



Synodus nigrotaeniatus, a new species of lizardfish (Aulopiformes: Synodontidae) from Indonesia

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Abstract

A new species of lizardfish, *Synodus nigrotaeniatus*, n. sp., is described from Lembeh Strait, North Sulawesi Province, Indonesia on the basis of six specimens, 129.7–233.5 mm SL. Diagnostic features include 11–12 (usually 12) dorsal-fin rays, 12–14 anal-fin rays, 13 pectoral-fin rays, 47–49 lateral-line scales, 48–49 total vertebrae, a deep suborbital pore with prominent surrounding fimbriae, and a rudimentary adipose fin that is scarcely visible without magnification. The new species is an apparent close relative of *S. sagineus* (mainly Australian distribution, but records from Sri Lanka, Bali, and West Papua), sharing most morphological and meristic features. Nevertheless, the two species differ in markings, with *S. sagineus* lacking the black midlateral stripe that is a key feature of *S. nigrotaeniatus*. The new species has a slightly wider interorbital space than *S. sagineus* (mean 4.4% vs. 3.5% SL) and slightly lower vertebral and lateral-line scale counts (48–49 and 47–49 respectively, vs. usually 51–54 and 51–55). Both species possess a well-developed suborbital pore, but the surrounding fimbriae of *S. nigrotaeniatus* are more numerous, sometimes branched, and extend upwards along the rear margin of the eye, compared to those of *S. sagineus*, which are generally fewer, thicker, and shorter, and do not extend along the posterior edge of the eye.

Key words: taxonomy, systematics, ichthyology, coral-reef fishes, Indo-Pacific Ocean, suborbital pore.

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Introduction

The lizardfishes of the genus *Synodus* are common inhabitants of sandy substrata in tropical and warm temperate seas. The majority, at least 35 of the 50 currently recognized species (Eschmeyer *et al.* 2017), inhabit the vast Indo-West Pacific region. Cressy (1981) provided a comprehensive review of the 21 Indo-West Pacific species known at that time, including descriptions of six new species. Waples & Randall (1988) subsequently reviewed the Hawaiian species and described four additional new species. Randall (2009) provided descriptions of five additional species. Since 2009, individual species descriptions were published by Chen *et al.* (2007), Randall & Pyle (2008), Ho *et al.* (2010), Prokofiev & Shao (2010), and Ho *et al.* (2016). Most of the recent discoveries involve trawl-collected specimens, often from depths in excess of 80 m.

The present paper describes a distinctive member of the genus that we first collected in July 2013 while scuba diving at Lembah Strait in North Sulawesi Province of Indonesia. A total of five specimens were eventually collected from the same general area. Its overall appearance, particularly the relatively stout body, gradually sloped snout profile, relatively high number of anal-fin rays, and the anal-fin base longer than the dorsal-fin base, influenced our initial incorrect determination that it was an undescribed species of *Trachinocephalus* Gill, 1861. However, thanks to advice from our colleagues Barry Russell and Benjamin Frable, we eventually established its correct generic allocation and close affinity to *Synodus sageneus* Waite, 1905, described from Australia.

Materials and Methods

Lengths of specimens are given as SL, measured from the median anterior point of the upper lip to the base of the caudal fin (posterior end of the hypural plate); body depth was measured vertically from the origin of the pelvic fins, and from the origin of the anal fin; body width was taken at the upper base of the pectoral fins; head length (HL) from the front of the upper lip to the posterior end of the opercular membrane, and snout length from the same anterior point to the nearest bony edge of the orbit; orbit diameter is the greatest bony diameter, and interorbital width the least bony width; upper-jaw length was measured from the front of the upper lip to the posterior end of the maxilla; caudal-peduncle depth is the least depth, and caudal-peduncle length the horizontal distance between verticals at the rear base of the anal fin and the caudal-fin base; lengths of spines and rays were measured from the point where they depart from the contour of the body; caudal-fin length is the horizontal length of the longest ray, and caudal concavity is the horizontal distance between verticals at the tips of the longest and shortest caudal-fin rays; pectoral- and pelvic-fin lengths were measured from the most anterior point of the base of the fin to the tip of the longest ray. Counts of tubed lateral-line scales do not include those posterior to the hypural plate (the tubed scales on the caudal-fin base angle downward). Counts of vertebrae include the hypural plate.

