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Revision of the jawfish genus *Lonchopisthus* with description of a new Atlantic species (Teleostei: Opistognathidae)

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Abstract

Synonymies, diagnoses, descriptions, illustrations, an identification key, and meristic frequency tables are provided for all species of *Lonchopisthus*. Most of the skeletal anatomy of *L. higmani* is also illustrated. A new jawfish, *Lonchopisthus ancistrus* n. sp., is described from the Gulf of Mexico and off Honduras based on 21 specimens 41–89 mm SL. The new species differs from other congeners by the following combination of characters: the posterior end of the maxilla strongly hooked; the cheek and opercle without scales; the membrane connecting the maxilla and premaxilla and the inner membrane covering the posterior part of the dentary pale; segmented dorsal-fin rays 11–13, with unbranched rays 2–5; longitudinal body-scale rows 33–39; and very long pelvic fins, 39.4–75.3% SL. *Lonchopisthus lemur* (and its synonym *L. meadi*) shares most characters with *L. ancistrus*, but differs in having shorter pelvic fins, 19.2–29.9% SL; fewer longitudinal body-scale rows, 26–33; the cheek and opercle scaled; and 5 infraorbitals (vs. 4). Both are relatively deep-water species, occurring from 100 m to at least 375 m (vs. 3–139 m in the other species). *Lonchopisthus micrognathus* is unique in having no branched caudal-fin rays at any size and the middle caudal-fin rays with free tips that may be used to maintain tactile contact with the substrate while hovering over its burrow. The western Atlantic *Lonchopisthus higmani* and eastern Pacific *L. sinuscalifornicus* are sister species that differ from the other Atlantic species in having the posterior end of the maxilla with a notch instead of a strong hook, the opercle with a large dark blotch, and one supraneural (vs. no supraneural).

Key words: taxonomy, systematics, ichthyology, life history, fishes, Caribbean Sea, Gulf of Mexico, *Lonchopisthus ancistrus*

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Introduction

As currently recognized, the Opistognathidae includes four valid genera and 85 species, not including about 25 undescribed species (distributions and number of species in parentheses): *Opistognathus* Cuvier, 1816 (Indo-Pacific, E. Pacific & W. Atlantic, 68); *Stalix* Jordan & Snyder, 1902 (Indo-West Pacific, 12); *Anoptoplacus* Smith-Vaniz, 2017 (W. Atlantic, 1); and *Lonchopisthus* Gill, 1862 (W. Atlantic & E. Pacific, 4). The primary purpose of this paper is to provide descriptions of the genus and all species of *Lonchopisthus*. This New World jawfish genus is known from six previously described western Atlantic and one eastern Pacific species, only four of which are considered to be valid. The first author became aware of another Caribbean species of *Lonchopisthus*, characterized by extremely long pelvic fins, when he examined two specimens in relatively poor condition that had been trawled off Honduras by the National Marine Fisheries Service vessel *Oregon I* in June 1962. Additional specimens of this new deep-water species were subsequently obtained from the Gulf of Mexico plus enough material of the other species of *Lonchopisthus* to allow a revision of this relatively poorly known genus. All species of *Lonchopisthus* are compared in Table 1.

The first species of *Lonchopisthus*, originally described as *Opistognathus micrognathus* Poey, was based on a single individual from Cuba (Poey 1860). As discussed by Mead (1959), specimens of this species subsequently sent by Poey to several U.S. museums were erroneously considered to be syntypes or cotypes. Gill (1862) proposed the genus *Lonchopisthus* for Poey's species, citing the lanceolate caudal fin as an important diagnostic character of the genus. A second nominal species, *L. vanderbilti* Mowbray, also from Cuba and based on a single specimen, was described by Mowbray in Borodin (1928). A new genus and species of jawfish, *Lonchistium lemur* Myers, based on a single specimen in poor condition taken by oyster dredge in 274 m off Puerto Rico, was described by Myers (1935). Although Myers compared his new genus with *Lonchopisthus micrognathus* and *L. vanderbilti*, questioning the validity of the latter species, he failed to recognize the more important characters that reflect the close phylogenetic relationships of all these species. He also incorrectly stated that *Lonchistium* has two anal-fin spines (vs. three spines in *Lonchopisthus*), having overlooked the small first spine. Because *Lonchistium lemur* had been assigned to a different genus, most subsequent authors did not compare it in their descriptions of other *Lonchopisthus* species. *Lonchopisthus lindneri* Ginsburg, based on three Gulf of Mexico specimens taken off Texas and Louisiana, was described by Ginsburg (1942) who stated that it "is nearest to *L. micrognathus*" but "differs chiefly in having fewer gill rakers on the first gill arch." Like other authors, Ginsburg failed to appreciate that gill raker numbers increase with growth in *L. micrognathus*. *Lonchopisthus higmani* Mead, was described from Suriname by Mead (1959), who provisionally recognized four nominal Atlantic species. But he stated "the paucity of specimens and their size distributions prevents me from providing a satisfactory revision of the species." Another new species, *L. meadi* Menezes & de Figueiredo, was described from Brazil by Menezes & de Figueiredo (1971) who agreed with Cervigón (1966) in considering *Lonchistium* a synonym of *Lonchopisthus*. In the original description, the holotype of *L. lemur* was compared with their new species, and, despite few apparent differences, the two nominal taxa were considered to represent different species, in part because they "were caught in different geographic areas which belong to two different zoogeographical regions." Subsequently, Menezes & de Figueiredo (1985: 41) stated that *Lonchopisthus meadi* and *L. lemur* are "very similar and perhaps identical." The only eastern Pacific species, *Lonchopisthus sinuscalifornicus* Castro-Aguirre & Villavicencio-Garayzar, was described from the Gulf of California by Castro-Aguirre & Villavicencio-Garayzar (1988). It is an unmistakable sister-species of the Atlantic *L. higmani*, a species that was overlooked by these authors in their original description.

Colin & Arneson (1978) presented details of the natural history of *Lonchopisthus micrognathus*, the only species of the genus for which life observations using scuba have been recorded. Like all opistognathids, *Lonchopisthus* occupy burrows that are constructed and maintained by the jawfish. Unlike many species of *Opistognathus* that strengthen their complex burrows with stones and shell fragments (Böhlke & Chaplin 1968, Colin 1973), the burrows of *Lonchopisthus* are unlined. Burrow stability is due to the cohesive character of the fine sediment. Areas occupied by *L. micrognathus* have the bottom marked with numerous large conical burrow openings and

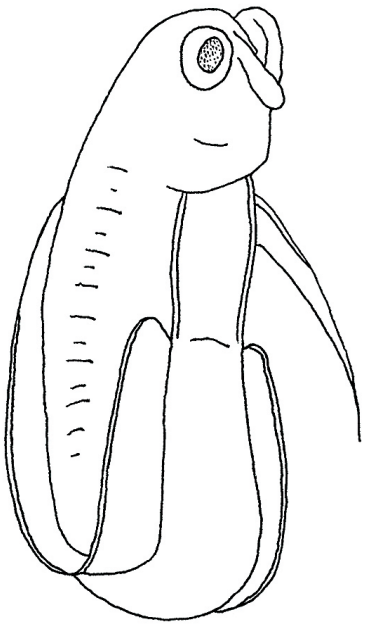


Figure 1. Diagrammatic drawing based on photograph of *Lonchopisthus micrognathus* engaged in cleaning fine sediment from gill arch (drawing by P.L. Colin).

small adjacent accessory entrances (see Colin & Arneson 1978, fig. 3). Vertical burrow-tube depths ranged from 17–35 cm with the narrowest diameter 2.5–5.0 cm. Burrow maintenance is a daily activity, and the lighter coloration of freshly disturbed sediment is easily recognized. A jawfish usually enters its burrow head first and sediment is removed with the mouth and expelled at the burrow margin. The smallest individuals observed burrowing, probably recently settled, were about 10 mm SL. An unusual behavior of *L. micrognathus* involves acutely bending the caudal peduncle and posterior half of the body into a U-shape (Fig. 1), and inserting part of the caudal fin into the opercular cavity (Colin & Arneson 1978). This is done while the fish is hovering in the water column. Once inserted, the fin is briefly moved forward and backward. The authors posited that this behavior serves to remove particles of fine sediments from the gill arches, rakers, and mouth.

Based on the number of individuals taken in trawl samples, all *Lonchopisthus* species occur in small to large colonies of indeterminate size. *Lonchopisthus micrognathus* lives commensally with the crab *Chasmocarcinus cylindricus* Rathbun, and burrows contain single jawfish that seldom venture more than 0.5 m from their burrows. During daylight hours, individuals of *L. micrognathus* spend most of their time hovering vertically over their burrows while facing into the current and using the tips of the deeply incised caudal-fin rays to maintain tactile contact with the burrow opening. When currents above the burrow are slow or absent, the pelvic fins are held erect, probably to maintain balance while in a vertical position, but are pressed against the body in stronger currents. Examination of gut contents indicates that all species of *Lonchopisthus* feed on zooplankton. Some specimens of *L. micrognathus* had guts packed with a mucus-like substance, which Colin & Arneson (1978) suggested may have been mucus sloughed by corals.

Males of all species of jawfishes are presumed to be oral mouth-brooders (Hess 1993, Smith-Vaniz, pers. obs.). The demersal egg mass or ball is tightly held together by entanglements of adhesive filaments (Mooi 1990), which allows the ball to be manipulated by the fish without breaking apart. The nearly spherical eggs of *L. micrognathus* are 0.8–0.9 mm in diameter and one egg mass, which was 10 mm in diameter, contained over 1000 eggs (Colin & Arneson 1978). At Puerto Rico, brooding was observed during seven different months in all seasons indicating that at least some reproduction occurs throughout the entire year. Most collections of *L. micrognathus* have been made on soft-bottom substrates, either from relatively shallow continental or back-reef habitats or on sandy-mud substrates in depths shallower than 100 m, although half the trawl collections of *L. lemur* have exceeded 200 m to a maximum depth of at least 375 m.

Materials and Methods

Specimen sizes in material examined are given as mm SL (standard length), with the number of specimens followed by the size range given in parentheses. Cleared and stained specimens are indicated as "C&S". All measurements were made with needle-point digital calipers and recorded to the nearest 0.1 mm. Because species of *Lonchopisthus* can be distinguished by many characters, only a few measurements were taken. Head length is distance from the middle of the upper lip to the posterodorsal tip of the opercular flap. Postorbital jaw length is a straight-line measurement from the posterior orbital margin at its junction with the rigid sphenotic bone to a vertical from the posterior end of the upper jaw. Postorbital jaw ratio is the postorbital jaw length divided by the orbit diameter. Orbit diameter is a diagonal (posterodorsal to anteroventral) measurement of the bony orbit; the

posterodorsal point of origin is the rigid sphenotic margin. Body depth is a vertical measurement from the origin of the anal fin. Caudal-peduncle (CP) length is a diagonal measurement from the base of the last anal-fin ray to the mid-base of the caudal fin; CP depth is the least depth of the caudal peduncle. In the color-pattern descriptions, stripes refer to markings aligned with the longitudinal axis of the body and bands or bars refer to markings aligned with the vertical axis of the body.

Counts of the rays of the median fins and characters associated with the vertebral column were usually taken from radiographs. The last two elements in the dorsal and anal fins have their bases in close approximation (split to base condition) and were counted as one ray in accord with the general practice of most authors, although the ultimate element has a separate rudimentary pterygiophore or stay. Pectoral-fin ray counts include the uppermost rudimentary ray. Pectoral-fin ray counts in the species accounts are reported for one side only, but in Table 2 total (bilateral) counts are given. Caudal-fin ray counts separated by a plus indicate rays associated with the dorsal followed by the ventral hypural plate. Vertebral counts from radiographs are presented as a formula: precaudal + caudal = total count. The supraneural and dorsal-fin anterior-pterygiophore interdigitation formula is modified from the "predorsal formula" of Ahlstrom *et al*. (1976). Each supraneural is indicated by "S" or their absence by a dash; neural spines are indicated by slashes and pterygiophores by Arabic numerals. The lateral-line terminus refers to the base of the posteriomost segmented dorsal-fin ray below which the lateral line ends; if the lateral-line terminus position was approximately mid-way between two dorsal-fin rays, the number was rounded and the higher value tabulated. The number of oblique body-scale rows is only an approximation due to the irregular size and arrangement of individual scale rows. Included in this count are all anteroventrally aligned scale rows in a longitudinal series from above the tip of the opercular flap to the base of the caudal fin (counts of posteroventrally aligned scale rows will result in lower values). The gill raker at the junction of the upper and lower limbs of the first gill arch is included in the lower-limb count; care was taken not to overlook rakers (often very small) at the ends of the gill arch. Counts of gill rakers were usually made only on the right side of specimens. Species of *Lonchopisthus* were compared in a multivariate cluster analysis using PRIMER version 7 software (Clarke & Gorley 2015). The analysis included 14 meristic and categorical variables (see Table 1). Raw meristic data were used and the state of bivariate or trivariate data were scored as 0, 1, or 2. Data were standardized and a resemblance matrix was computed from Bray-Curtis similarity values to visualize a non-metric multidimensional scaling (NMDS) plot.

Institutional abbreviations mostly follow Fricke & Eschmeyer (2017) and include the following collection depositories: American Museum of Natural History, New York (AMNH); Academy of Natural Sciences of Drexel University, Philadelphia (ANSP); California Academy of Sciences, San Francisco (CAS); Escuela Nacional del Ciencias Biológicas, Instituto Politécnico Nacional, Ciudad de México (ENCB-IPN); Florida Fish and Wildlife Conservation Commission, Fish & Wildlife Research Institute, St. Petersburg (FSBC); Field Museum of Natural History, Chicago (FMNH); Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs (GCRL); Natural History Museum of Los Angeles County, Los Angeles (LACM); Universidade de São Paulo, Museu de Zoologia, São Paulo (MZUSP); Scripps Institution of Oceanography, La Jolla (SIO); Biodiversity Research and Teaching Collections, Texas A&M University, College Station (TCWC); University of Arizona, Museum of Natural History, Tucson (UAZ); University of California at Los Angeles, Department of Ecology and Evolutionary Biology, Los Angeles (UCLA); Universidad de Costa Rica, San José (UCR); Florida Museum of Natural History, Gainesville (UF); University of Miami Marine Laboratory, Miami (UMML), collection transferred to UF; University of South Alabama, Department of Biological Sciences, Mobile (USA); and National Museum of Natural History, Washington, D.C. (USNM).

Lonchopisthus Gill, 1862

Lonchopisthus Gill, 1862: 241 (type-species *Opisthognathus* [*sic*] *micrognathus* Poey, 1860 by original designation and monotypy).
Lonchistium Myers, 1935: 3 (type-species *Lonchistium lemur* Myers, 1935 by original designation and monotypy).

Diagnosis. *Lonchopisthus* is the only opistognathid genus with 1) lanceolate caudal fins, 2) posterior end of maxilla with a hook or notch, 3) nasal and interorbital papillae present, and 4) anterior nostril consisting of a very small tube that lies flush against surface anteriorly and has a small flap on its raised posterior margin; other opistognathids lack nasal and interorbital papillae and anterior tubular nostril is equally erect on all sides.

Description. Opistognathids with posterior end of rigid maxilla with hook or notch (Fig. 2), and a terminally positioned moderate supramaxilla; opercle with a rounded posterior flap and two skin-covered spines at upper corner of opercular bone; margin of preopercle smooth and lower limb with a membranous flap; caudal fin lanceolate and relatively long (Fig. 3), typically attaining 35–70% SL in adults; caudal fin with 6–10 (3–5+3–5) procurrent rays, 16 (8+8) segmented rays, middle 0–13 branched (see Table 3); epurals 3 and hypural 5 present; dorsal-fin elements X–XI,10–19 (Table 2), spines straight with pungent tips and anterior rays 2–14 unbranched;

TABLE 1

Selected characters in species of *Lonchopisthus*[1]

	L. ancistrus	*L. lemur*	*L. micrognathus*	*L. higmani*	*L. sinuscalifornicus*
Supraneural bone*	absent	absent	absent	present	present
Maxilla posterior end*	strongly hooked	strongly hooked	strongly hooked	bluntly notched	bluntly notched
Caudal vertebrae*	typically 17	typically 17	typically 18	typically 18	typically 18
Dorsal-fin rays*	12–13	11–12	16–19	17–19	17–19
Anal-fin rays*	11–12	10–12	15–18	16–17	17–18
Unbranched dorsal-fin rays	2–5	2–6	11–15	9–14	8–14
Unbranched anal-fin rays	2–6	3–5	11–14	10–13	9–13
Branched caudal-fin rays*[2]	11–13	10–13	none	0–10	2–11
Cheek scale rows*	none	4-5	4-6	5-6	5-6
Body scale rows*	33–39	26–33	46–59	48–61	53–71
Infraorbital bones*	4	5	4	4	4
Premaxillary dark stripe*	no	no	yes	yes	yes
Inner 3 or 4 pelvic-fin rays*	pale	pale	light brown	dark brown	dark brown
Cheek color in life*	absent	absent	inconspicuous or absent	prominent dark blotch	prominent dark blotch
Pelvic fin length, adults (% SL)	39.4–75.3	19.2–29.9	21–33	19.2–33.3	26.8–34.3
Caudal-fin ray tips free*	no	no	yes	no	no

[1]Total gill-raker counts and characters indicated by an asterisk were included in a multivariate cluster analysis (see text and Fig. 9).
[2]See Table 3.

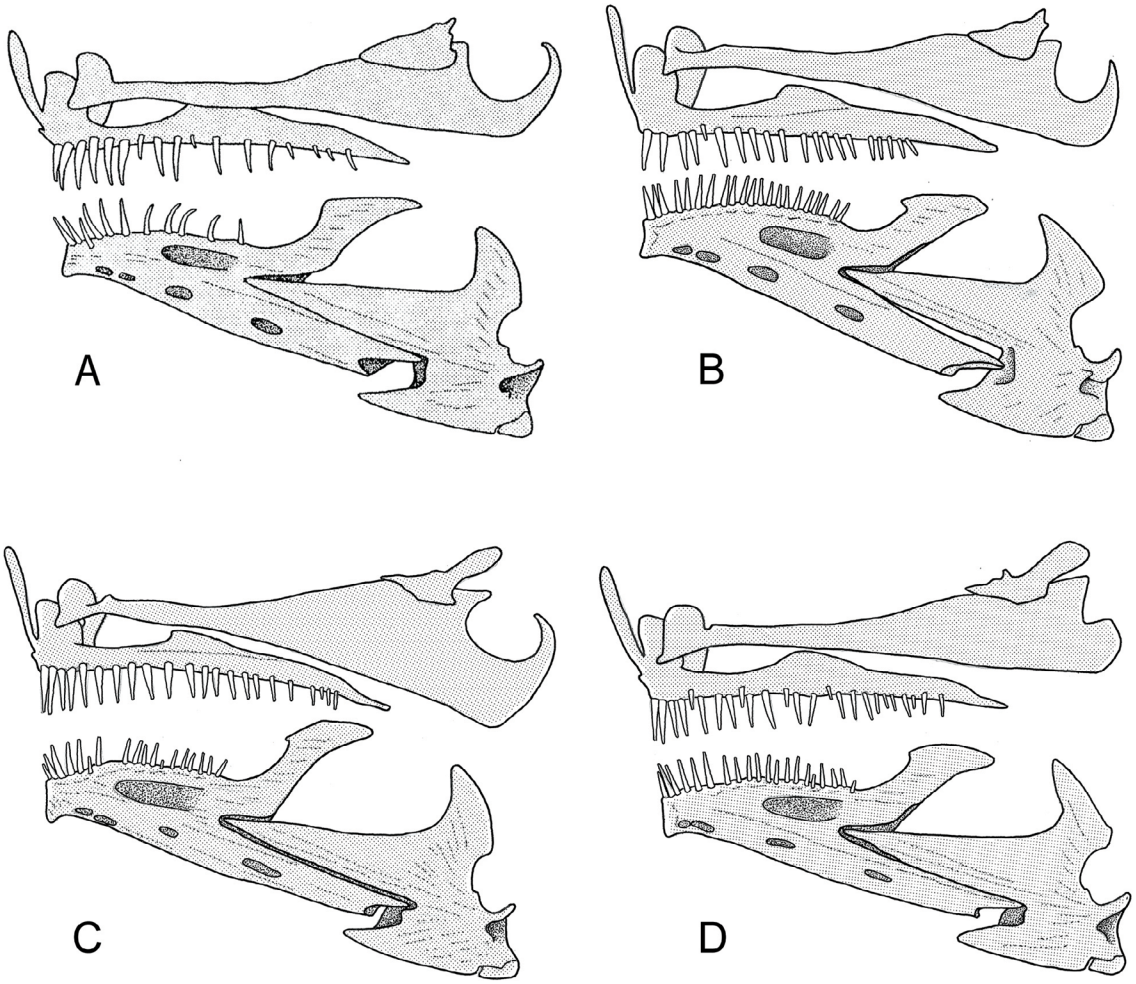


Figure 2. Jaws of *Lonchopisthus* species showing shapes of the posterior end on the maxilla and the slender teeth: A) *L. ancistrus*, ANSP 139305, 49 mm SL; B) *L. lemur*, ANSP 157372, 60 mm SL; C) *L. micrognathus*, ANSP 134238, 70 mm SL; D) *L. higmani*, ANSP 138423, 62 mm SL.

