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A new genus and species of the family Symphysanodontidae, *Cymatognathus aureolateralis* (Actinopterygii: Perciformes) from Indonesia

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Abstract

A new genus and species of the percoid family Symphysanodontidae, *Cymatognathus aureolateralis* are described based on three specimens collected from North Sulawesi, Indonesia. The new species shares with the confamilial genus *Symphysanodon* the unique supraneural and spinous dorsal-fin pterygiophore insertion pattern usually of 0/0/0+2+1/1/, T-shaped first supraneural, foreshortened base of the penultimate ventral procurrent caudal-fin ray, well-developed outer tooth patches at anterior tips of both jaws as well as along the medial surface of most of the length of the coronoid process of the dentary. The new species, however, is distinguishable from members of *Symphysanodon* by the following diagnostic characters: posterior tip of coronoid process of dentary abruptly depressed, so that teeth on anterior portion appear as an elevated patch, anterior tip of upper jaw not notched, and posterior nostril horizontally slit-like. Although the new species superficially resembles the members of the genus *Giganthias* (Giganthiidae) and some members of the subfamily Anthiadinae (Serranidae) in the unique characters it shares with *Symphysanodon*, it differs from *Giganthias* in having the above-mentioned unique pterygiophore insertion pattern and tips of all dorsal- and pelvic-fin spines smooth (vs. pterygiophore insertion pattern 0/0/2/1+1/1/, and tips of second, third and/or fourth dorsal- and pelvic-fin spines serrated), and from the members of Anthiadinae in having two flat opercular spines (vs. three) and 10 + 15 = 25 vertebrae (vs. 10 + 16–18 = 26–28). A revised diagnosis of the Symphysanodontidae is presented.

Key words: new genus, new species, familial diagnosis, Sulawesi, Bitung

Introduction

Slopefishes of the family Symphysanodontidae are widely distributed in tropical and subtropical waters of the Western and Central Pacific, Indian and Atlantic oceans (Anderson, 1970, Anderson & Springer, 2005, Nelson, 2006, Nelson *et al.*, 2016). Although they bear some resemblance to serranid fishes of the subfamily Anthiadinae in general appearance, mainly in coloration, they are classified in the separate family Symphysanodontidae (Katayama, 1984, Anderson & Springer, 2005, Nelson, 2006, Nelson *et al.*, 2016). The Symphysanodontidae were previously considered monogeneric, comprising only the genus *Symphysanodon* Bleeker 1877, characterized by a laterally compressed and usually elongate body, upper margin of maxilla slightly covered by narrow infraorbitals, no supramaxilla, no canine teeth in jaws, opercle with two flat spines, preopercle with right-angled corner, a single un-notched dorsal fin with nine spines and ten soft rays, anal fin with three spines and seven or eight soft rays, and 10 + 15 vertebrae (Katayama, 1984). Prior to Katayama's (1984) definition of the family, the morphological characters of the genus *Symphysanodon* were described in detail by Anderson (1970) and Johnson (1981).

During the third author's field survey of marine fishes around North Sulawesi, Indonesia, he found three specimens of brightly colored fish at a local fish market in Bitung, North Sulawesi. They were caught by hand line together with other targeted, deep-water priacanthids and lutjanids southeast of Bitung. These specimens are

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similar to giganthiid (*sensu* Johnson, 1984, Senou, 2002; giganthiine—*sensu* Katayama, 1960) fishes of the genus *Giganthias* Katayama, 1954 and anthiadine fishes of the genus *Caprodon* Temminck & Schlegel, 1843 in general appearance. Our detailed examination, however, revealed that the specimens closely resemble members of *Symphysanodon* in the configuration of the supraneural bones and spinous dorsal-fin pterygiophores, procurrent caudal-fin rays and number of vertebrae. Moreover, these specimens have outer tooth patches on the anterior tips of both jaws and dentition on the coronoid process of the lower jaw similar to adult males of *Symphysanodon*. The specimens differ from *Symphysanodon* in some aspects of dentition, distinctive configuration of the coronoid process, and shape of the posterior nostril. Therefore, based on these three specimens, we herein describe *Cymatognathus aureolateralis* as a new genus and species of the family Symphysanodontidae. *Cymatognathus*, the second genus introduced into a previously monogeneric family, has provided us an opportunity to revise diagnostic characters of the Symphysanodontidae.

Methods

Methods of counts and measurements generally follow Randall & Heemstra (2006). All measurements except for standard length were made with a digital caliper to the nearest 0.01 mm. Standard length was measured by a divider and scale to the nearest 0.1 mm and reported to three places. Cyanine blue was used to examine tooth patches, nostrils, cephalic sensory pores and scales. Several specimens of Symphysanodontidae (including a paratype of *C. aureolateralis* gen. et **sp. nov.**, FRLM 54552), Serranidae, Giganthiidae, Callanthiidae and Lutjanidae were partly dissected to observe osteological characters of the cranium. The suspensoria of *C. aureolateralis* (paratype, FRLM 54552), *Symphysanodon andersoni* Kottaus, 1974 (USNM 435866) and *S. katayamai* Anderson, 1970 (FRLM 11738) were removed, and cleared and stained for observation. Vertebral counts, observations of supraneural bones, spinous dorsal-fin perygiophores and caudal skeletons were made from X-ray photographs. The supraneural and pterygiophore insertion patterns are expressed in accordance with the method of Ahlstrom *et al.* (1976: 297). Cephalic sensory pores were counted in one paratype, FRLM 54552. The type specimens of *C. aureolateralis* were sexed by histological observation of gonads. Standard length is abbreviated as SL. Institutional codes follow Fricke and Eschmeyer (2017) with an additional abbreviation LBRC-F, LIPI Bitung Reference Collection–Fish, Technical Implementation Unit for Marine Biota Conservation, Indonesian Institute of Sciences.

Family Symphysanodontidae Katayama 1984

(Figure 1)

Type genus: *Symphysanodon* Bleeker 1877

Diagnosis. Jaws subequal or upper jaw slightly projecting; both jaws with large and small conical teeth, no villiform teeth and no canines (Figure 2); anterior tips of both jaws with exposed outer patches of large conical teeth on sides, left and right tooth patches of upper jaw well separated but those of lower jaw close-set in adults (Figure 2); outer tooth patches of the lower jaw fully or partly received into spaces between outer tooth patches of upper jaw; continuous tooth patch present along dorsal and medial surface of most of length of coronoid process of lower jaw (dentary) (Figures 2, 3); palato-premaxillary ligament passing from anteriormost part of palatine, across head of maxilla, to ascending process of premaxilla (see Johnson, 1981; Figure 4); no supramaxilla; suborbital area narrow, first and second infraorbitals slightly covering upper margin of maxilla when mouth closed; fronto-parietal crest developed; preopercle with right-angled corner; posterior margin of preopercle smooth or very weakly serrated; opercle with two flat spines; a single, un-notched dorsal fin with nine or ten spines and nine to eleven soft rays [almost always IX, 10]; anal fin with three spines and seven or eight soft rays; pelvic axillary scale lanceolate; 10 + 15 vertebrae; supraneural and dorsal-fin pterygiophore insertion pattern 0/0/0+2+1/1/ (*S. octoactinus* Anderson, 1970 exceptional in having 0/0/0+2/1+1/1/); first supraneural distinctly T-shaped; dorsal procurrent caudal-fin rays 12–14; ventral procurrent caudal-fin rays 10–12; base of penultimate ventral procurrent caudal-fin ray foreshortened; no procurrent spur (*sensu* Johnson 1975) on posteriormost ventral procurrent caudal-fin ray.

Remarks. Prior to Katayama's (1984) establishment of the Symphysanodontidae, Fourmanoir (1981) used the family name Symphysanodontidae for *Symphysanodon*. However, Fourmanoir's Symphysanodontidae is not

available because he did not describe any characters of his Symphysanodontidae (Art. 13.1.1, ICZN, 1999; van der Laan, 2014).

