

**Systematics of the waspfish genus *Neocentropogon*
Matsubara, 1943 and related genera
(Teleostei: Tetrarogidae)**

ハオコゼ科ナガハチオコゼ属魚類
および近縁属の分類学的研究

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Abstract

A taxonomic review of the family Tetraogidae (waspsfishes), characterized by a compressed body, head spines, a mobile lacrimal bone, skin at the gill opening not broadly connected to the isthmus, and the lower pectoral-fin rays not separated from other pectoral-fin rays, resulted in the recognition of 17 valid genera, viz., *Ablabys* Kaup 1873, *Centropogon* Günther 1860, *Cocotropsis* Barnard 1927, *Cottapistus* Bleeker 1876a, *Glyptauchen* Günther 1860, *Gymnapistes* Swainson 1839, *Liocranium* Ogilby 1903, *Neocentropogon* Matsubara 1943, *Neovespicula* Mandrytsa 2001, *Notesthes* Ogilby 1903, *Ocosia* Jordan and Starks 1904, *Paracentropogon* Bleeker 1876b, *Pseudovespicula* Mandrytsa 2001, *Richardsonichthys* Smith 1958, *Snyderina* Jordan and Starks 1901, *Tetraroge* Günther 1860, and *Trichosomus* Swainson 1839, with 45 valid species. Review of the genera *Trichosomus* (type species: *Apistus trachinoides* Cuvier 1829) and *Vespacula* (type species: *Prosopodasys gogorzae* Jordan and Seale 1905) resulted in the genus *Vespacula* as a junior synonym of *Trichosomus* because *P. gogorzae*, the type species of *Vespacula*, has been regarded as a junior synonym of *Trichosomus trachinoides*. Two new species of the genus *Ablabys* were described from Australia and the western Pacific Ocean, respectively, during this study. Another two undescribed species of the genera *Ocosia* and *Snyderina*, collected from Australia and the Philippines, respectively, were also reported.

Of the 17 genera, the genus *Neocentropogon*, diagnosed by the following combination of characters: body sparsely covered with small embedded cycloid scales, palatine teeth present, XIII–XVI dorsal-fin spines, the first dorsal fin originating above the orbit, five pelvic-fin soft rays, and membrane of lower four pectoral-fin rays deeply incised, was reviewed in detail and the following six species were regarded as valid: *Neocentropogon aeglefinus* (Weber 1913), *Neocentropogon affinis* (Lloyd 1909a), *Neocentropogon japonicus*

Matsubara 1943, *Neocentropogon mesedai* Klausowitz 1985, *Neocentropogon profundus* (Smith 1958), and *Neocentropogon trimaculatus* Chan 1966. *Neocentropogon trimaculatus* (anti-tropically distributed in East Asia and Australia) can be distinguished from its congeners by the presence of three dark blotches on the body (vs. absent or a single blotch); *N. affinis* (eastern Indian Ocean) and *N. aeglefinus* (Philippines to Australia) differ from other congeners in having a black blotch behind the opercle (vs. blotch absent), with the former distinguishable from the latter by dorsal rows of dark spots on the body, and pectoral and caudal fins (vs. spots absent), and 79–96 scale rows in the longitudinal series (vs. 94–137); *N. mesedai* (Red Sea) differs from *N. profundus* (southwestern Indian Ocean) and *N. japonicus* (northwestern Pacific Ocean) in having the lowermost four pectoral-fin rays elongated and XIII (vs. XIV–XVI) dorsal-fin spines, the latter species being separated by the symphyseal knob condition (unremarkable, *N. profundus* vs. pronounced, *N. japonicus*), dark dorsal spots on the body (vs. absent), and 5 anal-fin soft rays (vs. 6 or 7). Keys to species of *Neocentropogon* and to genera of the family were provided.

Introduction

The Indo-West Pacific family Tetraogidae (waspsfishes) is characterized by a compressed body, head spines, a mobile lacrimal bone, skin at the gill opening not broadly connected to the isthmus, and the lower pectoral-fin rays not separated from other pectoral-fin rays (Poss 1999), was regarded as comprising 18 valid genera, viz., *Ablabys* Kaup 1873, *Centropogon* Günther 1860, *Coccotropsis* Barnard 1927, *Cottapistus* Bleeker 1876a, *Glyptauchen* Günther 1860, *Gymnapistes* Swainson 1839, *Liocranium* Ogilby 1903, *Neocentropogon* Matsubara 1943, *Neovespicula* Mandrytsa 2001, *Notesthes* Ogilby 1903, *Ocosia* Jordan and Starks 1904, *Paracentropogon* Bleeker 1876b, *Pseudovespicula* Mandrytsa 2001, *Richardsonichthys* Smith 1958, *Snyderina* Jordan and Starks 1901, *Tetraroge* Günther 1860, *Trichosomus* Swainson 1839, and *Vespacula* Jordan and Richardson 1910, with 43 valid species overall (Fricke et al. 2020).

The genus *Neocentropogon* (type species: *Paracentropogon aeglefinus* Weber 1913), one of the most poorly known genera in the family, comprises 6 species, viz., *Neocentropogon aeglefinus*, *Neocentropogon affinis* (Lloyd 1909a), *Neocentropogon japonicus* Matsubara 1943, *Neocentropogon mesedai* Klausewitz 1985, *Neocentropogon profundus* (Smith 1958), and *Neocentropogon trimaculatus* Chan 1966. Apart from original descriptions and numerous brief treatments in general classifications and regional faunal studies, *Neocentropogon* has at no time been reviewed on the basis of type and non-type materials; thus, some taxonomic confusion has resulted. Accordingly, the present review of the genus has been made on an Indo-West Pacific basis. Examination of all available type specimens and a large number of non-type specimens of *Neocentropogon* representing wide distributional ranges in this study resulted in six species being regarded as valid. They are redescribed here in detail, including key to species of the genus *Neocentropogon*.

Similarly, taxonomic reviews and a key to all genera of Tetrarogidae on the basis of examination of all valid species have never been published, although some authors (e.g., Poss and Rama-Rao 1984; Poss 1999) provided a regional key to some genera. This study aims to provide a taxonomic revision and a complete key to the genera of the family, based on examination of numerous specimens.

Materials and methods

Counts and proportional measurements followed Motomura (2004a) and Motomura et al. (2008), except scale counts followed Chungthanawong and Motomura (2018). Standard and head lengths are expressed as SL and HL respectively. Head spine terminology follows Randall and Eschmeyer (2002: fig. 1) and Motomura (2004b: fig. 1). Osteological characters, including vertebral counts, were observed on radiographs of *Neocentropogon aeglefinus* (8 specimens: CSIRO H 4032-01, MNHN 2006-0256, 2014-0992, QM I. 21498, 32707, 34291, 38959, 38964), *Neocentropogon affinis* Lloyd 1909 (3: KAUM-I. 33280, SAIAB 65706, 2 specimens), *Neocentropogon japonicus* Matsubara 1943 (11: FAKU S511, 103972, KAUM-I. 20392, 20393, 30815, MNHN 1984-0635, 2005-0624, 2005-0709, 2005-1006, 2005-1298, NSMT-P 119710), *Neocentropogon profundus* Smith 1958 (1: MNHN 2006-0008), and *Neocentropogon trimaculatus* Chan 1966 (11: BMNH 1965.11.6.3, FAKU 75091, KAUM-I. 40487, 77115, 88804, MNHN 2003-1850, 2005-2624, 2014-1040, NSMT-P 112288, QM I. 22111, 38768). The formula for configuration of the supraneural bones, anterior neural spines and anterior dorsal-fin pterygiophores follows Ahlstrom et al. (1976). Swimbladder absence was confirmed by dissection of the abdomen on the right side of the body in *N. aeglefinus* (2: QM I. 21498, 2), *N. affinis* (KAUM-I. 33280), *N. japonicus* (8: FAKU S511, S512, 103972, KAUM-I. 20393, 30815, 81861, 114281, 114289), *N. trimaculatus* (5: KAUM-I. 77115, 77117, 88804, 97509, 97510). Color descriptions are based on preserved specimens. The key to genera was based on specimens representing 39 species in 17 genera examined during this study and the original descriptions of four species (Bleeker 1848; Weber 1913; Poss and Eschmeyer 1975; Fricke 2017). Comparative features for the genera are provided in Table 4. Institutional codes follow Sabaj (2019).

CHAPTER 1

Revision of the genus *Neocentropogon*

In this chapter, the examination of type and non-type specimens of the genus *Neocentropogon* collected from Indo-West Pacific resulted in six species being regarded as valid viz., *N. aeglefinus*, *N. affinis*, *N. japonicus*, *N. mesedai*, *N. profundus*, and *N. trimaculatus*. Taxonomic study of the genus *Neocentropogon* are shown, including a key to the species of genus *Neocentropogon* is provide.

Genus *Neocentropogon* Matsubara 1943

Neocentropogon Matsubara 1943: 429 (type species: *Paracentropogon aeglefinus* Weber 1913, by original designation).

Gadapistus de Beaufort, 1949: 68 (type species: *Paracentropogon aeglefinus*).

Diagnosis. A genus of the family Tetraogidae with the following combination of characters: XIII–XVI, 6–8 dorsal-fin rays, its origin anterior to vertical through posterior margin of orbit; three anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray not connected posteriorly to upper caudal-fin base; I, 5 pelvic-fin rays; 13–16 pectoral-fin rays, four lowermost rays simple and detached, their basal half connected by low membrane; head and snout profile oblique; nape flattened ; mouth large [37.4–49.9 (mean 45.2)% HL]; body sparsely covered with small embedded, non-imbricate cycloid scales; cirri and papillae absent on head and body; cleithral spine absent; small conical teeth on palatines; 18–26 lateral-line pores; lateral line running along upper one-third of body; tip of opercle directed backward, below lateral line.

Description. Body elongated, laterally compressed, progressively more compressed posteriorly, caudal peduncle short. Scales absent on head, pre-dorsal-fin area, dorsal- and anal-fin bases. Tentacles, cirri and skin flaps absent on head, body and fins. Lateral line straight, extending from above supracleithral spine to caudal-fin base, one lateral-line pore near caudal-fin base.

Head profile oblique with shallow concavity in front of eyes. Two nasal openings in front of orbit, subequal in diameter, tubular, anterior nostril higher than posterior nostril. Interorbital space convex, interorbital ridges weakly developed, median interorbital ridge and spines absent, ascending process of premaxilla intruding slightly into interorbital space. Nuchal, pterotic, upper posttemporal, lower posttemporal, and supracleithral forming ridges with minute spines, entirely covered with skin. Suborbital ridge weak, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost longest, sharp, projecting from skin; second and third short, sharp, projecting from skin; fourth and fifth blunt, with broad base, hidden under skin. Opercle with smooth V-shaped crests, upper crest with minute sharp spine projecting from skin, lower crest with weak blunt spines. Cleithral bone flattened, covered with thick skin. Lacrimal with 2 simple sharp spines; anterior lacrimal spine short, directed ventrally, its tip extending well beyond dorsal margin of maxilla; posterior lacrimal spine longer, directed posteriorly. Mouth moderately large, terminal, slightly oblique, maxillary extending posteriorly to about level with middle of eye, symphyseal knob present. Lips thick; gill rakers rather short, blunt; no slit behind last gill arch.

Dorsal fin continuous, origin anterior to posterior margin of orbit, 3 anteriormost dorsal-fin spines somewhat separated from rest of fin, spinous membrane of fin deeply notched, last dorsal-fin ray membrane connected posteriorly to caudal peduncle. Anal fin continuous, III, 5–8 anal-fin rays, origin about level with origin of eleventh dorsal-fin spine,

However, *Gadapistus* is regarded as an objective junior synonym of *Neocentropogon*, the type species of the two genera being the same (Mandrytsa 2001; this study).

After detailed examination of 202 specimens of *Neocentropogon*, this study recognizes the following six species in it: *N. aeglefinus*; *N. affinis*; *N. japonicus*; *N. mesedai*; *N. profundus*; *N. trimaculatus*. This membership is newly recognized here because a comprehensive taxonomic revision of this genus has not been performed before.

Neocentropogon is distinguished from all other genera in the family by the combination of characters given in the Diagnosis (above). The simple four lowermost pectoral-fin rays with their basal half connected by low membrane is a unique character within the family.

Key to the species of *Neocentropogon*

- 1a.** Body with single large dark blotch behind opercle2
- 1b.** Body without large dark blotch behind opercle4
- 2a.** Two dark blotches basally on dorsal fin; head with brownish stripes radiating from pupil; symphyseal knob unremarkable; postocular spine present; four lowermost pectoral-fin rays elongated; anal-fin soft rays 6–8 (usually 7) *N. trimaculatus*
- 2b.** No dark blotches basally on dorsal fin; head without brownish stripes; symphyseal knob pronounced; postocular spine absent; four lowermost pectoral-fin rays not elongated; anal-fin soft rays 5 or 6 (usually 6) 3
- 3a.** Rows of dark spots on dorsal half of trunk, and dorsal, pectoral, and caudal fins; scale rows in longitudinal series 79–96; scale rows above lateral line 0–8 *N. affinis*
- 3b.** Dark spots absent from trunk and fins; scale rows in longitudinal series 94–137; scale rows above lateral line 8–17 *N. aeglefinus*
- 4a.** Dorsal-fin spines XIII; four lowermost pectoral-fin rays elongated; lateral-line pores 18 *N. mesedai*

- 4b.** Dorsal-fin spines XIV–XVI; four lowermost pectoral-fin rays not elongated; lateral-line pores 19–24 5
- 5a.** Symphyseal knob unremarkable; irregular dark spots on dorsal body surface; dorsal-fin spines XIV; anal-fin soft rays 5; scale rows in longitudinal series 71–76; scale rows above lateral line 5–8; postocular spine absent; orbit diameter 15.4–17.0 % of SL *N. profundus*
- 5b.** Symphyseal knob pronounced; no dark spots on dorsal body; dorsal fin spines XIV–XVI (usually XV); anal-fin soft rays 6 or 7 (usually 7); scale rows in longitudinal series 97–139; scale rows above lateral line 10–21; postocular spine present; orbit diameter 11.4–14.1% of SL *N. japonicus*

***Neocentropogon aeglefinus* (Weber 1913)**

(English name: Onespot Waspfish) (Figs. 1, 2, 10; Tables 1, 2)

Paracentropogon aeglefinus Weber 1913: 500, pl. 6, fig. 8 (type locality: Halmahera Sea, Timor Sea, Savu Sea, Sumbawa, Indonesia); Nijssen et al. 1993: 81 (Indonesia; listed).