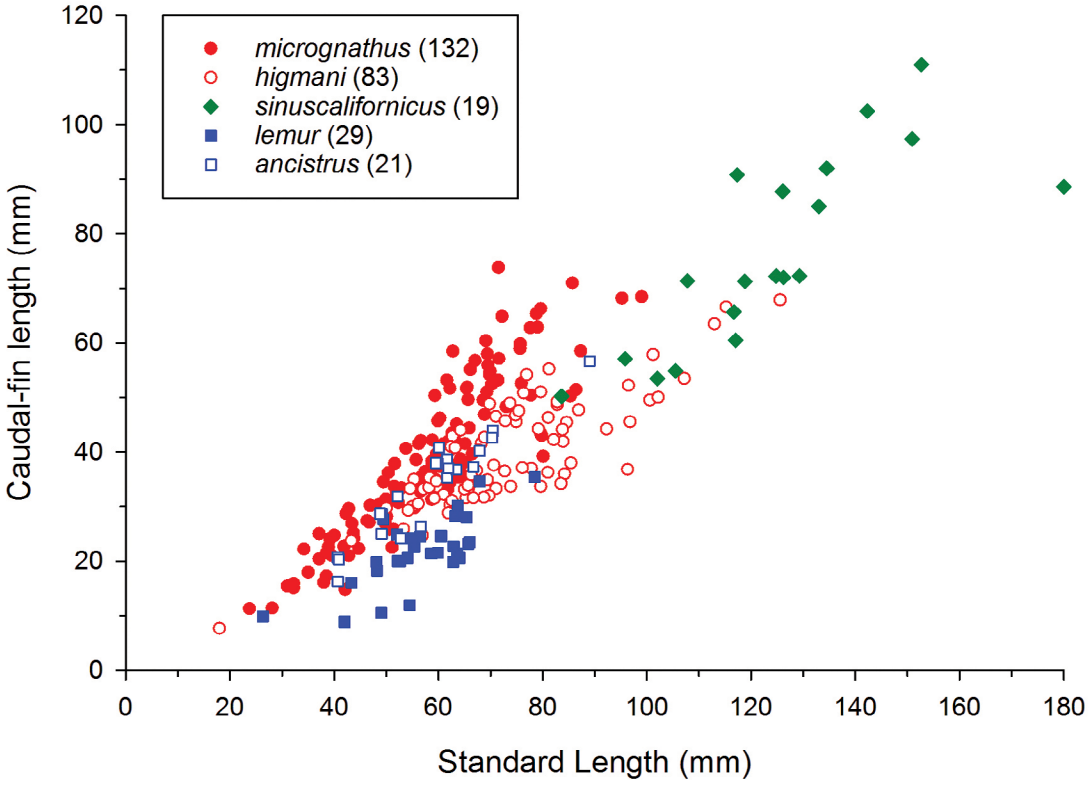


Figure 3. Caudal-fin length versus standard length in species of *Lonchopisthus*; sample sizes in parentheses.

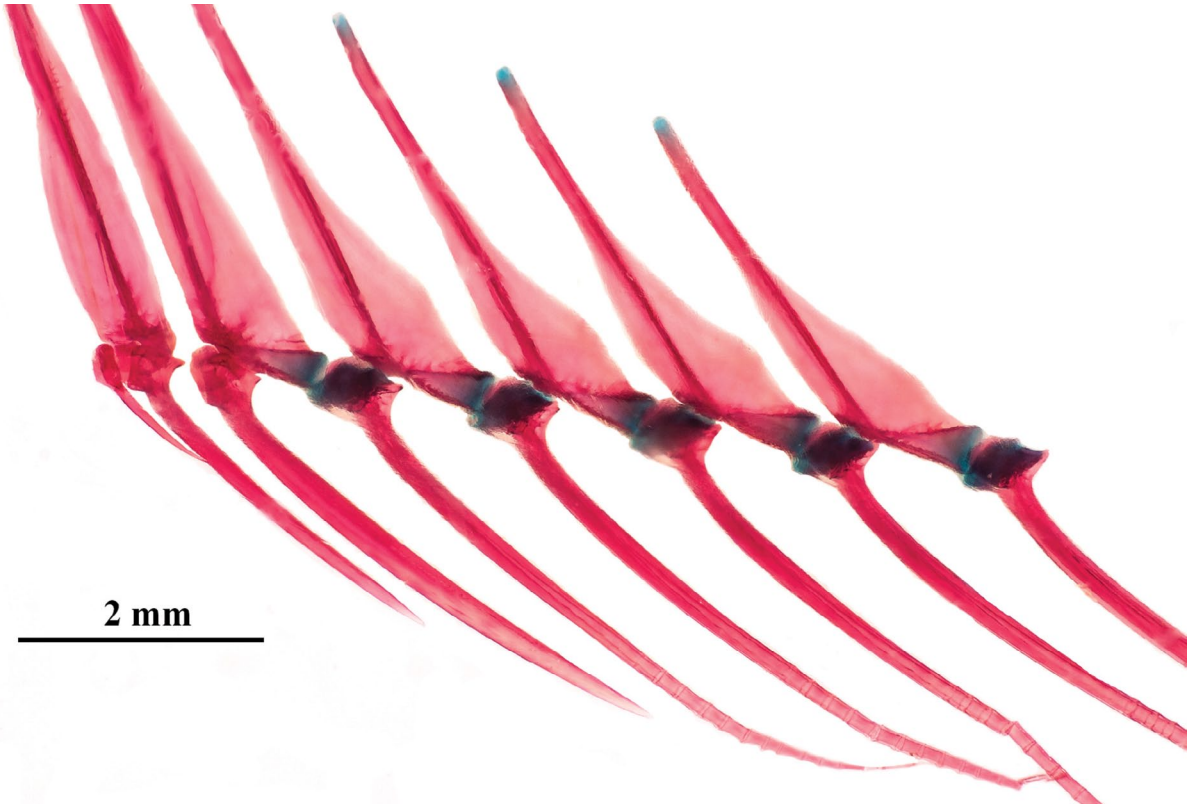


Figure 4. Anal-fin spines on first pterygiophore of *Lonchopisthus higmani*, ANSP 138423, 62.6 mm SL, showing relative sizes of the two supernumerary spines (Z.S. Randall).

anal-fin rays III, first pterygiophore with 2 supernumerary spines (Fig. 4),10–18, anterior rays 10–13 unbranched; terminal dorsal- and anal-fin pterygiophores supporting two rays (Fig. 5); pectoral-fin rays 17–21, the uppermost rudimentary; pelvic fin with 1 spine and 5 rays, first two (outermost) soft rays unbranched and innermost 3 (rarely 2) branched distally; caudal vertebrae 10+16–19 (typically 17 or 18); lateral-line terminus below dorsal-fin rays XI–9; scales cycloid and nape, pectoral-fin base, caudal-fin base, abdomen, breast, dorsal half of opercle and cheek scaled (except opercle and cheek naked in *L. ancistrus*); oblique body-scale rows in longitudinal series

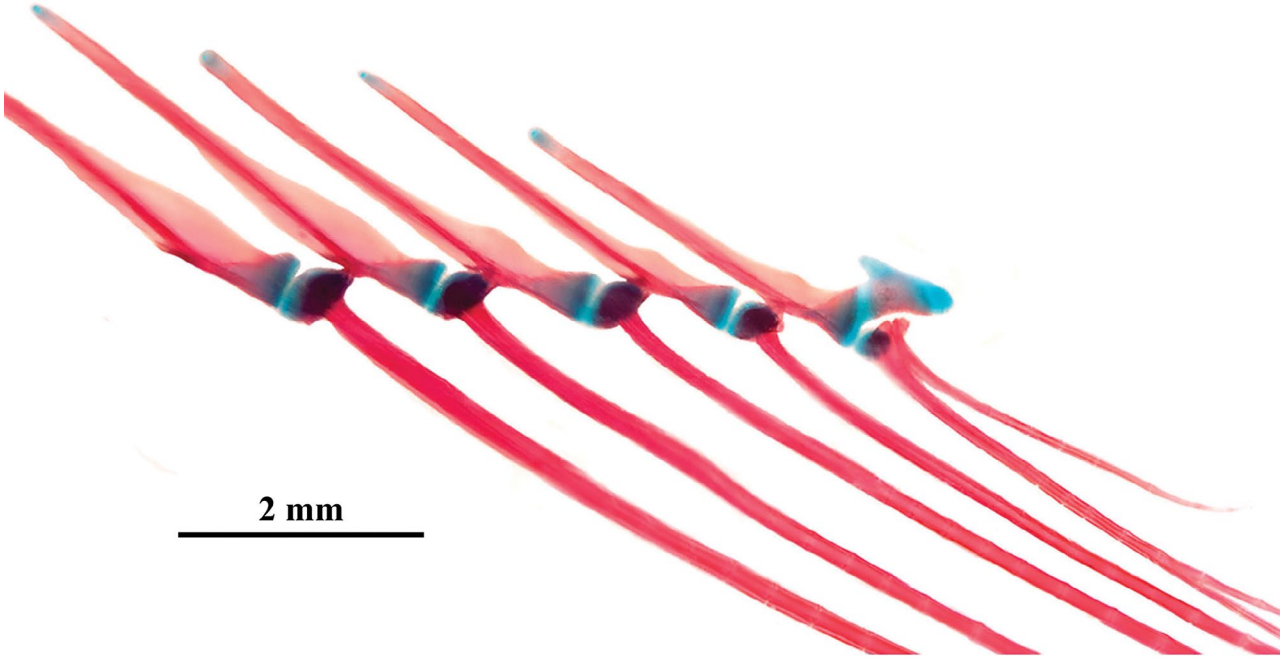


Figure 5. Terminal anal-fin pterygiophore of *Lonchopisthus higmani*, ANSP 138423, 62.6 mm SL; condition in all species of *Lonchopisthus* in which the terminal pterygiophore supports 2 rays (Z.S. Randall).

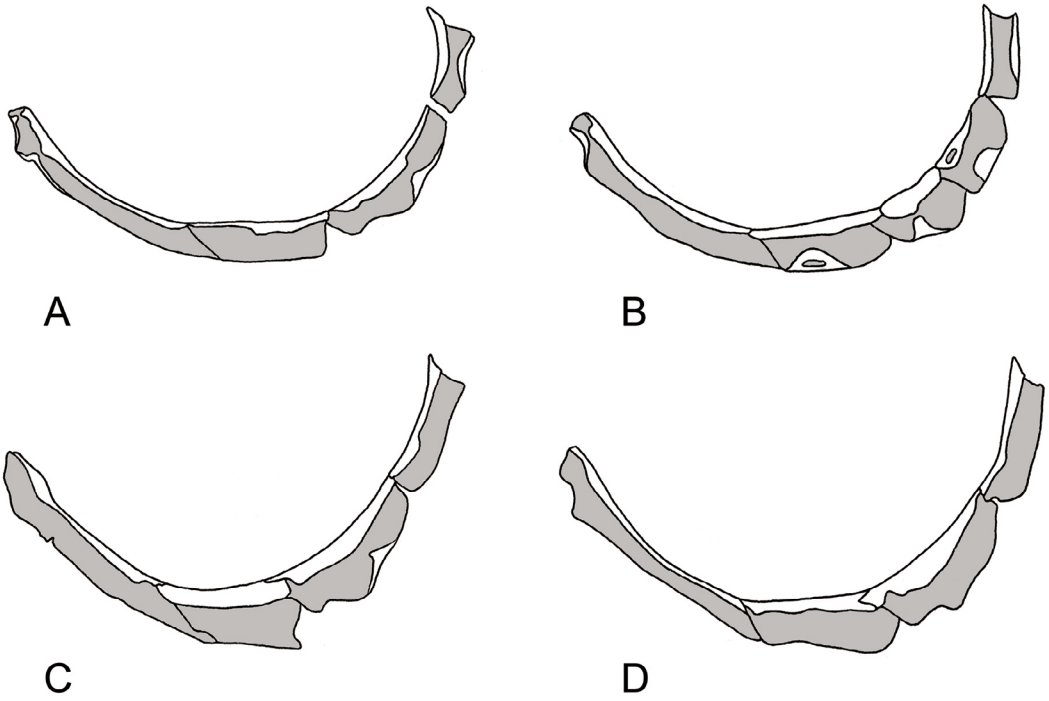


Figure 6. Infraorbital bones in four species of *Lonchopisthus*: A) *L. ancistrus*; B) *L. lemur*; C) *L. micrognathus*; D) *L. higmani*; specimen details as in Fig. 2.

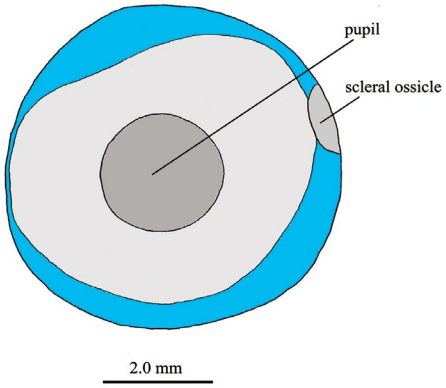


Figure 7. Eye of *L. higmani* showing position of pupil, single scleral ossicle and scleral cartilage; anterior to left, cartilage in blue.

26–71; infraorbitals 4 or 5 (5 only in *L. lemur*), consisting of open troughs laterally (Fig. 6) and 3rd infraorbital without a suborbital shelf; eye with a single posterior scleral ossicle about 15° above the horizontal axis (Fig. 7); branchiostegal rays 6; postcleithra 2, articulated with each other; vomerine and palatine teeth absent; premaxilla and dentary with single rows of slender, mostly straight teeth, and 1–3 smaller, inner, symphyseal dentary teeth usually present. Small papillae are behind anterior nostril and on interorbital area. Posterior nostril is an elongate oval opening at lower front margin of orbit; anterior nostril consisting of a very small tube that lies flush against surface anteriorly, and slightly raised posteriorly with a small flap on posterior margin (Fig. 8).

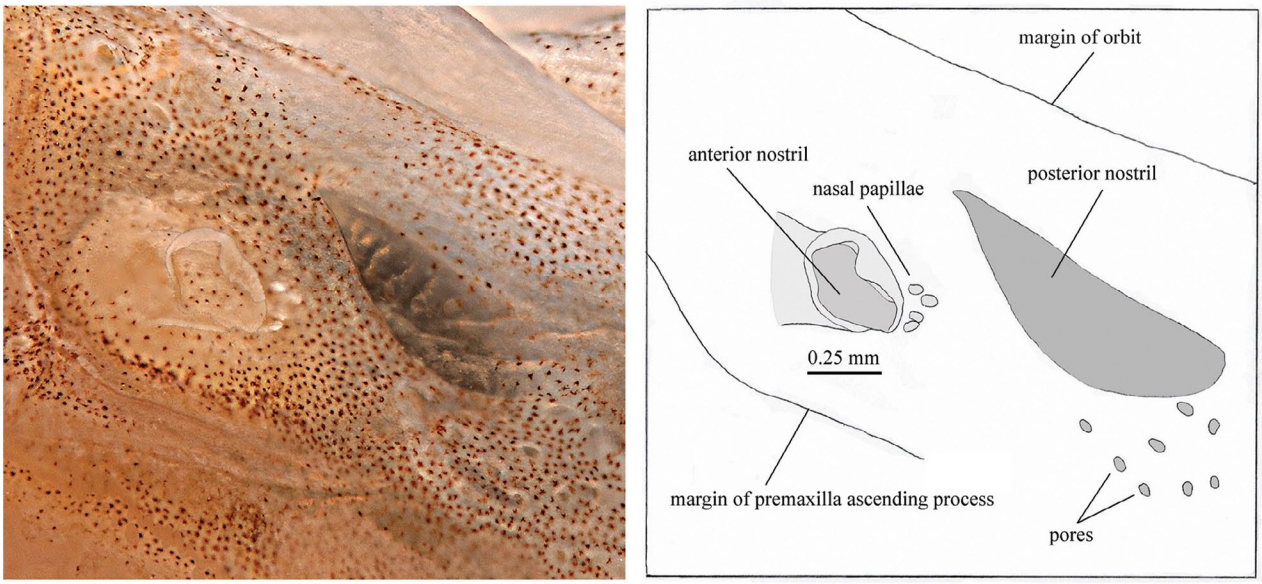


Figure 8. Nostrils of *Lonchopisthus micrognathus*, UF 152395, 89 mm SL, slightly canted dorsal view of right side, anterior to left (Z.S. Randall, adjacent drawing by W.F. Smith Vaniz).

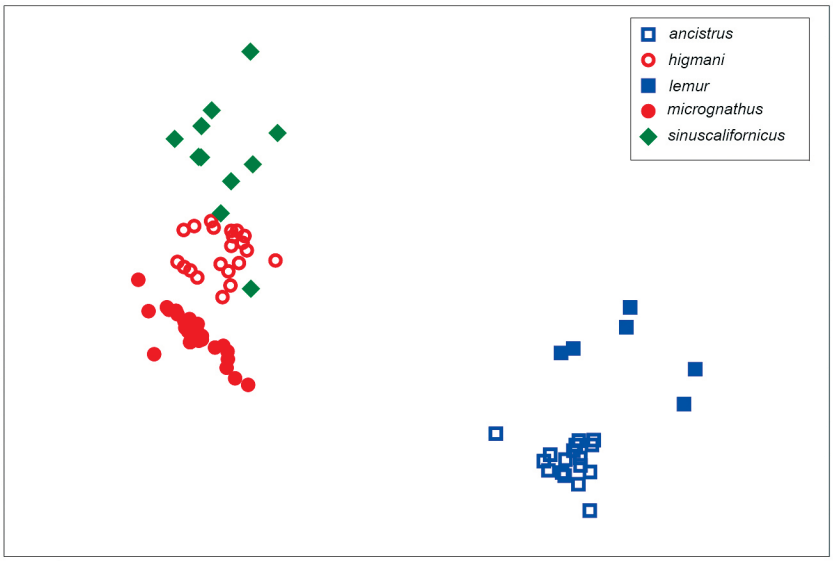


Figure 9. Non-metric multidimensional scaling (NMDS) plot of *Lonchopisthus* specimens based on fourteen meristic and categorical variables (see text and Table 1); 2D stress value = 0.05.

Etymology. A combination of the Greek *lonchos* (a spear) and *opisthen* (behind), in reference to the lanceolate caudal fin.

Relationships. We have not studied the comparative osteology of *Lonchopisthus* species and therefore do not present a cladogram of hypothesized relationships. Selected character states in species of *Lonchopisthus* are listed in Table 1. With the exception of slight overlap between *L. higmani* and *L. sinuscalifornicus*, specimens of *Lonchopisthus* clustered separately in the NMDS plot based on Bray-Curtis similarity values of 14 meristic and categorical variables, with a low 2D stress value of 0.05 (Fig. 9). Our observations on presumed character polarities as possible indications of relationships are discussed below.

1. The four derived characters given in the preceding generic diagnosis clearly establish *Lonchopisthus* as a monophyletic genus.

2. Maxilla shape: A strongly hooked or notched maxilla (Fig. 2) is a uniquely derived character in opistognathids. We consider the bluntly notched maxilla in *L. higmani* and *L. sinuscalifornicus* to be the plesiomorphic condition.

3. Supramaxilla shape: The supramaxilla is narrower and relatively elongate in *L. micrognathus*, *L. higmani* and *L. sinuscalifornicus* (Figs. 2C, 2D), and shorter and wedge-shaped in the other two species (Figs. 2A, 2B). We are uncertain which of the two character states represents the derived condition, but it is probably the former. Most opistognathids have a terminally positioned, wedge-shaped supramaxilla at the end of a rigid, truncate maxilla.

4. Premaxillary dark stripe: The majority of species in some genera of other families that typically occupy holes as adults also have prominent premaxillary stripes like those of *Lonchopisthus*, e.g. the Cepolidae (see Smith-Vaniz & Johnson 2016). Many species of the opistognathid genus *Opistognathus* also have dark premaxillary stripes or dark rictus pigmentation. Thus, the absence of a premaxillary stripe in *L. ancistrus* and *L. lemur* may be a synapomorphy.

5. Number of dorsal- and anal-fin rays, anterior unbranched rays, longitudinal body-scale rows and caudal vertebrae: *L. ancistrus* and *L. lemur* have lower numbers of these elements than in the other three species, suggesting that each species group represents a separate clade. The ecology of species of the two putative clades is also apparently different; *L. ancistrus* and *L. lemur* are deep-water species and the other three species typically occur in shallower depths.

6. Branched caudal-fin rays: The absence of branched caudal-fin rays at any size in *L. micrognathus* is likely a case of post-displacement paedomorphism, i.e. retention of a juvenile character state in the adult via delayed onset or cessation of growth (McNamara 1986). The opistognathid genera *Opistognathus* and *Stalix* typically have 12–14 branched caudal-fin rays in adults, so we regard the higher number of these branched rays in adults of *L. ancistrus* and *L. lemur* (see Table 3) as the plesiomorphic character state in *Lonchopisthus*.

7. Inner pelvic-fin ray color: The coloration of the inner pelvic-fin rays in *L. micrognathus*, *L. higmani*, and *L. sinuscalifornicus* is dark (vs. pale in others); we consider this shared color pattern to be a synapomorphy.

8. In life, adults of *L. micrognathus*, *L. higmani*, and *L. sinuscalifornicus* have narrow pale bands on the head and on the body at least anteriorly, which is probably another synapomorphy of this clade.

9. The very similar life-color pattern, especially the prominent dark cheek blotch of *L. higmani* and *L. sinuscalifornicus* is likely another synapomorphy and, combined with their amphi-American distributions (see Remarks for *L. sinuscalifornicus*), is strong evidence in support of a sister-species relationship.