As stated above, members of the Symphysanodontidae are generally similar to the Anthiadinae of the Serranidae, and Fowler (1928) placed *Symphysanodon* in the Anthiadinae. Munro (1967), Katayama (1968) and Anderson (1970) included *Symphysanodon* in the Lutjanidae. However, Johnson (1975) found no evidence from osteology and cheek myology for a close relationship between *Symphysanodon* and the Lutjanidae. Moreover, he noted that the base of the penultimate ventral procurrent caudal-fin ray is foreshortened in *Symphysanodon*, although there is no spur on the last ventral procurrent caudal-fin ray. He suggested that *Symphysanodon* is not a lutjanid and may occupy a very primitive position within the Percoidei. Subsequently Johnson (1981) provided a detailed description of *Symphysanodon* and treated the genus as *incertae sedis*. Our examinations of the Symphysanodontidae, Lutjanidae and Serranidae have further revealed that the Symphysanodontidae differ from the latter two families in having exposed outer tooth patches on the upper and lower jaws in adults (vs. no outer tooth patches on either jaw in the latter two families), continuous tooth patch present along the dorsal and medial surface of most of the length of the coronoid process of the lower jaw, a lanceolate pelvic axillary scale (vs. triangular or rectangular scale or an undeveloped scale), a unique (*S. octoactinius* exceptional) supraneural and dorsal-fin pterygiophore insertion pattern 0/0/0+2+1/1/, and 25 total vertebrae [vs. 24 or 26–28 (Anderson & Heemstra, 1989; Anderson *et al.*, 1990; present observation)]. The Symphysanodontidae are also distinguishable from the Serranidae by having a well-developed fronto-parietal crest (vs. undeveloped) and from the Lutjanidae by, among other things, having a right-angled preopercular corner (vs. round), as already stated by Katayama (1984), and no attachment of the adductor mandibulae to the subocular shelf (Johnson, 1981).

The supraneural and dorsal-fin pterygiophore insertion pattern (0/0/0+2+1/1/) that characterizes all but one species of Symphysanodontidae is also found in the African percoid family Dinopercidae (see Johnson, 1984). However, a relationship between those two families is probably rather distant, because the latter differs from the former as follows: lower jaw projecting; no outer patches of teeth at anterior tips of jaws; preopercle with round corner; posterior margin of preopercle serrated; opercle with one flat spine; a single dorsal fin notched with 11 spines and 17–19 soft rays; anal fin with three spines and 11–13 soft rays; no axillary scale; 10 + 16 vertebrae; first supraneural reverse L-shaped; procurrent spur on posteriormost ventral procurrent caudal-fin ray (Johnson, 1984; present observation).

Genus *Cymatognathus* gen. nov.
(Figure 1A)

Type species. *Cymatognathus aureolateralis* **sp. nov.**

Diagnosis. A symphysanodontid distinguishable from the other genus in the family, *Symphysanodon*, by the following: posterior tip of coronoid process of dentary abruptly depressed so that teeth on anterior portion appear as an elevated patch, creating a wavy contour on lower jaw (Figures 2A, 3A); anterior tip of upper jaw not notched (Figure 5A); posterior nostril horizontally slit-like (Figure 6A).

Description. Characters given in familial and generic diagnoses are not repeated. Body oblong, deep, compressed; mouth large, oblique; posterior tip of upper jaw just reaching to vertical through mid-pupil, its upper and lower corners rounded; upper lip posteriorly covered by maxilla; upper jaw projecting slightly beyond lower jaw; teeth in both jaws forming bands, outer teeth larger than the inner; small but somewhat robust conical teeth on vomer, palatines, endopterygoids and ectopterygoids (Figures 7A, 8A); anterior nostril rounded with slightly elevated rim (Figure 6A); metapterygoid without posteroventral projection (see "Remarks" below; Figure 8A); opercle with two flat, pointed spines, the upper broader than the lower; preopercle with almost smooth posterior margin; head and body almost completely covered by ctenoid scales; scales on head progressively smaller anteriorly; lateral line complete, gently curved anteriorly, running almost parallel to dorsal contour of body; dorsal fin with nine spines and ten soft rays, last spine and first soft ray subequal in length; anal fin with three spines and seven soft rays; caudal fin deeply forked with tips of both lobes filamentous; pectoral and pelvic fins long, posterior tips of pectoral and pelvic fins extending beyond level of anal-fin origin; hypurals 1, 2 and 5 autogenous, hypurals 3 and 4 represented by a single plate.

Etymology. The name "*Cymatognathus*" is derived from the Greek *kymatos* (wave) and *gnathos* (jaw) in reference to the characteristic wavy upper contour of the lower jaw.

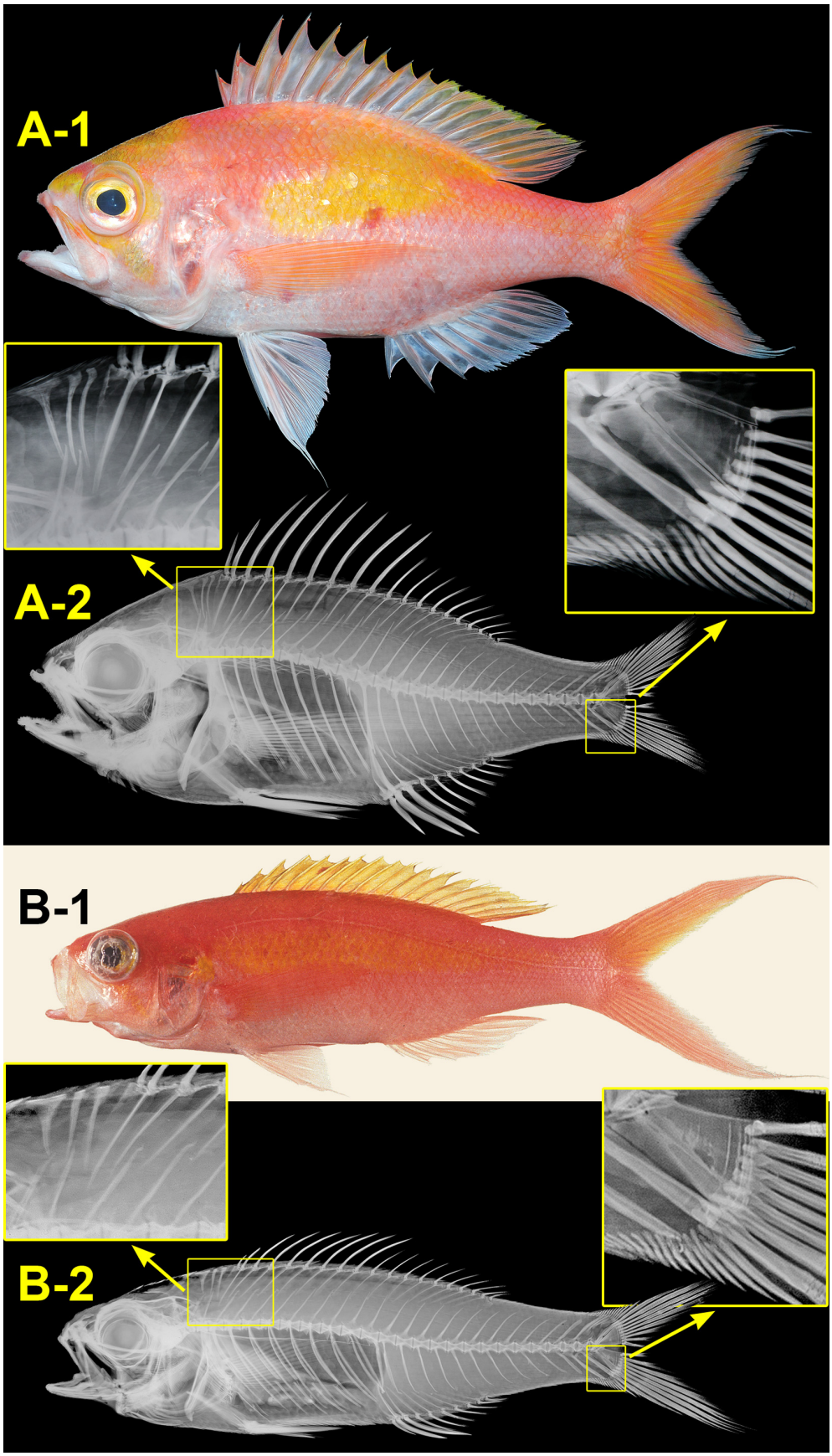

FIGURE 1. A. *Cymatognathus aureolateralis* **sp. nov.**, holotype, MZB 19251, 181 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan. 1. Fresh specimens (photographed by T. Peristiwady for *C. aureolateralis* and S. Kimura for *S. katayamai*). 2. X-ray photographs.