Neocentropogon aeglefinis [sic]: Hutchins 2001: 27 (Western Australia, Australia; listed).

Neocentropogon aeglefinus: Allen et al. 2006: 900 (Northwest Shelf, Western Australia; tropical, east-Indo-west Pacific; listed).

Neocentropogon affinis (not of Lloyd): Iwamoto and McCosker 2014: 287, pl. 16, fig. 92 (between Luzon and Mindoro, Philippines).

Material examined. 77 specimens (29.6–116.4 mm SL) — **AUSTRALIA:** AMS I. 16725-007, 29.6 mm SL, Sydney Heads, New South Wales (NSW), 33°87'S, 151°62'E, FRV *Kapala*; AMS I. 33598-002, 31.6 mm SL, NSW, 32°88'S, 152°00'E, FRV *Kapala*; AMS I.

37355-018, 3 specimens, 67.2–113.0 mm SL, Swain Reefs, Queensland (Qld), 22°13'08"S, 153°03'12"E, J. Lowry and K. Dempsey; AMS I. 37476-003, 30.6 mm SL, off Newcastle, NSW, 33°12'S, 151°75'E, FRV *Kapala*; AMS I. 37492-001, 33.8 mm SL, off Newcastle, NSW, 32°90'S, 151°97'E, FRV *Kapala*; AMS I. 37600-009, 2, 86.2–108.9 mm SL, Swain Reefs, Qld, 22°26'45"S, 153°09'10"E, J. Lowry and K. Dempsey; AMS I. 38419-001, 86.3 mm SL, off Newcastle, NSW, 32°09'S, 152°00'E, K. Graham; CSIRO B 4106, 6, 32.2–44.5 mm SL, off Monte Bello Islands, Western Australia (WA), 19°36'S, 116°12'E, 124 m depth, mesh wing trawl, CSIRO, 1 June 1980; CSIRO H 4032-01, 6, 47.0–62.4 mm SL, off Cape Lambert, WA, 19°03'S, 117°23'E, 146–154 m, Frank and Bryce demersal trawl, A. Graham and G. Yearsley, 30 Aug. 1995; CSIRO H 7267-04, 3, 84.1–108.2 mm SL, Swain Reefs, Qld, 22°51'S, 152°30'E, 132–134 m, prawn trawl, C. Rigby, 6 June 2011; CSIRO H 7277-01, 113.3 mm SL, Swain Reefs, Qld, 22°43'S, 152°38'E, 130 m, prawn trawl, C. Rigby, 24 June 2011; QM I. 21498, 2, 86.7–102.9 mm SL, Swain Reefs, Qld, 22°06'S, 153°02'E, 150 m, trawl, 28 Aug. 1983; QM I. 32707, 81.0 mm SL, Coolum, Qld, 26°35'S, 153°36'E, 114 m, trawl, 17 May 2001; QM I. 34047, 3, 35.6–97.3 mm SL, Qld, 27°48'S, 153°49'E, trawl, 17 July 2003; QM I. 34291, 10, 48.1–64.5 mm SL, Dampier, WA, 19°03'S, 117°22'E, 146 m, trawl, 30 Aug. 1995; QM I. 34330, 48.6 mm SL, east of Noosa, Qld, 26°25'S, 153°40'E, 119 m, trawl, 19 July 2002; QM I. 37930, 45.5 mm SL, Swain Reefs, Qld, 22°17.01'S, 152°47.07'E, 108 m, dredge, 16 Nov. 2005; QM I. 38595, 66.6 mm SL, east of Noosa, Qld, 26°19'S, 153°46'E, 109 m, trawl, 1 May 2009; QM I. 38596, 2, 69.9–88.7 mm SL, east of Noosa, Qld, 26°18.27'S, 153°46.15'E, 108 m, trawl, 30 Apr. 2009; QM I. 38959, 2, 87.0–100.9 mm SL, off Swain Reefs, Qld, 22°46.67'S, 152°36.49'E, 132–134 m, trawl, 5 June 2011; QM I. 38960, 107.0 mm SL, off Swain Reefs, Qld, 22°55.12'S, 152°14.86'E, 124–126 m, trawl, 27 June 2011; QM I. 38964, 102.7 mm SL, east of Swain Reefs, Qld, 22°08'S, 153°03'E, 150 m, trawl, 30 Apr. 2009; QM I. 38965, 2, 86.0–116.4 mm SL, south of Swain

reefs, Qld, 22°42'S, 152°49'E, 138 m, trawl, 20 June 2009; QM I. 38966, 89.0 mm SL, Swain Reefs, Qld, 22°48.00'S, 153°36.00'E, 133 m, trawl, 25 Apr. 2009. **INDONESIA:** AMS I. 24305-001, 93.53 mm SL, South Java, 08°45'S, 117°78'E, T. Gloerfelt-Tarp.

PHILIPPINES: CAS 235562, 3, 51.4–82.7 mm SL, between Luzon and Mindoro, 13°53'08"N, 120°07'47"E, Department of Agriculture, Bureau of Fisheries and Aquatic Resources, 1 June 2011; CAS 235572, 3, 65.9–78.9 mm SL, CAS 235749, 2, 78.6–80.4 mm SL, between Luzon and Mindoro, 13°53'17"N, 120°06'27"E, Department of Agriculture, Bureau of Fisheries and Aquatic Resources, 1 June 2011. **SOLOMON ISLANDS:** MNHN 2005-3411, 90.1 mm SL, RV *Alis*,; MNHN 2006-0086, 88.6 mm SL, 08°38'13"S, 157°23'02"E, 17–76 m, RV *Alis*, 6 Nov. 2004; MNHN 2006-0237, 47.7 mm SL, 08°36'03"S, 157°23'02"E, 176 m, RV *Alis*, 6 Nov. 2004; MNHN 2006-0256, 48.1 mm SL, 08°36'14"S, 157°25'08"E, 150–160 m, RV *Alis*, 6 Nov. 2004; MNHN 2006-0315, 7, 68.2–86.7 mm SL, 08°36'25"S, 157°23'02"E, 148–253 m, RV *Alis*, 6 Nov. 2004; MNHN 2014-0992, 85.3 mm SL, 10°25'60"S, 161°24'00"E, 190–232 m, RV *Alis*, 23 Sep. 2007. **VANUATU:** MNHN 2009-0099, 113.6 mm SL, 15°01'25"S, 166°53'45"E, 630–705 m, RV *Alis*, 8 Sep. 2005; MNHN 2009-0103, 95.1 mm SL, 15°09'06"S, 166°54'24"E, 220–277 m, 10 Sep. 2005, RV *Alis*.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays XIV, 7 (rarely XIII or XV, 6 or 8); anal-fin soft rays 6 (rarely 5); lateral-line pores 20–24; scale rows in longitudinal series 94–137; scale rows above lateral line 8–17; symphyseal knob pronounced; postocular spine usually absent; four lowermost pectoral-fin rays not elongated; orbit diameter 11.8–15.3% (mean 13.5%) of SL; large dark blotch behind opercular margin; blotches absent on dorsal fin base; spots absent on body dorsal surface and dorsal fin; pectoral fin dark brown.

Description. Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 3.1–4.2 in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales extending onto dorsal-, anal-, pectoral-, and pelvic-fin bases; no scales on head, pre-dorsal-fin area. No tentacles, cirri, or skin flaps on head, body or fins. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, simple tubular, anterior nostril tube longer than posterior one. Eye moderate, orbit diameter 2.7–3.5 in head length. Snout slightly short, its length 1.0–1.8 in orbit diameter. Ascending process of premaxilla present. Interorbital region concave, somewhat narrow; interorbital ridges weakly developed, diverging above ascending process of premaxilla, converging before dorsal-fin origin, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge without spines (minute postocular spine present in some specimens); parietal and nuchal forming continuous smooth ridge with nuchal spine; pterotic, upper posttemporal, lower posttemporal, and supracleithral spines sharp and projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fourth short with broad base, sharp and protruding from skin; lowermost pointed, covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical

through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to (or short of) vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest, its length 1.2–2.3 in second spine length; third spine longest, slightly longer than second spine; third to sixth spines progressively shorter; seventh to last spines progressively longer; last spine shorter than first soft ray. Membranes of spinous portion of dorsal fin deeply notched; membranes from first to fourth spines incised for about three-fourth of spine length, progressively shallower from fourth to last spines, the incision between penultimate and last spine one-third of spine length; entirely membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 2.5–3.7 in dorsal-fin base length. Origin of anal fin level with vertical through fourth dorsal-fin spine from the last; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate; its length slightly shorter than head length; four lowermost rays simple, detached, not elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 0.9–1.3 in head length, posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anus (reaching to anus in some specimens); basal half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length slightly shorter than pectoral fin length, posterior margin of fin rounded. Swimbladder present.

Color of preserved specimens: Head and body light brown, large dark blotch behind opercular margin, spots absent on body dorsal surface and dorsal-fin base; dorsal- and anal-fin light brown on spinous portion, dark on soft ray portion; pectoral- and pelvic-fin dark brown, paler basally.

Distribution. Currently known from the Philippines to Indonesia, Australia, the Solomon Islands, and Vanuatu in depths of 17–705 m [based on collected specimens (Fig. 10)].

Remarks. *Neocentropogon aeglefinus* was originally described as *Paracentropogon aeglefinus* by Weber (1913) on the basis of 14 specimens from Indonesia (Halmahera, Timor and Savu seas, and Lesser Sunda Islands). The syntypes, registered as ZMA 110234 (2 specimens), 110235 (4), 110236 (5), 110237 (1), and 110240 (2) (Fricke et al. 2020), are deposited at Naturalis Biodiversity Center, Leiden, the Netherlands. Because the Naturalis fish collection has long been inaccessible due to building renovations (and currently the covid-19 pandemic), the syntypes were unavailable for the present study. However, examination of the original description and figure (Weber 1913: 500, pl. 6, fig. 8) of *P. aeglefinus* showed it to be identical with specimens considered here as conspecific, the former having small embedded cycloid scales; XIV, 8 dorsal-fin rays; 15 pectoral-fin rays, the four lowermost rays detached with their basal half connected by low membrane; I, 5 pelvic-fin rays; palatine teeth; 22 lateral-line pores; no slit behind the last gill arch; and a large dark blotch behind the opercular margin.

Analyses of 35 measurements taken from 77 specimens (29.6–116.4 mm SL) of *N. aeglefinus* showed that several morphometric proportions (% of SL) changed with growth. Whereas relative post lacrimal spine length increased with growth (Fig. 2a), the relative length of pectoral fin, first dorsal-fin spine, second dorsal-fin spine, third dorsal-fin spine, fourth dorsal-fin spine, all anal-fin spines, pelvic-fin spine, and longest pelvic-fin soft ray

decreases (Figs. 2b–k). These proportional changes indicated that small specimens of *N. aeglefinus* have a relatively short lacrimal spine, longer dorsal-, anal-, and pelvic-fin spines, and longer pectoral fin (Fig. 1).

***Neocentropogon affinis* (Lloyd 1909a)**

(English name: Andaman Waspfish) (Figs. 3, 10; Tables 1, 2)

Gymnapistus affinis Lloyd 1909a: 162 (type locality: Gulf of Martaban, Myanmar, 14°50'N, 96°00'E); Lloyd 1909b: pl. 47 (Gulf of Martaban, Myanmar); Menon and Rama-Rao 1971: 344 (Gulf of Martaban, Myanmar).

Neocentropogon affinis: Poss and Rama-Rao 1984: 12 (key only); Poss 1999: 2308 (key only); Psomadakis et al. 2020: 363, pl. 24, fig. 175 (Myanmar).

Syntypes. ZSI 1172/2–1178/2, 4 syntypes, 56.2–67.2 mm SL, Gulf of Martaban, Myanmar, 14°50'N, 96°00'E, 84 m depth.

Other material examined. 3 specimens, 60.6–73.9 mm SL. **INDONESIA:** SAIAB 65706, 2 specimens, 60.6–62.8 mm SL, Nias Island, 02°43'60"N, 97°25'00"E, 23 Aug. 1980. **THAILAND:** KAUM–I. 33280, 73.9 mm SL, Ranong, 09°56'N, 98°35'E (purchased at Pak Nam Ranong Fishing Port), trawl.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays XIV, 7 (rarely XIV, 8); anal-fin soft rays 6; lateral-line pores 22–24; scale rows in longitudinal series 79–96; scale rows above lateral line 0–8; symphyseal knob pronounced; postocular spine absent; four lowermost pectoral-fin rays not elongated; orbit diameter 13.0–14.8% (mean 13.7%) of SL; a large dark blotch behind opercular margin; no

blotches on dorsal-fin base; rows of dark spots scattered on dorsal body surface and dorsal, pectoral, and caudal fins.

