14.6	6	8.3	14.1	17	9.3	14.8	6	8.1	13.6
Length of adipose-fin spine	8	8.9	11.2	5	8.0	11.8	17	8.2	13.1	6	8.1	11.7
Depth of caudal peduncle	8	15.6	18.5	6	15.7	18.0	17	15.1	17.3	6	15.2	17.9
Dorsal to adipose distance	8	22.2	26.0	6	24.5	28.6	17	25.1	28.1	6	26.2	28.7
Length of dorsal-fin base	8	19.4	21.9	6	19.3	23.0	17	19.2	21.2	6	19.5	22.1
Maximum cleithral width	8	26.0	30.3	6	26.1	28.3	17	25.1	28.3	6	25.9	27.1
Head length	8	31.4	33.6	6	28.5	33.8	17	28.6	33.8	6	28.6	32.4
Length of longer barbel	8	31.7	49.1	4	33.5	54.1	13	38.8	54.1	5	44.1	57.4
percent of head length												
Head depth	8	79.9	88.8	6	78.8	89.3	17	77.3	87.4	6	81.9	85.3
Least interorbital distance	8	55.8	60.9	6	58.0	62.7	17	57.1	62.4	6	59.4	62.2
Horizontal orbit diameter	8	16.0	19.7	6	14.4	19.2	17	14.3	20.3	6	15.6	18.6
Snout length	8	43.4	48.4	6	45.4	46.9	17	44.4	48.1	6	46.1	46.9
Least internareal distance	8	35.4	39.1	6	35.6	40.1	17	36.4	39.7	6	37.5	39.3
counts												
Upper series lateral scutes	8	26.0	26.0	6	26.0	27.0	17	26.0	27.0	6	26.0	27.0
Lower series lateral scutes	8	23.0	23.0	6	23.0	23.0	17	23.0	24.0	6	23.0	24.0
Preadipose azygous plates	8	8.0	13.0	6	9.0	12.0	17	9.0	13.0	6	9.0	11.0
Scutes along dorsal-fin base	8	8.0	9.0	6	8.0	9.0	17	8.0	9.0	6	8.0	9.0
Scutes adipose-caudal fins	8	6.0	6.0	6	5.0	6.0	17	5.0	7.0	6	5.0	6.0

branched, with about two thirds length of longest ray, followed by five branched rays. Mature females with small skin fold on external face of leading pelvic ray. Anal fin with two unbranched rays, well ossified but not pungent, and six branched rays. Adipose fin with pungent, depressible spine. Caudal fin forked or strongly concave.

Color in alcohol. Head, trunk and fins uniformly light brown or grayish, lighter ventrally. Head, trunk and fins covered with minute darker dots. Young specimens (about 20 mm SL) with light brown ground color and four or five dark transverse bands between dorsal-fin origin and caudal fin. With about 30 mm SL, however, the transverse bands are already reduced to small dark punctuations on head and trunk.

Comments. *Hoplosternum magdalenae* occurs west of the Andes, in the Lago Maracaibo basin in Venezuela, and in the drainages of Río Sinu and Río Magdalena in Colombia (Fig. 4). This region is separated by the Sierra de Abibe and Serranía

de las Palomas from the Río Atrato basin, where *H. punctatum* occurs.

***Hoplosternum punctatum* Meek & Hildebrand**
(Fig. 6)

Hoplosternum punctatum Meek & Hildebrand, 1916: 264 (Panamá: Río Marte Arnade, 6 miles east of Panama City)

Material examined. Type-specimens: USNM 78378 (2), paratypes of *Hoplosternum punctatum*; Panama: Río Marte Arnade, a small stream about 6 miles East of Panama City.

Other specimens: CAS 76513 (4), AMNH 11580 (52), 11581 (1), MCP 17302 (4+4 c&s), USNM 226419 (1), 109129 (1), UMMZ 217258 (1), 217259 (1), 217245 (1), 217300 (4).

Diagnosis. No uniquely derived features were found to diagnose *H. punctatum*.

This species is readily distinguished from *H. littorale*, however, by possessing highly devel-

Table 2. (Continued).

rio Madeira			Pará			Guianas			Río Orinoco			Trinidad		
n	low	high	n	low	high	n	low	high	n	low	high	n	low	high
15	72.3	148.6	17	66.0	143.0	10	66.4	137.2	15	83.5	144.6	8	78.2	150.3
15	29.9	33.7	17	29.5	33.3	10	29.3	33.4	15	29.0	33.3	8	28.6	32.7
15	46.3	50.0	17	46.2	50.2	10	44.5	49.4	15	45.1	49.8	8	43.1	49.0
15	47.4	54.6	17	47.8	51.9	10	48.0	53.8	15	48.5	52.0	8	45.6	51.5
15	81.9	85.0	17	80.6	84.6	10	81.6	84.2	15	82.6	86.6	8	81.0	84.5
15	88.1	93.5	17	89.4	93.1	10	89.5	92.7	15	86.0	93.8	8	88.0	91.7
15	8.9	12.6	16	8.8	13.6	10	9.0	12.0	15	10.7	14.3	8	9.3	11.3
15	8.7	14.9	13	8.9	13.5	9	7.1	13.3	15	8.3	13.0	6	9.2	13.0
15	8.2	11.7	14	8.8	13.8	9	9.6	14.0	14	7.9	11.0	7	8.2	11.3
15	14.7	17.8	17	14.9	17.9	10	15.2	18.6	15	14.7	16.4	8	14.8	18.0
15	23.2	27.5	17	24.9	30.6	10	25.0	28.7	15	22.4	27.2	8	24.1	28.2
15	18.7	21.7	17	18.7	22.4	10	19.6	22.1	15	18.7	22.2	8	19.9	21.7
15	24.0	27.5	17	24.4	27.3	10	24.2	26.6	15	25.7	27.8	8	24.1	26.9
15	28.5	35.1	17	28.5	32.7	10	27.5	32.7	15	27.9	34.0	8	26.6	31.5
15	37.4	59.8	13	31.1	68.2	8	40.5	55.0	11	38.7	58.4	7	37.8	63.9
15	76.8	87.3	17	78.9	85.8	10	79.3	88.4	15	77.6	86.3	8	80.6	86.8
15	55.1	62.1	17	57.4	62.9	10	57.1	65.6	15	59.0	67.5	8	61.5	64.6
15	16.5	21.4	17	15.5	21.3	10	15.7	21.1	15	16.1	19.7	8	16.0	20.3
15	44.6	48.1	17	43.7	47.6	10	45.2	48.9	15	47.2	52.8	8	45.2	48.9
15	34.6	39.9	17	35.6	39.5	10	36.2	38.7	15	35.1	38.1	8	35.3	38.1
15	26.0	27.0	17	26.0	27.0	10	26.0	27.0	15	26.0	27.0	8	25.0	26.0
15	23.0	23.0	17	23.0	23.0	10	23.0	23.0	15	23.0	23.0	8	22.0	23.0
15	8.0	11.0	17	8.0	12.0	10	10.0	14.0	15	5.0	9.0	8	8.0	15.0
15	8.0	9.0	17	8.0	9.0	10	8.0	9.0	15	8.0	9.0	8	8.0	9.0
15	5.0	7.0	17	6.0	6.0	10	6.0	6.0	15	5.0	7.0	8	6.0	6.0

oped coracoids, exposed on the ventral surface. From *H. magdalanae* it is distinguished by having the interopercle covered by skin and by the comparatively shallower caudal peduncle (14.3-17.2 % SL, vs. 17.4-19.5, in specimens larger than 55.0 mm SL).

Description. Morphometric data summarized in Table 4. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin straight to slightly convex. Largest recorded size 77.4 mm SL.

Head depressed; snout rounded in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch; upper barbel passing base of pectoral fin; lower barbel reaching base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, laterally placed; infraorbital bones comparatively small.

Coracoids well developed and exposed on ventral surface, usually overlapping in midline even in females. Upper lateral series with 25-27

scutes, 22-23 in lower series. Four to 7 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with strong spine, approximately half length of longest branched ray. Spine followed by one unbranched and seven branched rays. Pectoral fin with pungent spine and 8-10 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of fully developed nuptial males very elongated, reaching or slightly passing origin of pelvic fin. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Mature females with small skin fold on external face of leading pelvic ray. Anal fin with two unbranched rays, well ossified but not pungent, and six branched rays. Adipose fin with pungent, depressible spine. Caudal fin forked or strongly concave.