***Cymatognathus aureolateralis* sp. nov.**
New English name: Wavy Jaw Slopefish
(Figure 1A; Table 1)

Holotype: MZB 19251 (formerly LBRC-F 2837), male, 181 mm SL, fish market at Tanjung Kodok, Bitung, North Sulawesi, Indonesia, hook and line, no depth data, 2 May 2012, collected by T. Peristiwady.

TABLE 1. Counts and measurements of *Cymatognathus aureolateralis*, **gen. et sp. nov.**

	Holotype	Paratypes	
	MZB 19251	FRLM 54552	LBRCF-3374
Standard length (mm)	181	178	184
Counts			
Dorsal-fin rays	IX, 10	IX, 10	IX, 10
Anal-fin rays	III, 7	III, 7	III, 7
Principal caudal-fin rays	9+8	9+8	9+8
Dorsal procurrent caudal-fin rays	12	12	12
Ventral procurrent caudal-fin rays	11	11	11
Pectoral-fin rays	16 (16)	16 (16)	17 (15)
Pelvic-fin rays	I, 5	I, 5	I, 5
Gill rakers	12+23 (11+24)	12+24 (12+24)	13+23 (12+24)
Branchiostegal rays	7	7	7
Scales in lateral line	43 (44)	44 (44)	44 (44)
Scales above lateral line	7 (7)	7 (7)	7 (5)
Scales below lateral line	16 (16)	15 (15)	15 (16)
Measurements			
As % of standard length			
Head length	36.0	36.4	35.1
Body depth	39.5	41.2	39.6
Caudal-peduncle depth	12.8	12.7	12.9
Dorsal-fin base length	48.1	49.5	48.2
Length of first dorsal-fin spine	7.0	7.1	7.0
Length of second dorsal-fin spine	10.8	11.7	11.4
Length of third dorsal-fin spine	16.7	16.8	15.6
Length of fourth dorsal-fin spine	18.1	16.9	16.9
Length of ninth dorsal-fin spine	14.1	17.4	14.9
Length of longest dorsal-fin soft ray	18.5	18.5	19.7
Anal-fin base length	19.9	20.7	19.9
Length of first anal-fin spine	8.3	6.9	8.5
Length of second anal-fin spine	13.1	12.9	13.0
Length of third anal-fin spine	14.1	14.4	14.3
Pectoral-fin length	36.1	34.2	35.7
As % of head length			
Snout length	12.6	14.9	14.8
Orbit diameter	17.3	17.0	16.6
Interorbital width	17.9	17.7	18.4
Upper-jaw length	30.2	29.3	30.8

Figures in parentheses indicate counts on right side.

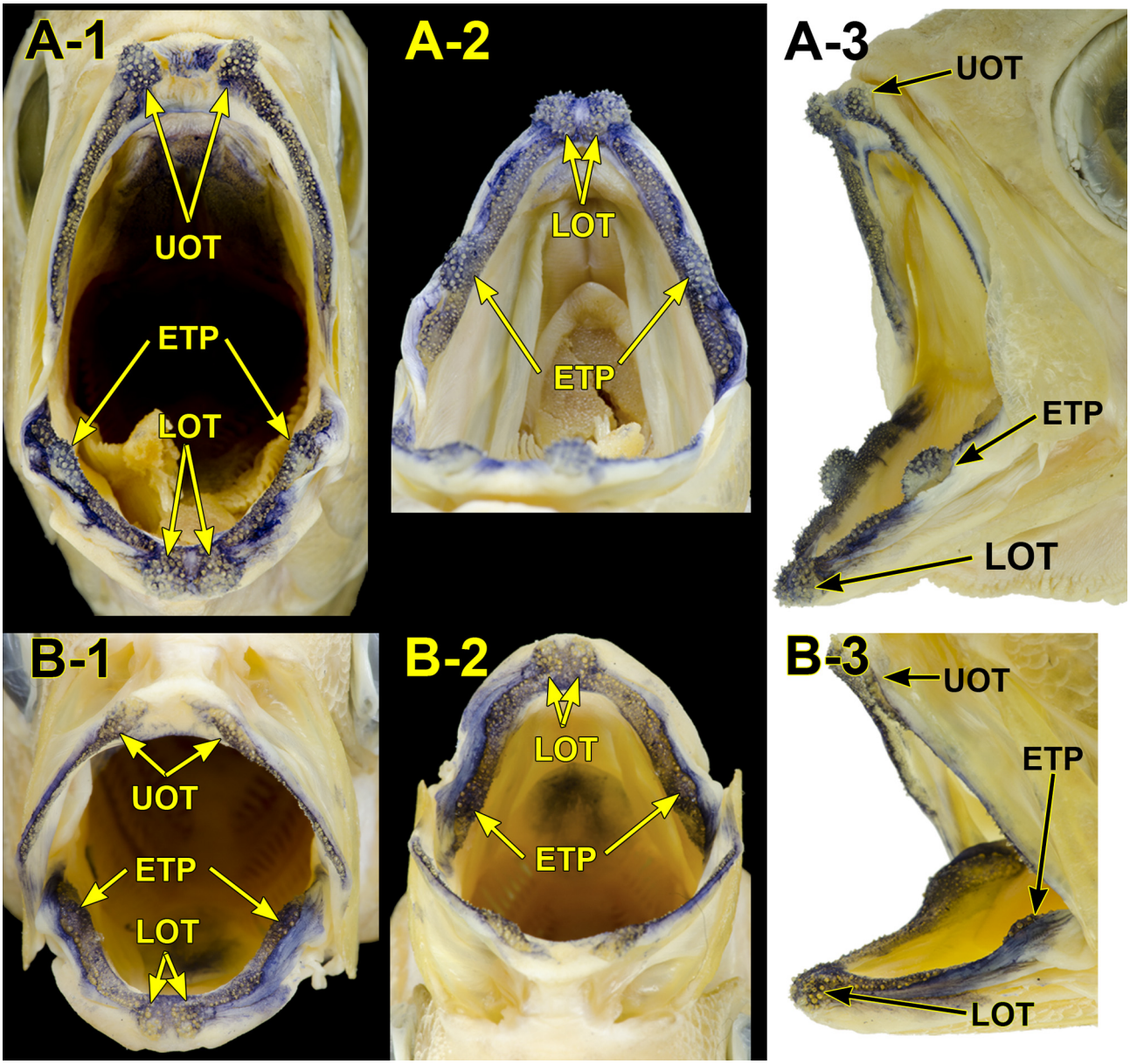

FIGURE 2. Tooth patches on jaws. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan. 1. Frontal view of both jaws. 2. Dorsal view of lower jaw. 3. Lateral view of both jaws. ETP = elevated tooth patch, LOT = outer tooth patch on lower jaw, UOT = outer tooth patch on upper jaw.

Paratypes: FRLM54552 (formerly LBRC-F 2918), male, 178 mm SL, Girian Fish Market, Bitung, North Sulawesi, Indonesia, hook and line, no depth data, 13 July 2012; collected by T. Peristiwady (partly dissected to observe the cranium and suspensorium); LBRC-F 3374, male, 184 mm SL, Girian fish market, Bitung, North Sulawesi, Indonesia, hook and line, no depth data, 17 June 2013, collected by T. Peristiwady.

Diagnosis. See generic diagnosis.