Type specimens are deposited at the Technical Implementation Unit for Marine Biota Conservation, Indonesian Institute of Sciences, Tandurusa, Bitung, North Sulawesi, Indonesia (LBRC) and the Western Australian Museum, Perth, Australia (WAM). Data in parentheses in the description refer to the range for paratypes, if different from the holotype. Morphometric data are given as percentages of the standard length. Comparative data for the closely related *Synodus sageneus* were taken from specimens in the WAM collection (see Material Examined) and from Cressy (1981). A photograph of a specimen of this species in the fish collection of the Commonwealth Scientific and Industrial Research Organisation, Hobart, Tasmania (CSIRO) is included.

Synodus nigrotaeniatus, n. sp.

Blackstripe Lizardfish

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Figures 1–3; Table 1.

Holotype. LBRC F-3773, 233.5 mm SL, Indonesia, North Sulawesi Province, Lembeh Strait, Aw Shucks dive site, 01° 30.013' N, 125° 14.573' E, 12 m, spear, M.V. Erdmann, 15 July 2013.

Paratype. LBRC F-0405, 190.0 mm SL, collected with holotype; LBRC F-1601, 187.5 mm SL, Indonesia, North Sulawesi Province, Lembeh Strait, Bitung, hook & line, purchased by T. Peristiwady from Winet Fish Market, 9 June 2010; LBRC F-1684, 152.0 mm SL, same data as LBRC F-1601, 6 September 2010; WAM P.34495–001, 129.7 mm SL, Indonesia, North Sulawesi Province, Lembeh Strait, Magic Crack dive site, 01° 29.401' N, 125° 14.243' E, 10 m, spear, M.V. Erdmann, 10 July 2015; WAM P.34635–001, 227.0 mm SL, Indonesia, North Sulawesi Province, Lembeh Strait, Jahir dive site, 01° 28.722' N, 125° 14.123' E, 10–12 m, spear, M.V. Erdmann, 16 July 2016.

Diagnosis. Dorsal-fin rays 11–12 (usually 12); anal-fin rays 12–14; pectoral-fin rays 11; lateral-line scales 47–49; total vertebrae 48–49; snout length much greater than eye diameter, 6.0–7.1% SL or 21.6–22.6% HL; interorbital space 3.8–4.9, mean 4.4% SL; anal-fin base 18.0–19.4% SL; a deep suborbital pore with prominent surrounding fimbriae extending upwards along rear margin of eye; adipose fin rudimentary, scarcely visible without magnification; preserved and live coloration mottled brown on back and whitish ventrally, separated by a prominent dark-brown to blackish mid-lateral stripe.

Description. Dorsal-fin rays 12 (11 in one paratype), branched except first two, last branched to base; anal-fin rays 14 (12 & 13 in each of two paratypes, 14 in one), unbranched except last, branched to base; pectoral-fin



Figure 1. *Synodus nigrotaeniatus*, A) preserved holotype (LBRC F-3773), 233.5 mm SL, Lembeh Strait, Indonesia; B) fresh paratype, 152.0 mm SL, Lembeh Strait, Indonesia (T. Peristiwady).