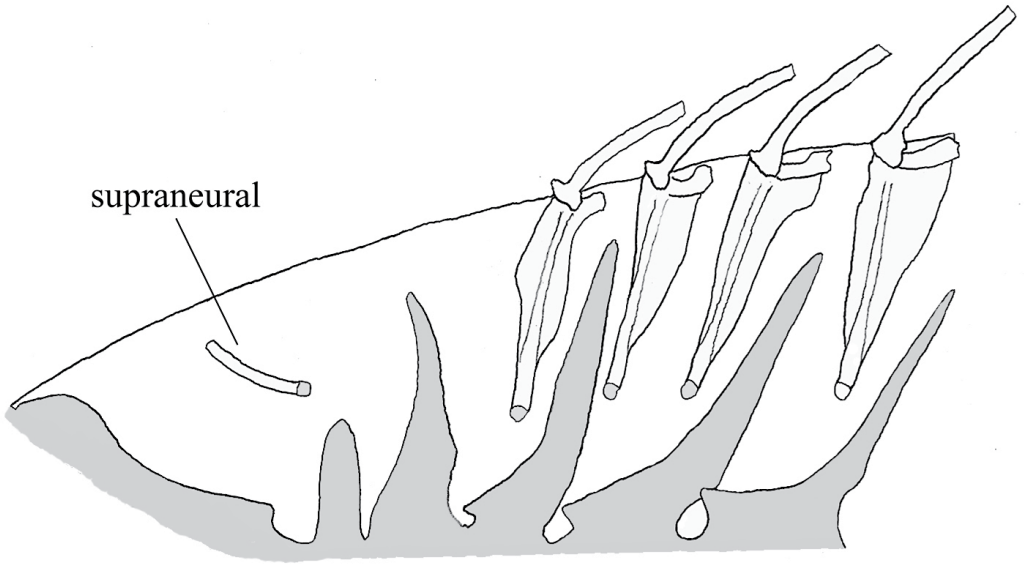


Figure 10. Supraneural and first four dorsal-fin pterygiophores of *Lonchopisthus higmani*, ANSP 138423, 62.6 mm SL.

10. Supraneurals: *L. higmani* and *L. sinuscalifornicus* both have one supraneural (Fig. 10); supraneurals are absent in the other species. On the basis of the character states discussed in numbers 3, 4, 5, 7, 8 above, *L. micrognathus* appears to be a member of the clade that includes *L. higmani* and *L. sinuscalifornicus*, so it is most parsimonious to assume that retention of supraneurals is the plesiomorphic character state. Species of *Opistognathus* have 0, 1, or 2 supraneurals and most species of *Stalix* have one supraneural.

11. Although autapomorphies are not helpful for phylogenetic inference, they are useful in defining species: *L. ancistrus* differs from congeners in having very elongated pelvic fins in adults, 39–75% SL (vs. 19–34%), and naked cheeks (vs. cheeks with 4–6 scale rows); *L. lemur* has 5 (vs. 4) infraorbitals; and *L. micrognathus* has two uniquely derived caudal-fin character states that are possibly correlated, i.e. caudal-fin rays of adults never branched and ray tips deeply incised and free distally. However, we were unable to unequivocally confirm that interradial caudal-fin membranes of *L. sinuscalifornicus* do not extend to the distal ray tips based on quality of available preserved specimens; fresh material will be required to resolve this.

Key to the species of *Lonchopisthus*

1a. Membranes connecting maxilla and premaxilla and covering inner posterior part of dentary pale; segmented dorsal-fin rays 11–13, anterior rays 2–6 unbranched; branched caudal-fin rays typically 10–13; body-scale rows in longitudinal series 26–39; relatively deep-dwelling species, typically occurring in depths >100 meters 2

1b. Membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; segmented dorsal-fin rays 16–19, anterior rays 8–15 unbranched; branched caudal-fin rays 0–11, see Table 3); body-scale rows in longitudinal series 47–59; relatively shallow-dwelling species, typically occurring in depths <100 meters 3

2a. Pelvic fin relatively long (Fig. 19), 39.4–75.3% SL in specimens >40 mm SL; cheeks naked; body-scale rows in longitudinal series 33–39; infraorbitals 4 (Fig. 6A) ..... ***L. ancistrus*, n.sp.**

2b. Pelvic fin relatively short, 19.2–29.9% SL in specimens >40 mm SL; cheeks scaled; body-scale rows in longitudinal series 26–33; infraorbitals 5 (Fig. 6B) ..... ***L. lemur***

3a. Bony posterior end of maxilla distinctly hooked (Fig. 2C); opercular blotch inconspicuous or absent; no branched caudal-fin rays; head usually shorter in congeners at comparable sizes (Fig. 27)... ***L. micrognathus***

3b. Bony posterior end of maxilla bluntly notched (Fig. 2D); opercular blotch conspicuous; branched caudal-fin rays 0–11 (see Table 3); head usually longer in congeners at comparable sizes 4

4a. Body-scale rows in longitudinal series 47–56 (Fig. 31); in life, anal fin and body posteriorly with scattered and larger white spots (western Atlantic Ocean) ..... ***L. higmani***

4b. Body-scale rows in longitudinal series 53–71; in life, anal fin and body posteriorly usually with rows of small white spots (eastern Pacific Ocean) ..... ***L. sinuscalifornicus***

TABLE 2

Frequency distributions for selected meristic characters in species of *Lonchopisthus*

	Dorsal-fin spines		Segmented dorsal-fin rays									mean
	X	XI	11	12	13	14	15	16	17	18	19	
ancistrus	2	19		18	3							12.1
lemur	1	45	7	39								11.8
micrognathus	2	158						5	112	35	1	17.2
higmani	5	82							22	64	1	17.8
sinuscalifornicus	1	20							5	15	1	17.8

	Total dorsal-fin elements									mean
	22	23	24	25	26	27	28	29	30	
ancistrus		20	1							23.0
lemur	8	38								22.8
micrognathus						12	114	33	1	28.2
higmani							26	61		28.7
sinuscalifornicus							6	14	1	28.1

	Segmented anal-fin rays									mean
	10	11	12	13	14	15	16	17	18	
ancistrus		4	17							11.8
lemur	1	11	34							11.7
micrognathus					1	1	69	88	2	16.6
higmani							25	60		16.7
sinuscalifornicus								20	1	17.0

	Total pectoral-fin rays								mean	Caudal vertebrae			
	35	36	37	38	39	40	41	42		16	17	18	19
ancistrus				4	5	8	2	2	39.7	3	15		
lemur				10	3	11	2	13	40.1	1	43		
micrognathus	6	78	20	50	1				36.8		2	157	1
higmani		1	4	38	17	23	2		38.8		1	85	
sinuscalifornicus			1	5	3	12	1		39.3			16	1

TABLE 3

Frequency distributions of branched caudal-fin rays in species of *Lonchopisthus*, grouped by mm SL

	Branched caudal-fin rays														mean
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	
ancistrus															
(40–49.9)												4	2		11.3
(50–59.9)						1	–	–	–	–	–	1	2	1	10.6
(60–69.9)													5	2	12.3
(70–89)												1	2		11.7
lemur[1]															
(< 29.9)											1	–	1		11.0
(30–39.9)									1	–	–	–	1		10.0
(40–49.9)											2	2			10.5
(50–59.9)											1	1	21		11.9
(60–69.9)												3	6	3	12.0
(78.5)												1			11.0
micrognathus															
(30–101)	122														–
higmani															
(<59.9)	14	1													0.1
(60–69.9)	12	5	2	–	1										0.7
(70–79.9)	6	1	4	–	4	1	1								2.1
(80–89.9)	1	2	1	4	2	1									2.6
(90–99.9)			2	–	2										3.0
(100–126)			1	–	4	1	1								4.1
sinuscalifornicus															
(64)	2														–
(80–89.9)			1	–	–	–	–	1							4.5
(90–109.9)						2	2								5.5
(110–129.9)						2	1	2	–	2	1				7.2
(> 130)						1	1	1	–	–	1	1			7.8

[1]Includes data from Menezes & de Figueiredo (1971).

TABLE 4
Frequency distributions of gill rakers in species of *Lonchopisthus*, grouped by mm SL

	Upper limb gill rakers														mean
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ancistrus															
(40–49.9)			1	-	3	2									16.0
(50–59.9)					1	1	3								17.4
(60–69.9)					2	4	1								16.9
(70–79.9)							2								18.0
(80–89)								1							19.0
lemur[1]															
(< 29.9)	2	2													12.5
(30–39.9)	1		1												12.0
(40–49.9)		2	3	3											14.0
(50–59.9)			7	8	2										14.7
(60–69.9)			6	6	1	1									14.8
(78.5)						1									17.0
micrognathus															
(14–19.9)	1	3	1												13.0
(20–29.9)			2	3	3	-	1								15.4
(30–39.9)					2	5	9	1							17.5
(40–49.9)						3	7	2	4	1					18.8
(50–59.9)							4	15	7	3					19.3
(60–69.9)							3	7	14	9	7	1			20.4
(70–79.9)							1	1	7	5	1	2	2	1	21.4
(80–89.9)								1	2	3	1				20.5
(>90)										1	2				22.0
higmani															
(40–49.9)						1	2								17.7
(50–59.9)						2	7	4	2						18.4
(60–69.9)							3	5	9	4	2	1			20.0
(70–79.9)							1	3	4	7	2	2			20.5
(80–89.9)							2	2	1	3	2	1	1		20.7
(90–126)								4	4	3					19.9
sinuscalifornicus															
(80–89.9)						1	1	-	-	-	1				19.0
(90–109.9)								2	2						19.7
(110–129.9)						1	1	5	1						18.8
(>130)							1	-	4						19.6

[1]Includes data from Menezes & de Figueiredo (1971).

TABLE 4 continued

Frequency distributions of gill rakers in species of *Lonchopisthus*, grouped by mm SL

	Lower limb gill rakers																				mean
	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
ancistrus																					
(40–49.9)								1	5												29.8
(50–59.9)									1	1	2	1									31.6
(60–69.9)									3	2	2										30.9
(70–79.9)									1	-	1										31.0
(80–89)																1					37.0
lemur[1]																					
(< 29.9)			2	-	-	2															25.5
(30–39.9)					1	1															26.5
(40–49.9)						1	3	3	1												28.5
(50–59.9)						4	4	6	2	1											28.5
(60–69.9)					1	5	-	-	3	2	2	1									29.3
(78.5)											1										32.0
micrognathus																					
(14–19.9)	1	-	3	1																	23.8
(20–29.9)				1	-	1	2	2	3												28.4
(30–39.9)								1	2	1	-	8	3	1	1						32.8
(40–49.9)											1	4	6	4	1	-	1				34.2
(50–59.9)										1	1	7	5	4	4	2	4	1			34.9
(60–69.9)										1	1	2	2	7	9	5	9	3	2		36.3
(70–79.9)											1	1	2	-	7	1	2	3	2	1	36.8
(80–89.9)												2	2	1	1		1				34.7
(>90)														2		1					35.7
higmani																					
(40–49.9)										1	1	-	1								32.3
(50–59.9)											2	5	5	-	2	1					33.9
(60–69.9)											1	2	2	9	8	1	1				35.2
(70–79.9)												2	2	3	6	6					35.6
(80–89.9)											1	3	4	-	2	-	1	1			34.7
(90–126)											1	1	5	3	-	-	-	1			34.6
sinuscalifornicus																					
(80–89.9)													1	1	-	-	1				35.7
(90–109.9)													1	1	1	1					35.5
(110–129.9)													3	4	-	1					34.9
(>130)												2	2	1							33.8

[1]Includes data from Menezes & de Figueiredo (1971).

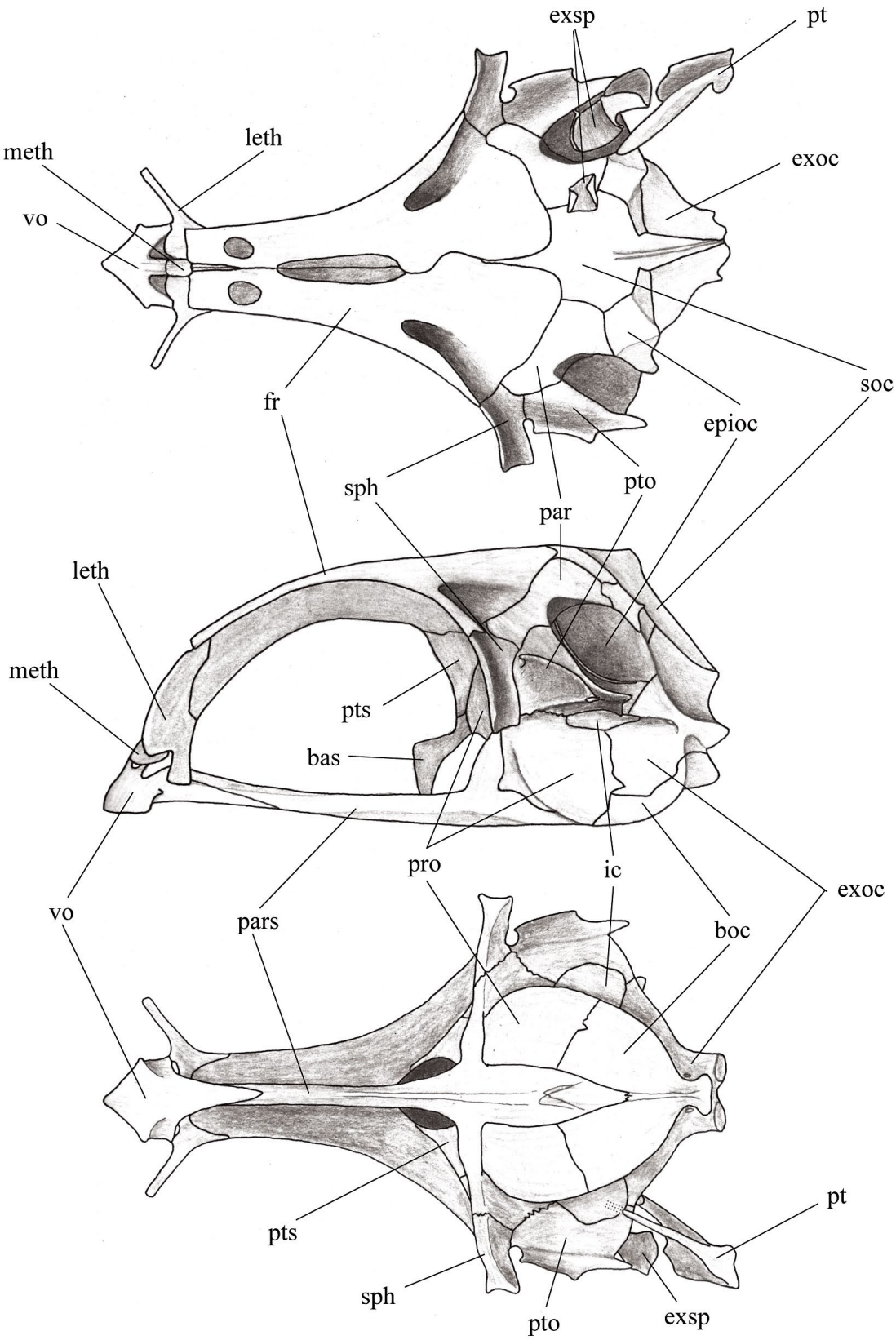


Figure 11. Neurocranium of of *L. higmani*; ANSP 138423, 62.6 mm SL, dorsal, lateral and ventral views. Abbreviations: **bas**, basisphenoid; **boc**, basioccipital; **epioc**, epioccipital; **exoc**, exoccipital; **exsp**, extrascapular; **fr**, frontal; **ic**, intercalar; **leth**, lateral ethmoid; **meth**, median ethmoid; **par**, parietal; **pars**, parasphenoid; **pro**, prootic; **pt**, posttemporal; **pto**, pterotic; **pts**, pterosphenoid; **soc**, supraoccipital; **sph**, sphenotic; **vo**, vomer.

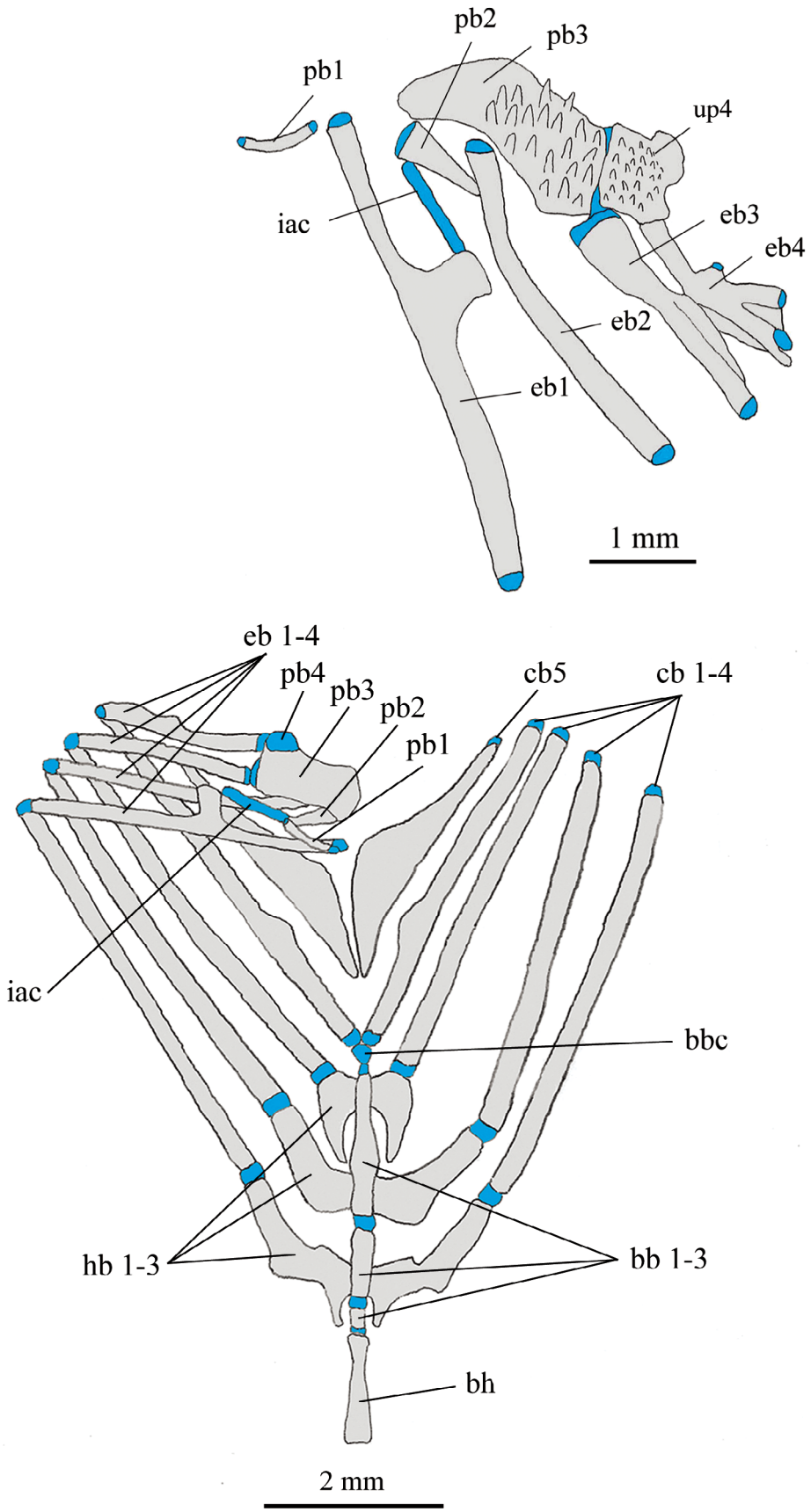


Figure 12. Gill arches (upper figure is enlarged ventral view of left pharyngobranchials) of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue; gill rakers omitted. Abbreviations: **bb**, basibranchial; **bbc**, basibranchial cartilage; **bh**, basihyal; **cb**, ceratobranchial; **eb**, epibranchial; **hb**, hypobranchial; **iac**, interarcual cartilage; **pb**, pharyngobranchial; **up**, upper pharyngeal tooth plate.

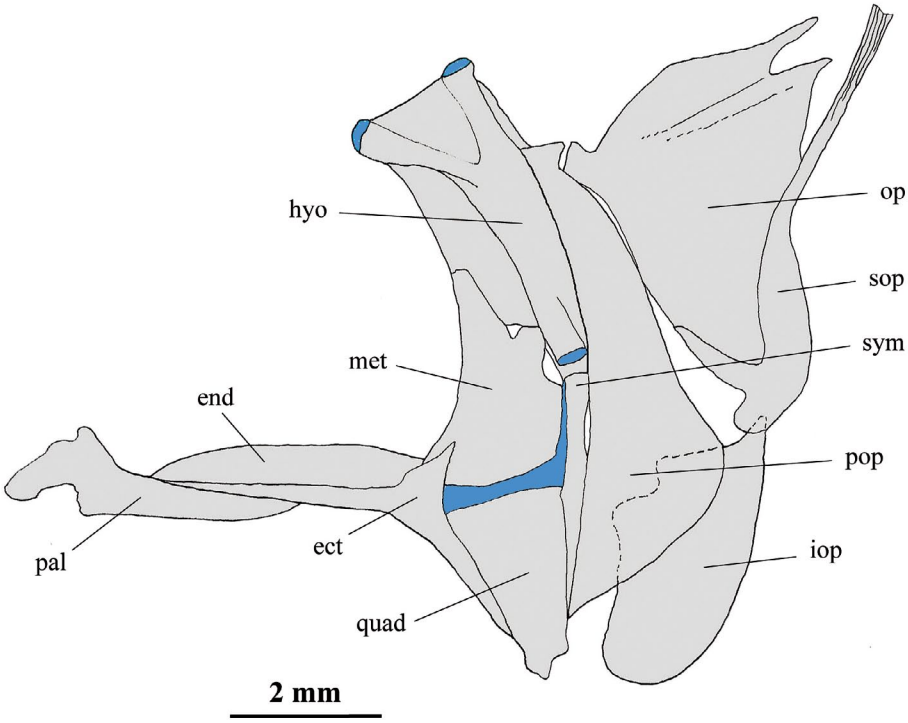


Figure 13. Suspensorium and opercular bones (lateral view, anterior to left) of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue. Abbreviations: **ect**, ectopteroid; **end**, endopteroid; **hyo**, hyomandibular; **iop**, interopercle; **met**, metapteroid; **op**, opercle; **pal**, palatine; **pop**, preopercle; **quad**, quadrate; **sop**, subopercle; **sym**, symplectic.