Description. Characters given in the familial and generic diagnoses and generic description are not repeated except for counts. Counts and measurements are shown in Table 1. Body deepest at base of fifth dorsal-fin spine; body width slightly less than half of body depth; mouth oblique, forming an angle of about 50° to horizontal axis of body; palato-premaxillary ligament between anteriormost part and head of premaxilla thick and short, passes over head of maxilla (Figure 4A); snout rounded and bulging at tip but concave dorsally just behind tip of snout; interorbital area broad, convex; scaly area on head anteriorly extending beyond level of anterior nostrils, reaching just behind tip of snout dorsally; narrow naked area on snout just below nostrils; tip of snout and throat with villiform papillae; second and third infraorbitals each with small, blunt retrorse spine posteroventrally; gill rakers

long, longest ca. 1.2 times length of longest gill filament; cephalic sensory system developed: two pores on snout, four on infraorbitals, 19 in temporal region and five on lower jaw; dorsal-fin origin located just above tip of upper opercular spine; membranes between dorsal- and anal-fin spines deeply incised; first dorsal-fin spine short, the second more than half of the third, the fourth longest, the fourth to ninth (last) spines progressively shorter; length of last spine almost twice that of the first (including holotype) or more, about equal to that of the first soft ray; eighth dorsal-fin soft ray longest, first to eighth soft rays gradually increasing posteriorly in length; all dorsal-fin soft rays branched; length of first anal-fin spine about half or two-thirds (including holotype) that of the second, third spine longest, slightly longer than the second; all anal-fin soft rays branched; second (holotype), third or fourth soft ray longest; pectoral fin long, about equal to length of head but shorter than body depth, reaching to a vertical through base of first (including holotype) or second anal-fin soft ray, tip pointed, all but uppermost and lowermost rays branched, fourth ray longest, fifth to lowermost rays progressively shorter; all pelvic-fin soft rays branched, length of spine shorter than first soft ray; first soft ray longest, tip forming a filament, first to fifth soft

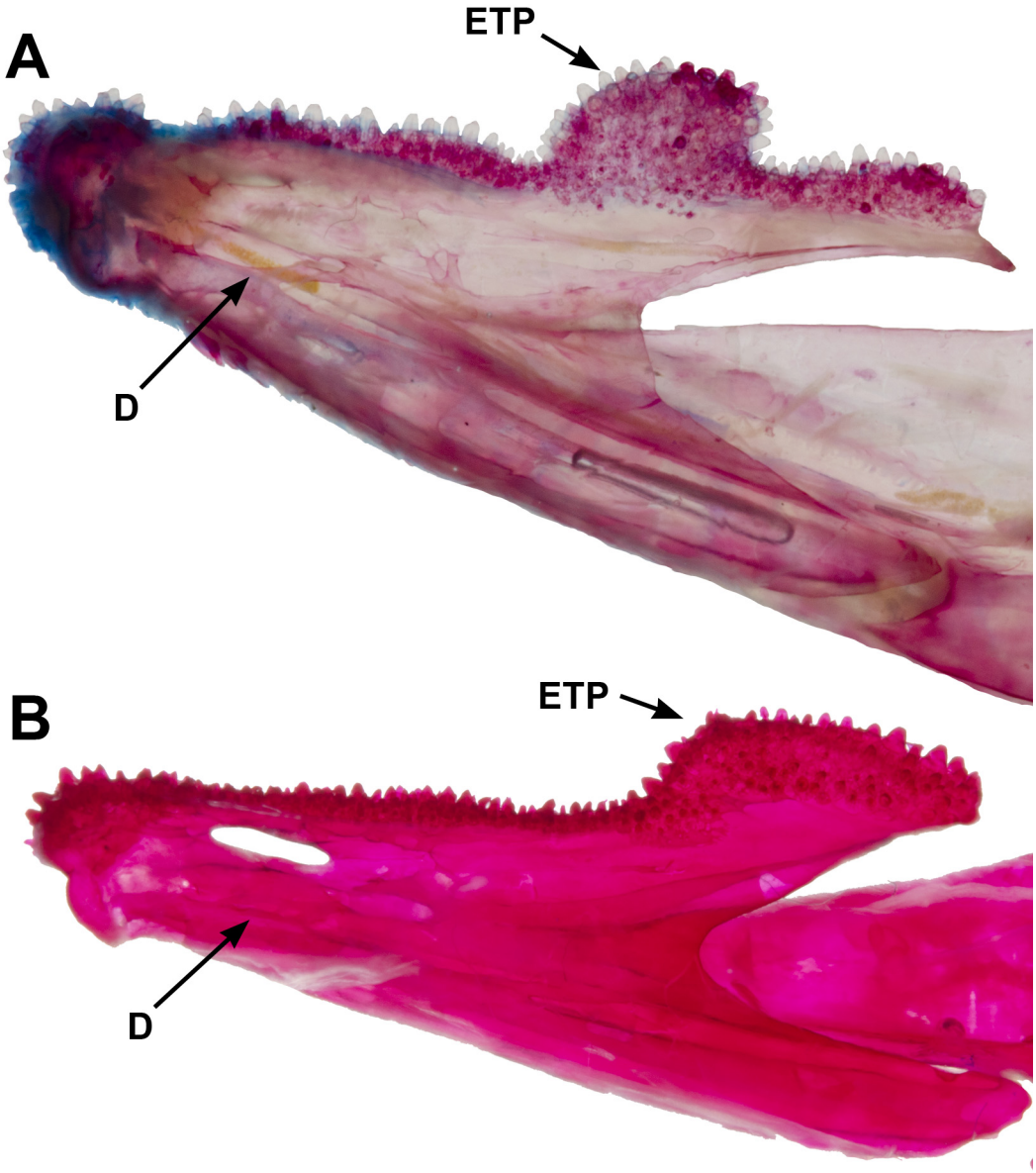

FIGURE 3. Medial view of lower jaw, showing "elevated" tooth patch (ETP) on dentary (D). A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan.

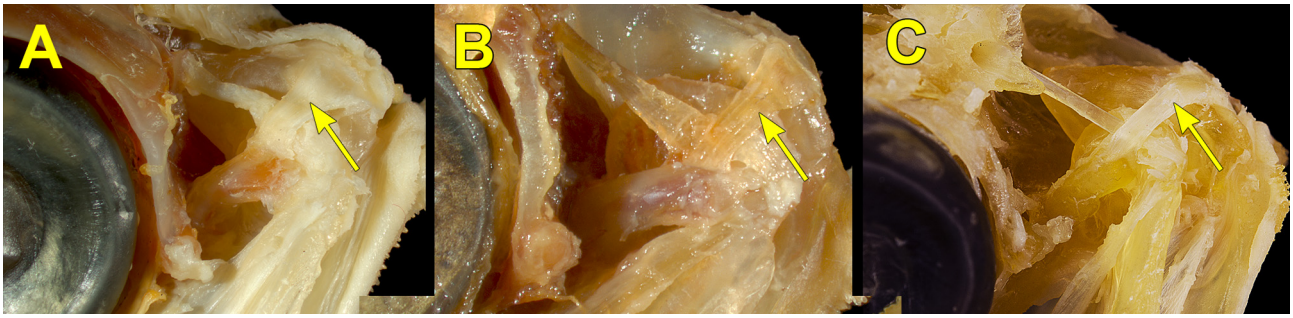

FIGURE 4. Palato-premaxillary ligament (arrows), lateral view of right side. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon andersoni*, USNM 435866, 200 mm SL, Salalah, Dhofar, Oman. C. *S. katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan.