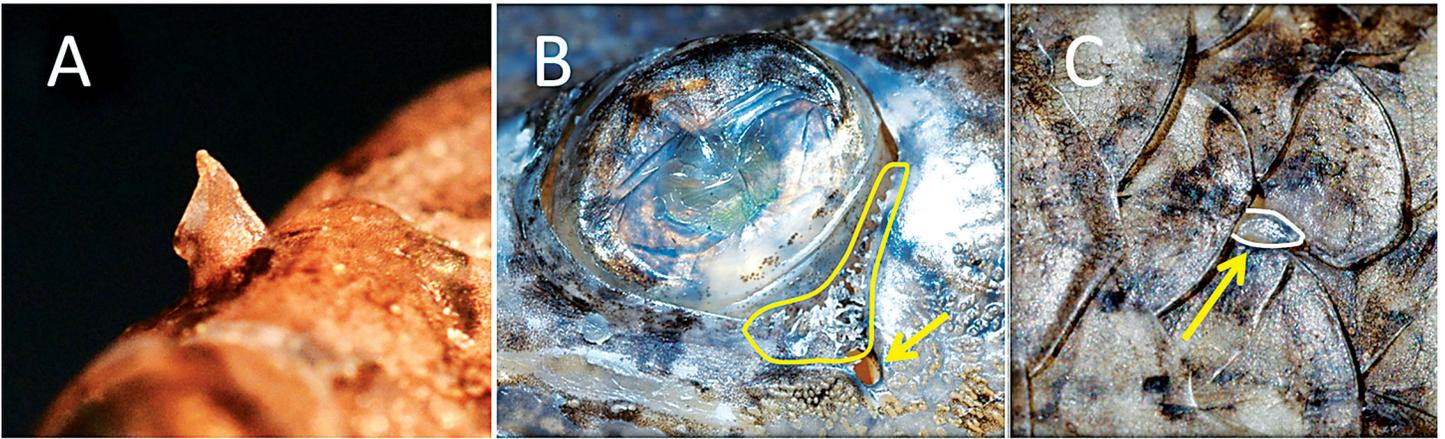


Figure 2. *Synodus nigrotaeniatus*, A) paratype (WAM P.34495-001), 129.7 mm SL, left anterior nasal flap (dorsal snout viewed from behind eye); B) same paratype, suborbital pore (arrow) and surrounding fimbriae (enclosed area); C) paratype (WAM P.34635-001), 227.0 mm SL, showing tiny adipose fin outlined in white (arrow) (G.R. Allen).

rays 13, upper two and lowermost unbranched; pelvic-fin rays 8, branched except outermost and two innermost; principal caudal-fin rays 19, uppermost and lowermost unbranched; upper procurrent caudal-fin rays 14, lower 12; lateral-line scales 48 (47 & 48 in one each, 49 in three); scales between lateral line and dorsal fin 5 (4 in two); scales below lateral line to origin of anal fin 7; median predorsal scales 18 (17 in one, 18 in four, 20 in one); circumpeduncular scales 15 (14 and 15 in two each, 16 in one); protruding gill rakers absent, about 100 filaments on first gill arch; total vertebrae 48–49.

Body depth at origin of pelvic fins 5.4 (6.0–6.6) in SL; body depth at anal-fin origin 7.8 (7.8–8.6) in SL; body width 6.3 (5.9–6.8) in SL; HL 3.6 (3.3–3.6) in SL; snout length 5.6 (3.7–6.6) in HL; orbit diameter 8.6 (7.0–9.1) in HL; interorbital space concave, least width 5.9 (6.1–7.2) in HL; caudal-peduncle depth 4.8 (4.7–5.7) in HL; caudal-peduncle length 2.7 (1.9–2.8) in HL.