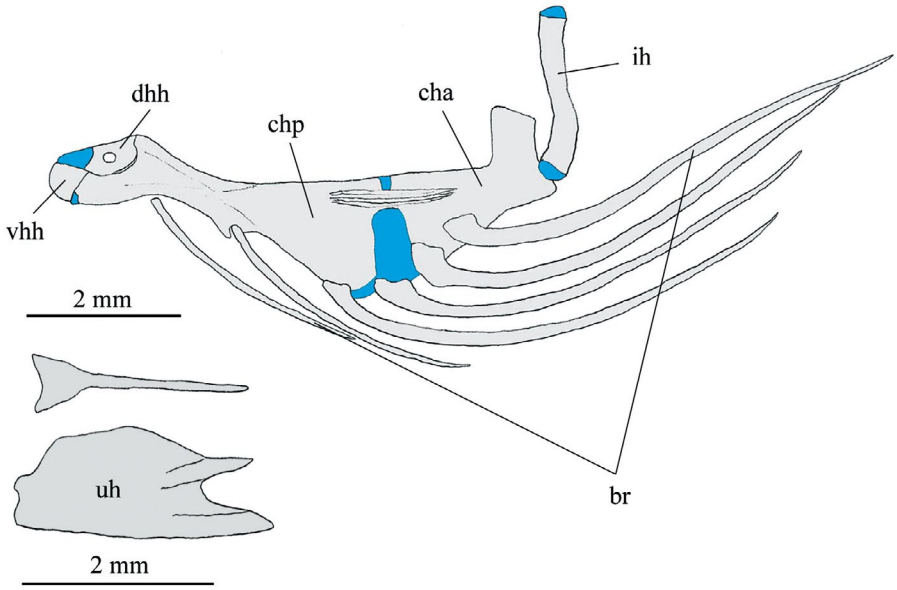


Figure 14. Hyoid arch (lateral view, anterior to left) and urohyal (dorsal and lateral views) of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue. Abbreviations: **br**, branchiostegal rays; **cha**, anterior ceratohyal; **chp**, posterior ceratohyal; **dhh**, dorsal hypohyal; **vhh**, ventral hypohyal; **ih**, interhyal; **uh**, urohyal.

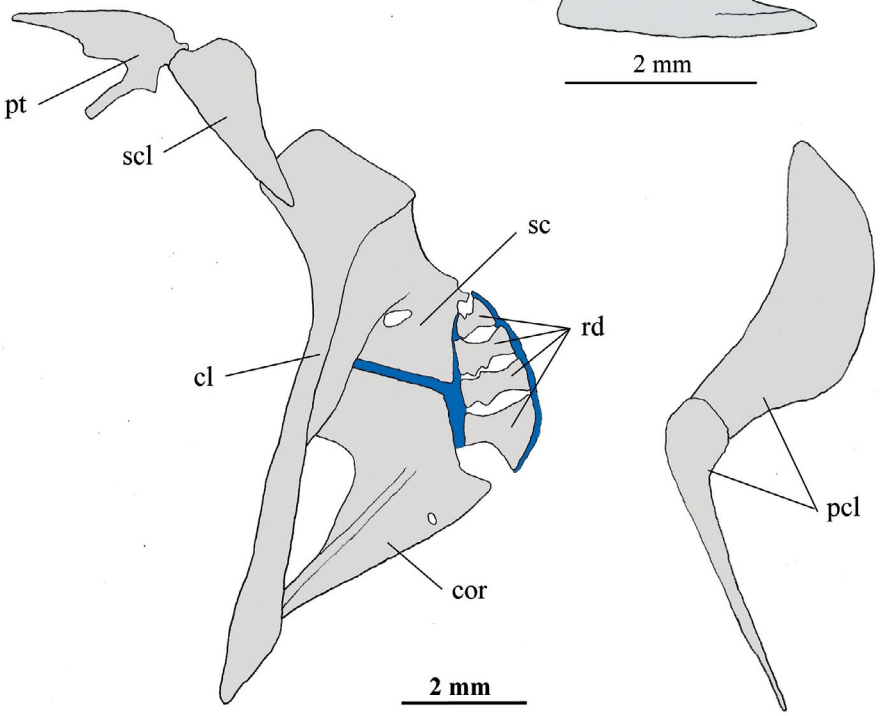


Figure 15. Pectoral girdle and postcleithra (lateral view, anterior to left) of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue. Abbreviations: **cl**, cleithrum; **cor**, coracoid; **pcl**, postcleithra; **pt**, posttemporal; **rd**, radials; **sc**, scapula; **scl**, supracleithrum.

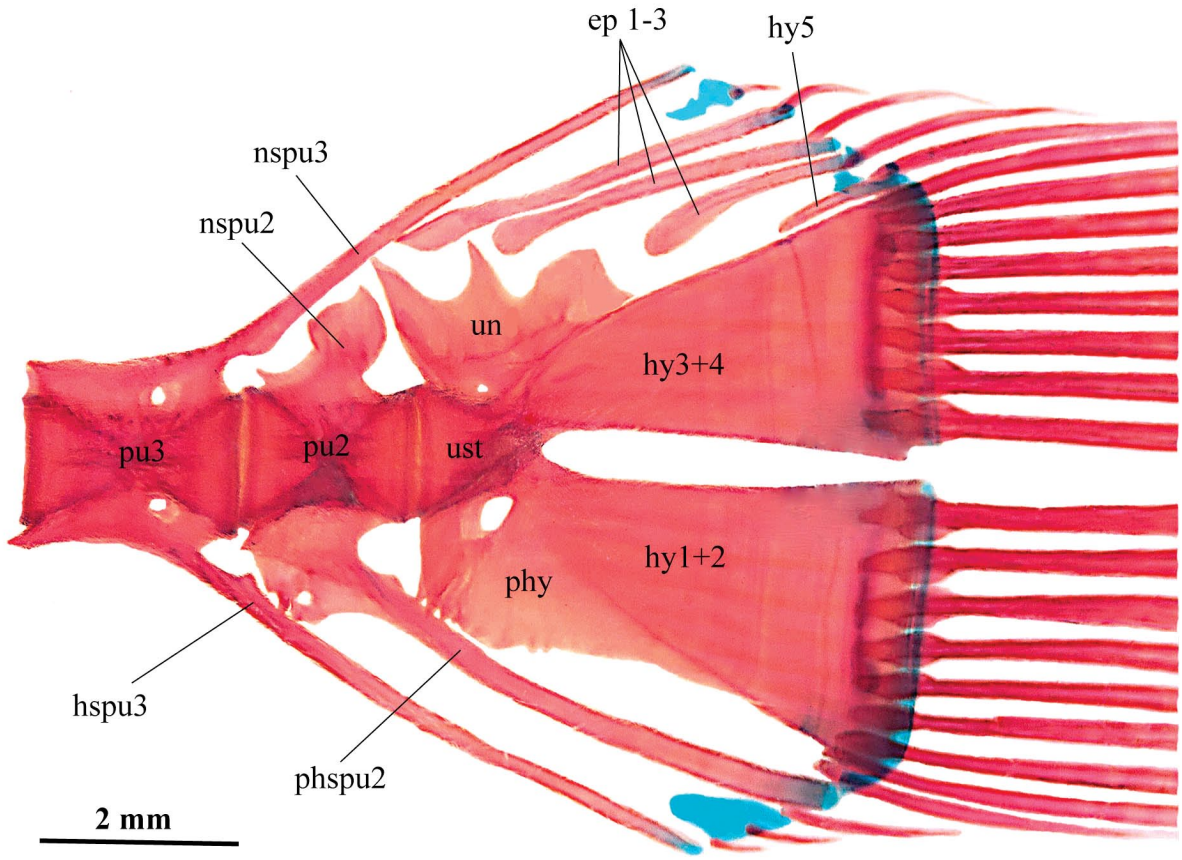


Figure 16. Caudal fin of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue. Abbreviations: **ep**, epural; **hspu**, haemal spine of preural centrum; **hy**, hypural; **nspu**, neural spine of preural centrum; **phy**, parhypural; **pu**, preural centrum; **un**, uroneural; **ust**, urostylar centrum (Z.S. Randall).

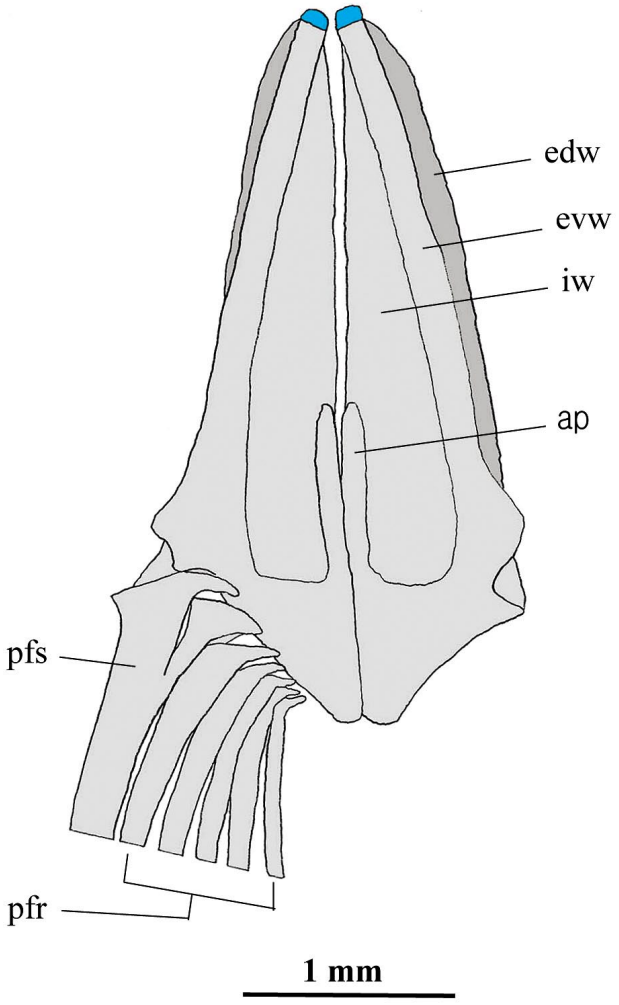


Figure 17. Ventral view of pelvic girdle (posterior to page bottom) of *L. higmani*; ANSP 138423, 62.6 mm SL. Cartilage in blue. Abbreviations: **ap**, anterior process; **edw**, external dorsal wing; **evw**, external ventral wing; **iw**, internal wing; **pfs**, pelvic-fin spine; **pfr**, pelvic-fin segmented rays.

Lonchopisthus ancistrus, n. sp.

Hook Jawfish
Bocón Gancho

urn:lsid:zoobank.org:act:2FB307CF-D9FC-40E2-A8A2-195B0B3B5156

Figures 2A, 3, 6A, 18–20, 25, 27, 31; Tables 1–4.

Lonchopisthus n. sp. Smith-Vaniz 2003: 1378 (in identification key).

Holotype. ANSP 139314 (formerly USA 5526), male, 60.1 mm SL, USA, eastern Gulf of Mexico off Florida, Desoto Canyon, 26° 25.2′ N, 84° 15′ W, 183 m, T.S. Searcy, R.L. Shipp & J.T. Williams, 3 February 1978.

Paratypes. (20 specimens, 41–89 mm SL) **Gulf of Mexico, off Florida**: AMNH 85526 (3, 41–70), ANSP 139305 (3, 49–70, including 1 C&S), GCRL 16118 (1, 60), UF 31477 (1, 61.7), & USNM 218684 (2, 68–69), all taken with holotype; AMNH 85581 (1, 49) & UF 233501 (1, 59.5), 26° 25’ N, 84° 14.5′ W, 183 m, 3 February 1978; ANSP 149354 (1, 56.6), 27° 52′ N, 84° 47′ W–27° 49′ N, 84° 42′ W, 194–176 m, 19 May 1982; ANSP 151569 (1, 63.4), 26° 15′ N, 84° 24′ W, 187 m, 24 April 1981; ANSP 138568 (1, 52), 25° 35′ N, 83° 42′ W, 110 m, 26 June 1950, R/V *Oregon* sta. 35; FMNH 94176 (1, 62), 26° 24′ 6.8” N, 84° 15′ W, 171 m, 21 August 1977; UF 153034 (1, 52.8), 26° 25′ N, 84° 20′ W, 183 m, 27 July 1975; UF 152902 (1, 40.5), 27° 50′ N, 84° 42′ W, 183 m, 27 July 1975; UF 153522 (1, 39.7), Middle Grounds, due west of St. Petersburg, 27° 49′ N, 84° 41′ W, 183 m, 28 October 1977. **Honduras**: ANSP 138162 (1, 89), 16° 26′ N, 81° 35′ W, 220 m, 6 June 1962, R/V *Oregon* sta. 3625.

Diagnosis. A species of *Lonchopisthus* distinguished by the following combination of characters: posterior end of maxilla strongly hooked (Fig. 2A); membranes connecting maxilla and premaxilla and covering inner posterior part of dentary pale; dorsal-fin elements X–XI,12–13; anal-fin elements III,11–12; branched caudal-fin rays 11–13 (exceptionally 5); cheek and opercle naked; oblique body-scale rows in longitudinal series 33–39; *L. ancistrus* is unique in having very long pelvic fins, 39.4–75.3% SL (Figs. 18 & 19); both it and *L. lemur* differ from other congeners in lacking an inner premaxillary dark stripe and having fewer numbers of segmented dorsal- and anal-fin rays (Table 2) and associated unbranched rays.

Description. Posterior end of maxilla strongly hooked. Dorsal-fin elements X or XI,12 or 13, with anterior rays 2–5 unbranched. Anal-fin elements III (2 supernumerary spines, first spine very small and easily missed),11–12,

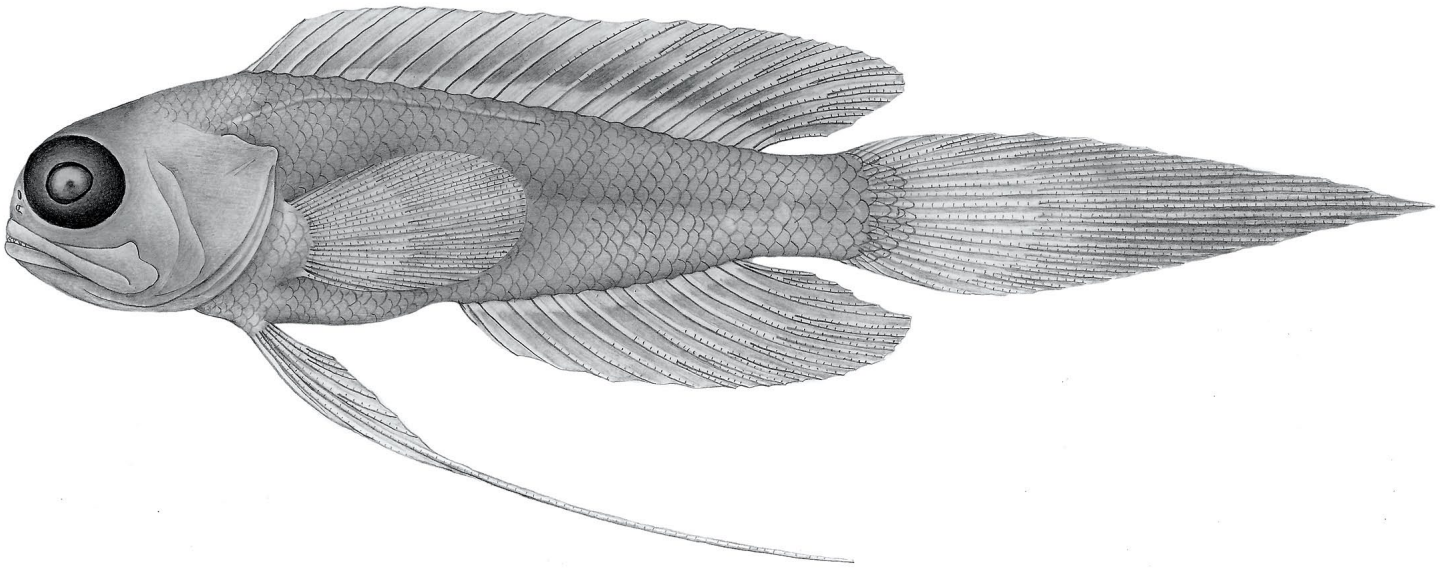
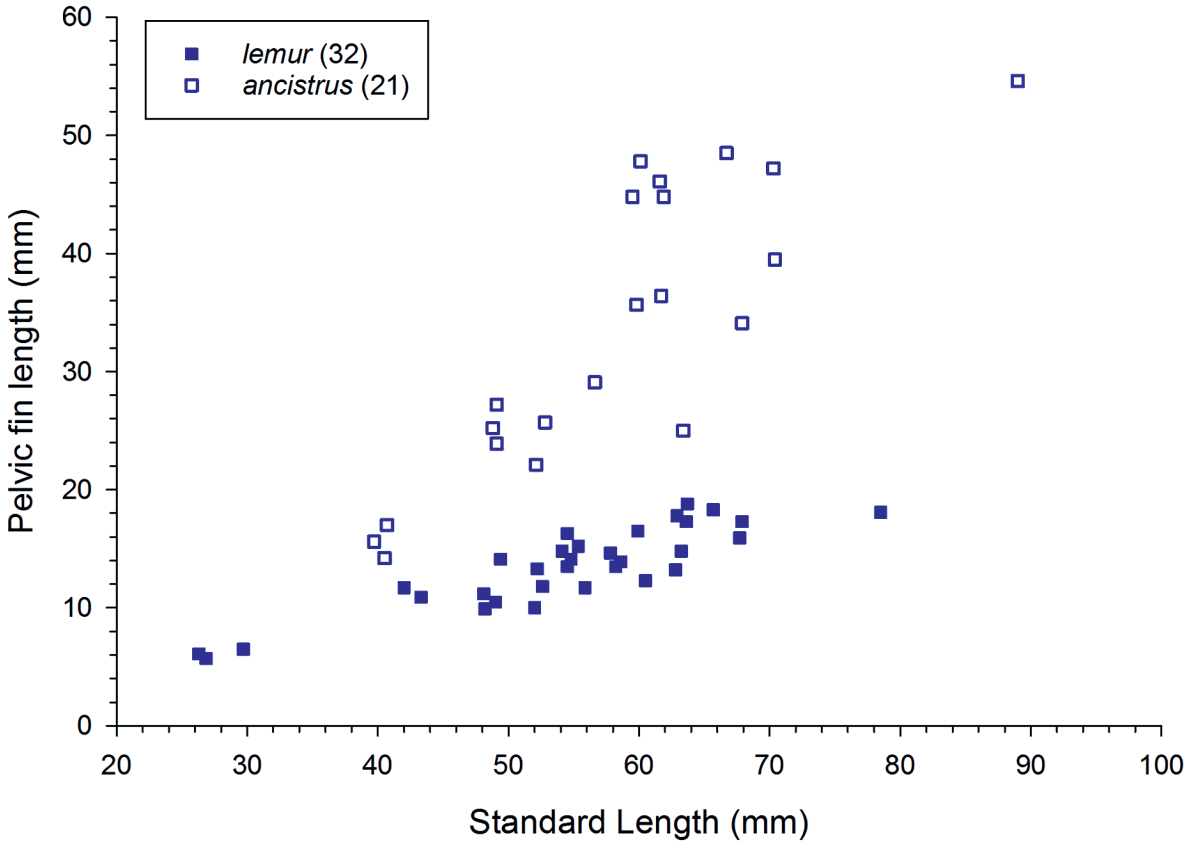


Figure 18. *Lonchopisthus ancistrus*, holotype, ANSP 139314, 60 mm SL, Gulf of Mexico (drawn by J.R. Schroeder).