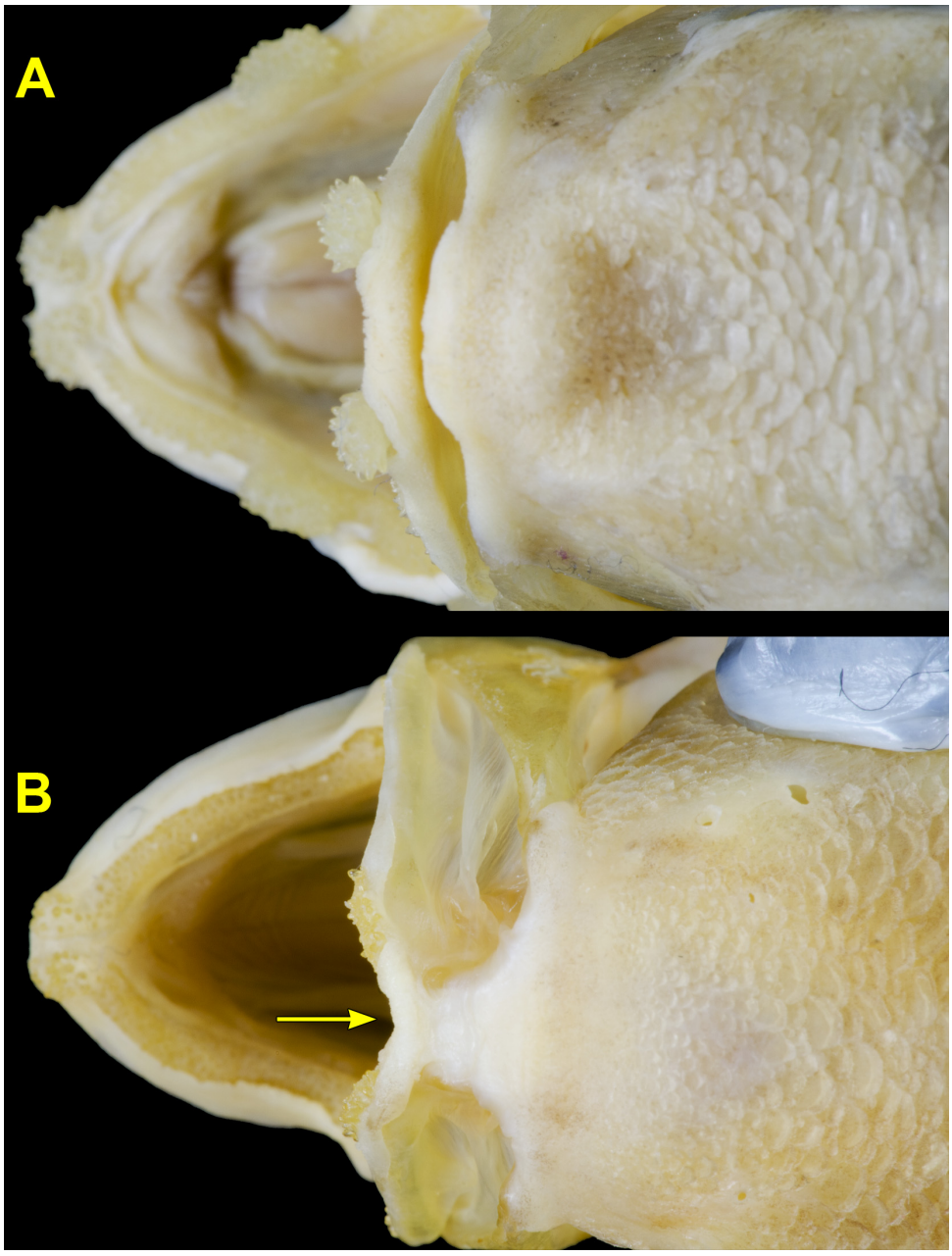

FIGURE 5. Dorsal view of upper jaw. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan. Arrow indicates notch at anterior tip of upper jaw.

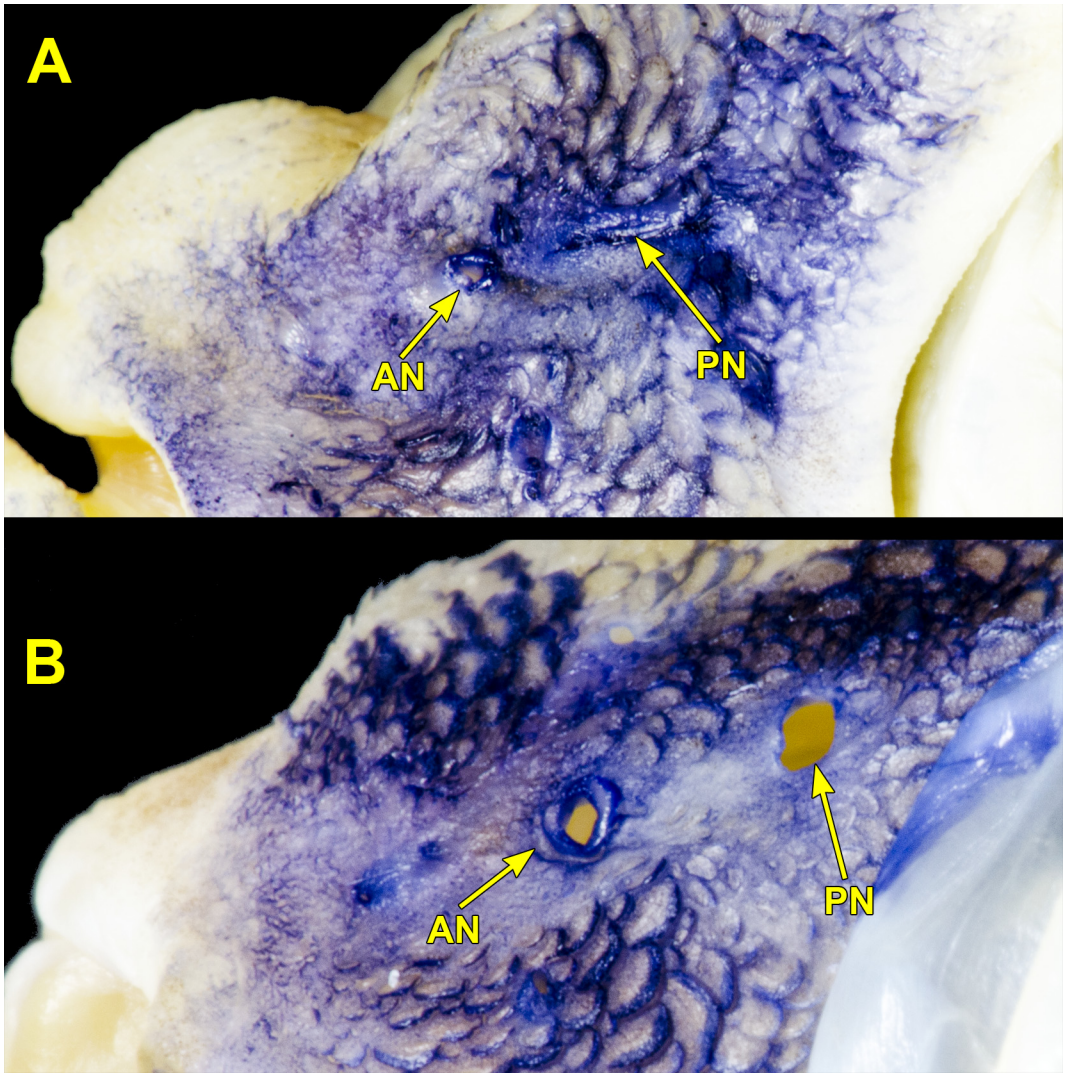

FIGURE 6. Lateral view of snout, showing nostrils. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan. AN = anterior nostril, PN = posterior nostril.

rays progressively shorter; dorsal- and anal-fin bases covered by small scales forming scaly sheath; small scales on caudal fin extending almost to its posterior margin; small scales on proximal one-fifth of pectoral fin and one-third of pelvic fin; pelvic-fin axil with two lanceolate scales.

Color when fresh (Figure 1A). Head and body deep pink dorsally grading to paler ventrally; a large bright yellow blotch mid-laterally on body; several yellow blotches on snout, occiput, surroundings of orbit, and cheek; dorsal-fin spines and soft rays mostly pale pink; soft portion of dorsal fin yellowish distally; anal- and pelvic-fin rays pinkish, dorsal-, anal-, and pelvic-fin membranes whitish; pectoral and caudal fins pinkish orange, posterior margin of caudal fin whitish.

Color of preserved specimens. Head, body and fins pale brownish uniformly.

Distribution. Currently known only from Bitung, North Sulawesi, Indonesia. No data on accurate depth is available, but according to a fisherman, the type specimens were collected as bycatch of hand-lining targeting *Priacanthus Etelis*, and *Pristipomoides*. These fishes are found at depths between 15 and 400 m (Anderson & Allen, 2001; Starnes, 1999). Recently the third author obtained a video clip that clearly shows *C. aureolateralis* **sp. nov.** *in situ* (a still image acquired from the video is shown in Figure 9). The video was taken off Lembeh Island, near Bitung, North Sulawesi, Indonesia, at a depth of 199 m on 12 November 2015, by an ROV as part of an ongoing survey of the Indonesian coelacanth.

Etymology. The specific name "*aureolateralis*" is derived from Latin *aurum* (gold) and *lateralis* (side) in reference to the bright yellow marking laterally on body.