Table 3. Biometric data of *Hoplosternum magdalanae*.

	n	range		mean	SD
		low	high		
Standard length (mm)	13	58.5	95.8	81.6	11.639
percent of standard length					
Depth of body	13	29.6	32.8	30.9	0.894
Predorsal distance	13	43.2	48.0	45.4	1.692
Prepelvic distance	13	46.8	50.9	48.9	1.253
Preanal distance	13	81.3	84.9	83.1	1.349
Preadipose distance	13	87.5	90.2	88.9	0.982
Length of dorsal-fin spine	12	11.5	14.5	13.2	1.025
Length of anal-fin spine	13	7.9	11.5	8.9	1.038
Length of adipose-fin spine	12	8.8	12.1	9.7	0.915
Depth of caudal peduncle	13	15.5	19.5	16.9	1.214
Dorsal to adipose distance	13	24.2	30.2	27.1	1.727
Length of dorsal-fin base	13	18.4	20.9	19.5	0.637
Maximum cleithral width	13	25.1	28.6	26.5	0.953
Head length	13	26.8	31.1	28.4	1.441
Length of longer barbel	13	35.8	56.6	44.7	5.820
percent of head length					
Head depth	13	76.9	89.8	84.2	4.212
Least interorbital distance	13	69.0	73.2	71.0	1.267
Horizontal orbit diameter	13	16.7	23.1	19.8	2.174
Snout length	13	50.8	53.3	52.0	0.817
Least internareal distance	13	37.4	40.7	39.5	1.033
counts					
Upper series lateral scutes	13	26.0	27.0	26.1	0.277
Lower series lateral scutes	13	22.0	23.0	22.9	0.277
Preadipose azygous plates	13	3.0	7.0	5.3	1.182
Scutes along dorsal-fin base	13	8.0	8.0	8.0	0.000
Scutes adipose-caudal fins	13	6.0	7.0	6.2	0.376

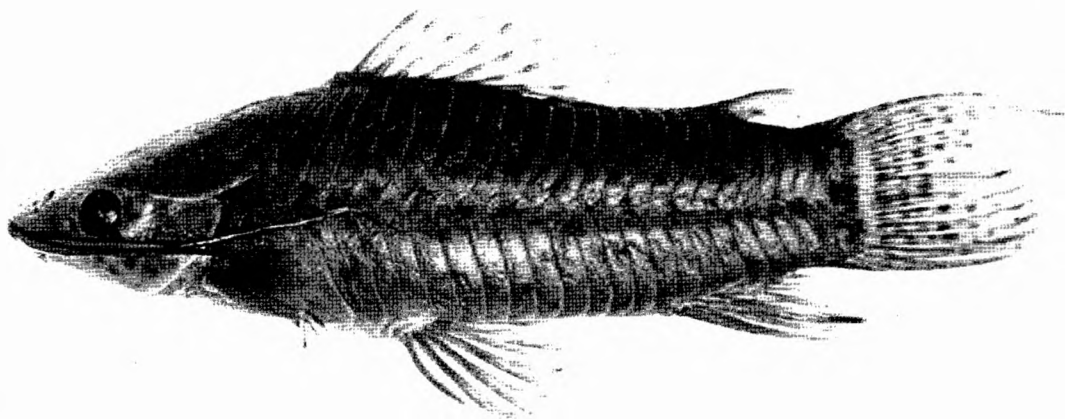


Fig. 6. *Hoplosternum punctatum*, UMMZ 217258, 54.5 mm SL; Panamá: Darien Province.

Color in alcohol. Head, trunk and fins uniformly light brown or grayish, lighter ventrally. Head, trunk and fins, especially dorsal and caudal fins, covered with minute darker dots. Area of skin

between posterior lateral scutes and base of middle caudal-fin rays strongly pigmented with brown, forming an elongated blotch on caudal-fin base. Color of young specimens unknown.

Table 4. Biometric data of *Hoplosternum punctatum*.

	n	range		mean	SD
		low	high		
Standard length (mm)	13	38.9	77.4	56.8	11.483
percent of standard length					
Depth of body	13	28.6	31.4	29.6	0.797
Predorsal distance	13	43.2	50.4	46.3	1.902
Prepelvic distance	13	45.9	52.9	50.1	2.318
Preanal distance	13	79.4	86.3	83.6	1.752
Preadipose distance	13	88.0	92.5	89.9	1.267
Length of dorsal-fin spine	12	12.2	14.6	13.3	0.776
Length of anal-fin spine	12	7.2	12.9	9.8	1.508
Length of adipose-fin spine	13	9.2	13.4	11.1	1.217
Depth of caudal peduncle	13	14.3	19.5	16.7	1.390
Dorsal to adipose distance	13	24.8	31.1	27.6	1.931
Length of dorsal-fin base	13	17.8	21.1	19.2	0.779
Maximum cleithral width	12	24.7	27.0	26.1	0.628
Head length	13	26.6	34.2	29.9	2.184
Length of longer barbel	12	42.4	59.0	48.6	5.318
percent of head length					
Head depth	13	73.0	85.9	78.5	3.707
Least interorbital distance	13	61.6	75.7	67.6	4.016
Horizontal orbit diameter	13	21.4	25.9	24.1	1.534
Snout length	13	47.1	53.0	50.9	2.018
Least internareal distance	13	37.7	42.5	39.9	1.544
counts					
Upper series lateral scutes	13	25.0	27.0	26.0	0.408
Lower series lateral scutes	13	22.0	23.0	22.8	0.439
Preadipose azygous plates	13	4.0	7.0	5.2	0.832
Scutes along dorsal-fin base	13	7.0	8.0	7.8	0.439

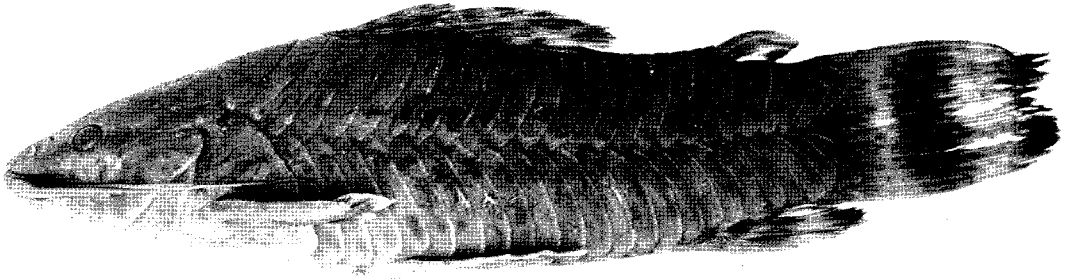


Fig. 7. *Megalechis thoracata*, UMMZ 205104, 81.8 mm SL; Bolivia: Beni: mouth of Arroyo Grande.

Comments. This species is only found in the Río Atrato basin in Colombia and in the Pacific coastal drainages of Panamá, in southern Central America (Fig. 4).

Hoplosternum punctatum is very similar to *H. magdalenae*, and both species have long been considered conspecific. Beside the characters described above, this species can also be distinguished from other *Hoplosternum* species by its small adult size. *Hoplosternum punctatum* is the smallest species in this genus, the smallest mature male examined being 56.1 mm SL (CAS 76513).

Megalechis, new genus

Type-species. *Callichthys thoracatus* Valenciennes, 1840.

Diagnosis. No uniquely derived features were found to diagnose *Megalechis*. Greatly elongated pectoral-fin spine in fully developed mature males is a derived feature of *Megalechis*, but this character is shared with *H. littorale*.

Megalechis can be further distinguished from *Dianema* and *Hoplosternum* by its rounded or emarginated caudal fin. From *Callichthys* it is distinguished by its exposed infraorbital bones, and from *Lepthoplosternum* by possession of dorsal and anal fins with two unbranched rays preceding the branched rays.

Etymology. From the Greek *me-gas*, large and *le-kis*, plate, in allusion to the extreme development of the coracoids on breast of fully developed males. Gender feminine.

Key to the species of *Megalechis*

1. - Caudal fin with a conspicuous vertical dark band, posterior border of caudal fin also dark; anal fin usually with five branched rays; dorsal-fin spine comparatively longer (52.0-64.0 % of dorsal-fin base in specimens of 90 mm SL or larger) (Amazonas, Orinoco and coastal drainages of Guianas).
..... *M. thoracata*
- Caudal fin grayish, with a lighter band on base of rays and sometimes darker punctuations in the middle, forming a faint transverse bar; anal fin usually with six branched rays; dorsal-fin spine comparatively shorter (32.0-47.0 % of dorsal-fin base in specimens of 90 mm SL or larger) (Amazonas, Orinoco, coastal drainages of Guianas and northeastern Brazil)
..... *M. personata*

Megalechis thoracata (Valenciennes) (Figs. 7-8)

Callichthys thoracatus Valenciennes, in Cuvier & Valenciennes, 1840: 309 (French Guiana: Mana)

Callichthys longifilis Valenciennes, in Cuvier & Valenciennes, 1840: 317 (French Guiana: Cayenne)

Callichthys pictus Müller & Troschel, 1848: 630 (British Guiana)

Callichthys sulcatus Kner, 1855: 110 (Brazil: Amazonas: Marabitanas)

Hoplosternum orinocoï Fowler, 1915: 229 (Venezuela: La Pedrita: Caño Ura-coa, delta do rio Orinoco)

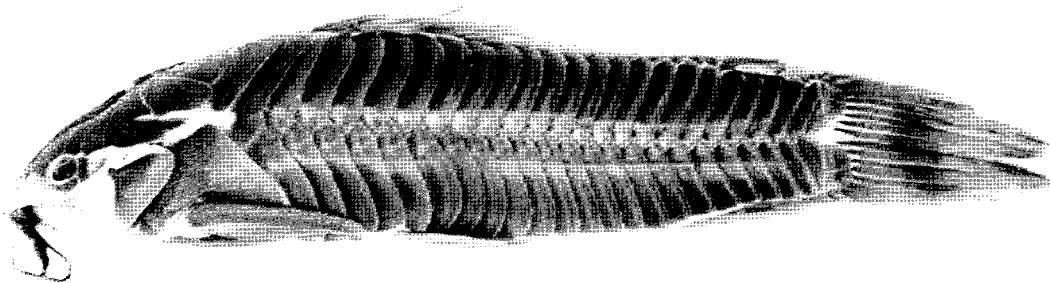


Fig. 8. *Megalechis thoracata*, ZMB 3151, 141.4 mm SL, holotype of *Callichthys pictus*; British Guiana (photograph by H.-J. Paepke).