Description. Data for the holotype are presented first, followed by other specimen data in parenthesis (if different). Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 3.5– 3.8 (3.3–3.7) in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales; no scales on head, pre-dorsal-fin area, dorsal surface below three anterior dorsal-fin spine base, pectoral- and pelvic-fin bases. No tentacles, cirri, or skin flaps on head, body or fins. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, simple rounded pore with low raised rim. Eye moderate, orbit diameter 2.8–3.1 (3.1–3.2) in head length. Snout length 1.4–1.7 (1.3–1.5) in orbit diameter. Ascending process of premaxilla present. Interorbital region from snout to occipital slightly concave; interorbital ridges weakly developed, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge with postocular spines; parietal and nuchal forming continuous smooth ridge without spines; pterotic spine, upper posttemporal, lower posttemporal, supracleithral spines sharp and projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fourth small with broad base, sharp and protruding from skin; lowermost blunt, covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior

lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest, its length 1.7–2.1 (1.6) in second spine length; second spine longest, its length 0.8–0.9 (1.0) in third spines; third to seventh spines progressively shorter; eighth to last spines progressively longer; penultimate and last spines subequal in length but shorter than first soft ray. Membranes of spinous portion of dorsal fin deeply notched, especially from first to sixth spines incised for about two-third, progressively shallower from sixth to last spines, incision between penultimate and last spine one-third of spine length; entire membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 3.2–3.4 (3.1–3.4) in dorsal-fin base length. Origin of anal fin level with vertical through eleventh dorsal-fin spine base; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate; its length slightly shorter than head length; four lowermost rays simple, detached, not elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 1.1–1.2 (1.2–1.3) in head length, posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anal-fin origin; basal

half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length shorter than pectoral fin length, posterior margin of fin rounded. Swimbladder present.

Color when fresh: Head and body brown, paler ventrally; dorsal fin brown, white basally; large dark blotch behind opercular margin, no blotches on dorsal-fin base, two or three irregular rows of yellow-brown spots on dorsal body surface; obscure yellow-brown spots on dorsal fin; pectoral and caudal fin brown with longitudinal rows of yellow-brown spots; anal fin brown, white basally; pelvic fin brown, paler basally (base on KAUM-I. 33280, Fig. 3b).

Color of preserved specimens: Similar to fresh color but head and body yellow-brown and yellow-brown spots become darker (base on other material examined due to holotype completely faded, Fig. 3a).

Distribution. Currently known only from the eastern Indian Ocean from the Gulf of Martaban and Andaman Sea to Nias Island, Indonesia [based on collected specimens (Fig. 10)]. The type specimens were collected in a depth of ca. 84 m.

Remarks. *Neocentropogon affinis* was originally described by Lloyd (1909a) as *G. affinis* on the basis of seven specimens (three specimens since lost) from the Gulf of Martaban, Myanmar. Although the remaining four syntypes are no longer in good condition and with fading color, Lloyd's (1909a) description of *G. affinis* matched the non-type specimens considered here as conspecific with *N. affinis* and characterized by a greyish-brown body with a greyish blotch behind the opercular margin, two irregular rows of spots above the lateral line, and the dorsal, pectoral, and caudal fins with obscure grey spots. However, Lloyd's (1909a) description was wrong stated on the number of dorsal-fin spines as three spines instead of fourteen.

According to no other specimens are known, the non-type specimens listed here represent only the second and third records of the species. Those collected from Nias Island, Indonesia indicate that the species is widely distributed in the eastern Indian Ocean.

***Neocentropogon japonicus* Matsubara 1943**

(English name: Spotless Waspfish) (Figs. 4, 10; Tables 1, 2)

Neocentropogon aeglefinus japonicus Matsubara 1943: 432, fig. 144 (type locality: Kochi, Japan); Nakabo 1984: 319 (Kochi, Japan); Nakabo 2002: 599 (Kochi, Japan; key); Shinohara et al. 2001: 314 (Kochi, Japan; listed); Ogihara and Motomura 2012: 139 (Kagoshima, Japan).

Neocentropogon japonicus: Poss 2000: 604 (South China Sea; listed); Ho et al. 2009: 28 (Taiwan).

Neocentropogon aeglefinus (not of Weber): Mohsin and Ambak 1996: 572, fig. 924 (South China Sea and Indonesia); Iwamoto and McCosker 2014: 287, pl. 16, fig. 91 (between Luzon and Mindoro, Philippines).

Holotype. FAKU 1761, 97.9 mm SL, Kochi.

Other material examined. 73 specimens, 27.5–108.5 mm SL. **JAPAN:** BSKU 1923, 86.6 mm SL, Mimase Fish Market, Kochi, 24 May 1952; BSKU 2230, 108.5 mm SL, BSKU 2231, 67.4 mm SL, Mimase Fish Market, Kochi, 11 Dec. 1952; BSKU 13753, 106.6 mm SL, Mimase Fish Market, Kochi, 3 Jan. 1968; BSKU 64652, 72.7 mm SL, 6 June 2003; BSKU 89660, 84.1 mm SL, Saga Fishing Port, Kuroshio, Hata, Kochi, 24 Dec. 2003; BSKU 106457, 89.8 mm SL, Irino Fishing Port, Kuroshio, Hata, Kochi, 15 Dec. 2011; FAKU S511, 98.9 mm SL, FAKU S512, 76.4 mm SL, Mimase, Kochi, 28 Dec. 1958; FAKU 103972, 94.0 mm SL,

Kochi; KAUM-I. 30815, 85.8 mm SL, Shibushi, Kagoshima, 31°38'N, 131°14'E, 70–100 m depth, trawl, G. Ogihara et al., 8 July 2010; KAUM-I. 81861, 104.9 mm SL, Tosa Bay, Kuroshio, Hata, Kochi, 33°03'N, 133°08'E, 80–120 m, bottom trawl, M. Matsunuma, 10 June 2016; KAUM-I. 91601, 27.4 mm SL, Okinawa, 27°10'N, 125°09'E, 114 m, trawl, M. Okamoto, 24 May 2015; NSMT-P 92005, 41.5 mm SL, Saga Fishing Port, Kuroshio, Hata, Kochi, K. Matsuura et al., 27 July 2008. **SOUTH CHINA SEA:** BSKU 17283, 89.8 mm SL, BSKU 17284, 95.8 mm SL, 06°51.6'N, 108°47.2'E, 135–137 m, beam trawl, O. Okamura, 10–11 July 1972. **TAIWAN:** FRLM 46985, 91.1 mm SL, FRLM 46986, 69.4 mm SL, Tungkang, Pingkang, Y. Hibino and H.-C. Ho, 22 Feb. 2014; KAUM-I. 20392, 79.7 mm SL, KAUM-I. 20393, 89.8 mm SL, Dong-gang, Pingtung, H.-C. Ho, 19 May 2008; KAUM-I. 110326, 81.7 mm SL, off Ke-tzu-liao, Ziguang, Kaohsiung, K. Koeda and H. Hata, 14 Dec. 2017; KAUM-I. 110810, 83.1 mm SL off Dong-gang, Pingtung, 22°39'N, 120°24'E, trawl, K. Koeda and S. Tashiro, 27 Nov. 2017; KAUM-I. 110877, 51.8 mm SL, off Dong-gang, Pingtung, 22°39'N, 120°24'E, K. Koeda and H. Hata, 14 Dec. 2017; KAUM-I. 114281, 98.4 mm SL, KAUM-I. 114282, 88.3 mm SL, KAUM-I. 114283, 99.5 mm SL, KAUM-I. 114284, 78.9 mm SL, KAUM-I. 114285, 79.3 mm SL, KAUM-I. 114286, 90.2 mm SL, KAUM-I. 114287, 91.9 mm SL, KAUM-I. 114288, 89.9 mm SL, KAUM-I. 114289, 106.9 mm SL, off Dong-gang, Pingtung, 22°39'N, 120°24'E, K. Koeda and H. Hata, 8 Mar. 2018; KAUM-I. 115464, 66.9 mm SL, KAUM-I. 115465, 63.8 mm SL, KAUM-I. 115466, 75.9 mm SL, off Dong-gang, Pingtung, 22°39'N, 120°24'E, K. Koeda and H. Wada, 10 May 2018; KAUM-I. 115573, 83.6 mm SL, off Dong-gang, Pingtung, 22°39'N, 120°24'E, K. Koeda and H. Wada, 8 May 2018; KAUM-I. 150450, 71.5 mm SL, Dong-gang, Pingtung, 22°27'N, 120°25'E, 100–400 m, trawl, M. Matsunuma, 27 Feb. 2017; NSMT-P 115111, 92.2 mm SL, Dong-gang Fishing Port, Pingtung, 17 Oct. 2013; NSMT-P 119710, 72.3 mm SL, Dong-gang Fishing Port, Pingtung, G. Shinohara et al., 7 Nov. 2013. **PHILIPPINES:** MNHN 1984-

0635, 3 specimens, 59.0–86.8 mm SL, Luzon, 13°07'58"N, 122°39'00"E, 280–440 m, RV *Coriolis*, 25 Nov. 1980; MNHN 2005-0624, 3, 79.2–87.2 mm SL, 14°00'07"N, 120°19'04"E, RV *Coriolis*, 31 May 1985; MNHN 2005-0684, 5 of 7, 63.5–100.9 mm SL, MNHN 2005-1006, 3, 72.6–92.2 mm SL, 14°00'00"N, 120°10'48"E, RV *Coriolis*, 1 June 1985; MNHN 2005-0709, 8, 66.3–95.8 mm SL, 14°00'07"N, 120°19'04"E, 191–197 m, RV *Coriolis*, 31 May 1985; MNHN 2005-0973, 3, 77.8–89.5 mm SL, 14°00'00"N, 120°11'24"E, RV *Coriolis*, 2 June 1985; MNHN 2005-1298, 8, 57.7–83.9 mm SL, 14°00'00"N, 120°16'58.8"E, 190–198 m, RV *Coriolis*, 2 June 1985; **LOCALITY UNKNOWN**: BSKU 11853, 107.0 mm SL.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays XV, 7 (rarely XIV or XVI, 6); anal-fin soft rays 7 (rarely 6); lateral-line pores 19–24; scale rows in longitudinal series 97–139; scale rows above lateral line 10–21; symphyseal knob pronounced; postocular spine present; four lowermost pectoral-fin rays not elongated; orbit diameter 11.4–14.1% (mean 12.7%) of SL; no large blotches behind opercular margin and on dorsal-fin base; no spots on dorsal body surface or dorsal fin; pectoral fin black.

Description. Data for the holotype are presented first, followed by other specimen data in parenthesis (if different). Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 3.7 (3.0–4.6) in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales extending onto dorsal- and anal-fin bases; no scales on head, pre-dorsal-fin area, pectoral- and pelvic-fin bases. No tentacles, cirri, or skin flaps on head, body or fins. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, simple rounded pore with low raised rim. Eye moderate, orbit diameter 3.1 (2.8–3.5) in head length. Snout length 1.3 (1.1–1.6) in orbit diameter. Ascending process of premaxilla present. Interorbital region from snout to occipital slightly concave; interorbital ridges weakly developed, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge with postocular spines; parietal and nuchal forming continuous smooth ridge with nuchal spine; pterotic, upper posttemporal, lower posttemporal, and supracleithral spines sharp, projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fourth small with broad base, sharp and protruding from skin; lowermost blunt, covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest, its length 1.5 (1.1–1.9) in second spine length; third spine longest, slightly longer than second and fourth spines; fourth to seventh spines progressively shorter; eighth to last spines progressively longer; penultimate and last spines subequal in length but shorter than first soft ray. Membranes of spinous portion of dorsal fin deeply notched especially between first to

fourth spines which almost incised to spinous base, its incised at the middle of spinous portion for two-third of spine length; entirely membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 3.1 (2.7–4.0) in dorsal-fin base length. Origin of anal fin level with vertical through base of fourth dorsal-fin spine from the last; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate; its length slightly shorter than head length; four lowermost rays simple, detached, not elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 1.3 (0.9–1.3) in head length, posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anus; basal half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pectoral fin length, posterior margin of fin rounded. Swimbladder present.

Color when fresh: Head and body light brown, paler ventrally; body with large dark blotch behind opercular margin; head with dark stripes radiating from pupil; dorsal fin with 2 large dark blotches on dorsal-fin base extending onto dorsal-fin membrane, first blotch on fifth to eighth spine, second on tenth dorsal spine to third dorsal ray (twelfth dorsal spine to second or third soft ray); spots absent on dorsal body surface (present in some specimens); pectoral and caudal fins with dark narrow cross bands; anal fin mottled dark; pelvic fin brown, paler basally [color features based KAUM–I. 30815 (Fig. 4b) due to holotype completely faded (Fig. 4a)]

Color of preserved specimens: Similar to fresh color but paler.

Distribution. Currently known from the Pacific coast of southern Japan (Kochi to Kagoshima prefectures) south to Taiwan, Hong Kong, the Philippines, and the South China Sea in depths of 70–440 m [based on collected specimens examined in this study (Fig. 10)].

Remarks. *Neocentropogon japonicus* was originally described by Matsubara (1943) as a subspecies of *N. aeglefinus* on the basis of four specimens from Kochi, Japan. Subsequently, Chan (1966) regarded *N. a. japonicus* as a separate species, *N. japonicus*. *Neocentropogon japonicus* can easily distinguished from *N. aeglefinus* in having no dark blotch behind posterior margin of opercle (vs. dark blotch behind posterior margin of opercle, in the latter), XIV–XVI (usually XV) [vs. XIII–XV (XIV)] dorsal-fin spine, 5–6 (6) [vs. 6–7 (7)] anal-fin soft rays.

Two specimens (BSKU 17283, 89.8 mm SL; BSKU 17284, 95.8 mm SL) from the South China Sea, midway between Indochina and Borneo, represent the southernmost distribution records of *N. japonicus*.