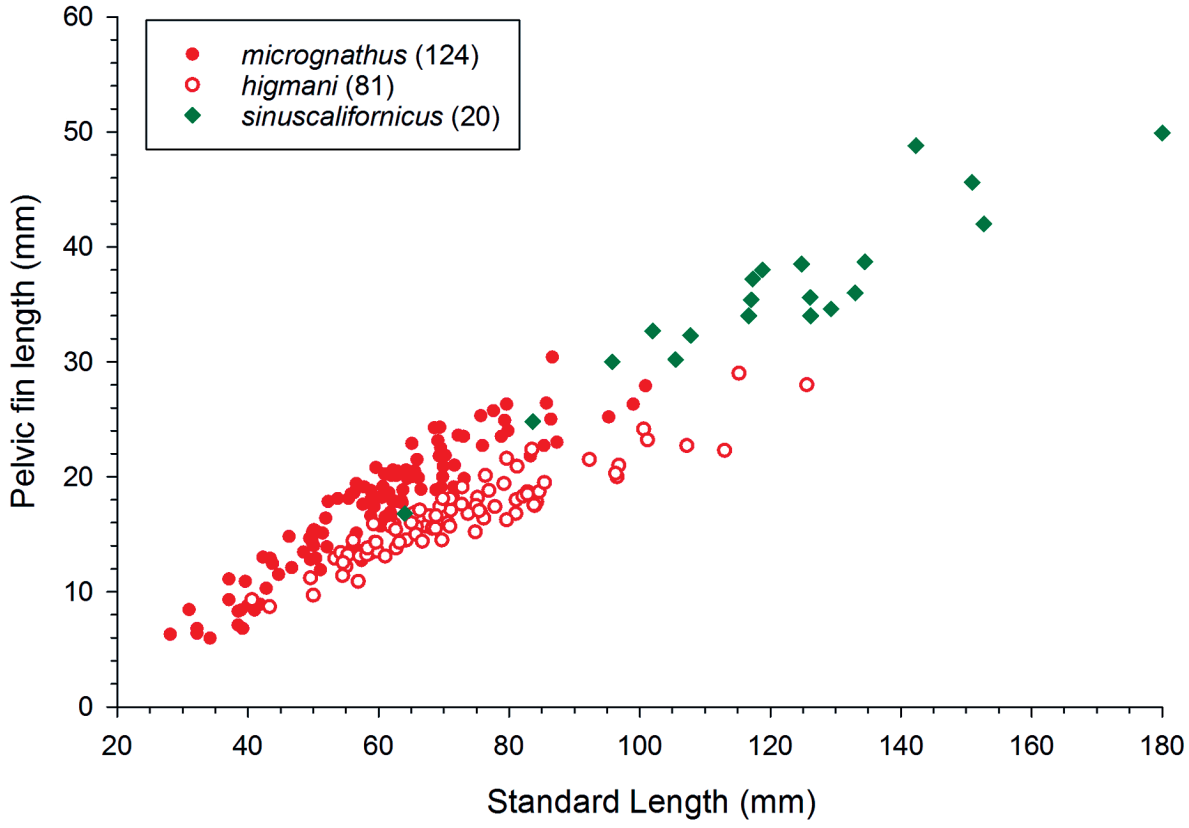


Figure 19. Pelvic-fin length versus standard length in species of *Lonchopisthus*; sample sizes in parentheses.

with anterior rays 2–6 unbranched. Pectoral-fin rays 19–21. Caudal fin with procurrent rays 8–10 (4–5+4–5), segmented rays 8+8, middle 11–13 branched (one of 21 specimens with 5), total elements 24–26; hypural 5 present. Vertebrae 10+16–17 (typically 17), last pleural rib on vertebra 10, epineurals 10–12. Insertion pattern of supraneural and anterior dorsal-fin pterygiophores (–/–/1/1+1/1/1). Gill rakers (number increases with increase in SL, see Table 4 & Fig. 25) in specimens 40–89 mm SL: upper 14–19; lower 30–33 (exceptionally 37); total 44–56. Infraorbital bones 4. Cheek and opercle naked. Oblique body-scale rows in longitudinal series 33–39. Lateral-line terminus below dorsal-fin rays 2–6. Pelvic fin length variable, depressed pelvic fin with tip extending to second segmented anal-fin ray in a 52.8 mm SL gravid specimen (UF 153034), to posterior end of fin in male holotype.

Measurements of the 60.1 mm SL male holotype, followed in parentheses by 18 paratypes, 40.7–89.0 SL (as percent of SL): predorsal length 31.1 (27.8–32.0); preanal length 54.9 (52.6–60.8); pelvic-fin length 79.5 (39.4–75.3); caudal-fin length 67.9 (40.0–63.9); depth at anal-fin origin 23.3 (20.7–26.3); caudal-peduncle depth 12.0 (9.7–11.9); caudal-peduncle length 16.3 (13.2–18.0); head length 32.1 (30.2–33.4); postorbital-head length 17.3 (15.1–17.6); upper-jaw length 20.0 (16.4–21.4); orbit diameter 12.0 (10.6–13.4). As percent of head length: postorbital head length 53.9 (49.4–57.1); upper-jaw length 62.2 (53.6–66.5); orbit diameter 37.3 (34.5–41.2).

Color when fresh. Based on two very low-resolution Kodachrome slides, the body and fins are dusky yellow, except for the elongate white pelvic-fin ray.

Color in alcohol. (Fig. 18). Most alcohol-preserved specimens either exhibit no obvious color pattern and are essentially uniformly pale, including the membranes connecting the maxilla and premaxilla and covering inner posterior part of dentary. In a few of the larger specimens, the dorsal, anal, and caudal fins are darker posteriorly and a narrow dusky stripe extends the entire length of the middle of the dorsal fin.

Etymology. The specific name is from the Greek *ankistron* (fish-hook), in allusion to the strongly hooked posterior end of the maxilla. The name is treated as a noun in apposition. We suggest the common name Hook Jawfish.

Distribution. Known only from the Gulf of Mexico and off Honduras (Fig. 20), where trawled in 110–220 m.

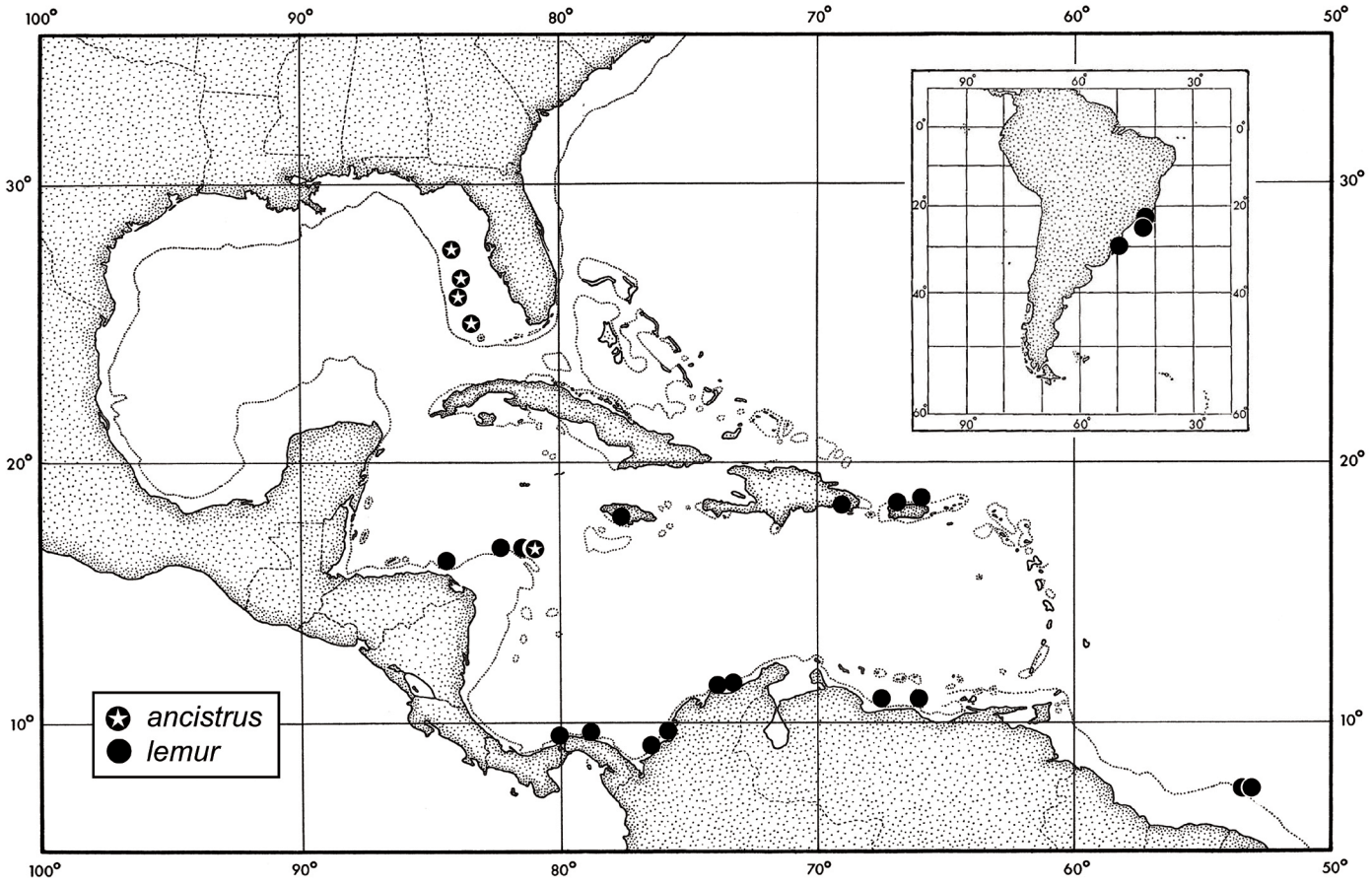


Figure 20. Geographic distributions of *Lonchopisthus ancistrus* and *L. lemur* in the western Atlantic Ocean.

Lonchopisthus lemur (Myers, 1935)

Ghost Jawfish
Bocón Fantasma

Figures 2B, 3, 6B, 19–22, 25, 27, 31; Tables 1–4.

Lonchistium lemur Myers, 1935: 3, fig. 1 (original description; Puerto Rico, off Punta Boca Juana, 18° 31′ 30″ N, 66° 14′ 55″ W, holotype USNM 93459); Cervigón 1966: 642 (Venezuelan record; description).

Lonchopisthus lemur. Palacio 1974: 65 (Colombian records); Cervigón 1994: 13, fig. 2 (Venezuelan record; description); Smith-Vaniz 1997: 1075 (listed); Robertson & Van Tassell 2015 (webguide with range and description; common name "Palemouth jawfish").

Lonchopisthus meadi Menezes & de Figueiredo, 1971: 198, fig.1 (original description; Rio Grande do Sul, 32° 12′ S, 50° 12′ W, holotype MZUSP 8014); Menezes & de Figueiredo 1985: 41, fig. 46 (description; "very similar and perhaps identical to *L. lemur*"); Smith-Vaniz 1997: 1075 (listed; synonym of *L. lemur*); Menezes *et al*. 2003: 78 (listed).

Lonchistium meadi. Roux 1973: 152 (description; "R/V *Calypso*" station 150).

Lonchistium sp. Nolf 1976: 736, pl. IX, figs. 9–11 (description of *Lonchopisthus* otoliths from Trinidad Neogene sediments [possibly *L. lemur*?]).

Lonchopisthus sp. Cervigón 1994: 14 (Venezuelan record; description).

Material examined. (46 specimens, 22.9–78.5 mm SL) **Jamaica**: ANSP 138447 (1, 52), 17° 55.7′ N, 78° 0′ W–17° 57′ N, 57° 3′ W, 265 m, 7 July 1970, R/V *Pillsbury* sta. 1232. **Dominican Republic**: ANSP 138448 (1, 23), 18° 21.7′ N, 69° 18.4′ W, 150 m, 10 July 1971, R/V *Pillsbury* sta. 1393. **Puerto Rico**: USNM 93459 (34, holotype of *Lonchistium lemur*), off Punta Boca Juana, 18° 30′ 50″ N, 66° 13′ 20″ W–18° 31′ 30″ N, 66° 14′ 55″ W, 275 m, 8 March 1933, Johnson Smithsonian Deep Sea Expedition sta. 105; FSBC 1564 (1, 44), 18° 26′ N, 67° 10.5′ W, 274 m, 6 Oct. 1959, R/V *Oregon* sta. 2654. **Honduras**: ANSP 157372 (2, 60–63, smaller C&S) & TCWC 5142.2 (3, 64–66), 16° 9′ N, 84° 73.1′ W, 339–531 m, 15 July 1970, R/V *Alaminos* sta. 72A10–15; FMNH 66601 (1, 64), 16° 38′ N, 82° 34′ W, 375–384 m, 21 Aug. 1957, R/V *Oregon* sta. 1869; FMNH 70909 (1, 55), 16° 39′ N, 81° 43′ W, 229 m, 22 Aug. 1957, R/V *Oregon* sta. 1878. **Panama**: ANSP 138516 (1, 42), 9° 37.5′ N, 78° 45′ W–9° 37′ N, 78° 52.2′ W, 64–128 m, 8 July 1966, R/V *Pillsbury* sta. 330; USNM 188291 (1, 49), 9° 18′ N, 80° 22′ W, 228 m, 29 May 1962, R/V *Oregon* sta. 3590. **Colombia**: UF 182407 (1, 78.5), N. of Cabo de la Aguja, 11° 16′ 54″ N, 74° 17′ W–11° 19′ 42″ N, 74° 14′ 24″ W, 165–210 m, 31 July 1968, R/V *Pillsbury* sta.785; UF 230167 (2, 30–48), WSW of Riohacha, 11.33° N, 73.81° W, 143–174 m, 31 July 1968, R/V *Pillsbury* sta. 783; UF 224613 (5, 48–64) and ANSP 138443 (2, 53–55, C&S), W. of Santa Marta, 11° 08.5′ N, 74° 18.1′ W–11° 7.6′ N, 74° 19.3′ W, 101–165 m, 31 July 1968, R/V *Pillsbury* sta. 786; UF 228178 (5, 45–68), W. of Cartagena, 10° 21.9′ N, 75° 47.3′ W–10° 20.2′ N, 75° 44′ W, 150–170 m, 1 Aug. 1968, R/V *Pillsbury* sta. 797; UF 222160 (1, 27), off Gulf of Darien, 9° 1.3′ N, 76° 40.2′ W–9° 0.1′ N, 76° 38.5W, 118–177 m, 17 July 1966, R/V *Pillsbury* sta. 399. **Venezuela**: ANSP 138449 (1, 63), 10° 54.7′ N, 66° 17.8′ W–10° 57.6′ N, 66° 18′ W, 234–280 m, 23 July 1968, R/V *Pillsbury* sta. 739; USNM 217801 (1, 63), 10° 45′ N, 66° 37′ W, 229 m, 17 Oct. 1963, R/V *Oregon* sta. 4465; FMNH 70910 (1, 61), Gulf of Triste, 10° 54′ N, 68° 01′ W, 183 m, 10 Oct. 1963, R/V *Oregon* sta. 4446. **French Guiana**: MCZ 40550 (2, 43–52), 7° 27′ N, 53° 47′ W, 220–229 m, 9 Sep. 1958, R/V *Oregon* sta. 2295; MCZ 40556 (1, 59), 7° 15′ N, 53° 25′ W, 211 m, 9 Nov. 1957, R/V *Oregon* sta. 2022; UF 230253 (1, 26), 7° 10′ N, 53° 36′ W, 126–135 m, 9 July 1968, R/V *Pillsbury* sta. 658. **Brazil**: MZUSP 8946-48 (3, 55–58), Rio de Janeiro, 23° 43′ S, 43° 55′ W, 106 m, 10 Aug. 1970, R/V *Prof. W. Besnard* sta. 1155; MZUSP 8945 (1, 68), Santa Catarina, 25° 48′ S, 46° 31′ W, 131–133 m, 31 May 1970, R/V *Prof. W. Besnard* sta. 1041; MZUSP 8021-26 (6, 52–63), Rio Grande do Sul, 30° 23′ S, 48° 37′ W, 199 m, 4 Dec. 1968, R/V *Prof. W. Besnard* sta. 437.

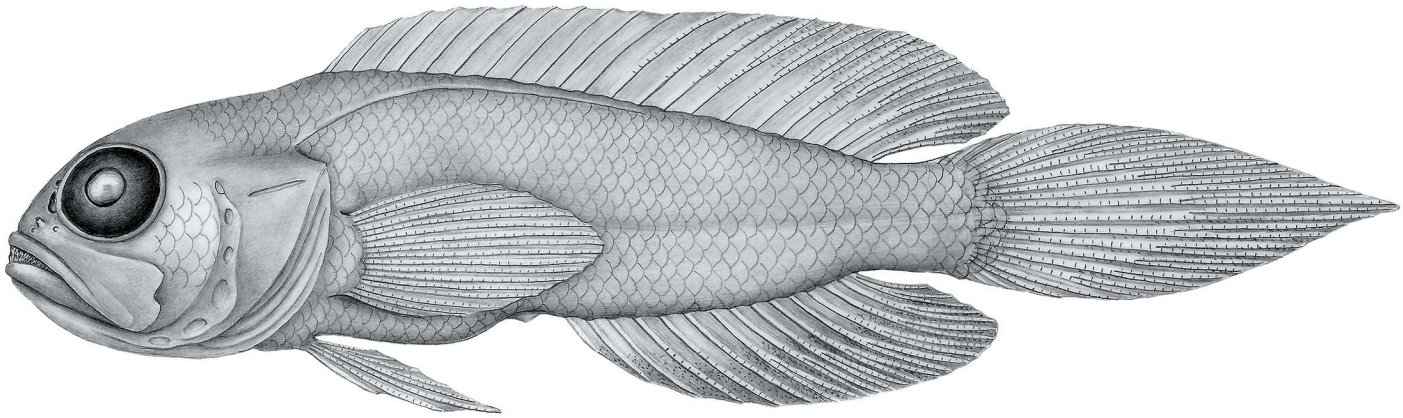


Figure 21. *Lonchopisthus lemur*, ANSP138447, 52 mm SL, male, off Jamaica; opercle scales not shown (drawn by J.R. Schroeder).

Diagnosis. A species of *Lonchopisthus* distinguished by the following combination of characters: posterior end of maxilla strongly hooked (Fig. 2B); membranes connecting maxilla and premaxilla and covering inner posterior part of dentary pale; dorsal-fin elements X–XI,11–12; anal-fin elements III,10–12; branched caudal-fin rays 10–13 (exceptionally 8); oblique body-scale rows in longitudinal series 26–33; pelvic fin 19.2–29.9% SL in specimens >40 mm SL; *L. lemur* is unique in having 5 (vs. 4) infraorbital bones (Fig. 6B), and both it and *L. ancistrus* differ from other congeners in lacking an inner premaxillary dark stripe and having fewer segmented dorsal- and anal-fin rays (Table 2) and associated unbranched rays.

Description. Posterior end of maxilla strongly hooked (note some specimens have posteroventral part of the hook partially broken-off, but still covered by skin, a condition that could be mistaken for naturally notched maxilla typical of *L. higmani*). Dorsal-fin elements X–XI,11 or 12, with anterior rays 2–6 unbranched. Anal-fin elements III (2 supernumerary spines, with first spine very small and easily missed),10–12, (rarely 10) with anterior rays 3–5 unbranched. Pectoral-fin rays 19–21. Caudal fin with procurrent rays 8–10 (4–5+4–5), segmented rays 8+8, middle 10–13 branched, total elements 23–25; hypural 5 present. Vertebrae: 10+16–17 (rarely 16), last pleural rib on vertebra 10, epineurals 11–13. Insertion pattern of supraneural and anterior dorsal-fin pterygiophores (–/–/1/1+1/1/1). Gill rakers (number increases slightly with increase in SL, see Table 4 & Fig. 25) in specimens 30–78.5 mm SL: upper 12–17; lower 26–33; total 38–50. Infraorbital bones 5. Cheek scale rows 4 or 5. Oblique body-scale rows in longitudinal series 26–33. Lateral-line terminus below dorsal-fin elements XI–6. Depressed pelvic fin with tip not extending to anal-fin origin.

Measurements of 25 specimens, 43.3–78.5 SL, as percent of SL: predorsal length 31.5–39.1; preanal length 53.0–71.4; pelvic-fin length 19.2–29.9; caudal-fin length 28.8–56.0; depth at anal-fin origin 21.5–28.2; caudal-peduncle depth 9.3–16.1; caudal-peduncle length 12.1–18.6; head length 28.3–39.9; postorbital-head length 14.5–20.4; upper-jaw length 18.4–22.4; orbit diameter 10.8–15.6. As percent of head length: postorbital-head length 44.3–56.2; upper-jaw length 55.4–67.6; orbit diameter 32.1–45.4.

Color when fresh. Menezes & de Figueiredo (1971: 203) described the coloration of *L. lemur* (as *L. meadi*) as: "silvery with scattered dark green blotches throughout body. Opercle and pectoral fin bases pink. Top of head dark. Anal fin black, tip of anal fins blacker than the rest of the fin. Tip of dorsal fin rays, median caudal fin rays and inner rays of ventral fins black. Spinous dorsal fin and pectoral fin with a coloration similar to that of the body."

Color in alcohol. (Fig. 21) Most alcohol-preserved specimens exhibit no obvious color pattern, including on the membranes connecting the maxilla and premaxilla and covering inner posterior part of dentary. A few specimens (FMNH 66601 and USNM 188291) have a prominent black spot in the dorsal fin between spines 4–7 or 5–8 that extends to the base of the fin. This spot is also present in two juvenile specimens, 26.3 mm SL (UF 230253) and 26.9 mm SL (UF 222160), so its occurrence is probably not a case of sexual dichromatism. Except for the dorsal-fin spot, these specimens agree well with other material of *L. lemur*.

Etymology. The specific name *lemur* is Latin for ghost. We propose the common name Ghost Jawfish.

Distribution. Known from off Jamaica, Hispaniola, Puerto Rico, Central America, northern South America and southern Brazil (Fig. 20), where trawled in about 106 m to at least 375 m; the two deepest trawl collections were 375–384 m and 339–531 m.

An unconfirmed record of *L. lemur* from the Bahama Islands (not plotted on the distribution map) is probably valid. One specimen, which could not be located (originally UMML 20773), was trawled by the R/V *Gerda* in 275–298 m off Grand Bahama Island, 26° 34′ N, 78° 25–26′ W, in 1965. The specimen, identified by J.C. Staiger, was collected with the holotype of *Symphysanodon octoactinus* Anderson, and the depth is reasonable for this jawfish.

Remarks. We regard *L. meadi* as a junior synonym of *L. lemur*. The putative diagnostic characters given by Menezes & de Figueiredo (1971) to distinguish *L. meadi* from *L. lemur* were the number of pectoral-fin rays and gill rakers. Because the authors did not include a list of material examined (other than the types of *L. meadi*), it is unclear where the values for these meristic characters for *L. lemur* were obtained. The discussion section of the description of *L. meadi* seems to indicate that the comparison was made from text provided by Myers (1935) in his description of *L. lemur*, based on a single specimen, the holotype. Our counts of pectoral-fin rays and gill rakers for non-Brazilian specimens circumscribe the range of values provided in the description of *L. meadi*.

We were unable to observe the purported sexual dimorphism in horizontal eye diameter suggested by Menezes & de Figueiredo (1971) and consider it unlikely, given the posited allometry in females (but not males) and lack of a difference between the sexes in vertical eye diameter. We can think of no logical ecological or adaptive explanation for how such a presumed sexually dimorphic trait might have evolved, and we know of no other acanthomorph with sexually dimorphic eyes, except for the deep-sea ceratioid anglerfishes (Pietsch 2009).