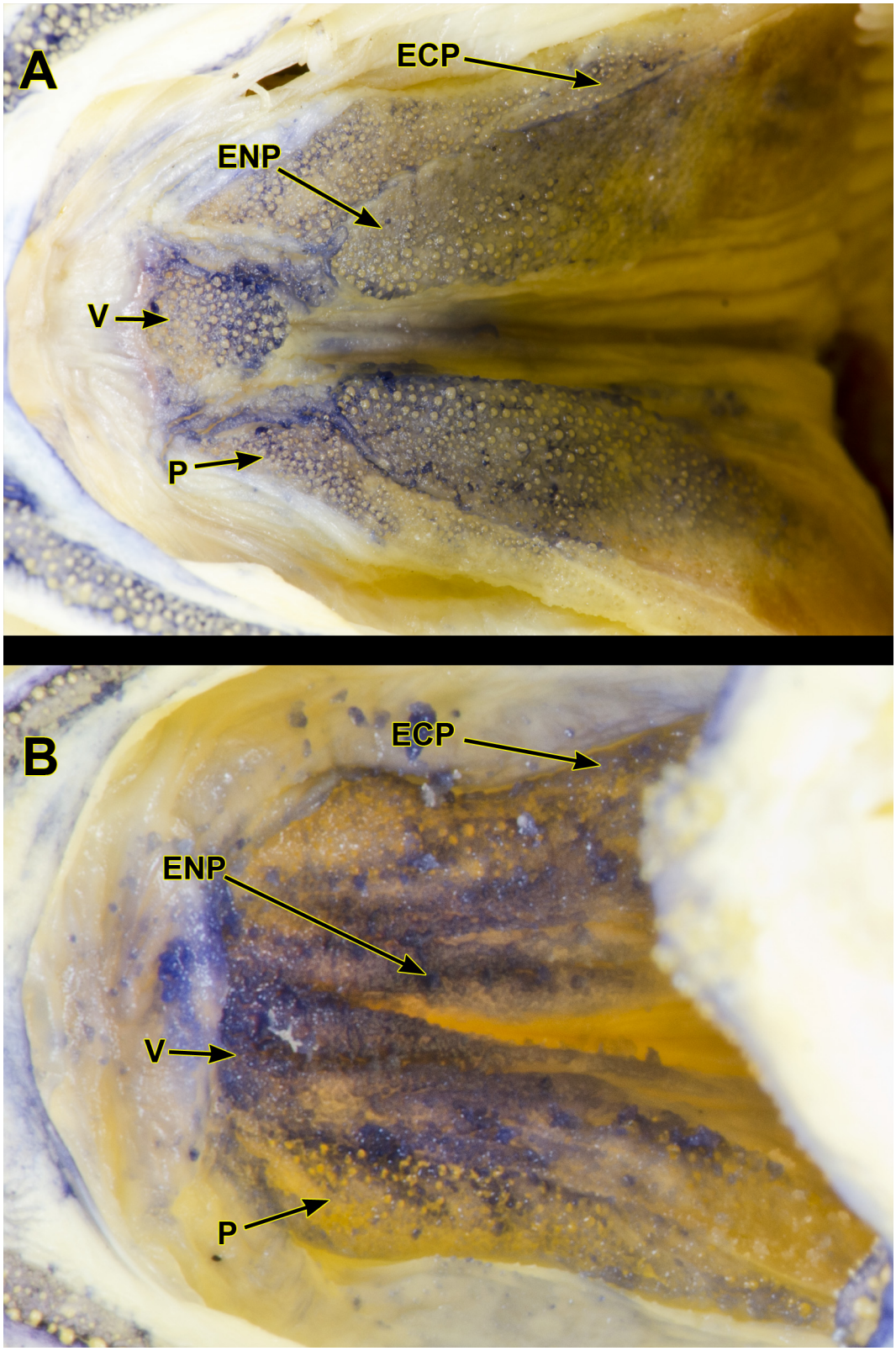

FIGURE 7. Tooth patches of vomer (V), palatines (P), endopterygoids (ENP) and ectopterygoids (ECP), ventral view. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia. B. *Symphysanodon katayamai*, FRLM 11738, 155 mm SL, Shima, Mie, Japan.

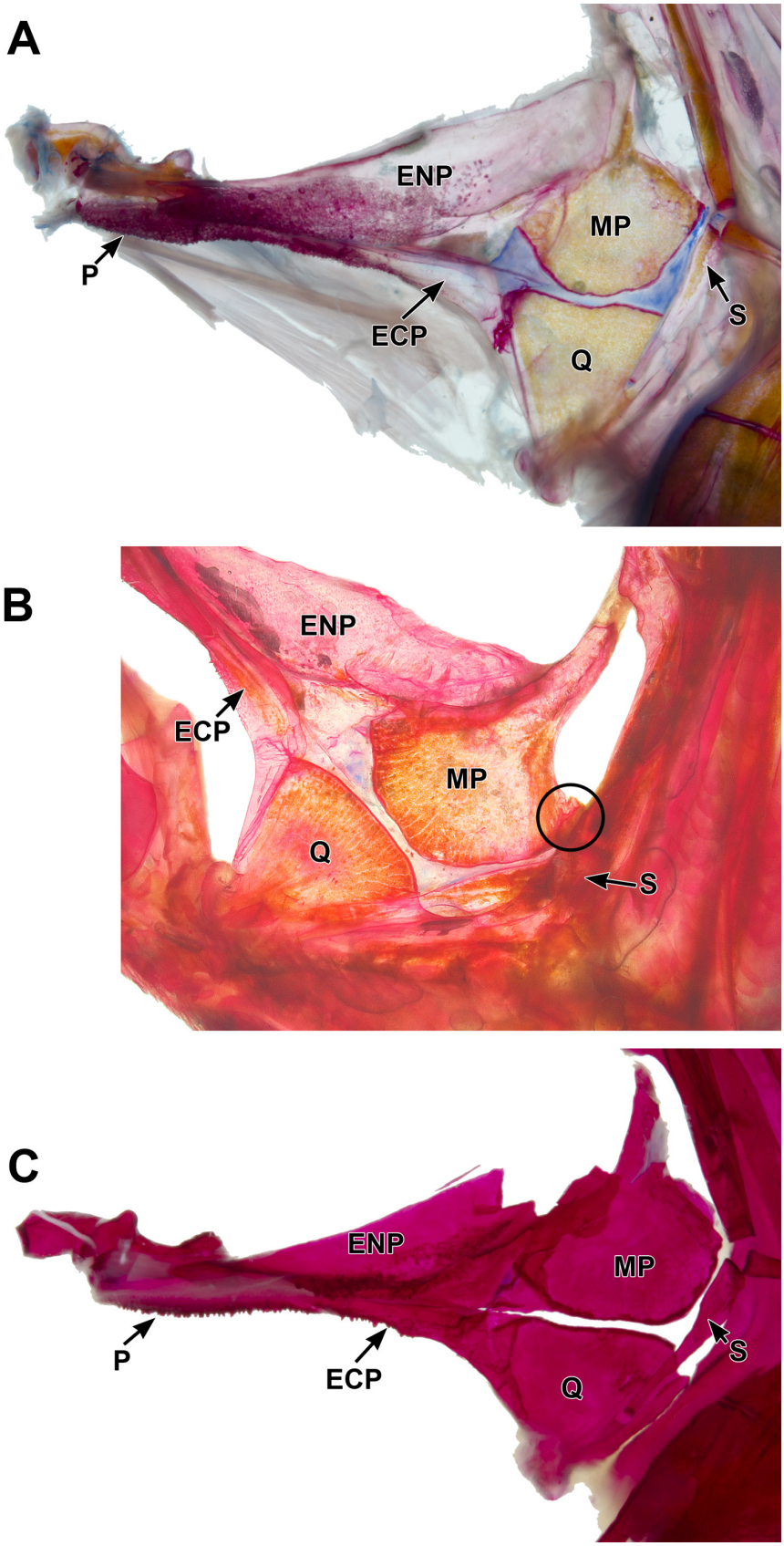

FIGURE 8. Right-side suspensorium. A. *Cymatognathus aureolateralis* **sp. nov.**, paratype, FRLM 54552, 178 mm SL, Bitung, North Sulawesi, Indonesia (medial view). B. *Symphysanodon andersoni*, USNM 435866, 200 mm SL, Salalah, Dhofar, Oman (lateral view, mirror image). C. *S. katayamai*, FRLM 11738, 155.4 mm SL, Shima, Mie, Japan (medial view). ECP = ectopterygoid, ENP = endopterygoid, MP = metapterygoid, P = palatine, Q = quadrate, S = symplectic. Circle indicates posteroventral projection of metapterygoid.