***Neocentropogon mesedai* Klausowitz 1985**

(English name: Meseda Waspfish) (Figs. 5, 10; Tables 1, 2)

Neocentropogon mesedai Klausowitz 1985: 17, figs. 1–3 (type locality: Mismaris-Trough, southwest of Jeddah, Saudi Arabia, Red Sea, 21°22'N, 39°04'E); Fricke et al. 2017: 1863, fig. 1 (Red Sea); Bogorodsky and Randall 2018: 261 (Red Sea); Golani and Fricke 2018: 56 (Red Sea; listed).

Holotype. SMF 20198, 62.1 mm SL, Mismaris Trough, southwest of Jeddah, Saudi Arabia, Red Sea, 21°22'N, 39°04'E, 363–383 m depth, RV *Valdivia*, 17 Apr. 1979.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays XIII, 8; anal-fin soft rays 5; lateral-line pores 18; scale rows in longitudinal series 85; scale rows above lateral line 2; symphyseal knob pronounced; postocular spine absent; four lowermost pectoral-fin rays elongated; orbit diameter 13.7% of SL; no large blotches behind opercular margin and on dorsal-fin base; spots absent on dorsal body surface, faint on dorsal fin; pectoral fin not black (light brown with poorly defined dark blotches) [color features based on Fricke et al. (2017: fig. 1) due to holotype completely faded (Fig. 5)].

Description. Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 4.0 in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales extending onto dorsal- and anal-fin bases; no scales on head, pre-dorsal-fin area, pectoral- and pelvic-fin bases. No tentacles, cirri, or skin flaps on head, body or fins, except at nasal openings. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, anterior nostril tubular with small dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Eye moderate, orbit diameter 3.1 in head length. Snout length subequal to orbit diameter. Ascending process of premaxilla present. Interorbital region from snout to occipital scarcely any concave; interorbital ridges weakly developed, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge without spines; parietal and nuchal forming continuous smooth ridge with nuchal spine; pterotic spine, upper posttemporal, lower posttemporal, supracleithral spines sharp and projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple

spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fourth small with broad base, sharp and protruding from skin; lowermost blunt, covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to (or short of) vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest; third and fourth spine longest, slightly longer than second and fifth spines; fourth to seventh spines progressively shorter; eighth to last spines progressively longer; last spine shorter than first soft ray. Membranes of anterior half spinous portion notched, incised for about one-third of spine length, membranes of posterior half spinous portion shallow incised [based on Klausewitz (1985: figs. 1–3) due to membrane of holotype broken]; entirely membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 3.5 in dorsal-fin base length. Origin of anal fin level with vertical through penultimate spine base; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate; its length slightly shorter than head length; four lowermost rays simple, detached, elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 1.1 in head length, posterior tip of fin extending

beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anal-fin origin; basal half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, posterior margin of fin rounded. Swimbladder present.

Color of preserved specimens: Head and body brown dorsally, paler ventrally, no large dark blotches behind opercular margin; dorsal fin light brown with 3 oblique rows of dark spots on dorsal-fin soft ray, lack of large dark blotches; anal fin light brown with dark spots on soft portion; pectoral fin brown with a dark small blotch on upper central, mottled dark brown on half posterior margin with dark spots; caudal fin light brown with 6 longitudinal rows of dark spots [color features based on Fricke et al. (2017: fig. 1) due to holotype completely faded (Fig. 5)].

Distribution. Currently known only from the Red Sea (Fig. 10), the type specimens having been collected from the central area at a depth of 363–383 m, and an additional specimen (Fricke et al. 2017) from the Gulf of Aqaba, northern Red Sea, at a depth of 300–350 m.

Remarks. *Neocentropogon mesedai* was originally described by Klausewitz (1985) on the basis of five specimens from Mismaris-Trough, southwest of Jeddah, Saudi Arabia, Red Sea. The species was included in the family Tetrarogidae due to the first dorsal-fin origin above the posterior margin of the orbit and the body covered with small cycloid scales, and in *Neocentropogon* due to the strongly incised dorsal-fin membrane, robust body, XIII dorsal-fin rays, and 14 or 15 pectoral-fin rays. The dorsal-fin spine number (XIII) in *Neocentropogon mesedai* is unique in the genus.

***Neocentropogon profundus* (Smith 1958)**

(English name: Deep Waspfish) (Figs. 6, 10; Tables 1, 3)

Paracentropogon profundus Smith 1958: 171, pl. 7, fig. I (type locality: off Mozambique).

Neocentropogon profundus: Quéro et al. 2011: 99, fig. 1 (Réunion).

Holotype. SAIAB 300, 56.4 mm SL, off Mozambique, western Indian Ocean, 146 m depth.

Other material examined. 4 specimens, 70.7–85.1 mm SL. **RÉUNION:** MNHN 2006-0008, 4 specimens, 70.7–85.1 mm SL, 21°04'01"S, 55°10'58.8"E, 210–227 m, RV *Marion-dufresne*, 22 Aug. 1982.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays XIV, 7; anal-fin soft rays 5; lateral-line pores 22–24; scale rows in longitudinal series 71–76; scale rows above lateral-line 5–8; symphyseal knob unremarkable; postocular spine absent; four lowermost pectoral-fin rays not elongated, orbit diameter 15.4–17.0% (mean 15.9%) of SL; no large blotches behind opercular margin and on dorsal-fin base; dark spots scattered on dorsal body surface, faint on dorsal fin; pectoral fin not black (white with scattered melanophores).

Description. Data for the holotype are presented first, followed by other specimen data in parenthesis (if different). Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 3.8 (3.6–4.0) in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales extending onto dorsal- and anal-fin bases; no scales on head, pre-dorsal-fin area, pectoral- and pelvic-fin bases. No tentacles, cirri, or skin flaps on head, body or fins,

except at nasal openings. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, anterior nostril tubular with small dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Eye moderate, orbit diameter 2.5 (2.4–2.7) in head length. Snout slightly short, its length 1.4 (1.3–1.6) in orbit diameter. Ascending process of premaxilla present. Interorbital region from snout to occipital scarcely any concave; interorbital ridges weakly developed, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge without spines; parietal and nuchal forming continuous smooth ridge with nuchal spine; pterotic, upper posttemporal, lower posttemporal, and supracleithral spines sharp and projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fourth small with broad base, sharp and protruding from skin; lowermost blunt, covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to (or short of) vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest, its

length 1.6 in second spine length; third and fourth spine longest, slightly longer than second and fifth spines; fourth to seventh spines progressively shorter; eighth to last spines progressively longer; last spine shorter than first soft ray. Membrane of spinous portion of dorsal fin deeply notched; its incised at the middle of spinous portion for about half of spine length, entirely membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 3.3–3.7 in dorsal-fin base length. Origin of anal fin level with vertical through penultimate spine base; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate; its length slightly shorter than head length; four lowermost rays simple, detached, not elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 1.1 (1.2–1.3) in head length, posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anal-fin origin; basal half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length slightly shorter than pectoral fin length, posterior margin of fin rounded. Swimbladder present.

Color of preserved specimens: Head and body creamy dorsally, white ventrally; fins white; without large blotches behind opercular margin and on dorsal-fin base; dorsal body surface with dark spots scattered, a row of dark spots along series of lateral line pore; faint on dorsal fin; pectoral fin white with scattered melanophores [color features based MNHN 2006-0008 (Fig. 6b) due to holotype completely faded (Fig. 6a)].

Distribution. Currently known only from the western Indian Ocean (Mozambique and Réunion) (Fig. 10). The specimens examined in this study were collected in depths of 146–

227 m. Eleven specimens of *N. profundus* were collected on the sea surface after the eruption of Piton de la Fournaise, Réunion (Quéro et al. 2011).

Remarks. *Neocentropogon profundus* was originally described (as *Paracentropogon profundus*) by Smith (1958) on the basis of a single specimen taken from the stomach of a rosy snapper, *Pristipomoides microlepis* (Bleeker 1869) [currently *Pristipomoides filamentosus* (Valenciennes in Cuvier and Valenciennes 1830)], caught in 146 m off Mozambique, western Indian Ocean. Poss and Rama-Rao (1984) regarded the species as belonging to *Neocentropogon* due to the lack of cirri on the posterior end of the interorbital ridge.

***Neocentropogon trimaculatus* Chan 1966**

(English name: Threespotted Waspfish) (Figs. 7, 8, 9, 10; Tables 1, 3)

Neocentropogon trimaculatus Chan 1966: 635, fig. 1 (type locality: about 85 miles southeast of Hong Kong, South China Sea, 21° 01.6' N, 115° 30.0' E); Poss 1999: 2321, unnumbered fig. (South China Sea, off the northwestern Shelf of Australis, Chesterfield Bank, and New Caledonia); Allen et al. 2006: 900 (off Northwest Shelf, Western Australia; tropical, west Pacific; listed); Fricke et al. 2011: 380 (New Caledonia; listed); Larson et al. 2013: 84 (northwestern Shelf of Australia; listed).

Holotype. BMNH 1965.11.6.3, 80.8 mm SL, off Hong Kong, South China Sea, 21°01'N, 115°30'E, 121 m depth, Agassiz trawl, D. Eggleston, 14 Aug. 1965.

Other material examined. 37 specimens, 24.5–145.6 mm SL. **AUSTRALIA:** AMS I. 33448-001, 70.5 mm SL, off Clarence River, NSW, 29°04'S, 153°06'E, FRV *Kapala*; CSIRO H 580-10, 3 specimens, 80.6–92.4 mm SL, Cairns, Qld, 17°33.08'S, 149°52.09'E, 302 m, lobster trawl, CSIRO, 3 Dec. 1985; CSIRO H 1358-08, 136.1 mm SL, Dunk Island, Qld,

18°06.2'S, 147°08.05'E, 200 m, lobster trawl, CSIRO, 9 Dec. 1985; NTM S. 12926-002, 71.1 mm SL, north of Bathurst Island, Arafura Sea, Northern Territory (NT), 10°04'S, 130°32'E, 15 Nov. 1990; NTM S. 12927-010, 2, 58.3–80.5 mm SL, north of Bathurst Island, Arafura Sea, NT, 09°59'S, 130°10'E, 16 Nov. 1990; NTM S. 13301-003, 6, 57.6–78.3 mm SL, west of Lynedoch Bank, Arafura Sea, NT, 10°05'S, 130°18'E, 16 Nov. 1990; NTM S. 14366-005, 2, 65.3–71.1 mm SL, Vulcan Shoal, Timor Sea, WA, 12°50'20"S, 124°26"E, 13 June 1996; NTM S. 14367-003, 72.2 mm SL, Barracouta Shoal, Timor Sea, WA, 12°42'50"S, 123°57'58"E, 13 June 1996; QM I. 22111, 106.8 mm SL, Swain Reefs, Qld, 22°00'S, 153°31'E, 270 m, trawl, 1 Nov. 1983; QM I. 34231, 117.9 mm SL, Coolum, Qld, 26°32'S, 153°39'E, trawl, 123 m, 8 Aug. 2001; QM I. 38768, 91.6 mm SL, Surfers Paradise, Qld, 28°00'S, 153°42'E, 102 m, trawl, 16 Sep. 2009. **JAPAN:** FAKU 75091, 87.5 mm SL, East China Sea, 27°23.56'N, 125°48.13'E, 130–132 m, U. Yamada, 6 July 1998; KAUM–I. 9519, 29.6 mm SL, Kataura, Kasasa, Minamisatsuma, Kagoshima, 31°25'N, 130°11'E, 27 m, set net, Y. Tsuji, 14 Apr. 2008; KAUM–I. 22469, 39.8 mm SL, west of Goto Islands, Nagasaki, midwater trawl, June 2009; KAUM–I. 77115, 145.6 mm SL, KAUM–I. 77116, 130.7 mm SL, East China Sea, 28°27'N, 126.25'E, 127 m, bottom trawl, 28 May 2015; KAUM–I. 77117, 116.0 mm SL, East China Sea, 26°47'N, 125°06'E, 138 m, bottom trawl, 17 May 2014; KAUM–I. 88804, 112.9 mm SL, East China Sea, bottom trawl, T. Uejo, 19 June 2016; KAUM–I. 97509, 123.1 mm SL, KAUM–I. 97510, 128.1 mm SL, Amami Islands, Kagoshima, 28°16'N, 126°15'E, 126 m, trawl, 5 Dec. 2016. **TAIWAN:** KAUM–I. 40487, 92.7 mm SL, Tashi, Yilan, 500 m, trawl, KAUM Fish Team, 6 July 2011. **NEW CALEDONIA:** MNHN 2003-1850, 139.3 mm SL, Chesterfield Islands, 24°46'58"S, 159°40'01"E, 285 m, RV *Coriolis*, 9 Oct. 1986, MNHN 2005-2624, 25.4 mm SL, Chesterfield Islands, 20°00'00"S, 158°46'01"E, 225 m, RV *Coriolis*, 22 July 1984; MNHN 2014-1040, 2, 48.8–59.3 mm SL, 18°30'17"S, 163°04'07"E, 275–305, RV *Alis*, 7 May 2008.

TONGA TRENCH: NSMT-P 112288, 66.4 mm SL, NSMT-P 129034, 80.91 mm SL, 22°10.8'S, 175°23.6'E, 288–312 m, RV *Kaiyo-maru*, 11 Jan. 1977.

Diagnosis. A species of *Neocentropogon* with the following combination of characters: dorsal-fin rays usually XIV, 8 (rarely XIII or XV, 6 or 7); anal-fin soft rays usually 7 (rarely 6 or 8); lateral-line pores 21–26; scale rows in longitudinal series 92–143; scale rows above lateral line 1–19; symphyseal knob unremarkable; postocular spine present; four lowermost pectoral-fin rays elongated; orbit diameter 10.5–14.7% (mean 12.7%) of SL; head with brownish stripes radiating from pupil; large dark blotch behind opercular margin; 2 large dark blotches on dorsal-fin base; spots absent on dorsal body surface; pectoral fin whitish with dark spots.