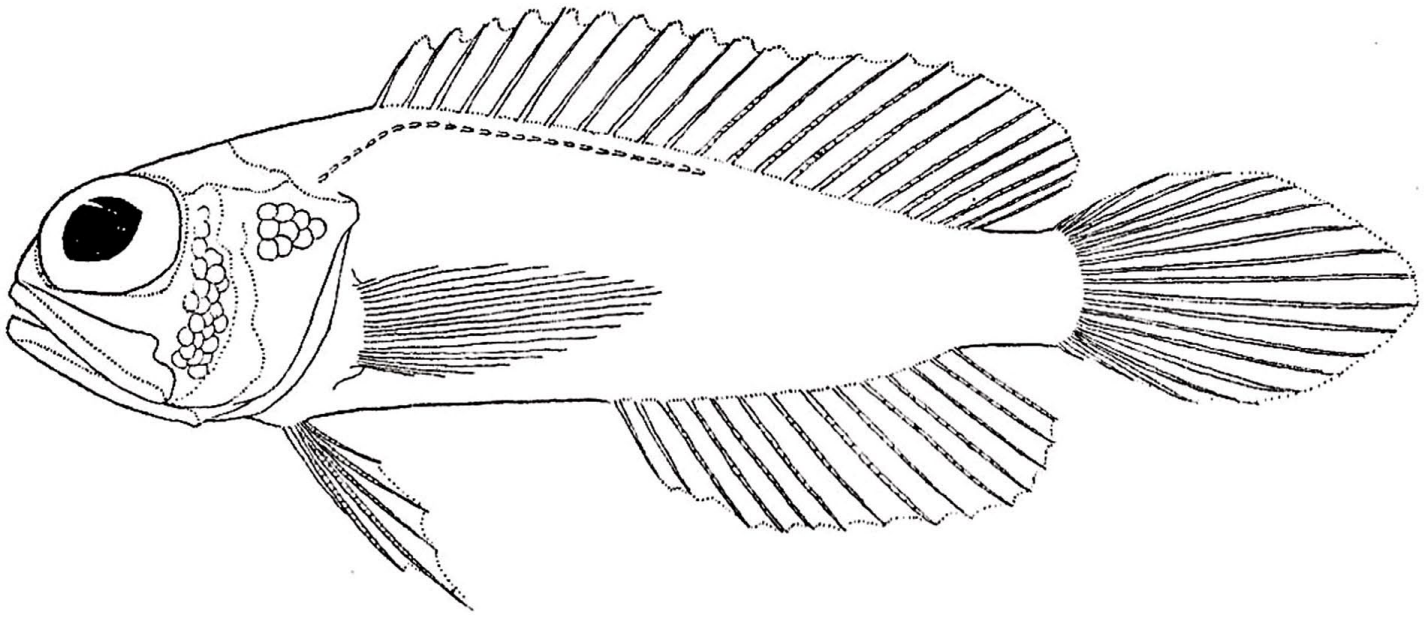


Figure 22. *Lonchopisthus lemur*, USNM 93459, 34 mm SL, holotype, off Puerto Rico, after Myers (1935).

Lonchopisthus micrognathus (Poey, 1860)

Swordtail Jawfish
Bocón Rayado

Figures 1, 2C, 3, 6C, 8, 19, 23–28, 31; Tables 1–4.

Opisthognathus [*sic*] *micrognathus* Poey, 1860: 287 (original description; Cuba; holotype presumably lost); Howell-Rivero 1938: 217 ("cotypes" listed).

Lonchopisthus micrognathus. Gill 1862: 241 (genus *Lonchopisthus* proposed for *O. micrognathus*); Jordan & Evermann 1898: 2286 (description); Jordan, Evermann & Clark 1930: 452 (listed); Longley & Hildebrand 1941: 243 (Tortugas, in catch of terns; brief description); Ginsburg 1942: 367 (description; comparison with *L. lindneri*); Mead 1959: 110 (description; comparison); Palacio 1974: 66 (Colombian records; first record of oral incubation); Colin & Arneson 1978 (life history; burrow morphology); Robins *et al*. 1980: 50 (common name "swordtail jawfish"); Robins & Ray 1986: 216, pl. 43 (brief description; distribution); Castro-Aguirre & Villavicencio-Garayzar 1988: 114 (in key to *Lonchopisthus* species); Mooi 1990: 458, fig. 3b (description of egg-surface morphology); Boschung 1992: 157 (listed; Alabama); Cervigón 1994: 15, fig. 3 (Venezuelan record; description); Hensely & Hensely 1995: 816 (listed in diet of terns at Dry Tortugas, Florida); Smith-Vaniz 1997: 1075 (listed); Aguilera 1998: 55 (listed; western Venezuela); Claro & Parenti 2001: 50 (listed; Cuba); Smith, C.L. *et al*. 2003: 27 (listed; Pelican Cays, Belize); McEachran & Fechhelm 2005: 202, unnumbered fig. (Gulf of Mexico; description); Page *et al*. 2013: 130 (common name "Swordtail Jawfish"); Robertson & Van Tassell 2015 (webguide with range and description; common name "Swordtail jawfish");

Lonchopisthus vanderbilti Borodin, 1928: 30, pl. 5, fig. 1 (original description; off coast of Cuba; holotype AMNH 222120; Mead 1959: 111 (description; comparison); Palacio 1974: 66 (Colombian records); Smith-Vaniz 1997: 1075 (listed; synonym of *L. micrognathus*).

Lonchopisthus lindneri Ginsburg, 1942: 366 (original description; Texas, off Padre Island, 27° 13.5′ N, 96° 40′ W; holotype USNM 119874); Mead 1959: 111, fig. 42 (description, including illustration of paratype; comparison); Starck 1968: 28 (Alligator Reef, Florida); Bailey *et al*. 1970: 47 (common name "swordtail jawfish"); Palacio 1974: 65 (Colombian record); Walls 1975: 293, unnumbered fig. (description); Hoese & Moore 1977: 225, fig. 358 (description); Castro-Aguirre & Villavicencio-Garayzar 1988: 115 (in key to *Lonchopisthus* species); Moore & Boardman 1991: 23 (listed in type catalog); Smith-Vaniz 1997: 1075 (listed; synonym of *L. micrognathus*).

Material examined. (195 specimens, 8.5–101 mm SL) **Florida Keys**: Monroe County: UF 152395 (2, 87–89), Dry Tortugas, 24.87° N, 82.45° W, 29 m, 14 Dec. 1976; UF 152407 (2, 80–87), Dry Tortugas, 24.8° N, 82.5° W, 31 m, 12 Dec. 1976; UF 213127 (1, 62), off Alligator Reef, 49 m, 2 April 1961; all Dry Tortugas: FSBC 1976–85 (1, 46), FSBC 1976-91 (1, 49), FSBC 1976-96 (1, 47), FSBC 1976-116 (1, 44), FSBC 1976-124 (3, 39–45), FSBC 1976-195 (2, 33–34), FSBC 1976-208 (1, 44), FSBC 1976-237 (4, 29–45), UF 208677 (2, 52–53), UF 214799 (1, 64), and UF 215760 (2, 39–50), Bush Key, all regurgitated by Sooty Terns, *Onychoprion fuscatus*; UF 116039 (1, 76), 24° 44′ 30″ N, 82° 7′ 30″ W, 20 m, 20 May 1978; UF 37470 (1, 87), NW of Key West, 24° 44.5′ N, 82° 7.5′ W, 20 m, 20 May 1978; Tortugas Shrimp Grounds (ca. 24° 45′–50′ N, 82° 10′ 30″ W): ANSP 138461 (2, 83–95), 26–31 m, 28 July & 6 Aug. 1959, UF 200563 (1, 59), 17 Jan. 1956, and UF 207014 (1, 85) 3–4 Aug. 1959; UF 36242 (1, 80), N. of Marquesas Key, 24° 39.1′ N, 82° 11′ W, 24 m, 3 Oct. 1982; FSBC 10262 (2, 99–101), 10 mi NNW of Loggerhead Light, 39.6 m, 4 Dec. 1977; FMNH 61319 (1, 87), SE of Tortugas, 24° 24′ N, 82° 55′ W, 13 April 1954; FSBC 5215 (2, 69–76), off Florida: 27° 37′ N, 83° 28′ W, 37 m, 2 July 1966; FSBC 5298 (1, 73), 26° 24′ N, 82° 38′ W, 14 Feb. 1966; FSBC 485 (1, 80), 24° 46′ N, 82° 22′ 30″ W, 1 April 1958. **Texas**: USNM 119874 (59, holotype of *L. lindneri*), off Padre Island, 27° 13.5′ N, 96° 40′ W, 77 m, 30 Jan. 1939, R/V *Pelican* sta. 112–3; USNM 119878 (2, 63), 27° 13′ N, 96° 47′ W, 59 m, 30 Jan. 1939; USNM 159220 (1, 70), 26° 13′ N, 96° 45′ W, 42 m, 2 June 1954, R/V *Oregon* sta. 1083; TCWC 4121.1 (1, 66), 28° 20′ N, 95° 8.7′ W, 36 m, 9

April 1979; TCWC 4130.1 (1, 69), 28° 14.8′ N, 95° 7.8′ W, 47 m, 9 Oct. 1980. **Mexico**: Yucatan: FSBC 3330 (2, 56–72), Alacranes Reef, 22° 28′ N, 89° 50′ W, 43 m, 27 April 1963; Gulf of Campeche: FMNH 61701 (1, 51), off Pta. Frontera, Aug. 1951; TCWC 2882.5 (3, 56–67), off Veracruz, 18° 57.5′ N, 95° 34.5′ W, 80 m, 22 Sep. 1971. **Cuba**: USNM 4785 (2, 59–74), MCZ 12515 (2, 77–78), and MCZ 12517 (2, 57–80), all received from F. Poey; USNM 82510 (1, 24), Cabanas Bay, dredged, 9 June 1914. **Belize**: Pelican Cays: USNM 347305 (2, 18–25), 21 m, 4 Sep. 1997. **Puerto Rico**: La Parguera vicinity, Laurel Reef: ANSP 131416 (4, 39–62), 18 m, 1 March 1975; ANSP 134238 (21, 24–78, including 7 C&S), 18–21 m, Jan. 1976; ANSP 141706 (4, 66–77), 21 m, 10 Oct. 1978. Media Luna Reef: UF 210956 (1, 69), 20 July 1960. **Antigua**: UF 11308 (51, 8.5–86), Green Island, 8 m, 15–30 April 1964. **Dominica**: USNM 438666 (1, 95), 15.6021° N, 61.4707° W, *Curasub* submersible, 139 m, 29 Feb. 2016. **Martinique Passage**: ANSP 138464 (1, 67), 14° 53.8′ N, 61° 4.9′ W–14° 54.2′ N, 61° 3.7′ W, 46–48 m, 7 July 1965, R/V *Pillsbury* sta. 913. **Martinique**: ANSP 121928 (2, 45–51), harbor W of Pt. Caracoli, 11–15 m, 7 July 1965. **Tobago**: UF 228908 (6, 28–49), 11° 10.6′ N, 60° 31.2′ W–11° 10.9′ N, 60° 32.3′ W, 68–73 m, 1 July 1969, R/V *Pillsbury* sta. 842. **Trinidad**: ANSP 138596 (5, 50–73), 10° 9.8′ N, 60° 34.3′ W–10° 10.3′ N, 60° 33.2′ W, 54–90 m, 30 June 1969, R/V *Pillsbury* sta. 837. **Suriname**: ANSP 138460 (1, 69), 7° 7′ N, 55° 8′ W–7° 7′ N, 55° 5′ W, 64 m, 11 July 1968, R/V *Pillsbury* sta. 671. **Venezuela**: ANSP 138462 (2, 26–29), 10° 36.1′ N, 68° 12.2′ W–10° 37.3′ N, 68° 11.4′ W, 22–26 m, 25 July 1968, R/V *Pillsbury* sta. 750; USNM 216400 (1, 50), 12° 14.5′ N, 70° 20′ W, 73 m, 10 Nov. 1958. **Colombia**: off Cartagena Bay: UF 230131 (2, 32–39), 10° 20.7′ N, 75° 39.1′ W–10° 18.4′ N, 75° 38.1′ W, 60–66 m, 1 Aug. 1968, R/V *Pillsbury* sta. 796; off Gulf of Morrosquillo: ANSP 138597 (1, 59), 9° 45.1′ N, 76° 9.1′ W–9° 45.5′ N, 76° 10.8′ W, 75–79 m, 16 July 1966, R/V *Pillsbury* sta. 392; UF 226776 (22, 35–66), 9° 31.3′ N, 76° 15.4′ W–9° 32.5′ N, 76° 17′ W, 56–58 m, 13 July 1966, R/V *Pillsbury* sta. 365; UF 228907 (3, 29–47), 9° 31.0 ′N, 75° 59.5′ W–9° 31.6′ N, 75° 56′ W, 33–36 m, 13 July 1966, R/V *Pillsbury* sta. 366; UF 228949 (3, 37–43), 9° 40′ N, 76° 1.5′ W–9° 41′ N, 76° 05.4′ W, 46–55 m, 13 July 1966, R/V *Pillsbury* sta. 371; off Gulf of Darien: UF 222285 (1, 29), 8° 48.7′ N, 77° 12.7′ W–8° 47.6′ N, 77° 14.2′ W, 96–98 m, 17 July 1966, R/V *Pillsbury* sta. 403; UF 230076 (1, 31), 8° 52.4′ N, 76° 50.4′ W–8° 52.4′ N, 76° 51.5′ W, 91–98 m, 17 July 1966, R/V *Pillsbury* sta. 400; UF 230078 (1, 26), 8° 51.2′ N, 77° 1.6′ W–8° 49.1′ N, 77° 4.1′ W, 72 m, 17 July 1966, R/V *Pillsbury* sta. 402. **Panama**: ANSP 138463 (1, 72), 9° 0.1′ N, 80° 45.8′ W–8° 59.7′ N, 80° 46.7′ W, 55 m, 20 July 1966, R/V *Pillsbury* sta. 437; UF 228177 (1, 34), 9° 37′ N, 79° 3′ W, 66 m, 19 Oct. 1965, R/V *Oregon* sta. 5737; UF 226751 (1, 40), 9° 8.9′ N, 79° 15.3′ W–9° 40.2′ N, 79° 17.4′ W, 64–70 m, 19 July 1966, R/V *Pillsbury* sta. 425.

Diagnosis. A species of *Lonchopisthus* distinguished by the following combination of characters: posterior end of maxilla strongly hooked (Fig. 2C); membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; dorsal-fin elements X–XI,16–19 (rarely 19); anal-fin elements III,14–18 (rarely 14, 15 or 18); no branched caudal-fin rays; oblique body-scale rows in longitudinal series 46–59; *L. micrognathus* is unique among its congeners in lacking branched caudal-fin rays at all sizes (Table 3), typically having a smaller head length (Fig. 27), and having tips of middle caudal-fin rays free (interradial membranes deeply incised).

Description. Posterior end of maxilla strongly hooked. Dorsal-fin elements X–XI (rarely X),16–19, with anterior rays 11–15 unbranched. Anal-fin elements III (2 supernumerary spines, with first spine very small and

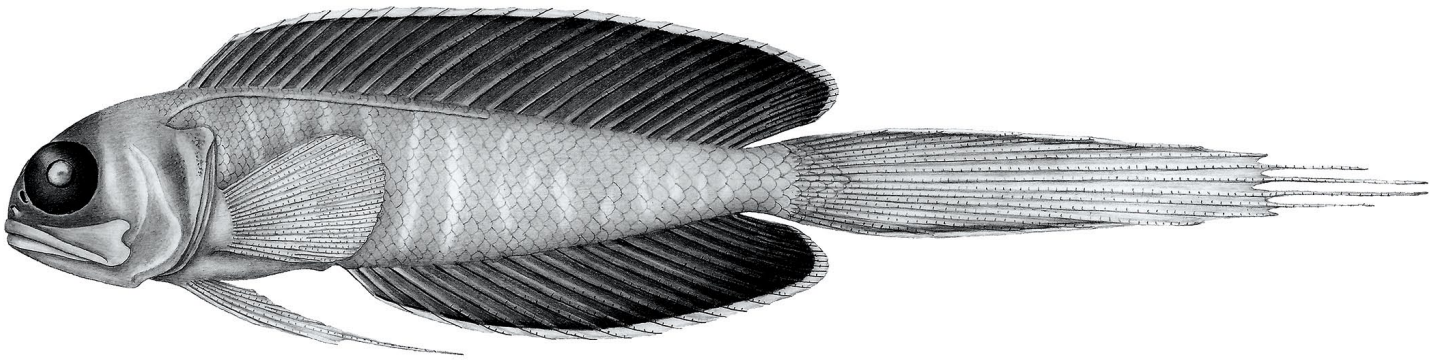


Figure 23. *Lonchopisthus micrognathus*, ANSP 141706, 71.9 mm SL, male, Puerto Rico, Laurel Reef; cheek and opercle scales not shown (drawn by J.R. Schroeder).

Figure 24. *Lonchopisthus micrognathus*, fresh photograph, USNM 438666, 95 mm SL, Dominica (C. Richards, courtesy Curaçao Sea Aquarium).

easily missed),14–18, with anterior rays 11–14 unbranched. Pectoral-fin rays 17–20. Caudal fin with procurrent rays 6–8 (3–4+3–4), segmented rays 8+8, none branched, tips of middle rays with free tips; total caudal-fin rays 22–24; hypural 5 present. Vertebrae: 10+17–19 (typically 18), last pleural rib on vertebra 10, epineurals 9–11. Insertion pattern of supraneural and anterior dorsal-fin pterygiophores (–/–/1/1+1/1/1). Gill rakers (number increasing with increase in SL, see Table 4 & Fig. 25) in specimens 30–126 mm SL: upper 16–25, lower 29–41, total 45–65. Infraorbital bones 4 (Fig. 6C). Cheeks scaled with 4–6 rows, in some specimens (UF 11308) these scales are partially embedded and easily overlooked. Oblique body-scale rows in longitudinal series 46–59. Lateral-line terminus below dorsal-fin rays 3–6. Depressed pelvic fin with tip extending from anal-fin origin to third segmented anal-fin ray.

Measurements of 95 specimens, 42.8–95.3 SL, as percent of SL: predorsal length 24.5–31.0; preanal length 42.6–55.0; pelvic-fin length 22.1–35.2; caudal-fin length 49.1–91.2; depth at anal-fin origin 17.0–27.0; caudal-peduncle depth 7.5–10.3; caudal-peduncle length 7.2–11.2; head length 24.8–30.9; postorbital-head length 13.2–17.5; upper-jaw length 13.9–18.4; orbit diameter 8.2–11.8. As percent of head length: postorbital-head length 47.1–62.6; upper-jaw length 47.8–69.1; orbit diameter 30.7–43.4.

Color when fresh. Fish from Dominica and Puerto Rico (Figs. 24 & 26) have a series of 6–8 narrow, pale, unbroken bands on the anterior half of the body that gradually become short dashes or spots posteriorly; head with two pale bands, the first just behind the eye; membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; background color of head and body tan and opercle usually with a dusky blotch; dorsal, anal, and caudal fins gray, becoming blackish distally with a narrow white or pale blue margin; pelvic fin white and pectoral fin either uncolored or with a narrow yellow margin (Dominica specimen only); iris dark brown.

Color in alcohol. A freshly preserved specimen from Puerto Rico (Fig. 23) agrees with those from the Antilles in having a series of irregular, narrow, pale bands on the head and body, and the dorsal, anal, and caudal fins with very narrow pale margins. Membranes connecting maxilla and premaxilla and covering the inner posterior part of dentary are darkly pigmented although not as black as in *L. higmani* and *L. sinuscalifornicus*. Except for the inner-jaw pigmentation, all specimens stored in alcohol eventually lose the marking described above, including the weak opercular blotch, any trace of the pale bands on the head and body, and the pale margins of median fins.

Etymology. The specific name is derived from the Greek *mikros* (small) and *gnathos* (jaw). The recognized common name is Swordtail Jawfish (Page *et al*. 2013).

Distribution. Broadly distributed on the continental shelf, from the Gulf of Mexico to northern South America, and from the Antilles (Fig. 28); a relatively shallow-water species, *L. micrognathus* has been collected in 8–98 m, except for one 139 m submersible collection off Dominica.