FIGURE 9. Live *Cymatognathus aureolateralis* **sp. nov.**, from a video clip taken at 199 m depth off Lembeh Island, near Bitung, North Sulawesi, Indonesia by ROV during the Biological Survey on the Indonesian Coelacanth.

Remarks. Although *C. aureolateralis* clearly differs from members of the genus *Symphysanodon* (except for *S. octoactinus*) in having a much deeper body than the latter (Anderson 1970, Anderson & Springer 2005; Figure 1), it shares the following characters with the latter, in addition to those indicated in the familial diagnosis: upper and lower corners of upper jaw rounded; upper lip posteriorly covered by maxilla; and caudal fin deeply forked with tips of both lobes filamentous (Figure 1). Hypurals 3 and 4 are fused in both *Cymatognathus* and all species of *Symphysanodon*, except *S. octoactinus*. Hypurals 1 and 2 are autogenous in *Cymatognathus* and in about half of the species of *Symphysanodon.* Of the shared characters listed in the familial diagnosis, the following characters are unique among basal percoids (*sensu* Johnson, 1984) and to both *Symphysanodon* and *Cymatognathus*, and are considered as synapomorphies of the family Symphysanodontidae: supraneural and dorsal-fin pterygiophore insertion pattern 0/0/0+2+1/1/ (*S. octoactinus* exceptional); T-shaped first supraneural; foreshortened base of penultimate ventral procurrent caudal-fin ray; palato-premaxillary ligament passing from anteriormost part of palatine, across head of maxilla, to ascending process of premaxilla; and well-developed outer tooth patches at tips of both jaws, those of the lower jaw received into spaces between those of the upper jaw. *Cymatognathus aureolateralis* is distinguishable from members of *Symphysanodon* by important characters described in the generic diagnosis, in particular the wavy contour of the lower jaw created by abrupt depression of posterior tip of the coronoid process of the dentary so that teeth on the anterior portion appear as an almost centrally-located elevated tooth patch, and the horizontally slit-like posterior nostril.

Cymatognathus aureolateralis superficially resembles *Giganthias* (Giganthiidae), comprising *Giganthias immaculatus* Katayama, 1954 and *G. serratospinosus* White & Dharmadi, 2012, in having tooth patches with robust conical teeth on the tip of lower jaw, and a deep compressed body with red and yellow coloration (Figure 10). However, *Cymatognathus* clearly differs from *Giganthias* in having an obviously "elevated" tooth patch posteriorly on the lower jaw (vs. no elevated tooth patch on lower jaw in *Giganthias*; Figure 10C), smaller teeth on the jaws short and conical (vs. slender and curved inward; Figure 10B, C), endopterygoids and ectopterygoids with small conical teeth (vs. edentate), upper lip posteriorly covered by maxilla (vs. not covered), lateral line gently curved anteriorly (vs. steeply curved), a single, un-notched dorsal fin with ten soft rays (vs. notched with 13–14 soft rays; Figure 10A), anal fin with seven soft rays (vs. eight), tips of all dorsal- and pelvic-fin spines smooth (vs. tips of second, third and/or fourth dorsal- and pelvic-fin spines serrated), supraneural bones three, the first T-shaped, the third inserting together with the first two dorsal pterygiophores in the second interneural space (vs. two, the first not T-shaped and only the first dorsal-fin pterygiophore inserting in the second interneural space), hypurals 3 and 4 fused (vs. all hypurals autogenous), and the penultimate ventral procurrent caudal-fin ray with

foreshortened base (vs. not foreshortened). *Cymatognathus aureolateralis* can be also distinguished from the Anthiadinae by the latter two characters and Callanthiidae by the last as well as having 25 vertebrae (vs. 26–28 in the Anthiadinae, and 24 in the Callanthiidae and Serranidae except for Anthiadinae) and opercle with two flat spines (vs. three). Accordingly, we establish *Cymatognathus* as a new genus in the family Symphysanodontidae.

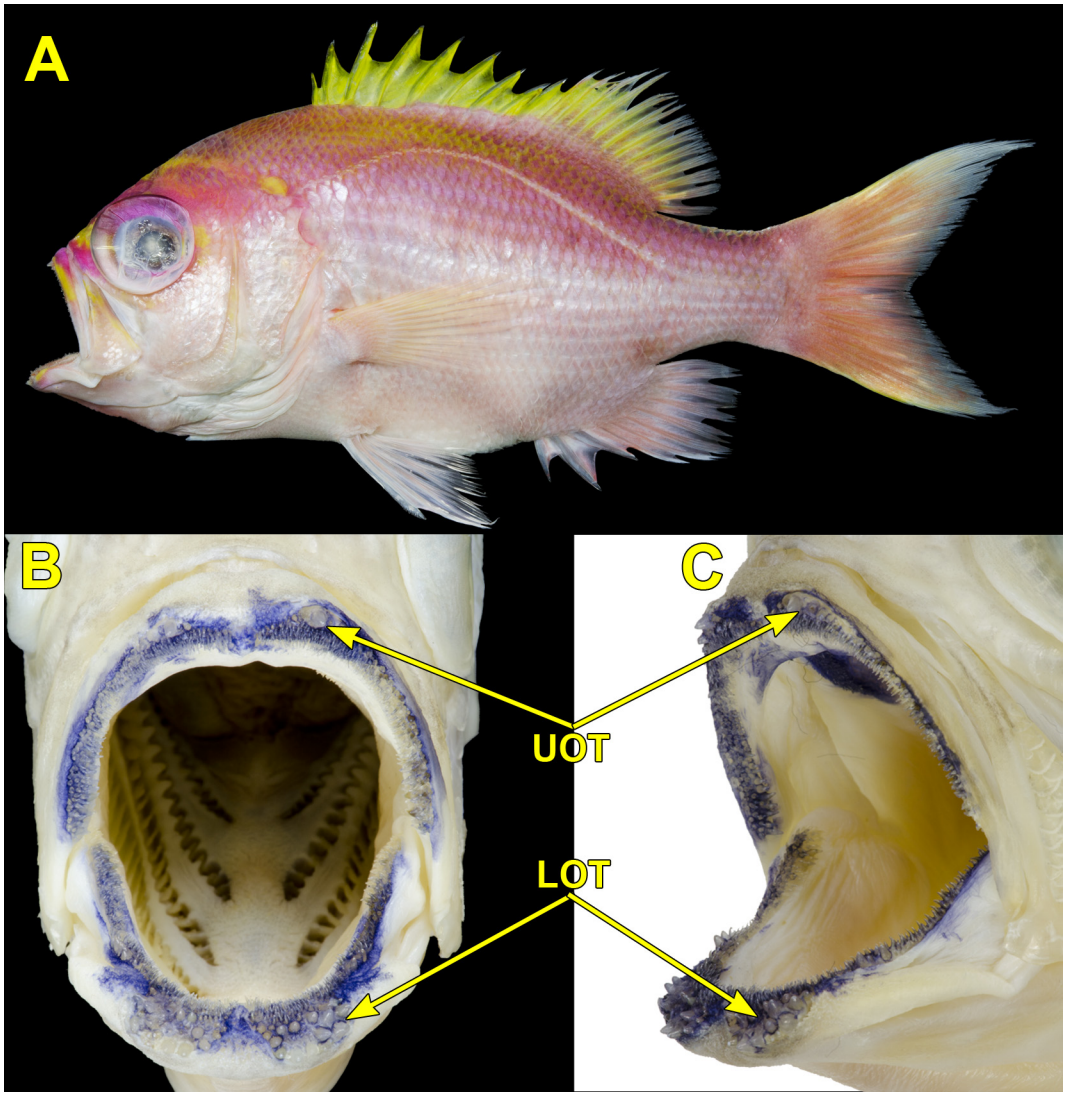

FIGURE 10. *Giganthias immaculatus*, FRLM 52792, 218 mm SL, Naha, Okinawa, Japan. A. Thawed specimen. B. Frontal view of both jaws. C. Lateral view of both jaws. LOT = outer tooth patch on lower jaw, UOT outer tooth patch on upper jaw.