Description. Data for the holotype are presented first, followed by other specimen data in parenthesis (if different). Body elongated, highly laterally compressed, progressively more compressed posteriorly; body depth slightly shorter than head length. Caudal-peduncle depth 3.4 (3.1–4.6) in body depth. Body sparsely covered with small embedded, non-imbricate cycloid scales extending onto all fin bases; no scales on head and pre-dorsal-fin area. No tentacles, cirri, or skin flaps on head, body or fins. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base; one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, simple rounded pore with low raised rim. Eye moderate, orbit diameter 3.0 (2.7–3.5) in head length. Snout length subequal to orbit diameter. Ascending process of premaxilla present. Interorbital region from snout to occipital scarcely any concave; interorbital ridges developed, median interorbital ridge and spines absent. Nasal spines absent. Bony rim of orbit forming ridge with postocular spine; parietal and nuchal forming continuous smooth ridge with nuchal spine; pterotic spine, upper posttemporal, lower posttemporal, supracleithral

spines sharp and projecting from skin. Suborbital ridge rather sharp, smooth, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp, longest, projecting from skin, its tip not reaching to posterior margin of opercle; second to fifth small with broad base, entirely covered with skin. Opercle with smooth V-shaped crests with spines hidden under skin. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Cleithral bone flattened. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine directed backward, its tip reaching to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, terminal, slightly oblique; posterior margin of maxilla reaching to (or short of) vertical through middle of eye. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob minute. No slit behind last gill arch; gill rakers rather short with blunt tips.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; first dorsal-fin spine shortest, its length 1.3–2.3 in second spine length; third spine longest, slightly longer than second and fourth spines; third to eighth spines progressively shorter; ninth to last spines progressively longer; last spine subequal in length to first soft ray. Membrane of anterior half spinous portion of dorsal fin deeply notched, its incised for about two-third (two-third to three-fourth) of spine length, membrane of posterior half spinous portion incised for half of spine length; entire membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and extending onto lower basal caudal fin. Anal-fin base short, its length 2.7 (2.5–3.3) in dorsal-fin base length. Origin of anal fin level with vertical through eleventh dorsal-fin spine base; first anal-fin spine shortest; third anal-fin spine longest, but shorter than first anal-fin soft ray; membrane of spinous portion of anal fin deeply notched; membrane of last anal-fin soft ray not continuous with caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate;

its length slightly shorter than head length; four lowermost rays simple, detached, elongated; fin origin level with vertical through fourth dorsal-fin spine base; fin length 1.1 (1.1–1.3 in 48.8–145.6 mm SL specimens; 0.5–0.7 in 24.5–39.8 mm SL specimens) in head length, posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base; second soft-ray longest; posterior tip of depressed fin not reaching to anus; basal half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pectoral fin length (its length shorter than pectoral fin length in juvenile), posterior margin of fin rounded. Swimbladder present.

Color when fresh: Head and body light brown, paler ventrally; body with large brown blotch behind opercular margin; head with reddish-brown stripes radiating from pupil; dorsal fin with 2 large brown blotches on dorsal-fin base extending onto dorsal-fin membrane, first blotch on fifth to eighth spine, second on tenth dorsal spine to third dorsal ray (twelfth dorsal spine to second or third soft ray); spots absent on dorsal body surface (present in some specimens); pectoral and caudal fins with reddish-brown narrow cross bands; anal fin mottled reddish-brown; pelvic fin reddish-brown, paler basally [color features based KAUM–I. 77116 (Fig. 7b)].

Color of preserved specimens: Similar pattern to fresh color but all blotched, spots, and stripes become darker (Fig. 7a).

Distribution. Currently known from southern Japan (including East China Sea) to Taiwan, Hong Kong, northern and eastern Australia, New Caledonia, and the Tonga Trench, from depths of 27–500 m [based on collected specimens (Fig. 10)], *N. trimaculatus* is considered to have an anti-equatorial distribution.

Remarks. *Neocentropogon trimaculatus*, originally described by Chan (1966) on the basis of a single specimen from waters off Hong Kong, is allopatrically distributed in the

Northern and Southern hemispheres (Fig. 10). Although gene flow between the two hemispheres is considered unlikely, comparisons of specimens did not show any significant differences in coloration or meristic and morphometric characters (Tables 1, 3). Accordingly, the northern and southern populations are regarded here as a single species.

Analyses of 35 measurements taken from 38 specimens (24.5–145.6 mm SL) of *N. trimaculatus* showed that several morphometric proportions (% of SL) changed with growth. Whereas relative suborbital width and posterior lacrimal spine length increased with growth (Figs. 9a–b), the relative length of pectoral fin, all dorsal-fin rays, all anal-fin spines, longest anal-fin soft ray, pelvic-fin spine, and longest pelvic-fin soft ray decreases (Figs. 9c–n). These proportional changes indicated that small specimens of *N. trimaculatus* have a relatively short lacrimal spine, narrow suborbital space, longer dorsal-, anal-, and pelvic-fin spines, and longer pectoral fin (Fig. 8).

Comparisons

Although *N. trimaculatus* (Fig. 7) resembled *N. aeglefinus* (Fig. 1) and *N. affinis* (Fig. 3) in sharing 13–15 (mode 14) dorsal-fin spines and a dark blotch behind the opercular margin above the pectoral fin, it could be easily distinguished from the latter two species by the two blotches on the dorsal-fin base extending up to the fin (vs. absent), head with brownish stripes radiating from the pupil (vs. absent), lowermost four pectoral-fin rays elongated (vs. not elongated), postocular spine present (vs. absent), 6–8 (mode 7) anal-fin soft rays [vs. 5 or 6 (6)], and symphyseal knob unremarkable (vs. pronounced). *Neocentropogon affinis* is clearly separated from *N. aeglefinus*, the former having rows of dark spots on the dorsal body surface, dorsal fin, pectoral fin, and caudal fin (vs. spots absent), 79–96 scale rows in the longitudinal series (vs. 94–137), and 0–8 scale rows above the lateral line (vs. 8–17). *Neocentropogon mesedai* (Fig. 5) is similar to *N. profundus* (Fig. 6) and *N. japonicus* (Fig. 4)

in lacking a dark blotch behind the opercular margin. However, it differs from the latter two species in having the four lowermost pectoral-fin rays elongated (vs. not elongated), 13 dorsal-fin spines (vs. 14–16), and 18 lateral-line pores (vs. 19–24). *Neocentropogon profundus* can be distinguished from *N. japonicus* by the unremarkable symphyseal knob (vs. pronounced), postocular spine absent (vs. present), 5 anal-fin soft rays (vs. 6–7), 71–76 scale rows in the longitudinal series (vs. 97–139), 5–8 scale rows above the lateral line (vs. 10–21), greater orbit diameter [15.4–17.0% (mean 15.9%) of SL vs. 11.4–14.1% (12.7%)], and irregular dark spots present on the dorsal body surface (vs. absent).

CHAPTER 2

Reviews of related genera of the family Tetrarogidae

In this chapter, the taxonomic study of related genera of the family Tetrarogidae and key to the genera will be provided. The taxonomic study of related genera resulted in 17 valid genera, viz., *Ablabys*, *Centropogon*, *Coccotropsis*, *Cottapistus*, *Glyptauchen*, *Gymnapistes*, *Liocranium*, *Neocentropogon*, *Neovespicula*, *Notesthes*, *Ocosia*, *Paracentropogon*, *Pseudovespicula*, *Richardsonichthys*, *Snyderina*, *Tetraroge*, *Trichosomus*, with 45 valid species. The genus *Vespacula* is regarded here as a junior synonym of *Trichosomus* because the type species of *Vespacula* is the junior synonym of type species of *Trichosomus*. Two undescribed species of the genus *Ocosia* and *Snyderina* will be described. Key to the species will be provided separately in each genus.

Key to the genera of Tetrarogidae

- 1a. Body covered with small scales 2
- 1b. Body not covered with scales 13
- 2a. Pelvic-fin rays I, 4 3
- 2b. Pelvic-fin rays I, 5 6
- 3a. Three anteriormost dorsal-fin spines forming separate fin; cirri, papillae, or tentacles on head and dorsal surface of body; lateral line running along dorsal-fin base; first dorsal-fin spine origin posterior to posterior margin of orbit *Trichosomus*
- 3b. Three anteriormost dorsal-fin spines not forming separate fin; cirri, papillae, or tentacles absent from body; lateral line not close to dorsal-fin base; first dorsal-fin spine origin anterior to posterior margin of orbit 4
- 4a. Dorsal-fin origin distinctly anterior to anterior margin of orbit *Cottapistus*

4b. Dorsal-fin origin distinctly posterior to anterior margin of orbit	5
5a. Dorsal-fin spines XIII or XIV (usually XIII); pectoral-fin rays 13–15; palatine teeth absent	<i>Liocranium</i>
5b. Dorsal-fin spines XIV or XV, pectoral-fin rays 10 or 11; palatine teeth present	<i>Paracentropogon</i>
6a. Dorsal-fin origin distinctly anterior to posterior margin of orbit	7
6b. Dorsal-fin origin distinctly posterior to posterior margin of orbit	9
7a. Head profile almost vertical, slightly concave; dorsal-fin spines XV–XVIII; membrane of last dorsal-fin soft ray posteriorly connected to caudal peduncle and upper base of caudal fin	<i>Ablabys</i>
7b. Head profile oblique, straight; dorsal-fin spines XII–XVI; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin	8
8a. Palatine teeth present; dorsal-fin spines XIII–XVI; four lowermost pectoral-fin rays detached, basal half connected by low membrane	<i>Neocentropogon</i>
8b. Palatine teeth absent; dorsal-fin spines XII–XIII; lowermost four pectoral-fin rays not detached	<i>Snyderina</i>
9a. Head profile vertical, squarish; mouth small, 22.7–29.2% of HL; nape deeply and broadly concave	<i>Glyptauchen</i>
9b. Head profile oblique; mouth large, greater than 30.0% of HL; nape flattened	10
10a. Dorsal fin continuous, without deeply incised membrane between third and fourth dorsal-fin spines; cleithral spine present	11
10b. Dorsal fin continuous with deeply incised membrane between third and fourth dorsal-fin spines (almost to dorsal-fin base); cleithral spine absent	12

- 11a.** Pectoral-fin rays 13 or 14; dorsal-fin origin vertical through preopercular margin; orbit diameter 11.1–16.0% of SL *Centropogon*
- 11b.** Pectoral-fin rays 11 or 12; dorsal-fin origin distinctly posterior to preopercular margin; orbit diameter 7.7–11.6% of SL *Notesthes*
- 12a.** Dorsal-fin origin vertical through preopercular margin *Neovespicula*
- 12b.** Dorsal-fin origin distinctly anterior to preopercular margin *Pseudovespicula*
- 13a.** Pelvic-fin rays I, 3; palatine teeth absent *Coccotropsis*
- 13b.** Pelvic-fin rays I, 5; palatine teeth present 14
- 14a.** Dorsal-fin origin distinctly posterior to posterior margin of orbit *Gymnapistes*
- 14b.** Dorsal-fin origin distinctly anterior to posterior margin of orbit 15
- 15a.** Head profile oblique, convex; dorsal tentacles on eye; lateral line running just below dorsal-fin base; tip of opercle curved dorsally, almost reaching to dorsal-fin base
..... *Richardsonichthys*
- 15b.** Head profile oblique, straight; tentacles absent on eyes; lateral line well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base 16
- 16a.** Small papillae on eyes, head, and body; dorsal-fin spines XIII or XIV *Tetraroge*
- 16b.** No small papillae on eyes, head, and body; dorsal-fin spines XIV–XVII *Ocosia*

Genus *Ablabys* Kaup 1873

Ablabys 1873: 80 (type species: *Apistus taenianotus* Cuvier 1829, by subsequent designation)

Amblyapistus Bleeker 1876a: 297 (type species: *Apistus taenianotus*).

Parocosia Whitley 1958: 45 (type species: *Amblyapistus slacksmithi* Whitley 1958).

Platypterus Swainson 1839: 65, 180, 265 (type species: *Apistes taenianotus*

Valenciennes 1839.

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XV–XVIII, 5–9 dorsal-fin rays; its origin distinctly anterior to vertical through middle of orbit; three anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to caudal peduncle and upper base of caudal fin; I, 5 pelvic-fin rays; III, 4–9 anal-fin rays; 11–13 pectoral-fin rays, four lowermost rays not detached; head and snout profile almost vertical, slightly concave; cleithral spine absent; nape flattened; body covered with small embedded cycloid scales; cirri and papillae absent on head and body; orbit diameter 8.2–12.7% of SL; mouth large, 26.1–40.4% of HL; teeth on palatines; lateral line well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly, caudal peduncle short. Body covered with small embedded cycloid scales, extending onto dorsal- and anal-fin bases, absent on head, pre-dorsal-fin area. Tentacles, cirri and skin flaps absent on head, body and fins, except on nostrils. Lateral line straight, extending from above supracleithral spine to caudal-fin base, one lateral-line pore near caudal-fin base.

Head profile almost vertical, slightly convex with shallow concavity in front of eyes. Nape flattened. Two nasal openings in front of orbit, subequal in diameter, tubular, anterior nostril longer with skin flap, posterior nostril simple. Interorbital space narrow, convex, interorbital ridges weakly developed, median interorbital ridge and spines absent, Ascending process of premaxilla weakly developed, intruding slightly into interorbital space. Nasal spines absent. Bony rim of orbit smooth. Pterotic, upper posttemporal, and lower posttemporal bones forming ridges without spines; supracleithral spine short, entirely covered

with skin. Suborbital ridge weakly developed, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost longest. Opercle with smooth V-shaped crests and blunt weak spines, directed upward. Cleithral bone flattened, covered with thick skin. Lacrimal with 2 simple spines; anterior lacrimal spine short, directed posteroventrally, its tip not reaching posterior margin of maxilla; posterior lacrimal spine longer, directed posteriorly. Mouth slightly large, terminal, slightly oblique, posterior margin of maxilla reaching to (or just short of) vertical through middle of pupil, bands of villiform teeth on jaws, vomer, and palatines. Symphyseal knob absent. Lips thick; gill rakers rather short, blunt; no slit behind last gill arch.