Material examined. Type-material: ZMB 3151, holotype of *Callichthys pictus*; British Guiana. - NMW 4775, lectotype of *Callichthys sulcatus* (present designation); NMW 47748 (1), paralectotype of *C. sulcatus*; Brazil: Amazonas: Marabitanas. - NMW 47767 (2), paralectotypes of *C. sulcatus*; Brazil: Roraima: rio Branco.

Other specimens: Rio Amazonas: USNM 264035 (11), 304430 (1), MCP 17305 (2+2 c&s), 17297 (1+1 c&s), CAS 76528 (3), 76531 (1), CAS-SU 33276 (1), 33278 (1), 33277 (1), 33275 (1), NRM 15429 (1), 15428 (2), 15422 (5), 15421 (3), 15424 (5), 7016 (1), ANSP 167693 (6), ROM 56330 (1), 56454 (1), UMMZ 167966 (1), MZUSP 26111 (1), 26020 (1), MCZ 8260 (5), 8270 (5), 8246 (5), 8226 (6), 8251 (10), 8238 (6), 8218 (8), MZUSP 19307 (1), 6347 (4), 24657 (9), 6110 (2), 24623 (1), 6783 (1), 6831 (1), 23504 (7), 15579-15584 (4), 23855 (5), 9460 (4), 25451 (30+3 c&s), 35696 (3), 24219 (1), 23907 (2), 24678 (2).

Rio Madeira: AMNH 40029 (2), 77413 (1), 12701 (1), UMMZ 205104 (6), MCP 17309 (2), MNHN 465 (1), 464 (3), 229 (5).

Rio Orinoco: NRM 15430 (2), 15427 (3), ANSP 133138 (5), 162691 (6), CAS-SU 48662 (2), 48663 (5), 48661 (4), CAS 6538, 6542 (3), 6624 (1), MCP 17304 (3).

Coastal streams of Guiana: CAS-SU 21850 (2), ROM 61956 (3), 61955 (1), NMW 46248 (1), 46246 (5), UMMZ 215875 (1), CAS 76527 (5).

Diagnosis. No uniquely derived features were found to diagnose *M. thoracata*.

This species is readily distinguished from *M. personata*, however, by possessing a transverse band and the distal border of caudal fin conspicuously dark, by having usually five branched anal-fin rays, and by the comparatively longer dorsal-fin spine (52.0-64.0 % of dorsal-fin base in specimens with 90 mm SL or larger).

Description. Morphometric data summarized in Table 5. Body elongated, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin straight to slightly convex. Largest recorded size 155.2 mm SL.

Head depressed; snout rounded or slightly triangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch;

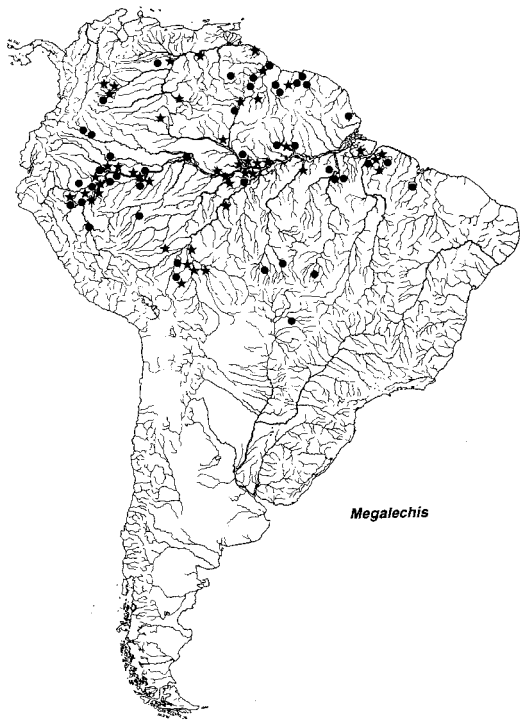


Fig. 9. Geographic distribution of the species of *Megalechis*. Dots: *M. personata*; and stars: *M. thoracata* (some symbols represent more than one collecting locality).

upper barbel reaching base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, laterally placed; infraorbital bones comparatively small.

Coracoids highly developed and exposed on ventral surface, meeting at midline in large specimens. Upper lateral series with 26-27 scutes, 22-24 in lower series. Five to 9 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to a single scute of upper lateral series.

Dorsal fin with strong spine, approximately half length of longest branched ray. Spine followed by one unbranched and 7-8 branched rays. Pectoral fin with one spine and 8-9 branched rays; spine with fleshy tip, with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of fully developed nuptial males very elongated, passing half length of pelvic fin. Pelvic fin rounded, inserted below third and fourth or fourth and fifth scute of lower lateral series; first ray unbranched, about two

thirds length of longest ray, followed by five branched rays. Anal fin with two unbranched rays, well ossified but not pungent, and five branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body usually with dark brown large blotches or irregular transversal stripes that fade and even disappear during growth. Furthermore, body and fins, including skin of ventral portion of head and abdomen with many small darker dots, smaller dorsally on body. Caudal fin with medial portion and distal tip of rays and adjoining membrane strongly pigmented with dark brown, forming both a wide medial transverse and a narrow apical band. Young specimens (about 20 mm SL) light brown in ground color, with four or five dark transverse bands between dorsal-fin origin and caudal fin. During growth the transverse bands become fragmented and

Table 5. Biometric data of *Megalechis thoracata*.

	n	range		mean	SD
		low	high		
Standard length (mm)	61	43.6	155.2	78.1	26.230
percent of standard length					
Depth of body	61	23.2	29.4	26.7	1.364
Predorsal distance	61	41.1	48.3	44.8	1.846
Prepelvic distance	61	44.2	54.9	50.3	2.104
Preanal distance	61	83.0	88.7	86.0	1.364
Preadipose distance	61	87.4	92.6	90.3	1.370
Length of dorsal-fin spine	61	9.8	13.9	11.9	1.007
Length of anal-fin spine	51	9.5	17.2	13.4	1.696
Length of adipose-fin spine	59	9.8	13.9	11.4	0.926
Depth of caudal peduncle	61	15.0	19.3	17.1	0.923
Dorsal to adipose distance	61	22.5	31.0	26.9	1.698
Length of dorsal-fin base	61	17.6	22.9	19.9	1.048
Maximum cleithral width	61	24.9	28.9	27.0	0.834
Head length	61	24.1	31.9	29.3	1.782
Length of longer barbel	58	37.3	77.2	56.0	7.598
percent of head length					
Head depth	61	67.5	87.4	75.1	4.271
Least interorbital distance	61	55.3	71.4	61.6	3.016
Horizontal orbit diameter	61	14.4	21.1	17.5	1.561
Snout length	61	45.1	54.8	49.9	2.354
Least internareal distance	61	41.0	48.7	45.1	1.814
counts					
Upper series lateral scutes	61	26.0	27.0	26.3	0.460
Lower series lateral scutes	61	22.0	24.0	23.0	0.288
Preadipose azygous plates	61	5.0	9.0	7.6	0.901
Scutes along dorsal-fin base	61	7.0	9.0	8.1	0.359
Scutes adipose-caudal fins	61	4.0	6.0	5.5	0.535

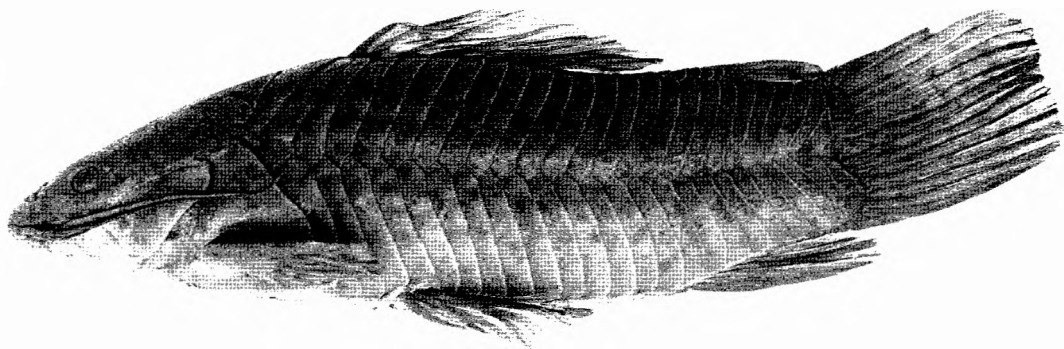


Fig. 10. *Megalechis personata*, USNM 305859, 100.7 mm SL; Bolivia: Beni: 40 km east of San Borja.

irregular, resulting in the pattern described above. One specimen of 25 mm SL (MZUSP 26111) already shows the characteristic dark bands on caudal fin.