Johnson (1981) described a posteroventral projection of the metapterygoid overlapping the symplectic in *S. berryi* Anderson, 1970 as a diagnostic feature of *Symphysanodon*. Our observations indicate that it is not present in all species of *Symphysanodon* (e.g., present in *S. andersoni*, but not in *S. katayamai*, Figure 8B, C) and is therefore not diagnostic for the genus. It is also absent in *Cymatognathus* (Figure 8A).

The dentition is better developed in males than females of *S. berryi* and *S. disii* Anderson, Baranes & Goren, 2011 (Anderson *et al.*, 2011). The outer tooth patches of a male *S. andersoni* (USNM 435866) are also much larger than those of the female (USNM 440280). However, sexual dimorphism in *C. aureolateralis* is unknown because no female specimens of the genus have been collected. The teeth in the jaws and on the palatines and pterygoids are more developed in *Cymatognathus* than even in male *Symphysanodon* (Figures 2, 3, 7, 8).

Comparative materials. Symphysanodontidae—*Symphysanodon andersoni*: USNM 435866, male, 200 mm SL, Salalah, Dhofar, Oman; USNM 440280, female, 168 mm SL, Somalia. *Symphysanodon berryi*: USNM 204086, holotype, 113 mm SL, Great Inagua Island, Bahamas. *Symphysanodon katayamai*: FRLM 11738*, male, 155 mm SL, Shima, Mie, Japan; FRLM 25765, 90.4 mm SL, Bitung, North Sulawesi, Indonesia; KAUM-I. 56003, male, 159 mm SL, Iloio, Panay, Philippines. *Symphysanodon maunaloae* Anderson, 1970: USNM 204389,

holotype, 67.5 mm SL, Hawaii. *Symphysanodon mona* Anderson & Springer, 2005: USNM 371386, holotype, 86.6 mm SL, Mona Passage, off western Puerto Rico. *Symphysanodon octoactinus*: USNM 204084, holotype, 79.7 mm SL, Grand Bahama Island, Bahamas. *Symphysanodon parini* Anderson & Springer, 2005: USNM 372776, holotype, 114 mm SL, Sala y Gomez Ridge, southeastern Pacific. *Symphysanodon typus* Bleeker, 1877: FRLM 25766*, 103 mm SL, Bitung, North Sulawesi, Indonesia; NSMT-P 63382, 63383, 83.1–98.6 mm SL, Bitung, North Sulawesi, Indonesia. *Symphysanodon xanthopterygion* Anderson & Bineesh, 2011: USNM 400886: holotype, 141 mm SL, Quilon, Kerala, India. **Callanthiidae**—*Callanthias japonicus* Franz 1910: FRLM 32588, 44915*, 153–160 mm SL, Shima, Mie, Japan. *Grammatonotus surugaensis* Katayama, Yamakawa & Suzuki, 1980: FRLM 45675: 87.0 mm SL, Minamiise, Mie, Japan. **Giganthiidae**—*Giganthias immaculatus*: FRLM 3665: 206 mm SL, Shima, Mie, Japan; FRLM 50837: 257 mm SL, Torishima I., Ogasawara Is., Japan; FRLM 52792*, 52793: 218–245 mm SL, Naha, Okinawa, Japan; LBRC-F 1380, 205 mm SL, Bitung, North Sulawesi, Indonesia; NSMT-P 18654, holotype, 252 mm SL, off Izu-Oshima, Tokyo, Japan; URM-P 03764, 39792, 240–268 mm SL, Naha, Okinawa, Japan. **Anthiadinae (Serranidae)**—*Caprodon schlegelii* Günther, 1859: FRLM 33363, 129 mm SL, Shima, Mie, Japan. *Odontanthias borbonius* (Valenciennes *in* Cuvier & Valenciennes, 1828): FRLM 25767, 34847, 84.9–91.9 mm SL, Bitung, North Sulawesi, Indonesia. *Odontanthias chrysostictus* (Günther, 1872): FRLM 34846, 40182, 129–132 mm SL, Bitung, North Sulawesi, Indonesia. *Odontanthias unimaculatus* (Tanaka,1917): FRLM 40181, 101 mm SL, Bitung, North Sulawesi, Indonesia; FRLM 45676, 126 mm SL, Minamiise, Mie, Japan. *Plectranthias japonicus* (Steindachner *in* Steindachner & Döderlein, 1883): FRLM 47681, 47682, 90.4–91.5 mm SL, Nha Trang, Vietnam. *Plectranthias kelloggi azumanus* (Jordan & Richardson, 1910): FRLM 50692, 52306, 98.8–91.4 mm SL, Shima, Mie, Japan. *Plectranthias sagamiensis* (Katayama, 1964): FRLM 7048, 7831, 58.0–53.0 mm SL, Shima, Mie, Japan. *Plectranthias yamakawai* Yoshino, 1972: FRLM 42846, 42847, 131–151 mm SL, Yoron I., Kagoshima, Japan. *Pseudanthias elongatus* (Franz, 1910): FRLM 6617, 6956*, 11736, 119–132 mm SL, Shima, Mie, Japan. *Pseudanthias pascalus* (Jordan & Tanaka, 1927): FRLM 10746, 10747, 119–111 mm SL, Naha, Okinawa, Japan. *Pseudanthias squamipinnis* (Peters, 1855): FRLM 45827, 45828, 64.3–71.7, Kumano, Mie, Japan. *Sacura margaritacea* (Hilgendorf 1879): FRLM 44937, 44938, 49210*, 109–112 mm SL, Shima, Mie, Japan. *Selenanthias analis* Tanaka, 1918: FRLM 06929, 44911, 104 mm SL, Shima, Mie, Japan. **Serraninae (Serranidae)**—*Chelidoperca hirundinacea* (Valenciennes *in* Cuvier & Valenciennes 1831): FRLM 7818, 139 mm SL, Mie, Japan; FRLM 47416, 137 mm SL, Tosa Bay, Mimase, Kochi, Japan. *Chelidoperca pleurospila* (Günther, 1880): FRLM 34624, 41021, 115–122 mm SL, Shima, Mie, Japan. **Epinephelinae (Serranidae)**—*Epinephelus areolatus* (Forsskål 1775): FRLM 45823*, 187 mm SL, Kumano, Mie, Japan. *Grammistes sexlineatus* (Thunberg 1792): FRLM 34732, 76.0 mm SL, Yaku I., Kagoshima., Japan; FRLM 39892, 87.2 mm SL, Kushimoto, Wakayama, Japan. *Liopropoma japonicum* (Doderlein *in* Steindachner & Döderlein, 1883): FRLM 10293, 46470, 169–188 mm SL, Shima, Mie, Japan. *Liopropoma latifasciatum* (Tanaka, 1922): FRLM 34845*, 34890, 125–129 mm SL, Bitung, North Sulawesi, Indonesia. **Lutjanidae**—*Aphareus rutilans* Cuvier *in* Cuvier & Valenciennes, 1830: FRLM 35534*, 183.0 mm SL, Owase, Mie, Japan. *Lutjanus bengalensis* (Bloch 1790): FRLM 33773, 33801, 22836, 118–123 mm SL, Owase, Mie, Japan. *Lutjanus fulvus* (Forster *in* Bloch & Schneider, 1801), FRLM 28898*, 149.0 mm SL, Iriomote I., Okinawa, Japan. *Lutjanus kasmira* (Forsskål, 1775): FRLM 28484, 156.0 mm SL, Hahajima I., Ogasawara Is., Japan; FRLM 33016, 160 mm SL, Iriomote I., Okinawa, Japan. Asterisks indicate the specimens for observation of cranium. **Dinopercidae**—*Dinoperca petersi* (Day, 1875): FRLM 27648, 271 mm SL, Durban, South Africa.

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