Dorsal fin continuous, without notch between spinous and soft dorsal, origin of first dorsal fin anterior to vertical through middle of orbit; first spine shortest, its length 2.6–6.0 in second spine; spinous membrane of fin from second to last spine weakly notched, membrane of last dorsal-fin ray posteriorly connected to dorsal caudal peduncle and upper basal caudal fin. Anal fin continuous, third anal-fin spine longest, membranes of spinous portion notched, membrane of last dorsal-fin ray posteriorly connected to caudal peduncle. Pectoral fin moderated, its length slightly longer than head length; uppermost ray unbranched, four lowermost rays not detached, reaching or extending beyond origin of first anal-fin spine, posterior margin of fin rounded. Origin of pelvic fin level with vertical through lower end of pectoral-fin base, posterior tip of depressed fin reaching (or beyond) anus. Caudal fin, moderated, slightly rhomboid or rounded. Swimbladder absent.

Remarks. *Ablabys taenianotus* was originally described by Cuvier (1829) as a species of *Apistus* in a footnote, based on a single specimen collected from Mauritius, Mascarenes, on the basis of having teeth on palatine, dorsal fin continuous, low number of pectoral-fin rays, moveable lacrimal spines present, body scaly. Subsequently, Kaup (1873) placed the species in his new genus *Ablabys* based on XVII dorsal-fin spines, origin above orbit; second

to fourth dorsal-fin spines elevated, forming notch between fourth and fifth spines; head with blunt spines; body elongated.

Swainson (1839) proposed a new genus, *Platypterus*, for *Apistes taenianotus* Valenciennes 1839 on the basis of dorsal fin high, continuous, origin level with vertical through middle of orbit, last ray connected to caudal fin; pectoral fin pointed, moderate, without detached rays; head almost vertical; mouth oblique or subvertical; scales minute; caudal fin rounded. However, *Platypterus* was preoccupied by *Platypterus* Valenciennes 1836 in fishes, and *Platypterus* Chadoir 1838 in Coleoptera. According to Swainson's (1839) original description and illustration, *Platypterus* Swainson 1839 has been considered as a junior synonym of *Ablabys*.

Bleeker (1876a) proposed a new genus, *Amblyapistus*, for *A. taenianotus* on the basis of head vertical with concavity in front of eyes; teeth on palatine; dorsal fin origin above orbit; dorsal-fin rays XV–XVII, 7–10; anal-fin rays III, 5–8; pelvic-fin rays I, 5. However, *Amblyapistus* is regarded as an objective junior synonym of *Ablabys*, the type species of the two genera being the same.

Whitley (1958) proposed a new genus, *Parocosia*, for *Amblyapistus slacksmithi* Whitley 1958 on the basis of XVII dorsal-fin spines, origin level with vertical through middle of orbit; III anal-fin spines; I, 5 pelvic-fin rays; pectoral fin without free rays, body naked (a few vestigial scales near lateral line). Because, *Am. Slacksmith*, the type species of *Parocosia*, has been regarded as junior synonym of *A. taenianotus*, *Parocosia* is considered a junior synonym of *Ablabys*.

The genus *Ablabys* easily distinguished from other genera by having steep snout profile, blunt head spines, an elongated and highly laterally compressed body, small mouth, and the first dorsal-fin spine inserted anterior to or above the anterior margin of the orbit (Bleeker

1852; Prokofiev 2008). In this study, membrane of last dorsal-fin soft ray connected posteriorly to upper caudal-fin base is a unique character within the family.

Key to the species of *Ablabys*

- 1a. Anal-fin soft rays 7–9; anal-fin bases long, 28.2–35.0% of SL; posterior margin of dorsal and anal fin somewhat pointed2
- 1b. Anal-fin soft rays 4 or 5; anal-fin bases short, 19.8–24.7% of SL; posterior margin of dorsal and anal fin rounded3
- 2a. Anal-fin soft rays 8–9, scales absent on the thorax, 6 total gill rakers, second dorsal-fin spine 1.1–1.2 times of third dorsal-fin spine length*A. gymnothorax*
- 2b. Anal-fin soft rays 7, scales present on the thorax, 4 or 5 total gill rakers, second dorsal-fin spine 1.4–1.6 times of third dorsal-fin spine length*A. macracanthus*
- 3a. 12 or 13 lateral-line pores, scale rows in longitudinal series less than 55*A. pauciporus*
- 3b. 20–25 lateral-line pores, scale rows in longitudinal series more than 744
- 4a. Dorsal-fin rays XV, 8 or 9; posterior lacrimal spine long, 8.5–12.2% of SL; preopercle with 5 simple spines, uppermost longest, almost reaching to posterior margin of opercle, sharp and projecting from skin, second to fifth blunt and hidden under skin*A. binotatus*
- 4b. Dorsal-fin rays XVII–XVIII, 6 or 7 (usually XVII, 7); posterior lacrimal spine short, 4.0–5.4% of SL; preopercle with 5 simple blunt spines, uppermost longest but distinctly short of posterior margin of opercle, entirely covered with skin*A. taenianotus*

***Ablabys binotatus* (Peters 1855b)**

(English name: Redskinfish) (Figs. 11, 16; Table 5)

Apistus binotatus Peters 1855b: 434 (type locality: Ibo, Mozambique); Peters 1855a: 241 (Ibo, Mozambique); Paepke and Fricke 1992: 275 (Ibo, Mozambique; listed).

Amblyapistus binotatus (Peters 1855): Whitley 1858: 46 (Mozambique).

Amblyapistus marleyi Regan 1919: 202, fig. 5 (type locality: Durban, KwaZulu-Natal, South Africa); Poss 1986: 479 (Durban, KwaZulu-Natal, South Africa).

Ablabys binotatus: Poss 1986: 479, fig. 150.1 (Mozambique); Poss in Smith and Heemstra 1986: 479 (Mozambique); Anderson et al. 1998: 22 (Maldives); Varghese 2013: 1, fig. 1 (Gulf of Mannar, India); Fricke et al. 2018: 136, fig. 16 (Madagascar; listed).

Holotype. ZMB 814, holotype of *Apistus binotatus*, 95.2 mm SL, Ibo, Mozambique, 12°S, 40°40'E; BMNH 1919.4.1.32, holotype of *Amblyapistus marleyi*, 94.3 mm SL, Durban, KwaZulu-Natal, South Africa.

Other material examined. 1 specimen. **MOZAMBIQUE:** CAS 48679, 90.6 mm SL, Delagoa Bay.

Diagnosis. A species of *Ablabys* with the following combination of characters: dorsal-fin rays XV, 8 or 9 (usually 8); anal-fin rays III, 5; pectoral-fin rays 12; total gill rakers 5, including rudiments; scale rows in longitudinal series 84–96; thorax without scales; lateral-line pores 21–24; posterior lacrimal spine long, 8.5–12.2% of SL; preopercle with 5 simple spines, uppermost longest, almost reaching to posterior margin of opercle, sharp and projecting from skin, second to fifth blunt and hidden under skin; second dorsal-fin spine subequal to third dorsal-fin spine length; anal-fin bases relatively short, 24.4% of SL. Posterior margin of dorsal and anal fin rounded.

Distribution. Currently known only from Indian Ocean from South Africa north to Mozambique [based on collected specimens (Fig. 16)].

Remarks. *Ablabys binotathus* sharing the same distribution area with *A. macracanthus* and resembled in sharing XV–XVI, 8–9 dorsal-fin rays; 12–13 pectoral-fin rays. However, it easily distinguished from *A. macracanthus* in having 5 anal-fin soft rays (vs. 7 anal-fin soft rays, in the latter); white blotch on mid body above lateral line (vs. no white blotch on mid body above lateral line); second and third dorsal-fin spines longest (vs. second dorsal-fin spine longest). Although the limited number of specimens, Varghese (2013) reported the specimens collected from India showing a different from those collected from Africa in having XVI dorsal-fin spines (vs. XV dorsal-fin spines, in the latter). This points that the further revision of this species is needed.

***Ablabys gymnothorax* Chungthanawong and Motomura 2018**

(English name: Scaleless Spiny Waspfish; Japanese name: Kasasa-haokoze) (Figs. 12, 16; Table 5)

Ablabys gymnothorax Chungthanawong and Motomura 2018: 120, fig. 4 (type locality: Kagoshima, Japan; paratype localities: Taiwan and Vietnam).

Ablabys macracanthus (not of Bleeker): Prokofiev 2008: 302, fig. 2 (Nha Trang Bay, Vietnam).

Holotype. KAUM–I. 77808, 47.9 mm SL, off Kasasa, Minami-satsuma, Kagoshima, Japan, 31°25'44"N, 130°11'49"E, 27 m depth, set net, coll. M. Itou, 21 Aug. 2015.

Paratypes. 2 specimens, 59.9–82.8 mm SL. NMMB-P 13565, 82.8 mm SL, Nha Trang, Vietnam, H.-C. Ho and M.-Y. Lee, 18 Apr. 2009; NMMB-P 27337, 67.8 mm SL, Da-Si, Yilan, Taiwan, H.-C. Ho, 25 Feb. 2013; NSMT-P 70563, 59.9 mm SL, Nha Trang, Vietnam.

Diagnosis. A species of *Ablabys* with the following combination of characters: dorsal-fin rays XVI, 9; anal-fin rays III, 8 or 9 (usually 9); pectoral-fin rays 12 or 13 (12); total gill rakers 6, including rudiments; scale rows in longitudinal series 88–90; thorax without scales; lateral-line pores 20; posterior lacrimal spine short, 2.4–3.8% of SL; preopercle with 5 simple blunt spines, entirely covered with skin uppermost longest, second to fifth small; second dorsal-fin spine 1.1–1.2 times of third dorsal-fin spine length; anal-fin bases relatively long, 32.1–35.0% of SL. Posterior margin of dorsal and anal fin pointed.

Distribution. Currently known only from East Asia, including waters off southern Japan, Taiwan and central Vietnam [based on collected specimens (Fig. 16)].

Remark. *Ablabys gymnothorax* is similar to *A. macracanthus* in sharing more than 7 anal-fin soft rays and a relatively long anal-fin base (length 28.2–35.0% of SL). However it is distinguished from the latter by having XVI, 9 dorsal-fin rays [vs. XV or XVI, 8 or 9 (mode XV, 8) in the latter], 8 or 9 (9) anal-fin soft rays (vs. 7), 6 total gill rakers [vs. 4 or 5 (5)], 88–90 (89) scale rows in longitudinal series [vs. 73–78 (73)], 11–13 (13) scale rows above the lateral line [vs. 5–7 (5 or 6)], 30–34 (30) scale rows below the lateral line [vs. 23–28], scales absent on the thorax (vs. present), and membrane of spinous portion of dorsal fin not incised and the membrane of anterior five spines forming arch shape [vs. membrane of spinous portion of dorsal fin incised and the membrane of anterior five spines not forming arch shape (Figs. 12–13)]. In morphometrics, *A. gymnothorax* differs from *A. macracanthus* in shorter head length [27.7–29.5% (mean 29.2%) of SL vs. 30.2–34.0% (32.1%) in the latter], narrower interorbital width [4.1–4.4% (4.2%) of SL vs. 5.0–6.4% (5.6%)], shorter upper-jaw length [7.6–8.4% (8.1%) of SL vs. 9.0–10.2% (9.7%)], shorter postorbital length [14.9–15.6% (15.2%) of SL vs. 16.4–19.0% (18.0%)], shallower caudal-peduncle depth [9.3–9.7% (9.6%) of SL vs. 10.5–11.4% (10.8%)], longer third dorsal-fin spine length [35.8–40.8% (38.3%) of SL vs. 21.5–27.2% (24.8%)], longer fourth dorsal-fin spine length [25.4–30.6% (28.1%) of

SL vs. 16.6–20.4% (18.0%)], longer fifth dorsal-fin spine length [19.1–24.7% (22.2%) of SL vs. 14.6–15.1% (14.8%)], longer sixth dorsal-fin spine length [17.4–19.6% (18.6%) of SL vs. 12.9–15.6% (14.1%)], longer penultimate dorsal-fin spine length [17.2–19.8% (18.9%) of SL vs. 15.8–18.2% (17.4%)], longer last dorsal-fin spine length [17.8–20.6% (19.5%) of SL vs. 16.6–19.4% (17.8%)], longer longest dorsal-fin soft ray length [24.2–29.9% (28.2%) of SL vs. 24.1–26.7% (25.6%)], and shorter pelvic-fin spine length [12.7–14.9% (14.0%) of SL vs. 15.6–17.9% (23.2%)] (Tables 5, 6, Figs. 12, 13). Although examined specimens of *A. gymnothorax* had 9 + 17 vertebrae (vs. 9 + 16 in *A. macracanthus*), two specimens only of each species were counted. Examination of further specimens should clarify the existence or otherwise of any variation in this character.

The naked thorax and 8 or 9 anal-fin soft rays found in *A. gymnothorax* are unique characters within *Ablabys*.

***Ablabys macracanthus* (Bleeker 1852)**

(English name: Spiny Waspfish, Spiny Leaf-fish) (Figs. 13, 16; Table 6)

Apistus macracanthus Bleeker 1852: 267 (type locality: Wahai, northern Ceram, Indonesia).

Ablabys macracanthus (Bleeker 1852): Poss in Carpenter and Niem 1999: 2308 (key only); Allen and Adrim 2003: 29 (Indonesia); Allen and Erdmann 2012: 246, unnumbered fig. (Indonesia); Fricke et al. 2014:55 (Madang, Papua New Guinea; listed); Fricke et al. 2019: 104 (New Ireland, Papua New Guinea; listed); Psomadakis et al. 2020: 363, fig. 173 (Myanmar).