Comments. This species is distributed east of the Andes in the northern portion of South America, including the rio Amazonas and Río Orinoco as well as the coastal drainages of the Guianas (Fig. 9).

The lectotype of *Callichthys sulcatus* Kner, 1855 (NMW 47755) is herein designated and the type-locality is thus restricted to Marabitanas, Amazonas, Brazil. There are two localities named Marabitanas in the Amazon, one in Amazonas State and other in Pará State. The type-locality of *Callichthys sulcatus*, however, can be easily identified by following the travel of Johann Natterer in Brazil, collector of the syntypes, as described by Papavero (1971).

Callichthys longifilis is only tentatively placed as a synonym of this species, as little evidence is found in the original description and the type-specimens was not available for a direct examination. A close inspection of the type can show that it is actually synonym of *M. personata*.

***Megalechis personata* (Ranzani)**
(Figs. 10-11)

Callichthys personatus Ranzani, 1841: 62 (Brazil)
Hoplosternum thoracatum surinamensis Hoedeman,
1952: 5-7 (Suriname)

Callichthys exaratus Müller & Troschel, 1848: 630
(British Guiana)

Material examined. Type-material: ZMB 3150, holotype of *Callichthys exaratus*; Guiana. - ZMA 100292, holotype of *Hoplosternum thoracatum surinamensis*; ZMA 100295 (2), 100297 (1), 100300 (1), paratypes of *H. t. surinamensis*; Suriname. - ZMA 100298 (1), 100299 (5), paratypes of *H. t. surinamensis*; Suriname: Paramaribo. - ZMA 100301 (1), paratype of *H. t. surinamensis*; West-Indies.

Other specimens: rio Amazonas:

USNM 311311 (1), 167880 (4), 199179 (8), 305859 (1), 317951 (1), 34577 (3), 304580 (1), NRM 15426 (1), 15436 (1), 7017 (1), NMW 47794 (3), 47791 (1), 46261 (1), 46253 (1), MHNG 1583.70 (1), 2157.25 (2), MCP 17306 (1), 17308 (2), CAS 76526 (3), 76529 (2), 76530 (2), CAS-SU 36203 (1), 52602 (1), 22156 (2), MZUSP 38704 (1), 26642 (4), 26020 (7), 26424 (3), 30848 (25), 30849 (26), 30854 (1), 30853 (1), 30851 (2), 38250 (2), 22455 (4), 23346 (3), 23423 (2), 23370 (2), 22593 (2), 19307 (2), 24657 (6), 30852 (1), 22294 (2), 23856 (2), 5004 (1), 36865 (7), 35632 (4), 23901 (8), 15579-15584 (2), ROM 56401 (1), MCZ 8219 (5).

Northeastern Brazil streams: MZUSP 43601 (1), CAS-SU 22163 (3).

Coastal streams of the Guianas: USNM 167881 (2), USNM 225541 (2), 225544 (1), 225543 (1), CAS 76532 (3), 76533 (3), 76534 (2), AMNH 38204 (4), 17636 (1), NMW 46240 (2), ZMB 8435 (3), 3147 (1), 19612 (1), ZMA 102238b (2 of 3 paratypes of *Hoplosternum thoracatum cayennae*).

Río Orinoco: CAS-SU 53801 (1), CAS 65011 (2), MCP 17303 (2+2 c&s, formerly ANSP 165468).

Río Paraguai: MZUSP 25262 (1).

Diagnosis. No uniquely derived features were found to diagnose *M. personata*.

It is readily distinguished from *M. thoracata*,

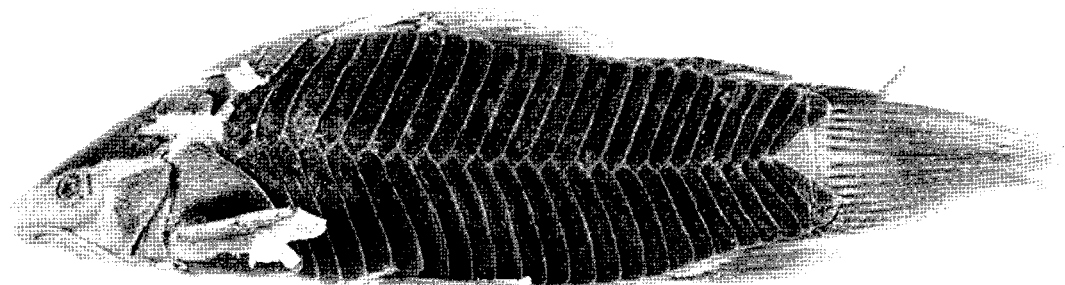


Fig. 11. *Megalechis personata*, Mus. Zool. Bologna 100934, 90.4 mm SL, holotype of *Callichthys personatus*; Brazil (photograph C. Weber).

however, by lacking (of having a faint) transverse pigment band and distal border on the caudal fin, by having usually six branched anal-fin rays, and by the comparatively shorter dorsal-fin spine (32.0-47.0 % of dorsal-fin base in specimens of 90 mm SL or larger).

Description. Morphometric data summarized in Table 6. Body elongate, slightly compressed.

Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin usually convex. Largest recorded size 124.2 mm SL.

Head depressed; snout rounded or slightly triangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch; upper barbel reaching base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partial-

Table 6. Biometric data of *Megalechis personata*.

	n	range		mean	SD
		low	high		
Standard length (mm)	55	50.8	124.2	81.4	21.178
percent of standard length					
Depth of body	55	24.6	30.4	28.1	1.235
Predorsal distance	55	41.9	47.8	44.8	1.300
Prepelvic distance	55	46.0	55.5	50.8	1.808
Preanal distance	55	81.9	88.8	85.4	1.757
Preadipose distance	55	88.4	95.0	90.9	1.209
Length of dorsal-fin spine	54	7.1	12.2	9.5	1.236
Length of anal-fin spine	48	7.3	16.7	11.7	2.277
Length of adipose-fin spine	52	8.5	13.2	10.8	1.126
Depth of caudal peduncle	55	15.6	21.3	18.4	1.292
Dorsal to adipose distance	55	22.6	30.9	26.3	1.809
Length of dorsal-fin base	55	19.6	24.6	22.3	1.061
Maximum cleithral width	55	23.8	29.4	26.1	1.138
Head length	55	25.9	33.5	29.5	1.622
Length of longer barbel	47	33.2	66.5	50.3	6.934
percent of head length					
Head depth	55	69.7	85.4	79.2	3.965
Least interorbital distance	54	55.3	71.3	63.2	3.307
Horizontal orbit diameter	55	14.9	20.9	17.8	1.295
Snout length	55	43.8	54.5	49.3	2.161
Least internareal distance	55	38.3	46.2	43.5	1.622
counts					
Upper series lateral scutes	55	26.0	27.0	26.6	0.485
Lower series lateral scutes	55	23.0	24.0	23.2	0.417
Preadipose azygous plates	54	5.0	10.0	7.7	1.188
Scutes along dorsal-fin base	55	8.0	9.0	8.5	0.503
Scutes adipose-caudal fins	54	5.0	7.0	5.7	0.514

ly exposed, interopercle covered by skin. Eyes small, dorso-laterally placed; infraorbital bones comparatively small.

Coracoids highly developed and exposed on ventral surface, meeting and sometimes overlapping at midline in large specimens. Upper lateral series with 26-27 scutes, 23-24 in lower series. Five to 10 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to a single scute of upper lateral series.

Dorsal fin with strong spine, shorter than half length of longest branched ray; spine followed by one unbranched and 7 branched rays. Pectoral fin with one spine and 9-10 branched rays; spine with fleshy tip, with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of fully developed nuptial males very elongated, passing half length of pelvic fin. Pelvic fin rounded, inserted below third and fourth or fourth and fifth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Anal fin with two unbranched rays, well ossified but not pungent, and six branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body usually with pattern of dark brown large blotches or irregular transverse stripes that fade and may disappear during growth. Furthermore, body and fins, including skin of ventral portion of head and abdomen with many small darker dots, these dots smaller dorsally. Caudal fin homogeneously grayish, with a lighter band on base of rays and usually with darker punctuations more distally, sometimes forming a faint vertical bar. Young specimens (about 20 mm SL) light brown in ground color with four or five dark transverse bands between dorsal-fin origin and caudal fin. During growth the transverse bands become fragmented and irregular, resulting in the pattern described above. Caudal fin of young is homogeneously dark.