Remarks. Although Mead (1959) believed that *L. vanderbilti* was a valid species, in a footnote he discussed the poor condition of the holotype due to "long exposure to the bright lights of a display case and the copper wire by which it was affixed to a glass display case." However, Mowbray's original illustration of the holotype is adequate for positive identification. All of the characters Mead (1959) mentioned to distinguish *L. micrognathus*

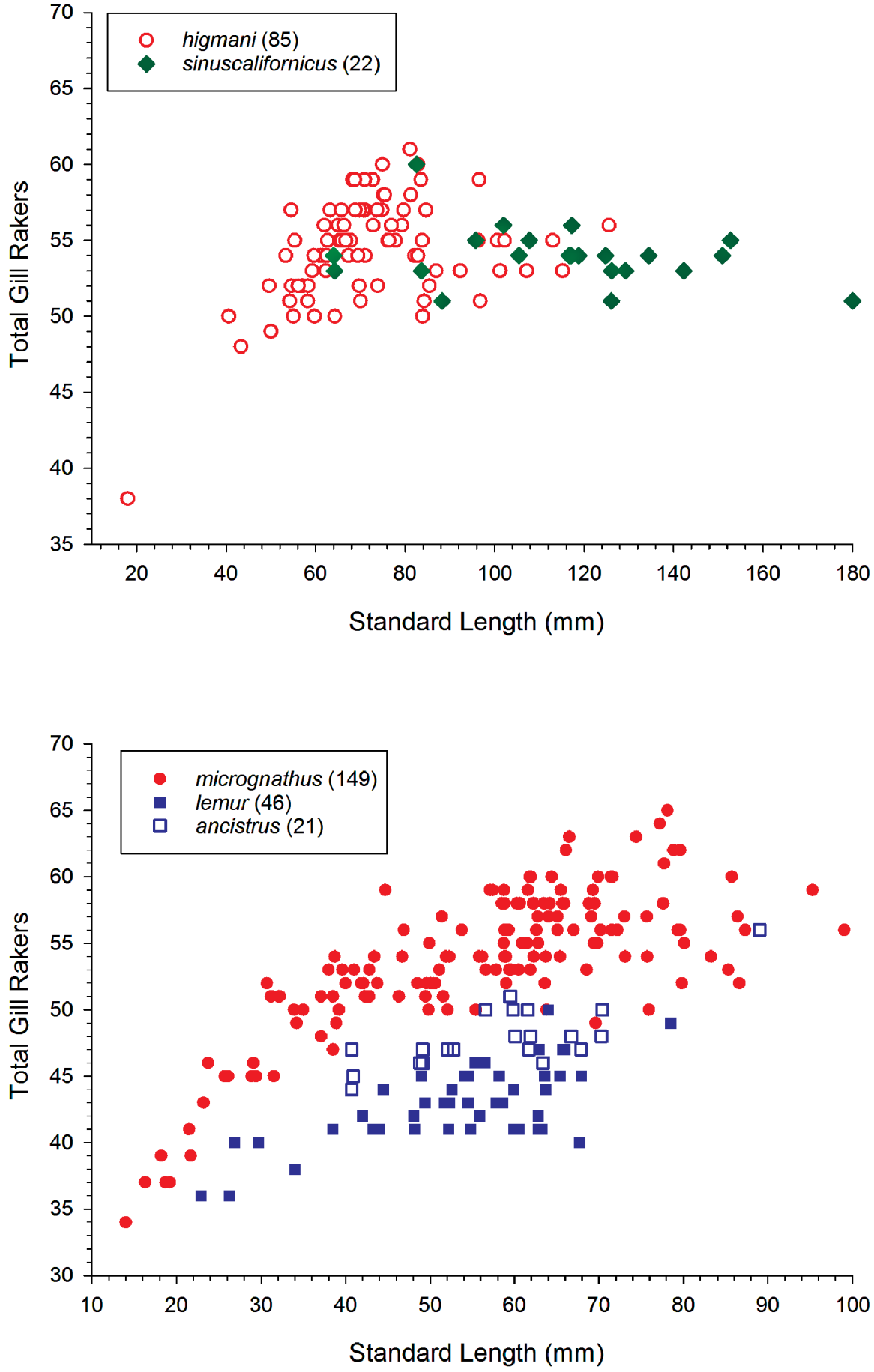


Figure 25. Total gill rakers versus standard length in species of *Lonchopisthus*; sample sizes in parentheses.

from both *L. vanderbilti* and *L. lindneri* are shared by all three nominal species. Mead (1959: 110) stated that "the paucity of specimens and their size distribution prevents me from providing a satisfactory revision of the species." Of particular importance is that *L. micrognathus* is the only species of *Lonchopisthus* that lacks branched caudal-fin rays at all sizes, the number of gill rakers increases with size (Fig. 25), and most of the color pattern is lost after preservation in alcohol.

Hensely & Hensely (1995) noted that *L. micrognathus* had been reported in the diets of adult Sooty Terns (*Onychoprion fuscatus*) and Brown Noddies (*Anous stolidus*) at Dry Tortugas, Florida, for over 50 years. They stated that neither of these birds dive for prey and jawfishes are not known to ascend to the surface. A simple explanation is that jawfishes are part of the bycatch of shrimp-trawlers active in the area, and these terns have been observed feeding on the discarded bycatch.

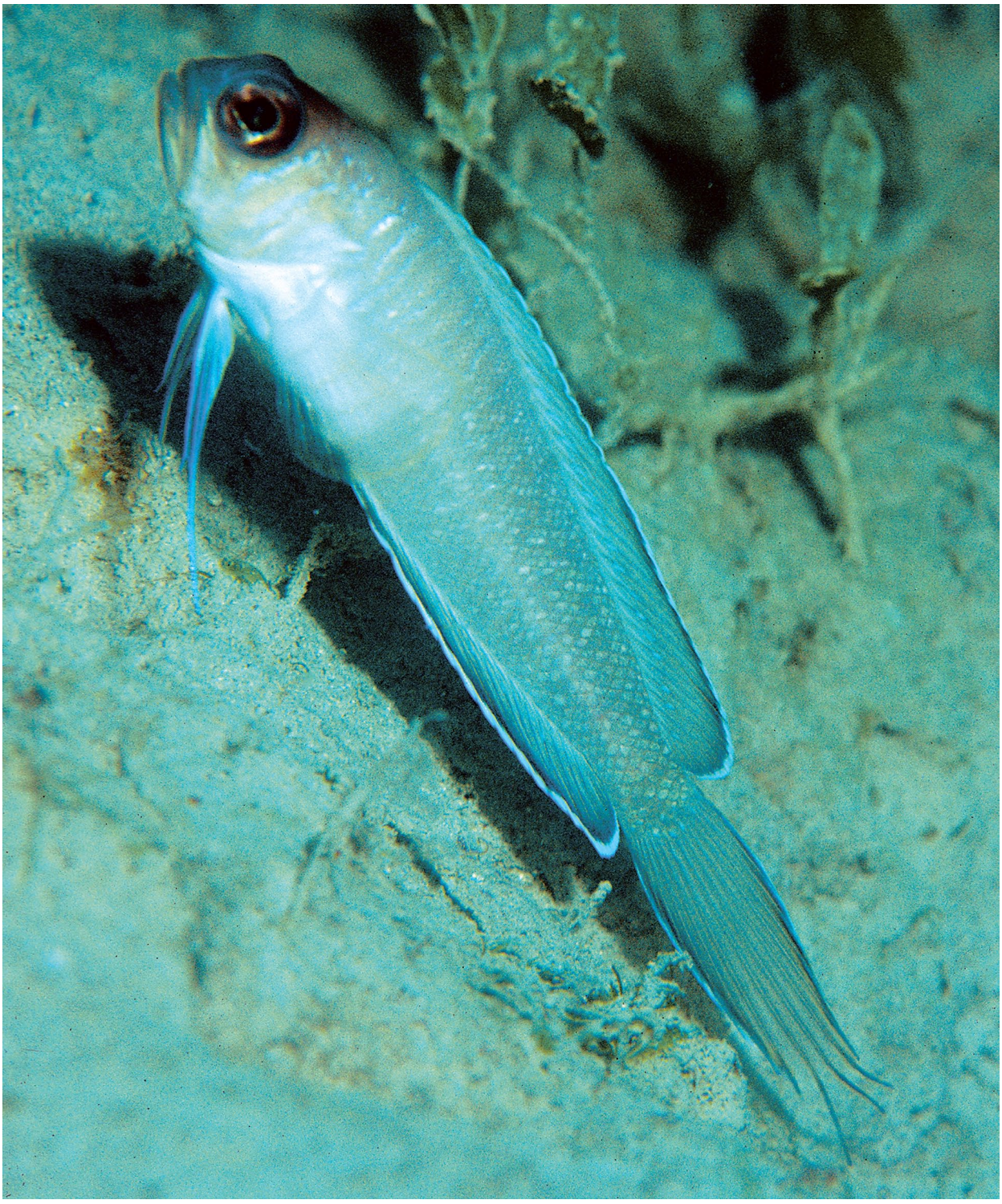


Figure 26. *Lonchopisthus micrognathus*, underwater photograph, Laurel Reef, Puerto Rico (P.L. Colin).

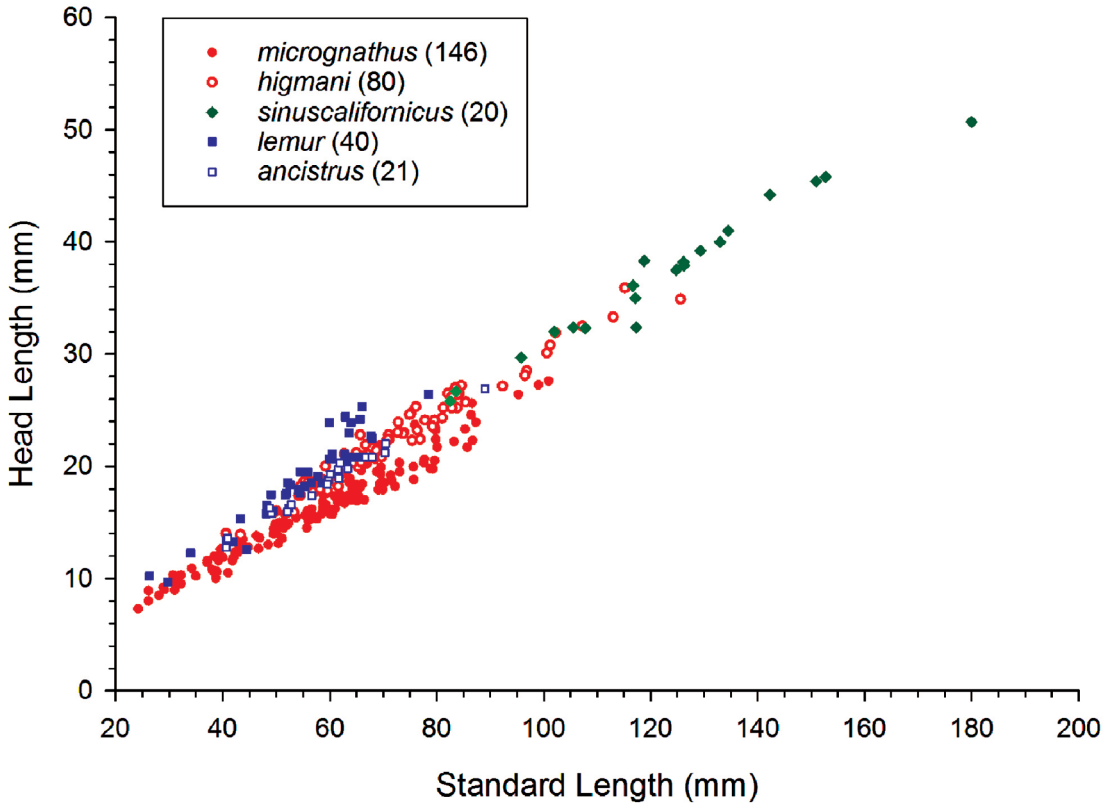


Figure 27. Head length versus standard length in species of *Lonchopisthus*; sample sizes in parentheses.

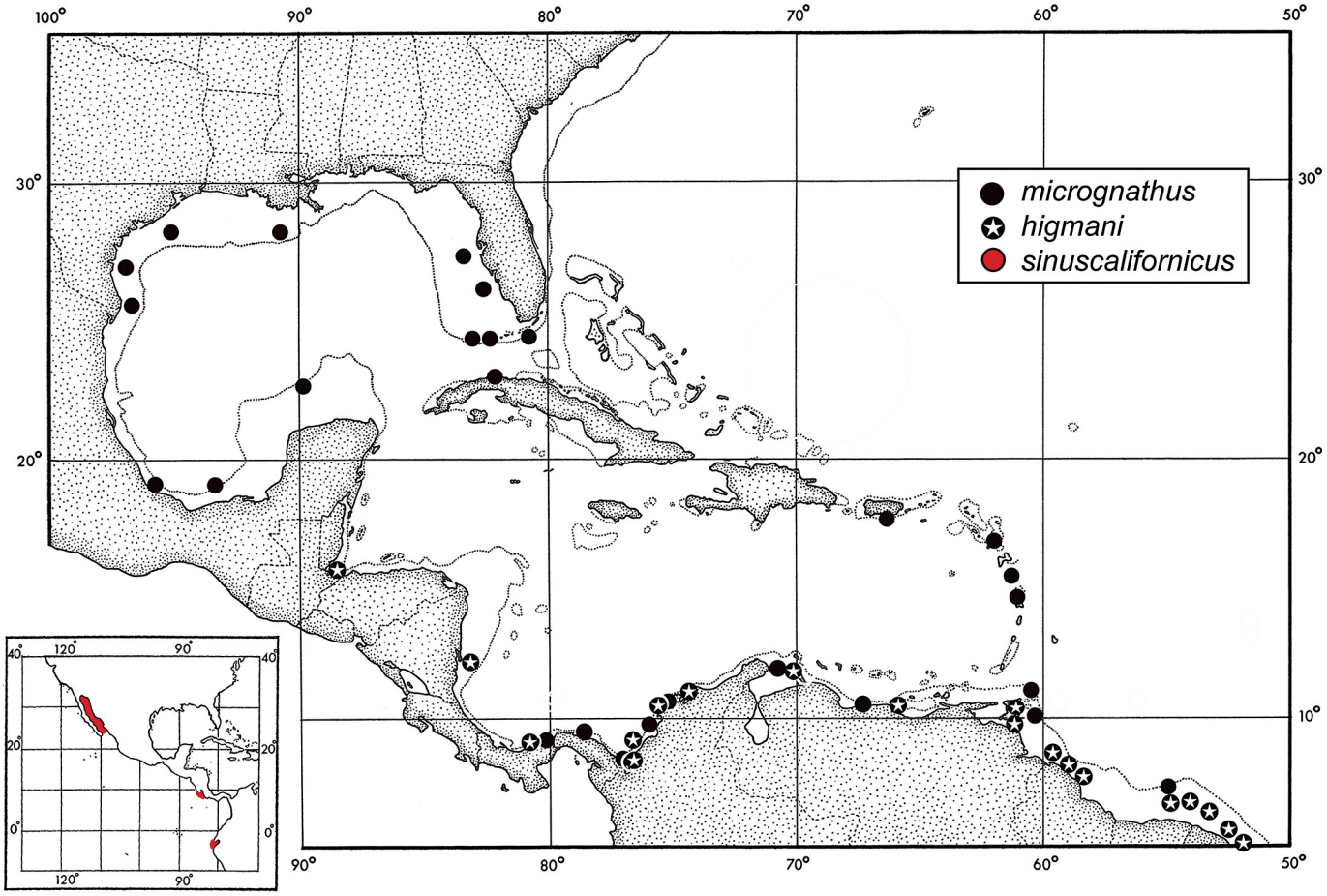


Figure 28. Geographic distributions of *Lonchopisthus micrognathus, L. higmani,* and *L. sinuscalifornicus*.

Lonchopisthus higmani Mead, 1959

Spotcheek Jawfish
Bocón Mejilla Manchada

Figures 2D, 3–5, 6D, 7, 10–17, 19, 25, 27–31; Tables 1–4.

Lonchopisthus higmani Mead, 1959: 104, fig. 41 (original description; Suriname, 6° 41′ 30″ N, 54° 16′ W; holotype USNM 158983); Cervigón 1966: 640, fig. 276 (Venezuelan record; description); Palacio 1974: 65 (Colombian records); Shimizu in Uyeno *et al*. 1983: 401, unnumbered color photograph (brief description; Suriname and French Guiana); Böhlke 1984: 135 (listed in type catalog); Ibarra & Stewart 1987: 53 (listed in type catalog); Gill & Mooi 1993: fig. 1e (illustration of cheek musculature); Cervigón 1994: 12, fig. 1 (description); Smith-Vaniz 1997: 1075 (listed); Aguilera 1998: 55 (listed; western Venezuela); Robertson & Van Tassell 2015 (webguide with range and description; common name "Higman's jawfish").

Material examined. (87 specimens, 18–126 mm SL) **Belize**: Gulf of Honduras: ANSP 138454 (2, 53–57), 16° 1.5′ N, 88° 42.5′ W, 13 m, 19 March 1968, R/V *Pillsbury* sta. 615; UF 218899 (1, 60), 16° 01′ N, 88° 43′ W, 13 m, 19 March 1968, R/V *Pillsbury* sta. 616. **Nicaragua**: ANSP 138424 (1, 80), 12° 15.8′ N, 83° 31.1′ W, 20–24 m, 28 Jan. 1971, R/V *Pillsbury* sta. 1333. **Panama**: ANSP 138453 (1, 78), 9° 7′ N, 80° 40.3′ W, 66–86 m, 20 July 1966, R/V *Pillsbury* sta. 435. **Colombia**: off Puerto Colombia: UF 229709 (1, 65), 10° 59.3′ N, 75° 5.3′ W, 55 m, 23 May 1964, R/V *Oregon* sta. 4868; USNM 216395 (1, 66), 9° 32.8′ N, 76° 9.3′ W, 60 m, 26 May 1964, R/V *Oregon* sta. 4894; off Gulf of Morrosquillo: USNM 216396 (1, 57), 9° 38′ N, 75° 54.5′ W, 42 m, 25 May 1964, R/V *Oregon* sta. 4886. USNM 216397 (1, 61), 9° 32.8′ N, 76° 9.3′ W, 60 m, 26 May 1964, R/V *Oregon* sta. 4894; USNM 217799 (1, 62), 9° 51′ N, 76° 9′ W, 99 m, 24 Dec. 1968, R/V *Oregon II* sta. 10211; USNM 216398 (1, 60), 9° 30′ N, 76° 7.5′ W, 40–42 m, 26 May 1964, R/V *Oregon* sta. 4892; USNM 217800 (1, 58), 9° 35′ N, 76° 8′ W, 59 m, 29 Dec. 1968, R/V *Oregon II* sta. 10234; USNM 216399 (3, 50–63), 9° 35′ N, 76° 4.5′ W, 40–55 m, 26 May 1964, R/V *Oregon* sta. 4895A; UF 229710 (1, 55), 9° 30′ N, 76° l.5′ W, 26–27 m, 26 May 1964, R/V *Oregon* sta. 4891; UF 226499 (1, 58), 9° 40′ N, 76° 1.5′ W–9° 41′ N, 76° 5.4′ W, 46–55 m, 13 July 1966, R/V *Pillsbury* sta. 371; off Gulf of Darien: UF 228811 (9, 18–64), 8° 51.9′ N, 76° 37.2′ W–8° 53.9′ N, 76° 37.2′ W, 37 m, 12 July 1966, R/V *Pillsbury* sta. 361; USNM 217798 (1, 69), 8° 50′ N, 76° 38′ W, 46 m, 30 Nov. 1968, R/V *Oregon II* sta. 10245; UF 16977 (1, 70), 8° 48′ N, 76° 53′ W, 48 m, 1 Dec. 1968, R/V *Oregon II* sta. 10254. **Venezuela**: UF 228176 (21, 62–81), SIO 77 374 (3, 66–84) and ANSP 138423 (11, 41–83, including 5 C&S), 10° 57′ N, 65° 52′ W–11° 3′ N, 65° 59′ W, 70–156 m, 22 July 1968, R/V *Pillsbury* sta. 736; ANSP 138421 (1, 81), 11° 52′ N, 70° 22′ W–11° 52.2′ N, 70° 21.8′ W, 35 m, 27 July 1968, R/V *Pillsbury* sta. 761; UF 228668 (1, 97), 11° 44′ N, 70° 22′ W, 48 m, 5 Oct. 1965, R/V *Oregon* sta. 5664. **Trinidad**: ANSP 138422 (1, 113), 9° 56.5′ N, 60° 46′ W–9° 59′ N, 60° 46′ W, 55–59 m, 30 June 1969, R/V *Pillsbury* sta. 836; UF 228952 (2, 70–84), 10° 09.8′ N, 60° 34.3′ W–10° 10.3′ N, 60° 33.2′ W, 54–90 m, 30 June 1969, R/V *Pillsbury* sta. 837. **Guyana**: UF 16978 (1, 67), 8° 49′ N, 59° 31′ W, 68 m, 26 April 1969, R/V *Oregon II* sta. 10497; ANSP 137659 (2, 84–85), 8° 33′ N, 58° 50′ W, 66–75 m, 28 Aug. 1958, R/V *Oregon* sta. 2229; FMNH 66391 (2, 71–76) and UF 204203 (1, 83), 8° 32′ N, 59° 5′ W, 51–60 m, 28 Aug. 1958, R/V *Oregon* sta. 2226; USNM 186059 (1, 82), 8° 30′ N, 58° 56′ W, 68 m, 28 Aug. 1958, R/V *Oregon* sta. 2228; MCZ 40543 (1, 107), 8° 8′ N, 58° 20′ W, 53 m, 19 Sep. 1958, R/V *Oregon* sta. 2346; USNM 186058 (1, 74), 8° 6′ N, 58° 20′ W, 42–48 m, 29 Aug. 1958, R/V *Oregon* sta. 2237. **Suriname**: ANSP 134215 (4, 81–97), 6° 46′ N, 54° 27′ W, 46 m, 28 June 1972, R/V *Oregon II* sta. 12032; USNM 158984 (1, 87), 6° 42.5′ N, 54° 11′ W, 42 m, 14 June 1957, R/V *Coquette* sta. 221; USNM 158983 (102, holotype of *L. higmani*), 6° 41′ 30″ N, 54° 16′ W, 44 m, 14 June 1957, R/V *Coquette* sta. 216. **French Guiana**: ANSP 134214 (1, 101), 6° 12′ N, 53° 23′ W, 46 m, 1 July 1972, R/V *Oregon II* sta. 12042; USNM 292182 (2, 85–115), 6° 5′ N, 53° 30′ W, 40 m, 1 July 1972, R/V *Oregon II* sta. 12043; UF 16979 (1, 126), 5° 50′ N, 52° 16′ W, 60 m, 4 May 1969, R/V *Oregon II* sta. 10571; ANSP 134216 (1, 96), 5° 4′ N, 51° 54′ W, 40 m, 3 July 1972, R/V *Oregon II* sta. 12055.