Material examined. 5 specimens, 57.2–70.2 mm SL. **MYANMAR:** SAIAB 203482, 2 specimens, 60.1–65.6 mm SL, off Clara Islands, 10°70'57"N, 97°49'57"E. **THAILAND:** KAUM–I. 33282, 70.2 mm SL, KAUM–I. 33283, 57.2 mm SL, Pak Nam Ranong Fishing Port, Ranong, 09°56'N, 98°35'E; ZSI 1747, 59.2 mm SL, Andaman Sea.

Diagnosis. A species of *Ablabys* with the following combination of characters: dorsal-fin rays XV or XVI, 8 or 9 (usually XV, 8); anal-fin rays III, 7; pectoral-fin rays 12 or 13 (13); total gill rakers 4 or 5, including rudiments; scale rows in longitudinal series 73–78; thorax with scales; lateral-line pores 18–20; posterior lacrimal spine short, 3.6–4.4% of SL; Preopercle with 5 simple blunt spines, entirely covered with skin, uppermost longest, second to fifth small; second dorsal-fin spine 1.4–1.6 times of third dorsal-fin spine length; anal-fin bases relatively long, 28.2–33.3% of SL. Posterior margin of dorsal and anal fin pointed.

Distribution. Currently known from Myanmar east to Thailand [based on collected specimens (Fig. 16)].

Remarks. Although *A. macracanthus* is similar to *A. gymnothorax* in sharing more than 7 anal-fin soft rays and a relatively long anal-fin base, it can be distinguished from the latter in many characters. Comparisons between *A. macracanthus* and *A. gymnothorax* were given in Remarks of *A. gymnothorax*.

***Ablabys pauciporus* Chungthanawong and Motomura 2018**

(English name: Lesser-scaled Cockatoo Waspfish) (Figs. 14, 16; Table 6)

Ablabys pauciporus Chungthanawong and Motomura 2018: 115, fig. 1 (type locality: Queensland, Australia).

Holotype. QM I. 36106, 43.6 mm SL, north of Riptide Cay, Swain Reefs, Queensland, Australia, 20°58'05"S, 151°51'03"E, 44 m depth, dredge, Great Barrier Reef Seabed Biodiversity Survey Team, 26 May 2004.

Paratypes. KAUM–I. 117177, 46.6 mm SL, east of Centenary Cay, Swain Reefs, Queensland, Australia, 21°16'05"S, 152°27'09"E, 65 m, dredge, Great Barrier Reef Seabed Biodiversity Survey Team, 21 Nov. 2005; QM I. 40672, 52.4 mm SL, west of Gannett Cay, Swain Reefs, Queensland, Australia, 21°57'03"S, 152°15'09"E, 63 m, trawl, Great Barrier Reef Seabed Biodiversity Survey Team, 23 Nov. 2005.

Diagnosis. A species of *Ablabys* with the following combination of characters: dorsal-fin rays XVI or XVII, 5 or 6 (usually XVII, 6); anal-fin rays III, 4 or 5 (5); pectoral-fin rays 11; total gill rakers 4 or 5, including rudiments; scale rows in longitudinal series 47–55; thorax with scales; lateral-line pores 12–13; posterior lacrimal spine relatively long, 5.6–7.0% of SL; preopercle with 5 simple spines, uppermost longest, sharp and projecting from skin, second to fifth blunt and hidden under skin; second dorsal-fin spine subequal to third dorsal-fin spine length; anal-fin bases relatively short, 19.8–22.8% of SL. Posterior margin of dorsal and anal fin rounded.

Distribution. Currently known only from the Great Barrier Reef, Queensland, Australia [based on collected specimens (Fig. 16)].

Remark. *Ablabys pauciporus* resembles *A. taenianotus*, in sharing III, 4 or 5 anal-fin rays and a relatively short anal-fin base (length 19.8–24.7% of SL), 11 or 12 pectoral-fin rays, and a white blotch often present above the lateral line at mid-body (Tables 6, 7; Figs. 14, 15). However it is clearly distinguished from the latter by having strongly notched interspinous dorsal-fin membranes (vs. weakly notched or unnotched), 5 or 6 (mode 6) dorsal-fin soft rays [vs. 6 or 7 (7)], 12 or 13 (12) lateral-line pores [vs. 20–25 (23)], 47–55 scale rows in longitudinal series [vs. 74–99 (89)], 0 or 1 (1) scale row above the lateral line [vs. 6–15 (10)],

17 or 18 (18) scale rows below the lateral line [vs. 24–36 (30)], 4 or 5 (5) scale rows between the last dorsal-fin spine base and lateral line [vs. 6–12 (10)], 1–4 scale rows between the sixth dorsal-fin spine base and lateral line [vs. 7–12 (12)], and bright reddish orange body with small whitish spots on fins when fresh and whitish body and fins in preserved specimens (vs. brownish body with blackish fins in fresh and preserved specimens). Morphometric differences between the species include: greater head depth [28.1–30.3% (mean 29.1%) of SL in *A. pauciporus* vs. 22.1–26.4% (23.7%) in *A. taenianotus*], greater orbit diameter [12.4–12.7% (12.5%) of SL vs. 8.8–11.4% (9.8%)] and longest pelvic-fin soft ray length [30.5–31.2% (30.9%) of SL vs. 19.3–28.5% (24.8%)] (Tables 6–7; Figs. 14–15). Although examined specimens of *A. pauciporus* had 9 + 15 vertebrae (vs. 10 + 15 in *A. taenianotus*), two specimens only of each species were counted. Examination of further specimens should clarify the existence or otherwise of any variation in this character.

***Ablabys taenianotus* (Cuvier 1829)**

(English name: Cockatoo Waspfish) (Figs. 15, 16; Table 7)

Apistus taenianotus Cuvier 1829: 168 (type locality: Mauritius, Mascarenes, Indian Ocean); Blanc and Hureau 1968: 60 (Mauritius, Mascarenes, Indian Ocean; listed); Lacepède 1802, pl. 3, fig. 2 (Mauritius, Mascarenes, Indian Ocean).

Amblyapistus taenianotus (Cuvier 1829): Fowler 1934: 77, fig. 19 (Bali, Indonesia); Nakabo in Masuda et al. 1984: 319, pl. 285-D (Japan; listed).

Apistes taenianotus Valenciennes in Cuvier and Valenciennes 1839: 528 (Based on Lacepède 1802, pl. 3, fig. 2).

Tetraroge cristagalli Günther 1860: 134 (type locality: Philippines); Jordan and Richardson 1910: 52 (Philippines; listed).

Amblyapistus slacksmithi Whitley 1958: 45 (type locality: Heron Island, Capricorn Group, Queensland, Australia).

Ablabys taenionotus [sic]: Kuitert 1993: 107 (south-eastern Australia)

Ablabys taenianotus: Allen and Swainston 1988: 48 (north-western Australia); Francis 1993:159 (Australia; listed); Randall et al. 1990: 78 (Great Barrier Reef); Allen 1997: 76, pl. 19 fig. 11 (Indo-West Pacific); Randall et al. 1997: 78 (Great Barrier Reef); Poss 1999: 2309, unnumbered fig. (western Pacific); Nakabo 2000: 599 (Japan; key); Poss in Randall and Lim 2000: 604 (South China Sea; listed); Kimura and Peristiwady in Matsuura and Peristiwady 2000: 176 (Lombok Island, Indonesia); Hutchins 2001: 27 (Western Australia, Australia; listed); Nakabo 2002: 599 (Japan: key), Allen and Adrim 2003: 29 (Indonesia); Kimura et al. in Kimura and Matsuura 2003: 37 (Bitung, northern tip of Sulawesi, Indonesia); Randall 2005: 129, unnumbered fig. (New Caledonia); Prokofiev 2008: 304 (Nha Trang Bay, Vietnam); Fricke et al. 2009: 41 (Réunion; listed); Motomura et al. 2010: 93 (Yaku-shima, Kagoshima, Japan); Fricke et al. 2011:380 (New Caledonia; listed); Allen and Erdmann 2012:246 (Indonesia); Larson et al. 2013:83 (Northern Territory, Australia; listed); Fricke et al. 2014:55 (Madang, Papua New Guinea; listed); Koeda et al. 2016: 23 (Yonaguni island, Japan; listed); Fricke et al. 2018: 136, fig. 16 (Madagascar; listed); Motomura in Kimura et al. 2018: 79, unnumbered fig. (Ha long Bay, Vietnam); Fricke et al. 2019:105, fig. 46 (New Ireland, Papua New Guinea; listed); Psomadakis et al. 2020: 363, fig. 174 (Myanmar).

Holotype: AMS IB. 3898, holotype of *Amblyapistus slacksmithi*, 26.9 mm SL, Heron Island, Capricorn Group, Queensland, 23°26'S, 151°55'E; BMNH 1843.9.30.21, holotype of *Tetraroge cristagalli*, 84.5 mm SL, Philippines.

Material examined. 36 specimens, 16.4–100.9 mm SL. **AUSTRALIA:** AMS I. 19119-001, 35.0 mm SL, Camp Cove, Sydney Harbour, New South Wales, 33°83'S,

151°27'E; AMS I. 24011-001, 37.8 mm SL, Sugarloaf Island, Lord Howe Island, New South Wales, 31°55'S, 159°08'E; AMS I. 27139-001, 66.4 mm SL, Middleton Reef, Tasman Sea, 29°49'S, 159°07'E; AMS I. 30310-036, 16.4 mm SL, North Solitary Island, New South Wales, 29°93'S, 153°38'E; QM I. 37450, 93.0 mm SL, Waddy Point, Fraser Island, Queensland, 24°54'S, 153°26'E; QM I. 38729, 46.4 mm SL, Southport Seaway, Queensland, 27°56'23"N, 153°25'18"E. **CHINA:** NSMT-P 63009, 20.8 mm SL, west coast of Dadonghai, Hainan. **INDONESIA:** FRLM 15683, 78.8 mm SL, FRLM 15694, 48.0 mm SL, FRLM 16753, 92.8 mm SL, FRLM 16754, 52.2 mm SL, FRLM 20273, 80.3 mm SL, NSMT-P 56883, 76.5 mm SL, NSMT-P 56963, 81.2 mm SL, Kuta, Lombok; FRLM 26409, 68.4 mm SL, Tandurusa, Bitung, Sulawesi. **JAPAN:** FAKU 121549, 62.2 mm SL, Shirahama, Wakayama; FAKU 121706, 100.9 mm SL, Tanabe Bay, Shirayama, Wakayama; KAUM-I. 2013, 59.4 mm SL, Yoron Island, Amami Islands; KAUM-I. 2909, 70.2 mm SL, off Kouzaki-yama, Kataura, Kasasa, Minami-satsuma, Kagoshima, 31°26'00"N, 130°10'05"E; KAUM-I. 20310, 68.2 mm SL, west of Kamazeno-hana, Kurio, Yaku Island, Osumi Islands, 30°16'03"N, 130°24'48"E; KAUM-I. 37692, 42.0 mm SL, off south coast of Iwo Island, Osumi Islands, 30°46'32"N, 130°16'43"E; KAUM-I. 39723, 22.1 mm SL, off Shinaha, northwest coast of Yoron Island, Amami Islands, 27°03'41"N, 128°25'00"E; KAUM-I. 65178, 49.5 mm SL, Kurose Port, Akaogi, Kasasa, Minami-satsuma, Kagoshima, 31°22'29"N, 130°10'06"E; KAUM-I. 71170, 48.2 mm SL, Chabana Port, Chabana, Yoron Island, Amami Islands, 27°02'56"N, 128°24'20"E; KAUM-I. 79321, 21.6 mm SL, Kasari Bay, Kasari, Amami-Oshima Island, Amami Islands, 28°30'29"N, 129°39'35"E; KAUM-I. 83663, 38.8 mm SL, Omonawa Port, Isen, Tokuno-shima Island, Amami Islands, 27°40'05"N, 128°58'09"E; KAUM-I. 83671, 83.7 mm SL, off Kuba, Nakagusuku, Okinawa Island, Okinawa Islands, 26°16'59"N, 127°49'00"E; KAUM-I. 83953, 60.9 mm SL, off east of Sakinoyama, Kataura, Kasasa, Minami-satsuma, Kagoshima, 31°25'4"N, 130°11'49"E;

KAUM-I. 104281, 44.0 mm SL, off Chabana Beach, Yoron Island, Amami Islands, 27°03'07"N, 128°24'02"E; NSMT-P 119414, Shiba, Kakeroma Island, Amami Islands; NSMT-P 30209, 99.8 mm SL, NSMT-P 30216, 62.5 mm SL, Igaya Bay, Miyake Island, Izu Islands; NSMT-P 80853, 73.7 mm SL, Taketomi, Iriomote Island, Yaeyama Islands. **PAPUA NEW GUINEA:** QM I. 9086, 85.0 mm SL, Cape Gazelle, New Britain, 04°20'S, 152°24'E.

Diagnosis. A species of *Ablabys* with the following combination of characters: dorsal-fin rays XVII–XVIII, 6–7 (usually XVII, 7); anal-fin rays III, 4–5 (5); pectoral-fin rays 11–12 (11); total gill rakers 5–7 (6), including rudiments; scale rows in longitudinal series 74–105; thorax with scales; lateral-line pores 20–25; posterior lacrimal spine relatively short, 4.0–5.4% of SL; preopercle with 5 simple blunt spines, uppermost longest but distinctly short of posterior margin of opercle, entirely covered with skin; second dorsal-fin spine 1.0–1.2 times of third dorsal-fin spine length; anal-fin bases relatively short, 20.2–24.7% of SL, Posterior margin of dorsal and anal fin rounded.