Mouth slightly inferior and oblique, forming an angle of about 19° to horizontal axis of body; mouth large, upper-jaw length 1.4 in (1.5–1.7) HL; teeth in jaws dagger-like, laterally compressed, largest slightly smaller than pupil diameter, mostly angling medially and inwardly depressible (except some of outer row in upper jaw that are fixed); teeth of upper jaw in two closely set rows, those of outer row about 1/3–1/2 length of inner teeth, and largely covered by lip, those of inner row widely spaced; teeth in lower jaw in three closely set rows, progressively larger medially, outer row hidden by lip; palatine teeth in 3–4 rows on each side, progressively longer and more widely spaced medially, angling inwardly and posteriorly; free (anterior) part of tongue with dense band of about 30–40 recurved, posteriorly depressible teeth; remainder (posterior part) of tongue with separate narrow band of about 35–40 slightly smaller teeth in 3–4 irregular rows, separated by a gap from teeth on free part of tongue.

Nostrils on a line from upper edge of orbit to front of upper lip; anterior nostril about 1/3 snout length in front of anterior edge of orbit, tubular with triangular flap on posterior edge (Fig. 2A); posterior nostril ovate, without a rim; internarial distance about equal to 1/2 distance from eye to anterior nostril; adipose eyelid surrounding margin of eye, interrupted below rear corner of eye by a deep suborbital pore or pit separating posterior circumorbital and suborbital regions (Fig. 2B), surrounding margin of adipose eyelid immediately anterior and posterior to pore with about 9 or 10 prominent fimbriae, some branched, extending upwards along rear margin of eye.

Cycloid scales covering body, nape, opercle, and cheek; median predorsal scales extending forward to about level of posterior end of upper jaw; about 7 oblique scale rows on cheek (following dorsal contour of jaw); no scales on dorsal, anal, or paired fins; triangular patch of scales basally on each caudal-fin lobe; caudal-fin-base scales progressively more pointed posteriorly; patch of small scales covering upper and lower procurrent caudal-fin rays; triangular scaly process of about 12 scales midventrally at base of pelvic fins.

Predorsal length about equal to distance from dorsal-fin origin to anterior edge of eye, 2.3 (2.2–2.4) in SL; dorsal-fin base 1.7 (1.8–2.1) in HL; third dorsal-fin ray longest, 2.1 (1.7–2.3) in HL; anal-fin base 1.4 (1.4–1.8) in HL; third anal-fin ray longest, 3.9 (3.7–4.3) in HL; caudal fin forked, lobes pointed, longest ray 1.6 (1.5–1.9) in HL; caudal concavity 4.0 (2.7–5.7) in HL; pectoral fins relatively short, asymmetrically rounded when spread, 2.1