Comments. As with *M. thoracata*, this species is distributed east of the Andes in the northern portion of South America, including the rio Amazonas and Río Orinoco as well as the coastal drainages of the Guianas (Fig. 9). One single specimen of *M. personata*, however, was apparently collected in the rio Paraguay system (MZUSP 25262).

I was unable to examine the holotype of *Callichthys personatus* (Mus. Zool. Bologna 100934) but a photograph and measurements taken by Claude Weber (MHNG) allowed a precise identification. Two of the three paratypes of *H. thoracatum cayennae* (synonym of *H. littorale*) in lot ZMA 102238b are actually *M. personata*.

Lepthoplosternum, new genus

Type-species. *Callichthys pectoralis* Boulenger, 1895.

Diagnosis. A small notch on lower lip, lateral to the median notch, forming a small fleshy projection on each side of lip is unique to *Lepthoplosternum*.

The anal fin having a single unbranched ray preceding the branched ones is also a derived feature of this genus, but this character is also shared with some, but not all, species of *Corydoras*.

Etymology. From the Greek *leptos*, meaning small and delicate, and *Hoplosternum*. Gender neutral.

Comments. Unlike all other genera of the subfamily Callichthyinae, the species of *Lepthoplosternum* are not present in the northern portion of the South American continent, north of the rio Amazonas (Fig. 12). The species are found in the upper Río Amazonas in Peru, middle rio Madeira, rio Paraguay and in the laguna dos Patos drainage, in southern Brazil. The species of *Lepthoplosternum* are traditionally known, especially in the world-wide aquarium trade, as 'dwarf hoplos' and are frequently identified as *Hoplosternum pectorale*.

Key to the species of *Lepthoplosternum*

1. - First dorsal-fin ray (including fleshy tip) comparatively longer (60.2-79.8 % HL).
..... 2
- First dorsal-fin ray (including fleshy tip) comparatively shorter (42.6-60.0 % HL).
..... 3
2. - First dorsal-fin ray almost as long as the second ray (20.5-24.7 % SL); caudal peduncle comparatively deeper (22.7-25.2 % SL); body comparatively narrower (cleithral



Fig. 12. Geographic distribution of the species of *Lophoplosternum*. Stars: *L. altamazonicum*; circles: *L. beni*; dots: *L. pectorale*; and asterisks: *L. tordilho* (some symbols represent more than one collecting locality).

width 79.3-90.8 % HL) (Upper Río Amazonas in Peru).

- *L. altamazonicum*
- 3. - First dorsal-fin ray comparatively shorter (16.5-20.2 % SL); caudal peduncle comparatively lower (17.6-22.8 % SL); body comparatively wider (cleithral width 94.7-107.4 % HL) (Río Madeira system in the region of Beni, Bolivia).
..... *L. beni*
- 3. - Body comparatively narrower (cleithral width 26.3-28.6 % SL); 25-26 scutes on upper lateral series; 22-23 on lower (Rio Paraguay system).
..... *L. pectorale*
- Body comparatively wider (cleithral width 29.3-30.0 % SL); 24 scutes on upper lateral series; 21 on lower (Laguna dos Patos system).
..... *L. tordilho*

Lophoplosternum pectorale (Boulenger)
(Fig. 13)

Callichthys pectoralis Boulenger, 1895: 525 (Paraguay: Chaco: Monte Sociedad)

Material examined: MZUSP 35905 (1), 25133 (1), 25142 (11), CAS 76517 (1), 76515 (2), 76514 (2), AMNH 1446 (1), NMW 46264 (1), 46244 (1), UMMZ 207826 (1), 207371 (9), 206258 (1), 208109 (1), 206976 (1), MHNG 1554.29-32 (4), 2206.11 (2), 2166.100 (2), 2348.98 (1), 2166.99 (3+1 c&s), 2486.71-72 (2), USNM 232286 (4), 304581 (3).

Diagnosis. No uniquely derived features were found to diagnose *L. pectorale*.

This species is readily distinguished from *L. altamazonica* and *L. beni* by its comparatively shorter first dorsal-fin ray (42.6-60.0 % HL), and from *L. tordilho* by the comparatively narrower body (cleithral width 26.3-28.6 % SL) and by the higher counts of lateral scutes (25-26 in upper and 22-23 in lower series).

Description. Morphometric data summarized in Table 7. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin usually straight, sometimes slightly convex. Largest recorded size 60.3 mm SL.

Head depressed; snout rounded or slightly quadrangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch and small, additional lateral notch, forming a small fleshy projection on each side; upper barbel passing base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, latero-dorsally placed; infraorbital bones comparatively small.

Coracoids exposed on ventral surface, covered by skin antero-medially and sometimes meeting each other anteriorly in mature males. Upper lateral series with 25-26 scutes, 22-23 in lower series. Five or 6 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with delicate, pungent spine, about half length of longest branched ray; spine followed by 7 branched rays. Pectoral fin with one spine and 8-9 branched rays; spine with stronger

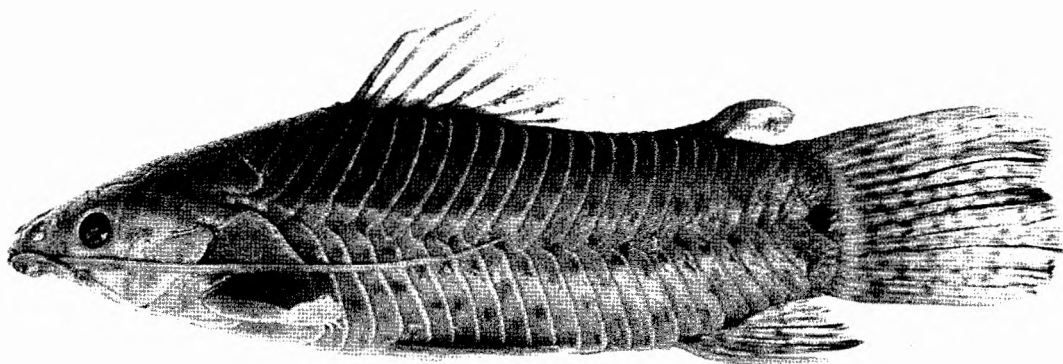


Fig. 13. *Lepthoplosternum pectorale*, MHNG 2166.100, 49.1 mm SL; Paraguay: Estero Patino.

odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of nuptial males thickened but not elongated. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Anal fin with one single unbranched ray, well ossified but not pungent, and

five branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body, fins and skin of underparts of head and abdomen covered with small dark brown

Table 7. Biometric data of *Lepthoplosternum pectorale*.

	n	range		mean	SD
		low	high		
Standard length (mm)	11	42.3	60.3	49.5	6.059
percent of standard length					
Depth of body	11	27.5	31.7	28.8	1.366
Predorsal distance	11	42.1	47.0	44.4	1.549
Prepelvic distance	11	46.6	52.8	50.3	1.692
Preanal distance	11	82.7	85.8	84.8	0.943
Preadipose distance	11	87.9	90.9	89.5	0.893
Length of dorsal-fin spine	11	12.5	17.4	15.3	1.390
Length of anal-fin spine	11	16.1	20.5	18.4	1.234
Length of adipose-fin spine	11	10.0	12.7	11.3	0.908
Depth of caudal peduncle	11	18.7	21.1	20.0	0.666
Dorsal to adipose distance	11	23.5	26.7	24.9	1.098
Length of dorsal-fin base	11	20.0	23.4	21.5	0.929
Maximum cleithral width	11	26.3	28.6	27.4	0.641
Head length	11	26.9	30.3	28.7	1.079
Length of longer barbel	11	56.0	71.9	67.6	4.528
percent of head length					
Head depth	11	76.5	86.6	79.9	2.969
Least interorbital distance	11	61.0	67.5	64.7	1.731
Horizontal orbit diameter	11	17.6	21.1	18.9	1.157
Snout length	11	46.0	50.8	47.7	1.482
Least internareal distance	11	41.9	44.8	43.7	0.802
counts					
Upper series lateral scutes	11	25.0	26.0	25.5	0.522
Lower series lateral scutes	11	22.0	23.0	22.2	0.405
Preadipose azygous plates	11	5.0	6.0	5.8	0.405
Scutes along dorsal-fin base	11	8.0	9.0	8.1	0.302
Scutes adipose-caudal fins	11	4.0	6.0	5.0	0.447