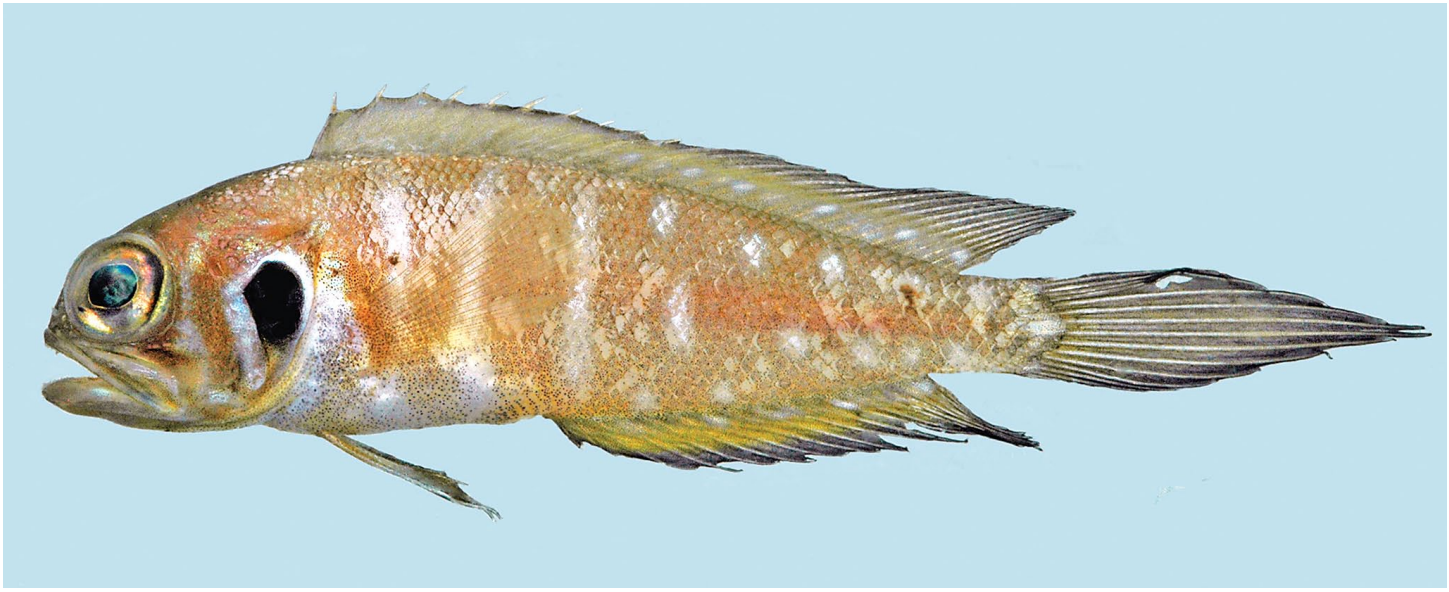


Figure 29. *Lonchopisthus higmani*, AMNH I.2489278, 41.3 mm SL, Bocas del Toro, Panama (J.L. Van Tassell & D.R. Robertson).

Diagnosis. A species of *Lonchopisthus* distinguished by the following combination of characters: posterior end of maxilla notched (Fig. 2D); membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; dorsal-fin elements X–XI,17–19 (rarely 19); anal-fin elements III,16–17; branched caudal-fin rays 0–6; oblique body-scale rows in longitudinal series 47–56; the allopatric *L. higmani* and *L. sinuscalifornicus* differ from other congeners in having the opercle with a prominent dark blotch and one supraneural bone present (absent in other congeners), *L. higmani* differs from *L. sinuscalifornicus* in having fewer body-scale rows 47–56, mean 52.7 (vs. 53–71, mean 62.9; see also Fig. 31), and larger and more scattered white spots on the posterior third of the body and on the dorsal and anal fins.

Description. Posterior end of maxilla hooked. Dorsal-fin elements X–XI,17–19, with anterior rays 9–14 unbranched rays. Anal-fin elements III (2 supernumerary spines, with the first spine very small and easily missed, see Fig. 4),16–17, with anterior rays 10–13 unbranched. Pectoral-fin rays 18–21. Caudal fin with procurrent rays 6–8 (3–4+3–4), segmented rays 8+8, middle 0–6 branched (number of branched rays increasing with increase in SL, see Table 3); hypural 5 present. Vertebrae: 10+17–18 (rarely 17); last pleural rib on vertebra 10, epineurals 9–11. Insertion pattern of supraneural and anterior dorsal-fin pterygiophores (S/–/1/1+1/1/1). Gill rakers (number increasing slightly with increase in SL, see Table 4 & Fig. 25) in specimens 40–126 mm SL: upper 17–24; lower 31–39; total 48–61. Infraorbital bones 4. Cheeks with 5 or 6 scale rows. Oblique body-scale rows in longitudinal series 47–56. Lateral-line terminus below dorsal-fin rays 1–8 (usually 5–8). Depressed pelvic fin with tip extending from anal-fin origin to first segmented anal-fin ray.

Measurements of 75 specimens, 43–126 SL, as percent of SL: predorsal length 26.8–35.3; preanal length 47.0–80.5; pelvic-fin length 19.2–33.3; caudal-fin length 41.0–70.5; depth at anal-fin origin 25.0–31.5; caudal-peduncle depth 8.3–11.0; caudal-peduncle length 7.0–15.9; head length 27.8–34.7; postorbital-head length 15.1–18.6; upper-jaw length 16.3–20.0; orbit diameter 8.9–13.5. As percent of head length: postorbital-head length 47.2–63.6; upper-jaw length 52.0–66.4; orbit diameter 29.5–43.2.

Color when fresh. Our knowledge of the life colors of *L. higmani* is based solely on Fig. 29. The most noticeable aspect of the color pattern is the prominent black opercular blotch that is mostly ringed by white, wider on the anterior margin; membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; head with one narrow pale band just behind the eye and body anteriorly with three slightly wider pale bands that become scattered pale spots posteriorly; background color of head and body tan, abdomen grayish white; dorsal and anal fins with a few indistinct pale spots along the base of the fin and the anal fin black distally with a broad yellow stripe along the basal two-thirds of fin; dorsal and caudal fins mostly dark gray; pelvic fin brownish and pectoral fin pale yellow.

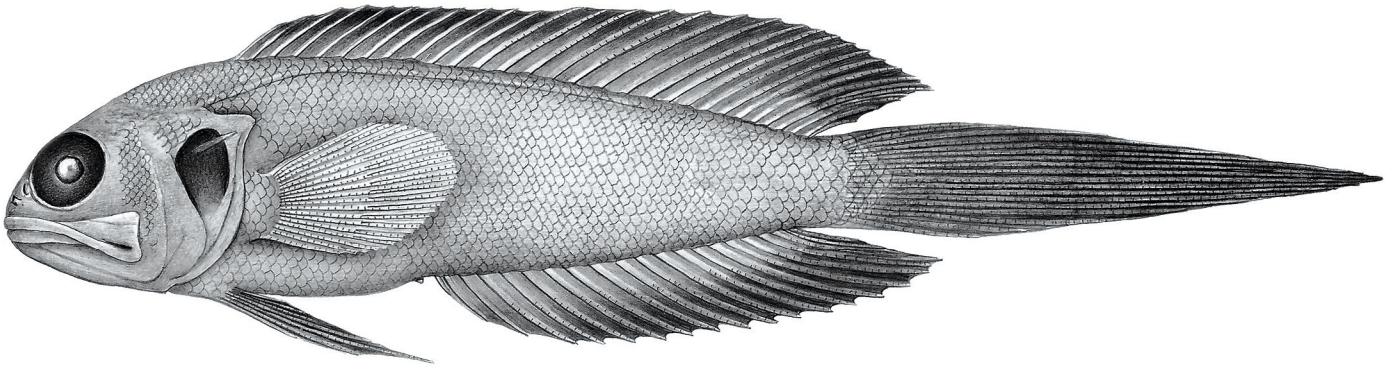


Figure 30. *Lonchopisthus higmani*, ANSP 138423, 79.6 mm SL, male, off Venezuela (drawn by J.R. Schroeder).

Color in alcohol. (Fig. 30) Except for the dark inner-jaw pigmentation, and the prominent opercular blotch, all specimens stored in alcohol eventually lose the marking described above, including any trace of the pale bands and spots on the head and body; the dorsal and anal fins are usually very dark posteriorly and the caudal fin is uniformly dark; pelvic fin with inner three rays and membranes brown and the others pale.

Etymology. Named for James B. Higman (see Anonymous 2010) whose efforts yielded important collections of this species from Suriname. We suggest the common name Spotcheek Jawfish for this species.

Distribution. Known along the continental shelf from the Gulf of Honduras to northern South America (Fig. 28); apparently a relatively shallow-water species, *L. higmani* has been collected by trawl in about 13–99 m.

Remarks. See Remarks for *L. sinuscalifornicus* below.

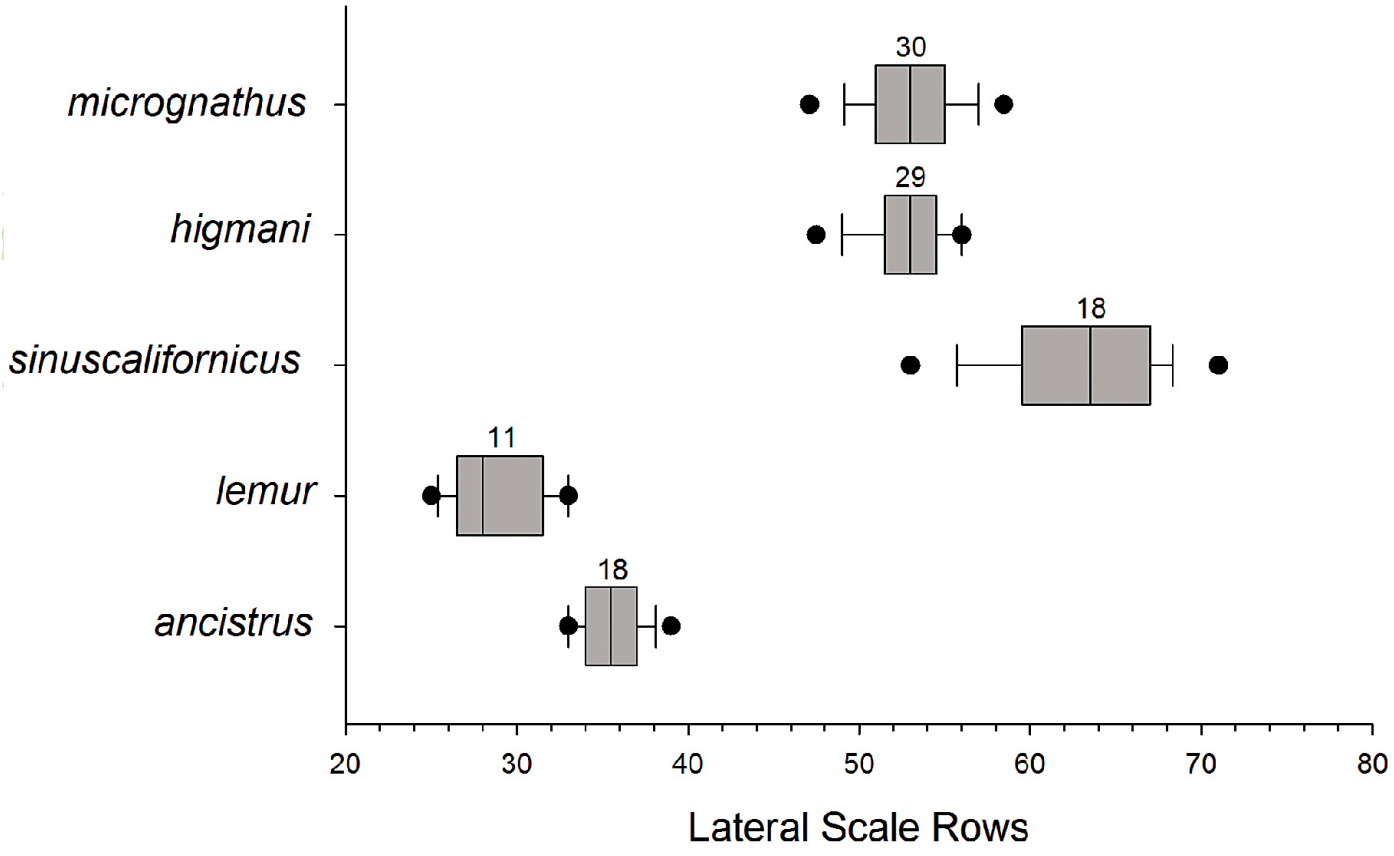


Figure 31. Box plots of body longitudinal scale rows in species of *Lonchopisthus*. Values are 25th and 75th percentile (shaded boxes), median (vertical line in shaded boxes), 10th and 90th percentile (whiskers), and 5th and 95th percentile (solid circles). Sample sizes indicated above each box.

Lonchopisthus sinuscalifornicus Castro-Aguirre & Villavicencio-Garayzar, 1988

Longtail Jawfish
Bocón Cola Larga

Figures 3, 19, 25, 27, 28, 31–33; Tables 1–4.

Lonchopisthus sinuscalifornicus Castro-Aguirre & Villavicencio-Garayzar, 1988: 109, figs. 1–3 (original description; Gulf of California, Mexico, Baja California, La Paz Bay, holotype ENCB IPN 5999); Bussing & López 1993: 140, unnumbered fig. (brief description; Costa Rica; common name "bocón acufíada"); Abitia-Cárdenas *et al*. 1994: 173 (listed); Allen & Robertson 1994: 213, color plate XIII, fig. 11 (brief description; Gulf of California); Thomson *et al*. 2000: 198 (listed); Bussing & Lavenberg 2003: 529 (distribution); Guzmán 2011: 173 (listed in type catalog); Page *et al*. 2013: 130 (common names English "Longtail Jawfish" and Spanish "Bocón Cola Larga"); Robertson & Allen 2015 (webguide with range and description; common name "Longtailed jawfish").

Material examined. (23 specimens, 64–180 mm SL) **Gulf of California**: SIO 61-282 (2, 129–134.5), center of Bahia de Los Angeles, 29° 00′ N, 113° 30′ W; SIO 75-400 (1, 151), 1 mi off Bahia San Luis Gonzaga, 29° 48′ N, 114° 22′ W, <50 m; SIO 66-557 (1, 180), Sinaloa, off mouth of Rio San Lorenzo, 24° 32′ N, 107° 50′ W, 3 m; SIO 79-15 (1, 117), off Boca de la Trinidad, 23° 36.2′ N, 109° 31.5′ W, 49–56 m, 14 April 1978; UAZ 71-74 (1, 126), Sonora, off Moro Colorado, ca. 28° 18′ N, trawled, 22 Oct. 1971; UAZ 67-55 (3, 82.5–108), Bahia Santa Inez, 26° 57.2′ N, 111° 52.2′ W, 5 Oct. 1967, TeVega Cr. 16 sta. 55; USNM 285745 (1, 125), Sonora, Puerto Lobos; UCLA W50-43 (1, 88, C&S), Sonora, ca. 80 mi. S. Guaymas vicinity of Boca del Rio Mayo, 26° 40′ N, 109° 47′ W, 11–18 m, 27–29 Jan. 1950; UCLA W52-54 (1, 126), off Sonora, Mexico, 3 mi. S. of Los Banos between Yavaros and Agiabampo, 27 Jan. 1952, P.A. Salazar. **Costa Rica**: SIO 79-4 (1, 105.5), Golfo de Papagayo, 10° 47′ N, 85° 47′ W, 49 m, 2 April 1978, R/V *Alpha Helix*; UCR 1-22 (1, 84), Puntarenas Prov., Bahia Caldera, 9° 55′ N, 84° 47′ W, trawled in 40 m, O. Blanco; UCR 259-2 (1, 142), Puntarenas Prov., Gulf of Nicoya, 10° 3′ N, 85° 0′ W, shrimp trawl, 1969; UCR 1031-1 (4, 117–133), Puntarenas Prov., Peñon de la Bruja, 73 m, 28 April 1974; UCR 1978.7 (1, 102), Puntarenas Prov., frente a Playa Hermosa, al sur de Jaco, 9° 30′ N, 84° 39′ W, 66–76 m, 15 Nov. 1987, R/V *Dr. Fridtjof Nansen* sta. 931. **Panama**: ANSP 139338 (2, 64 including 1 C&S), no precise locality data. **Colombia**: UF 114259 (1, 155), no precise locality data.

Diagnosis. A species of *Lonchopisthus* distinguished by the following combination of characters: posterior end of maxilla notched; membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish; dorsal-fin elements X–XI,17–19; anal-fin elements III,17–18 (rarely 18); branched caudal-fin rays 0–11; the allopatric *L. sinuscalifornicus* and *L. higmani* differ from other congeners in having the opercle

Figure 32. *Lonchopisthus sinuscalifornicus*, ca. 177 mm SL, Panama, Pacific side; deeply split caudal-fin rays likely an artifact (D.R. Robertson).

Figure 33. *Lonchopisthus sinuscalifornicus*, 138 mm SL, Gulf of California (M. Johnson, courtesy Prescott College Kino Bay Center).

with a prominent dark blotch and one supraneural bone present (absent in other congeners); *L. sinuscalifornicus* differs from *L. higmani* in having more body-scale rows 53–71, mean 62.9 (vs. 47–56, mean 52.7; see also Fig. 31), and smaller white spots on the posterior third of the body and on the dorsal and anal fins with those on the fins often arranged in rows.

Description. Posterior end of maxilla notched. Dorsal-fin elements X–XI,17–19, with anterior rays 8–14 unbranched. Anal-fin elements III (2 supernumerary spines, with first spine very small and easily missed),17–18, with anterior rays 9–13 unbranched. Pectoral-fin rays 18–21. Caudal fin with procurrent rays 8 (4+4), segmented rays 8+8, middle 0–11 branched (number of branched rays increasing with increase in SL, see Table 3), total elements 23–25; hypural 5 present. Vertebrae: 10+18 (rarely 19); last pleural rib on vertebra 10, epineurals 9–11. Insertion pattern of supraneural and anterior dorsal-fin pterygiophores (S/–/1/1+1/1/1). Gill rakers (number not increasing with increase in SL, see Table 4 & Fig. 25) in specimens 82.5–180 mm SL: upper 17–22; lower 33–38; total 51–60. Infraorbital bones 4. Cheeks with 5 or 6 scale rows. Oblique body-scale rows in longitudinal series 53–71. Lateral-line terminus below dorsal-fin rays 6–9. Depressed pelvic fin with tip extending from anal-fin origin to first segmented anal-fin ray.

Measurements of 20 specimens, 64–180 SL, as percent of SL: predorsal length 25.6–33.4; preanal length 47.5–51.6; pelvic-fin length 26.3–34.3; caudal-fin length 49.2–77.4; depth at anal-fin origin 21.6–28.8; caudal-peduncle depth 8.1–9.9; head length 27.6–32.5; postorbital-head length 16.0–19.4; upper-jaw length 15.8–17.9; orbit diameter 7.7–12.0. As percent of head length: postorbital-head length 53.6–63.8; upper-jaw length 52.4–59.8; orbit diameter 27.4–37.0.

Color when fresh. (Figs. 32 & 33) Body ground color grayish brown, nape and dorsum of head brownish, median fins blue-black. Abdomen, pectoral-fin base, and edge of opercular membrane white or pale cream. Opercular spot blue-violet, outlined in blue-white. Membranes connecting maxilla and premaxilla and covering inner posterior part of dentary blackish with a bluish cast. Iris grayish-yellow. Streaks and spots on body and fins blue-white.

Color in alcohol. Except for the dark inner-jaw pigmentation, and the prominent opercular blotch, all specimens stored in alcohol eventually lose the marking described above, including any trace of the pale bands on the head and body and the pale margins of the median fins.

Etymology. A combination of the Latin *sinus* (Gulf) and California in reference to the type locality. The recognized common name is Longtail Jawfish (Page *et al*. 2013).

Distribution. An eastern tropical Pacific endemic known from the Gulf of California, Costa Rica, Panama, Colombia, and Ecuador (Fig. 28); a shallow-water species, *L. sinuscalifornicus* has been collected in 3–73 m. In addition to the material listed above, a specimen from Isla Gorgona, Colombia is available (LACM 45791.001), and an Ecuadoran record is based on meristic data and a detailed sketch of a specimen from Salango Island (1° 35′ S, 80° 50′ W), kindly provided by Philippe Bearez.

Remarks. *Lonchopisthus sinuscalifornicus* and *L. higmani* are a geminate species pair presumably descended from a common ancestor isolated on either side of the Panamanian Isthmus by the closure of the Central American Seaway approximately 3.5 Ma (million years ago) (Coates & Obando 1996, Coates & Stallard 2013). However,

Bacon *et al*. (2015) inferred 7 Ma as the most recent partial closure of the Isthmus of Panama sufficient to split marine trans-isthmian taxa. In addition to the minor distinguishing characters given in the diagnosis, adults of *L. sinuscalifornicus* attain a much larger size of at least 180 mm SL (269 mm TL), while adults of *L. higmani* range in size from 50–126 mm SL (90–193.5 mm TL).

Acknowledgments

This revision would not have been possible without the generous cooperation of the curators, collection managers, and support staff of the institutions cited in the Methods and Materials section who loaned specimens and provided catalog numbers and other curatorial assistance. We especially appreciate the help of Benjamin Frable, Naércio Menezes, and Mark Sabaj. We are also grateful to the following individuals who provided photographs or helped us obtain them: Carole C. Baldwin, Patrick L. Colin, Maria Johnson, Zachary S. Randall, Chris Richards, D. Ross Robertson, James Van Tassell, and Jeffrey T. Williams. We thank Kevin W. Conway and two anonymous reviewers for constructive reviews of the manuscript. G. David Johnson provided advice about gill-arch structure and names of elements. Howard L. Jelks assisted with the multivariate analysis and provided helpful comments on a draft of the manuscript. Any use of trade, product, or company names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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