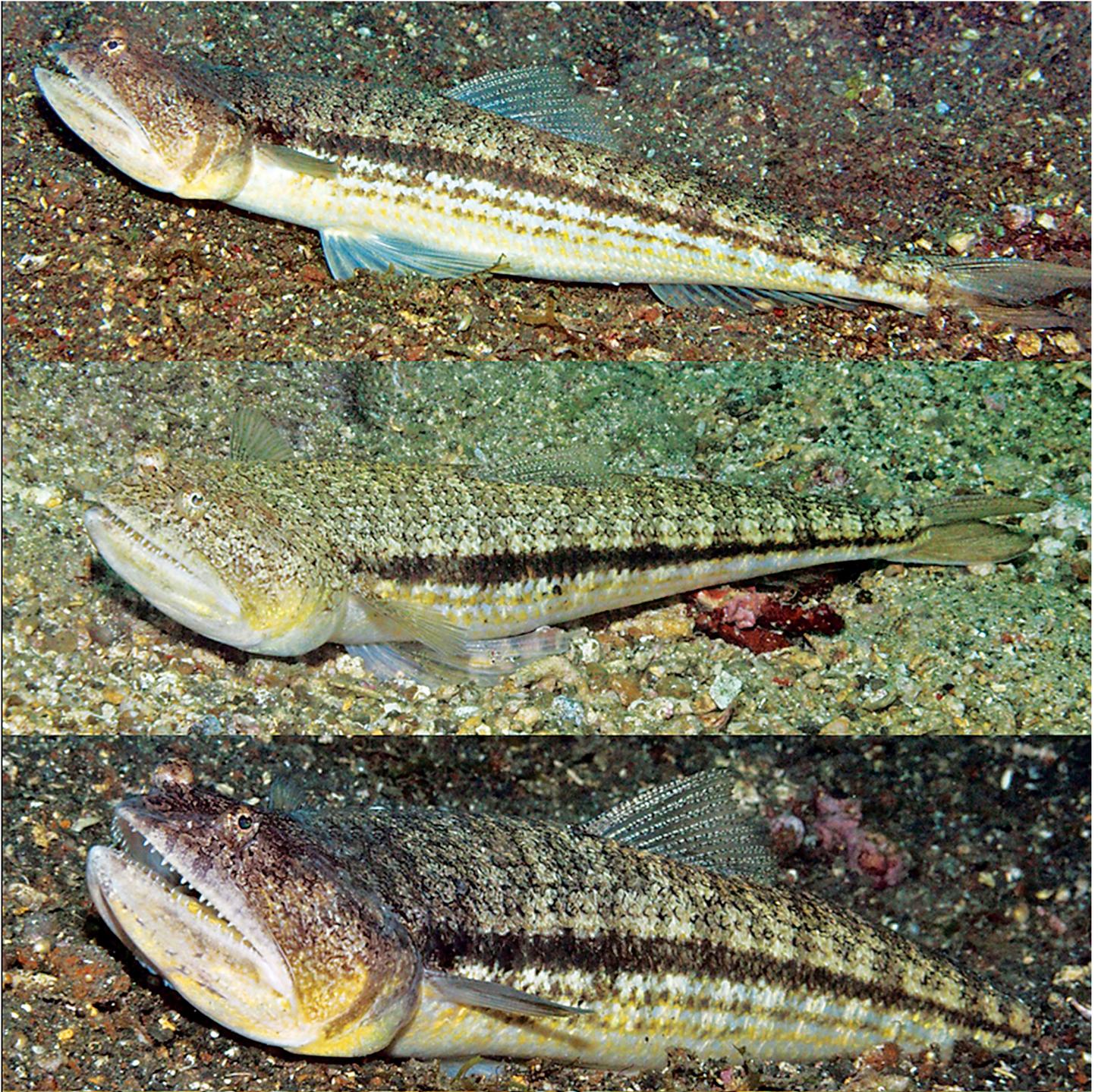


Figure 3. *Synodus nigrotaeniatus*, underwater photographs of adults, approximately 180–220 mm SL, Lembah Strait, North Sulawesi Province, Indonesia (G.R. Allen).

(1.9–2.2) in HL; sixth and seventh pelvic-fin rays longest, 1.1 (1.1–1.2) in HL; adipose fin rudimentary (Fig.2C), less than 1/2 length of each adjacent scale.

Color in life. (Fig. 3) Variegated pattern of blackish streaks and shades of grey with about 16 brownish-gray saddles on upper back, most continued as faint bars to middle of side; dark brown to blackish mid-lateral stripe from upper edge of gill cover to caudal-fin base, narrowing posteriorly, with white stripe immediately below; lower side with series of narrow yellow stripes corresponding with horizontal scale rows, uppermost 1–2 often brownish; dorsal head and cheeks strongly mottled with irregular grey and brown markings; brown-to-yellow bar on posterior edge of preopercle; dark-brown-to-blackish spot (about pupil size) immediately above upper rear edge of opercle; upper lip with fainter brown mottling and six brown bars usually evident; lower rear corner of