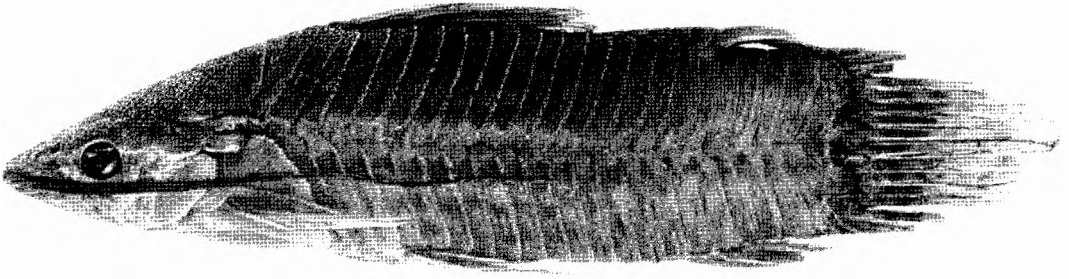


Fig. 14. *Leptoplosternum altamazonicum*, MHNG 2551.01, 50.3 mm SL, holotype; Peru: Pucallpa: Río Ucayali.

roundish dots. Caudal fin homogeneously grayish or brownish, with a lighter band on base of rays and small darker punctuations more distally, sometimes arranged in sinuous vertical lines. Smallest specimen examined (18.3 mm SL) have a color pattern similar to that found in adults, but with comparatively larger and less numerous darker dots.

Comments. *Leptoplosternum pectorale* seems to be the widest distributed species of this genus, occurring in the rio Paraguay drainage in Brazil, Paraguay and Argentina (Fig. 12). This species has been traditionally confused with *M. thoracata*, which is not common in the rio Paraguay drainage.

Leptoplosternum altamazonicum,
new species
(Fig. 14)

Holotype. MHNG 2551.01, 50.3 mm SL, male; Peru: Pucallpa: Río Ucayali; 13 Oct 1981, F. Dolores.

Paratypes. MHNG 2388.94 (6), 30.7-42.7 mm SL, MCP 17313 (1+2 c&s), 44.2 mm SL; collected with the holotype. - MZUSP 26425 (1), 33.7 mm SL; Peru: Pucallpa: Río Ucayali; 20 Jan 1975, H. Ortega. - MHNG 2157.23 (2), 23.6-26.5 mm SL, MCP 17301 (2), 24.5-27.2 mm SL; Peru: Jenaro Herrera: Supay; 20 Jun 1978, P. de Rham. - USNM 284581 (1), 21.4 mm SL; Peru: Loreto: creek entering Río Manite about 10 km upriver of junction of Río Manite and Río Amazonas; 21 Aug 1986, R. P. Vari, H. Ortega & A. Gerberich. - CAS-SU 58853 (1), 31.1 mm SL; Peru: Loreto: Río Ampiyacu; 20 Nov 1940, W. G. Scherer. - NRM 15420 (3), 26.8-40.0 mm SL, MCP 17296 (1), 29.1 mm SL; Peru: Loreto: Sacarita del Tuyé, opposite to Pebas, Río

Ampiyacu drainage; 12 Aug 1981, S. O. Kullander et al. - MHNG 2157.26 (1), 27.4 mm SL; Peru: Padre Isla: Cocha Largo; 14 Jul 1980, P. de Rham.

Diagnosis. No uniquely derived features were found to diagnose *L. altamazonicum*.

This species is readily distinguished from *L. pectorale* and *L. tordilho* by its comparatively longer first dorsal-fin ray (60.2-79.8 % HL). From *L. beni* it is distinguished by possessing the first dorsal-fin ray almost as long as the second ray (20.5-24.7 % SL), by the comparatively deeper caudal peduncle (22.7-25.2 % SL), and by its narrower body (cleithral width 79.3-90.8 % HL).

Description. Morphometric data summarized in Table 8. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin usually straight. Caudal peduncle comparatively very deep. Largest recorded size 50.3 mm SL.

Head depressed; snout rounded or slightly quadrangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch and small, additional lateral notch, forming a small fleshy projection on each side; upper barbel passing base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, dorso-laterally placed; infraorbital bones comparatively small.

Coracoids exposed on ventral surface, covered by skin antero-medially and sometimes meeting each other anteriorly in mature males. Upper lateral series with 25-26 scutes, 21-23 in lower series. Five to 7 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with delicate, pungent spine, about two thirds length of longest branched ray; spine usually followed by 7 branched rays. Pectoral fin with one spine and 8-9 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of nuptial males thickened but not elongated. Pelvic fin rounded, inserted below third and fourth or fourth and fifth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Anal fin with one single unbranched ray, well ossified but not pungent, and five branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body, fins and skin of underparts of head and abdomen covered with small dark brown roundish dots. Area of skin between last lateral scutes and base of middle caudal-fin rays pigmented with brown. Caudal fin homogeneously

grayish or brownish, with a lighter band on base of rays and small darker punctuations more distally, sometimes arranged in sinuous vertical lines. Color pattern of young unknown.

Comments. *Lepthoplosternum altamazonicum* is only found in upper Rio Amazonas drainage, in Peru (Fig. 12).

Etymology. Specific epithet in allusion to the area of endemism of the species, the upper Rio Amazonas. An Adjective.

Lepthoplosternum beni, new species
(Fig. 15)

Holotype. USNM 329424, 44.7 mm SL, mature male; Peru: Madre de Dios: Tambopata Reserve (12°15'S 69°17'W); 5 Nov 1979, R. McDiarmid.

Paratypes. USNM 304582 (2), 41.4-43.7 mm SL, MCP 17299 (1), 50.3 mm SL; collected with the

Table 8. Biometric data of *Lepthoplosternum altamazonicum*.

	n	range		mean	SD
		low	high		
Standard length (mm)	8	37.0	50.3	41.5	4.216
percent of standard length					
Depth of body	8	26.2	29.3	28.0	0.859
Predorsal distance	8	42.8	46.3	45.0	1.215
Prepelvic distance	8	49.5	53.2	52.0	1.127
Preanal distance	8	82.9	88.0	85.8	1.687
Preadipose distance	8	87.7	90.3	88.9	1.192
Length of dorsal-fin spine	7	20.5	24.7	22.2	1.503
Length of anal-fin spine	5	15.1	21.2	18.0	2.474
Length of adipose-fin spine	8	13.3	16.8	15.2	1.122
Depth of caudal peduncle	8	22.7	25.2	23.5	0.812
Dorsal to adipose distance	8	18.8	24.5	22.0	1.717
Length of dorsal-fin base	8	20.8	25.3	22.1	1.431
Maximum cleithral width	8	24.9	27.7	26.3	0.889
Head length	8	29.4	31.4	30.5	0.771
Length of longer barbel	4	70.3	90.0	80.1	9.162
percent of head length					
Head depth	8	71.6	78.3	76.0	2.240
Least interorbital distance	8	66.4	73.1	70.0	2.316
Horizontal orbit diameter	8	20.8	23.3	21.7	0.790
Snout length	8	50.0	53.8	51.7	1.425
Least internareal distance	8	44.0	49.6	46.3	1.919
counts					
Upper series lateral scutes	8	25.0	26.0	25.1	0.354
Lower series lateral scutes	8	21.0	23.0	21.5	0.756
Preadipose azygous plates	8	5.0	7.0	5.4	0.744
Scutes along dorsal-fin base	8	8.0	9.0	8.4	0.518
Scutes adipose-caudal fins	8	5.0	6.0	5.5	0.535

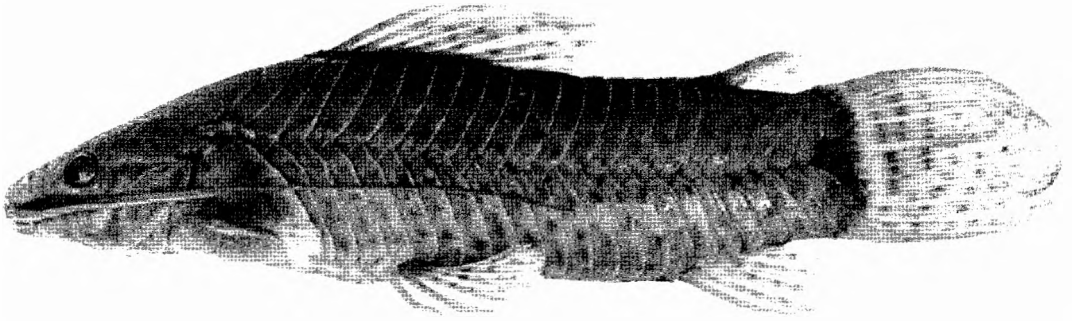


Fig. 15. *Lepthoplosternum beni*, USNM 329424, 44.7 mm SL, holotype; Peru: Madre de Dios: Tambopata Reserve.

holotype. - USNM 302284 (12), 26.4-33.0 mm SL; Bolivia: Beni: E. B. B. Campamento Trapiche La Pascana (former course of Río Maniqui); 2 Aug 1988, R. Vasquez & L. Torres. - USNM 302276 (2), 31.2-34.3 mm SL; Bolivia: Beni: E. B. B. Campamento Trapiche 500 m upstream bridge of Río Curiraba; 24 Jul 1988, H. Ortega et al. - AMNH 58760 (4), 24.0-42.5 mm SL; Bolivia: Beni: Río Mamoré; 27 Sep 1965, S. Anderson. - USNM

305858 (26), 25.3-45.2 mm SL, MCP 17300 (4+2 c&s), 38.4-44.3 mm SL; Bolivia: Beni: E. B. B. Campamento Trapiche La Pascana (former course of Río Maniqui); 30 Jul 1988, H. Ortega, H. Quintana & R. Zamuriano.