TABLE 1

Proportional measurements of type specimens of *Synodus nigrotaeniatus*, n. sp.
as percentages of the standard length

	holotype		paratypes			
	LBRC F-3773	WAM P. 34635	LBRC F-0405	LBRC F-1601	LBRC F-1684	WAM P. 34495
Standard length (mm)	233.5	227.0	190.0	187.5	152.0	129.7
Body depth (at pelvic-fin origin)	18.5	15.1	15.4	16.0	15.4	16.5
Body depth (at anal-fin origin)	12.8	11.6	12.7	11.7	12.9	11.7
Body width	16.0	16.8	15.3	14.8	15.1	16.0
Head length	27.5	29.1	28.9	30.0	27.6	28.2
Snout length	6.0	6.3	6.5	7.1	6.3	6.3
Orbit	3.2	3.2	3.7	3.4	3.9	3.9
Interorbital width	4.7	4.4	4.2	4.9	3.8	4.0
Upper-jaw length	19.3	20.0	18.1	18.8	16.3	16.9
Caudal-peduncle depth	5.7	5.5	5.1	6.0	5.9	6.0
Caudal-peduncle length	10.2	11.3	10.3	12.7	13.4	14.7
Predorsal-fin length	43.0	42.9	44.4	45.1	42.0	42.5
Preanal-fin length	69.2	67.3	68.2	71.8	67.4	68.5
Preadipose-fin length	81.4	82.1	82.1	81.9	81.9	80.9
Prepelvic-fin length	34.8	35.5	35.7	36.6	35.1	33.8
Dorsal-fin base	16.1	15.5	14.8	14.7	15.2	13.8
Longest dorsal-fin ray	13.2	12.6	14.7	16.2	15.1	16.3
Anal-fin base	19.4	19.4	19.1	17.1	19.6	18.0
Longest anal-fin ray	7.0	6.8	7.5	7.6	7.4	7.0
Caudal-fin length	17.3	15.1	17.3	17.5	17.8	17.6
Caudal concavity	6.9	5.5	9.2	9.0	10.4	5.0
Pectoral-fin length	12.9	13.0	13.0	14.0	14.2	14.9
Pelvic-fin length	24.8	25.2	24.3	27.5	25.6	24.1

cheek, adjacent interopercle, and chin pale yellow; fins mainly translucent with whitish rays, except caudal fin mainly white with brown lower lobe and narrow brownish area on dorsal margin of upper lobe; dorsal fin with brown and white mottling on fin rays.

Color in alcohol. (Fig. 1) Mottled gray dorsally on sides and nape and yellowish tan on lower half of body and ventral head; mid-lateral gray stripe from upper rear edge of opercle to caudal-fin base and a pair of thin, irregular, gray stripes immediately below; dorsal surface of head dark gray; cheek and upper 2/3 of opercle mottled brownish; dorsal fin translucent grayish with fine, dark-gray bands on rays; dorsal fin generally gray, darker on lower lobe and along dorsal margin of upper lobe; anal and pelvic fins translucent pale tan; pectoral fins mainly translucent grayish, except lowermost portion pale tan.

Etymology. The species is named *nigrotaeniatus* (Latin: black stripe), with reference to the diagnostic marking on the side of the body.

Distribution and habitat. The new species is currently known only from Indonesia at Lembah Strait, North Sulawesi Province. It occurs on sandy bottoms in 10–30 m and is sometimes seen with only the snout and eyes protruding above the substrate. Typical of other synodontids, it is a “lie-and-wait” predator that relies on its camouflage and the habit of hiding under the sand to gain an advantage over approaching small fishes.

Comparisons. The new species is very similar to *Synodus sageneus* Waite, 1905 (Fig. 4), which is widely distributed around the northern coast of Australia with extra-limital records from Sri Lanka and Indonesia (Bali and West Papua). These two species differ markedly from congeners in having a relatively robust body with the eyes directed more dorsally, a more gradually angled snout profile, an anal-fin base that is longer than the dorsal-fin base, more anal-fin rays (12–15 vs. 8–11), a tiny and inconspicuous adipose fin, and a prominent suborbital pore with surrounding fimbriae.



Figure 4. *Synodus sageneus*, fresh adults: A) CSIRO H 7986-02, 208 mm SL, Kedongan fish market, Bali, Indonesia (W. White); B) approx. 190 mm SL, Gintota (just north of Galle), SW Sri Lanka, depth about 20 m (Ton Nientied).

The name *Xystodus* Ogilby, 1910 is available if these two species eventually prove to constitute a distinct genus. It was first used for *X. banfieldi* Ogilby, 1910 from northern Queensland, which Whitley (1943) placed in the synonymy of *S. sageneus*.

Synodus nigrotaeniatus is clearly separable from *S. sageneus* on the basis of color pattern (Fig. 1 vs. Fig. 4). *Synodus sageneus* is generally a paler fish and lacks the black midlateral stripe that is a key feature of *S. nigrotaeniatus*. In addition, the brown mottling on the back is denser in *S. sageneus* and the pattern of brown bars across the lips is more prominent. Fresh specimens suggest that *S. sageneus* lacks the yellow hue that is present on the lower jaw and ventral portion of the cheek and opercle of *S. nigrotaeniatus*. Morphological and meristic comparisons confirm the close relationship of the two species: the only differences we observed involve the interorbital width, vertebral counts, and the number of lateral-line scales. The interorbital space is slightly wider in *S. nigrotaeniatus* (3.8–4.9% SL, mean 4.4% SL for six specimens, vs. 2.8–3.8% SL, mean 3.5% SL for 15 specimens). Although additional specimens would be probative, *S. nigrotaeniatus* appears to have slightly lower vertebral and lateral-line scale counts (48–49 and 47–49 respectively, vs. usually 51–54 and 51–55 for 15 specimens of *S. sageneus*). Both species possess a well-developed suborbital pore, but the surrounding fimbriae of *S. nigrotaeniatus* are more numerous, sometimes branched, and extend upwards along the rear margin of the eye (as in Fig. 2B), compared to those of *S. sageneus*, which are generally fewer, thicker, and shorter and do not extend along the rear margin of the eye (Fig. 5).

Remarks. The deep pore or pit below the posterior portion of the eye is a key feature of the new species and *S. sageneus*. Examination of various *Synodus* species at WAM revealed that a small slit or indentation is always present, but never forms a deep pore and is lacking the elaborate fimbriation of the adjacent adipose eyelid. It seems strange that the indentation, although common among synodontids, has not been previously mentioned in specialized taxonomic literature dealing with this family. Generally, for most synodontids there is typically a shallow indentation that is internally blocked by a continuation of the adipose membrane, rather than forming a deep pore as in the new species and *S. sageneus* (Fig.5).