Diagnosis. No uniquely derived features were found to diagnose *L. beni*.

This species is readily distinguished from

Table 9. Biometric data of *Lepthoplosternum beni*.

	n	range		mean	SD
		low	high		
Standard length (mm)	10	38.4	50.3	42.8	3.401
percent of standard length					
Depth of body	10	26.6	29.3	28.3	0.818
Predorsal distance	10	42.9	46.0	44.2	0.918
Prepelvic distance	10	48.8	52.6	50.6	1.229
Preanal distance	10	83.3	87.1	84.6	1.131
Preadipose distance	10	86.8	91.1	89.4	1.286
Length of dorsal-fin spine	10	16.5	20.2	17.9	1.124
Length of anal-fin spine	9	17.9	20.8	19.7	1.097
Length of adipose-fin spine	10	9.3	13.7	12.0	1.460
Depth of caudal peduncle	10	17.6	22.8	19.9	1.678
Dorsal to adipose distance	10	21.2	27.3	24.9	2.083
Length of dorsal-fin base	10	21.3	23.4	22.3	0.715
Maximum cleithral width	10	27.1	29.1	28.3	0.674
Head length	10	27.0	29.7	28.3	0.863
Length of longer barbel	10	59.6	86.1	73.1	7.944
percent of head length					
Head depth	10	73.6	81.4	78.6	2.235
Least interorbital distance	10	62.4	75.6	67.8	4.335
Horizontal orbit diameter	10	19.3	21.9	20.6	0.974
Snout length	10	47.2	53.7	49.4	1.893
Least internareal distance	10	42.3	50.4	45.3	2.395
counts					
Upper series lateral scutes	10	24.0	25.0	24.9	0.316
Lower series lateral scutes	10	21.0	22.0	21.6	0.516
Preadipose azygous plates	10	4.0	8.0	5.7	1.337
Scutes along dorsal-fin base	10	7.0	9.0	8.2	0.632
Scutes adipose-caudal fins	10	4.0	6.0	5.2	0.632

L. pectorale and *L. tordilho* by its comparatively longer first dorsal-fin ray (60.2-79.8 % HL). From *L. altamazonicum* it is distinguished by the first dorsal-fin ray comparatively shorter (16.5-20.2 % SL), by the shallower caudal peduncle (17.6-22.8 % SL), and by its wider body (cleithral width 94.7-107.4 % HL).

Description. Morphometric data summarized in Table 9. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin usually straight or slightly convex. Largest recorded size 50.3 mm SL.

Head depressed; snout rounded or slightly quadrangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch and small, additional lateral notch, forming a small fleshy projection on each side; upper barbel passing base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, latero-dorsally placed; infraorbital bones comparatively small.

Coracoids exposed on ventral surface, covered by skin antero-medially and almost meeting each other anteriorly in mature males. Upper lateral series with 24-25 scutes, 21-22 in lower series. Four to 8 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with delicate, pungent spine, about half length of longest branched ray; spine usually followed by 7 branched rays. Pectoral fin with one spine and 7-8 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of nuptial males thickened but not elongated. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Anal fin with one single unbranched ray, well ossified but not pungent, and five branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body, fins and skin of underparts of head and abdomen covered with small dark brown roundish dots. Area of skin between last lateral

scutes and base of middle caudal-fin rays pigmented with brown. Caudal fin homogeneously grayish or brownish, with a lighter band on base of rays and small darker punctuations more distally, sometimes arranged in sinuous vertical lines. Smallest specimen examined (23.6 mm SL) has color pattern similar to that found in adults.

Comments. *Lepthoplosternum beni* is distributed in the Río Mamoré system, Río Madeira drainage, in the Beni region of Bolivia and Peru (Fig. 12).

Etymology. Specific epithet in allusion to the area of endemism of the species, the Río Mamoré drainage in the region of Beni, Bolivia. A noun in apposition.

Lepthoplosternum tordilho, new species
(Fig. 16)

Holotype. MCP 16310, 44.2 mm SL, mature male; Brazil: Rio Grande do Sul: marginal lagoon near sanga do Junco, on dust road between highway BR-116 and Barra do Ribeiro; 21 Oct 1987, L. R. Malabarba, F. G. Becker & M. Schneider.

Paratypes. UFRGS 4195 (1 c&s), 44.9 mm SL; collected with the holotype. - MCP 16308 (3), 27.5-43.8 mm SL, UFRGS 902 (2), 34.8-42.2 mm SL; Brazil: Rio Grande do Sul: small creek below road BR-290, 2 km West from junction with highway BR-116, rio Jacui drainage, Eldorado do Sul; 15 Oct 1980, L. R. Malabarba. - MCP 16309 (2 c&s), not measured, UFRGS 966 (2), 28.2-33.5 mm SL; Brazil: Rio Grande do Sul: creek at Granja Minuano, close to road BR-290, rio Jacui drainage, Eldorado do Sul; 25 Oct 1981, L. R. Malabarba, P. A. Buckup & R. E. Reis. - UFRGS 901 (1), 45.8 mm SL; Brazil: Rio Grande do Sul: small dam on road between Guaiba and highway BR-290, Eldorado do Sul; 4 Nov 1979, L. R. Malabarba, C. S. Souto, P. A. Buckup & P. Silveira.

Diagnose. No uniquely derived features were found to diagnose *L. tordilho*.

This species is readily distinguished from *L. altamazonicum* and *L. beni* by its comparatively shorter first dorsal-fin ray (42.6-60.0 % HL). From *L. pectorale* it is distinguished by its comparatively wider body (cleithral width 29.3-30.0 % SL), and by possessing 24 scutes in upper and 21 in lower lateral series.

Description. Morphometric data summarized in Table 10. Body elongate, slightly compressed. Trunk and caudal peduncle progressively more compressed towards caudal fin. Body profile between snout and dorsal-fin origin slightly convex. Largest recorded size 45.8 mm SL.

Head depressed; snout pointed or slightly quadrangular in dorsal view. Mouth slightly inferior; lower lip laminar with deep median notch and small, additional lateral notch, forming a small fleshy projection on each side; upper barbel passing base of pectoral fin; lower barbel passing base of pelvic fin. Opercle partially exposed, interopercle covered by skin. Eyes small, latero-dorsally placed; infraorbital bones comparatively small.

Coracoids exposed on ventral surface, covered by skin antero-medially and sometimes meeting each other anteriorly in mature males. Upper lateral series with 24 scutes, 21 in lower series. Three to 5 azygous plates between dorsal and adipose fins. Lateral line sensory canal reduced to one single scute of upper lateral series.

Dorsal fin with delicate, pungent spine, about half length of longest branched ray; spine usually followed by 7 branched rays. Pectoral fin with one spine and 7 branched rays; spine with stronger odontodes anteriorly and small retrorse hooks posteriorly. Pectoral spine of nuptial males thickened but not elongated. Pelvic fin rounded, inserted below third and fourth scute of lower lateral series; first ray unbranched, with about two thirds length of longest ray, followed by five branched rays. Anal fin with one single unbranched ray, well ossified but not pungent, and five branched rays. Adipose fin with pungent, depressible spine. Caudal fin emarginated or rounded.

Color in alcohol. Ground color of head, trunk and fins light brown, lighter or yellowish ventrally. Body, fins and skin of underparts of head and abdomen covered with small dark brown roundish dots. Area of skin between last lateral scutes and base of middle caudal-fin rays pigmented with brown. Caudal fin homogeneously grayish or brownish, with a lighter band on base of rays and small darker punctuations more distally, sometimes arranged in sinuous vertical lines. Color pattern of young unknown.

Comments. All lots now known of *L. tordilho* are from the type-locality or very close to it (Fig. 12),

but this species is presumably more widespread in the laguna dos Patos drainage. Its type-locality is a very small dam, but it is more frequently found in small creeks, usually modified for agricultural irrigation.

Etymology. Tordilho is a regional name for the horse color pattern consisting of a light brownish or grayish background with many small darker dots. It is given in allusion to the color pattern of the new species. A noun in apposition.

Biogeography

The patchy pattern of collecting efforts for fishes across South America limits a precise understanding of the historical biogeography of South American freshwater fishes, and may mask the actual areas of endemism of some species. In spite of this, the coincidence of the documented areas of endemism of some species with those for other fish taxa is noteworthy. The lack of a phylogeny completely resolved at the species level for the subfamily Callichthyinae prevents a detailed discussion of the historical biogeography of the group. An examination of the correlation between the distribution of some of its members and general areas of endemism in South America, however, has interesting results.

The three species of *Hoplosternum* are completely allopatric and show a trans-Andean distribution pattern common to some other groups of fishes. *Hoplosternum punctatum* is only found in the Río Atrato of northwestern Colombia and further to the west in the Pacific slope drainages of Panama. *Hoplosternum magdalenae*, occurs to the west of the Andean Cordilleras in the Río Sinú, Río Magdalena in northern Colombia and Lago Maracaibo in northwestern Venezuela, while the sister-group to these two species, *H. littorale*, ranges east of the Andes. The same distribution pattern is shown by the members of family Ctenoluciidae. The distributions of *Ctenolucius beani* and its sister-species *C. hujeta* exactly match those of *H. punctatum* and *H. magdalenae* respectively, while its sister-group, the genus *Boulengerella*, inhabits most of the cis-Andean lowlands of northern South America (Vari, 1995: 51, fig. 26). These coincident cladistic and distributional patterns support a possible common vicariance event that began in the late Miocene (Vari, 1995 and references therein) during the

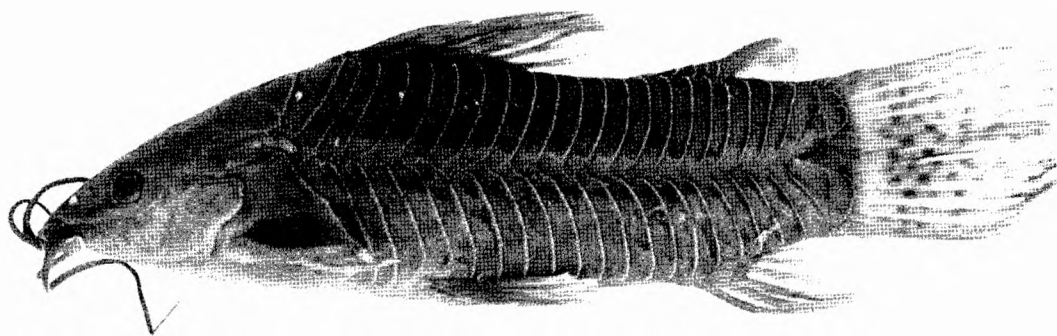


Fig. 16. *Lepthoplosternum tordilho*, MCP 16310, 44.2 mm SL, holotype; Brazil: Rio Grande do Sul: lagoon near sanga do Junco.

final uplift of the Andes some 13 millions years ago (Fig. 17).

As pointed out by Vari (1995: 88) the above distribution pattern contrasts with the typical situation of different congeneric species in the Río Magdalena and Lago Maracaibo basins among fish taxa that have been critically analyzed (Curimatidae [Vari, 1988, 1992], Prochilo-

dontidae [Castro, 1990], *Acestrocephalus*, *Cynopotamus* [Menezes, 1976] and *Creagrutus* [Harold & Vari, 1994]). None of the representatives of these five groups in these areas, however, have their sister-group relationships resolved, a fact that precludes a direct comparison with those taxa for which phylogenetic hypotheses are available.

Table 10. Biometric data of *Lepthoplosternum tordilho* new species.

	n	range		mean	SD
		low	high		
Standard length (mm)	5	33.5	45.8	41.3	4.694
percent of standard length					
Depth of body	5	29.9	33.4	31.6	1.398
Predorsal distance	5	45.0	47.8	46.5	1.043
Prepelvic distance	5	49.3	52.5	51.1	1.208
Preanal distance	5	85.2	87.5	86.6	0.923
Preadipose distance	5	89.6	92.2	91.0	1.101
Length of dorsal-fin spine	4	17.9	18.8	18.2	0.415
Length of anal-fin spine	4	18.5	20.6	19.4	0.965
Length of adipose-fin spine	5	10.7	13.3	12.4	1.054
Depth of caudal peduncle	5	21.0	22.3	21.7	0.545
Dorsal to adipose distance	5	23.9	26.6	25.4	0.968
Length of dorsal-fin base	5	20.0	24.0	22.4	1.431
Maximum cleithral width	5	29.3	30.0	29.7	0.335
Head length	5	30.1	31.9	30.8	0.752
Length of longer barbel	4	61.6	69.9	66.3	3.717
percent of head length					
Head depth	5	80.4	87.0	83.8	2.867
Least interorbital distance	5	61.7	68.2	65.2	2.881
Horizontal orbit diameter	5	18.1	19.6	18.6	0.633
Snout length	5	45.8	49.3	47.4	1.410
Least internareal distance	5	42.0	44.9	43.8	1.238
counts					
Upper series lateral scutes	5	24.0	24.0	24.0	0.000
Lower series lateral scutes	5	21.0	21.0	21.0	0.000
Preadipose azygous plates	5	3.0	5.0	4.4	0.894
Scutes along dorsal-fin base	5	8.0	8.0	8.0	0.000
Scutes adipose-caudal fins	5	4.0	4.0	4.0	0.000

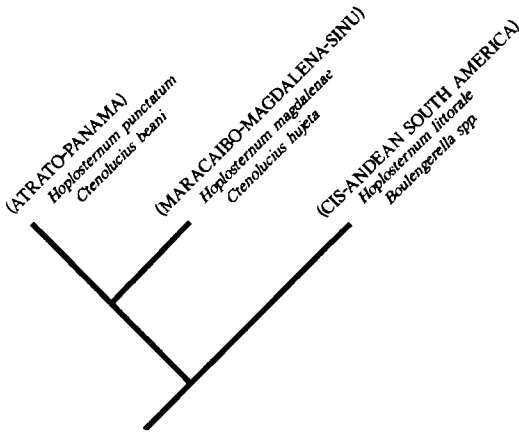


Fig. 17. Area cladogram supported by *Hoplosternum* species and Ctenolucids (see distribution maps herein and in Vari [1995] for known distributions).

The four species of *Lepthoplosternum* are similarly allopatric and restricted to well documented areas of endemism demonstrated by other fish groups. *Lepthoplosternum altamazonicum* occurs in the upper portions of Río Amazonas and its tributaries in Peru; *L. beni* is found in the upper Río Madeira drainage in Bolivia and Peru; *L. pectorale* is endemic to the Río Paraguay drainage; and *L. tordilho* occurs in the coastal laguna do Patos drainage in southern Brazil. Species of two other demonstrated monophyletic groups share the same areas of endemism with *Lepthoplosternum* (Fig. 18). *Xenurobrycon* is a small glandulocaudin characid genus of four species, three of which are endemic to the upper Río Amazonas, upper Río Madeira and Río Paraguay, a pattern shared with the species of *Lepthoplosternum*. The fourth *Xenurobrycon* species is known from a single locality in middle Amazon (Weitzman, 1987).

The monophyletic characid genus *Brachychalcinus* also shares areas of endemism with *Lepthoplosternum*. *Brachychalcinus* includes five species, three of which share the same areas of endemism cited above for *Lepthoplosternum* and *Xenurobrycon*. The two other species of *Brachychalcinus* occur in the Guianas and in rio Parnaíba basin in northeastern Brazil (Reis, 1989). The lack of a well-resolved species-level phylogeny for the species of *Lepthoplosternum*, *Xenurobrycon* and *Brachychalcinus* precludes the proposal of sound biogeographic hypothesis, but their shared areas of endemism are possibly indicative of some common biogeographic phenomenon.

The superposition of the areas of endemism of *Brachychalcinus* and *Xenurobrycon* is even more striking if we consider that the major components of the sister-groups to both genera share approximately the same distribution pattern. The sister-group of *Brachychalcinus* is the genus *Stethaprion*, with *S. crenatum* in the lower rio Amazonas and rio Madeira, and *S. erythroptus* in the middle and upper rio Amazonas (Reis, 1989: 49, fig. 25). The sister-taxon to *Xenurobrycon* is the clade composed by *Tytttocharax* plus *Scopaeocharax*. The former is found in the middle and lower rio Amazonas and rio Madeira, while *Scopaeocharax* occurs in the western Amazon (Weitzman & Fink, 1985: 71, fig. 80). This pattern, however, is not shared by the callichthyids, as the sister-group of *Lepthoplosternum* is composed by *Megalechis* plus *Dianema* plus *Hoplosternum*, having a much broader distribution in South America.

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Fig. 18. Summary of known localities of *Lepthoplosternum* (dots), *Xenurobrycon* (stars; from Weitzman, 1987: 119, fig. 4), and *Brachychalcinus* (circles, from Reis, 1987: 59, fig. 29).

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