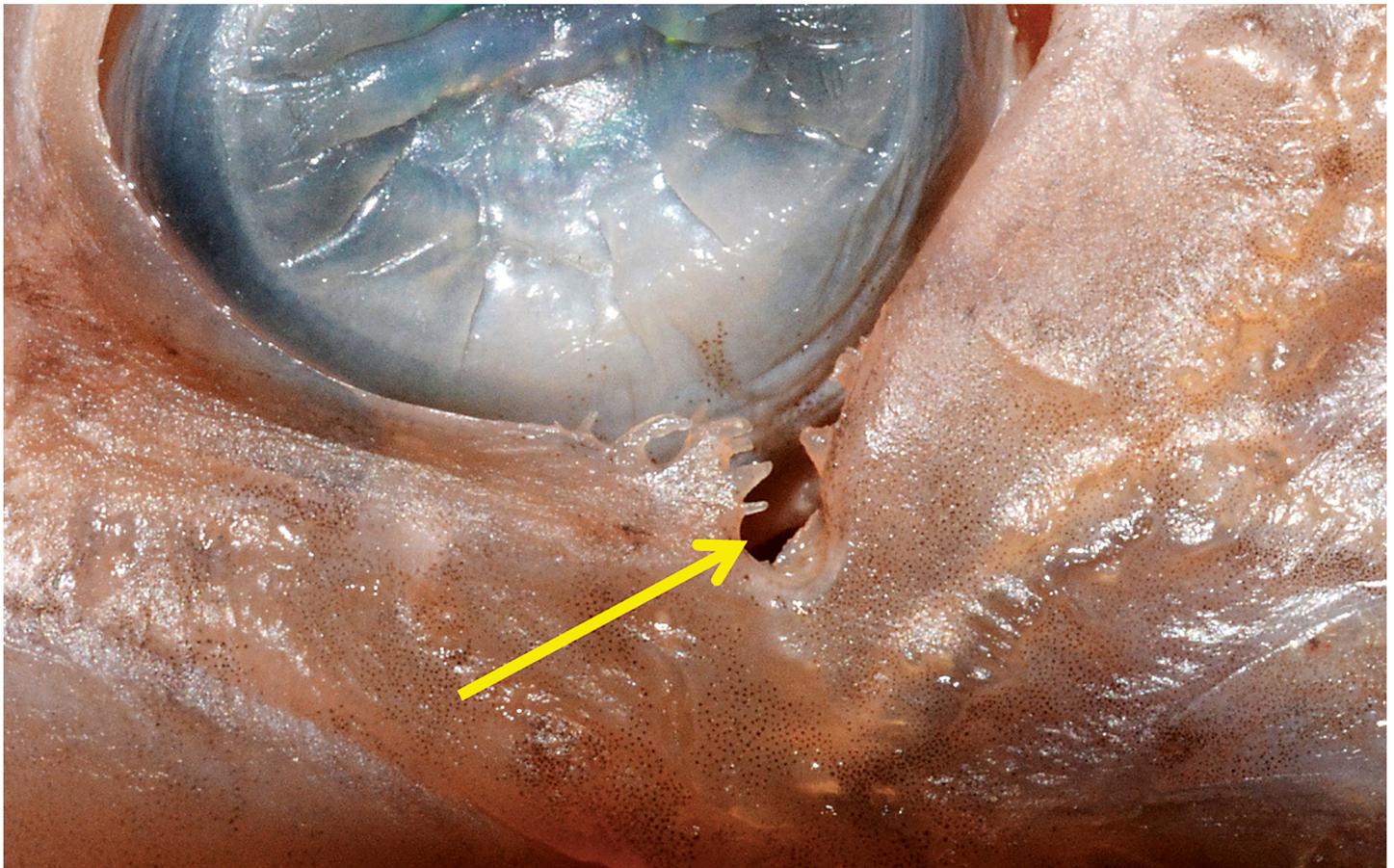


Figure 5. *Synodus sageneus*, WAM P.4785-001, 247.0 mm SL, Shark Bay, Western Australia, suborbital pore (arrow) and associated fimbriae, image reversed (G.R. Allen).

Material examined. (all Western Australia) *Synodus sagineus*: WAM P.13254-001 (holotype), 242.0 mm SL, between Fremantle and Houtman Abrolhos Islands; WAM P.813-001, 166.7 mm SL, Shark Bay; WAM P.4785-001, 247.0 mm SL, Shark Bay; WAM P.8756-001, Kuri Bay, West Kimberley District; WAM P.20075-001, 111.7 mm SL, Dampier Archipelago; WAM P.30239-037, 200.1 mm SL, Exmouth Gulf; P.30312-007, 8 specimens, 29.4–148.5 mm SL, Cleghorn Island, East Kimberley District; WAM P.31656-002, 91.8 mm SL, Dampier Archipelago; WAM P.31696-001, 168.0 mm SL, Shark Bay; WAM P.31708-005, 181.4 mm SL, Shark Bay; WAM P.31711-003, 160.0 mm SL, Shark Bay; WAM P.31887-003, 74.0 mm SL, Dampier Archipelago; WAM P.32429-011, 2 specimens, 125.5–147.7 mm SL, Shark Bay.

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