Distribution. The species is distributed from Japan south to China, Philippines, Indonesia, Papua New Guinea and Australia [based on collected specimens (Fig. 16)].

Remarks. Although *Tetraroge alboguttata* Liénard in Sauvage 1891 has been regarded as junior synonyms of *A. taenianotus*, the original description indicates *T. alboguttata* differs from a species of *A. taenianotus* in having XII, 10 dorsal-fin rays [vs. XVII–XVIII, 6–7 (XVII, 7)] in the latter]; 6 anal-fin soft rays [vs. 4–5 (usually 5)]; no teeth on palatine or vomer (vs. teeth on vomer and palatine). However, the taxonomic status of *T. alboguttata* is regarded herein as unknown since the specimen of *T. alboguttata* no longer exists and no illustrations of the nominal species were given, the original description only indicates *T. alboguttata* is not a species of *Ablabys* (this study).

Tetraroge vestitus De Vis 1884 has been regarded as junior synonyms of *A. taenianotus*. However, study of holotype of *T. vestitus* showed various characters different

from *A. taenianotus* such as having XVI–XVII, 7–8 (usually XVI, 8) dorsal-fin rays [vs. XVII–XVIII, 6–7 (XVII, 7)] in the latter]; 13–14 pectoral-fin rays [vs. 11–12 (11)]; dorsal fin origin anterior to vertical through middle of orbit (vs. dorsal fin origin above vertical through preopercular margin); body covered with cycloid scale (vs. ctenoid scaled); caudal fin rhomboid (vs. caudal fin rounded); smaller orbit diameter [8.8–11.4% (mean 9.8%) of SL vs. 11.9–14.6% (13.6%)]; mouth smaller [9.1–15.1% (10.9%) of SL vs. 15.2–18.7% (16.7%)]; shorter head length [33.7–38.8% (33.8%) of SL vs. 39.0–45.1% (42.3%)]; narrower body depth [22.1–26.4% (23.7%) of SL vs. 30.6–38.0% (34.8%)] (Tables 7, 10). Therefore, *T. vestitus* has been regarded as a junior synonym of *C. marmoratus* (this study).

Comparisons between *A. taenianotus* and *A. pauciporus* were given in Remarks of *A. pauciporus*.

Genus *Centropogon* Günther 1860

Centropogon Günther 1860: 128 (type species: *Cottus australis* Shaw 1790, by subsequent designation)

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XVI–XVII, 7–9 (usually XVI, 8) dorsal-fin rays; its origin vertical through preopercular margin; dorsal fin continuous, without deeply incised membrane between third and fourth dorsal-fin spines; membrane of last dorsal-fin soft ray not connected posteriorly to upper caudal-fin base; I, 5 pelvic-fin rays; III, 5 anal-fin rays; 13–14 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique; orbit diameter 11.1–16.0% of SL; nape flattened; cleithral spine present; body covered with small imbricate ctenoid scales; cirri and papillae absent on head and body; mouth large, its length 30.3–43.8% of HL, small

conical teeth on palatines; lateral line complete, not close to dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly, body depth slightly less than head length, caudal peduncle short. Body covered with small, imbricate ctenoid scales, arranged in regular series; scales absent on head, pre-dorsal-fin area, and dorsal-fin base. Tentacles, cirri and skin flaps absent on head, body and fins, except on nostrils. Lateral line complete, continuous, extending from above supracleithral spine to caudal-fin base, one lateral-line pore near caudal-fin base, lateral line well separated from dorsal-fin base.

Head profile oblique, slightly convex, dorsal margin of orbit protruding above dorsal profile. Nape flatted. A pair of nasal openings in front of orbit, slightly large, subequal in diameter, anterior nostril tubular with dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Bony rim of orbit with supraocular and postocular spines. Interorbital space narrow, convex, interorbital ridges developed, median interorbital ridge and spines absent, Ascending process of premaxilla developed, intruding slightly into interorbital space. Nasal spines sharp, projecting from skin. Parietal forming ridges with blunt spines. Pterotic and posttemporal forming ridges with sharp spines. Supracleithral spine short, sharp. Suborbital ridge well developed, connected posteriorly to base of uppermost preopercular spine, a spine on the anterior of suborbital ridge. Preopercle with 5 simple spines; uppermost longest, sharp and projecting from skin, with narrow base, its posterior tip not reaching to opercular margin; second to fifth short, sharp, with broad base. Opercle with smooth V-shaped crests and sharp spines, directed upward. Upper end of gill opening reaching or above horizontal line through middle of eye. Cleithral spine sharp and strong. Lacrimal with 2 sharp simple spines; anterior lacrimal spine short, directed posteroventrally; posterior lacrimal spine longer, directed backward, its posterior tip reaching

to (or short of) vertical through middle of orbit; lateral lacrimal spines absent. Mouth slightly large, terminal, slightly oblique, posterior margin of maxilla reaching to (or just short of) vertical through middle of orbit, bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. Gill rakers rather short, blunt; slit behind last gill arch.

Dorsal fin continuous, with notch between spinous and soft dorsal, origin of first dorsal fin above vertical through preopercular margin, last spine slightly longer than penultimate spine but shorter than first soft ray; membranes of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth to one-third of spine length, membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto upper margin of caudal fin. Anal-fin base short, origin of anal fin level with vertical through penultimate dorsal-fin spine; first anal-fin spine shortest; second anal-fin spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin somewhat notched; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, moderate, its length 1.0–1.3 in head length; without free rays; fin origin level with vertical through fourth dorsal-fin spine base; posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin slightly shorter than pectoral fin, its origin level with vertical through lower end of pectoral-fin base; second soft ray longest, posterior tip of depressed fin reaching to anus; half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.0–1.2 in pectoral fin length; posterior margin of fin rounded.

Remark. *Cottus australis* was originally described by Shaw (1790) as a species of *Cottus*. Subsequently, Günther (1860) placed the species in his new genus *Centropogon* on the basis of having compressed head and body; scale present, no groove on the occiput; preorbital and preoperculum armed with spines; dorsal fin continuous with XIV–XV spines; pectoral fin without appendages; villiform teeth on jaws, vomer, and palatine; no cleft behind

fourth gill. However, Günther (1862) and this study revealed the cleft behind fourth gill in all species belong to the genus *Centropogon*.

Key to the species of *Centropogon*

1a. Snout rounded; interorbital width large, 8.9–11.4% of SL; interorbital space from snout to occiput scarcely any concavity; interorbital ridge prominent; occipital pit large and deep, gill raker 6–9*C. latifrons*

1b. Snout angular; interorbital width narrow, 4.7–8.2% of SL; interorbital space from snout to occiput narrow between eyes; interorbital ridge weak; occipital pit narrow and shallow, gill raker 8–162

2a. A broad naked area above lateral line from first to sixth dorsal-fin spine; preocular and sphenotic spine sharp; posterior margin of maxilla short of vertical through middle of orbit; 5 vertical broad dark bands present, 3 on body, 1 on caudal-fin base, and 1 on middle of caudal fin*C. australis*

2b. No broad naked area between the basis of the spinous dorsal fin and the lateral line; preocular and sphenotic spine absent; posterior margin of maxilla reaching to vertical through middle of orbit; marbled or mottled pattern on head and body *C. marmoratus*

***Centropogon australis* (Shaw 1790)**

(English name: Fortescue, Fortie, Barred Fortescue, Eastern Fortescue, Southern Fortescue, Southern Bulltrout) (Figs. 17, 20; Table 8)

Cottus australis Shaw in White 1790: 266, pl. 52 fig. 1 (type locality: between Botany Bay and Broken Bay, New South Wales, Australia); McCulloch 1929: 388 (between Botany Bay and Broken Bay, New South Wales, Australia; listed).

Scorpaena jacksoniana Quoy and Gaimard 1824 (type locality: Port Jackson, Sydney, New South Wales, Australia); McCulloch 1929: 388 (Port Jackson, Sydney, New South Wales, Australia; listed); Paxton et al. 1989: 439 (New South Wales, Australia; listed), Allen et al. 2006: 897 (New South Wales, Australia; listed).

Tetraroge hamiltoni De Vis 1884: 460 (type locality: Moreton Bay and Tweed River, New South Wales, Australia; Syntypes locality: Dunwich, Australia); Paxton et al. 1989: 439 (New South Wales, Australia; listed); Allen et al. 2006: 897 (New South Wales, Australia; listed).

Centropogon australis: McCulloch 1929; Paxton et al. 1989: 439 (New South Wales, Australia; listed); Kuitert 1993: 118, unnumbered fig. (southern Queensland to eastern Victoria); Poss 1999: 2311, unnumbered fig. (Australia); Johnson 1999: 727 (eastern and western Australia; listed); Allen et al. 2006: 897 (New South Wales, Queensland, Victoria, Australia; listed); Johnson and Motomura 2008: 499, unnumbered fig. (southeast Australia).

Holotype. MNHN 0000-6640, holotype of *Scorpaena jacksoniana*, 69.3 mm SL, Port Jackson, Sydney, New South Wales, Australia.

Syntype. QM I. 116, syntype of *Tetraroge hamiltoni*, 70.5 mm SL, Moreton Bay and Tweed River, Australia, J. Hamilton.

Other materials. 15 specimens, 20.0–64.3 mm SL. **AUSTRALIA:** AMS I. 44632-040, 48.9 mm SL, Tathra, New South Wales, 36°44'15"S, 149°58'60"E, AMS party, S.E. Reader, and A. Hay; AMS I. 46994-004, 44.5 mm SL, Port Kembla, New South Wales, 34°27'35"S, 150°53'52"E, M. Lockett; QM I. 30889, 31.4 mm SL, Dunwich, Queensland, 27°29'S, 153°24'E, 0.2–1.0 m depth, J. Johnson, 18 Aug. 1997; QM I. 26091, 6 specimens, 20.0–48.2 mm SL, Eldershots, Moreton Bay, Queensland, 27°51'S, 153°24'E, trawl, V. Wadley, 14 May 1974; WAM P. 27070-001, 58.8 mm SL, Noosa Heads, Queensland,

26°23'S, 153°06'E, spear, B. Hutchins, 9 Dec. 1980; WAM P. 27119.001, 48.4 mm SL, 6 km south of Mallacoota, Victoria, New South Wales, 37°34'S, 149°46'E, rotenone, B. Hutchins, 20 Feb. 1981; WAM P. 28828.013, 1 of 6, 55.1 mm SL, Queensland, 27°06'S, 153°20'E, beam trawl, V. Wadley and P. Young, 1972; WAM P. 28850.004, 2 specimens, 53.5–64.3 mm SL, Sutherland Shire, New South Wales, 34°04'S, 151°07'E, rotenone, CSIRO Team, 14 May 1976; WAM P. 28861.002, 60.8 mm SL, New South Wales, 34°00'S, 151°12'E, CSIRO Team.

Diagnosis. A species of *Centropogon* with the following combination of characters: XVI, 7–9 (usually 8) dorsal-fin rays; III, 5 anal-fin rays; 13–14 (14) pectoral-fin rays; snout angular; interorbital width narrow, 4.7–7.1% of SL; interorbital space from snout to occiput narrow between eyes; interorbital ridge weakly developed; occipital pit narrow and shallow; preocular and sphenotic spines sharp; gill rakers 12–16; a broad naked area above lateral line from first to sixth dorsal-fin spine; posterior margin of maxilla short of vertical through middle of orbit; 5 vertical broad dark bands present, 3 on body, 1 on caudal-fin base, and 1 on middle of caudal fin.

Distribution. Currently known only from Queensland and New South Wales, Australia [based on collected specimens (Fig. 20)].

Remarks. *Scorpaena jacksoniana* was originally described by Quoy and Gaimard (1824), based on a specimen collected from Port Jackson, Sydney, New South Wales, Australia, as a species of *Scorpaena* on the basis of resembled to *Scorpaena. Tetraroge hamiltoni* was originally described by De Vis (1884) based on specimens collected from Dunwich, Moreton Bay and Tweed River, New South Wales, Australia (only specimens from Dunwich, Moreton Bay existed). However, Paxton et al. (1989) treated both of them as species of *Centropogon*. The examination of both type specimens also agreed well with

Shaw's (1790) description and illustration, including non-type specimens regarding in this study as *C. australis*.

***Centropogon latifrons* Mees 1962**

(English name: Western Fortescue, Pale Fortescue) (Figs. 18, 20; Table 9)

Centropogon australis latifrons Mees 1962: 28, pl. 1 (type locality: Cheyne Beach, east of Albany, Western Australia, Australia); Hutchins and Smith 1991: 16 (Western Australia, Australia; listed); Moore et al. 2008: 17 (Western Australia, Australia; listed).

Centropogon latifrons: Gomon et al. 1994: 478 (southern Australia), Hutchins 2001: 27 (Western Australia, Australia; listed); Allen et al. 2006: 897 (Western Australia, Australia; listed); Johnson and Motomura 2008: 500 unnumbered fig. (Australia); Hoschke et al. 2019:155 (Rottnest Island, Australia; listed).

Centropogon australis (not of Mees): Paxton et al. 1989: 439 (Australia; listed).

Holotype: WAM P. 5140, 46.7 mm SL, Cheyne Beach, east of Albany, Western Australia, Australia, R.J. Mckay, 31 Oct. 1959.

Paratype: WAM P. 4871-001, 72.7 mm SL, collected with holotype; WAM P. 4872, 53.8 mm SL, Geraldton, Western Australia, Australia, K. Parsons, Jan. 1960.

Other materials. 14 specimens, 34.9–84.6 mm SL. **AUSTRALIA:** WAM P. 5376, 9, 34.9–45.3 mm SL, Nancy cove, Rottnest Island, Western Australia; WAM P. 5398.001, 44.3 mm SL, Rottnest Island, Western Australia, 32°00'S, 115°30'E, R.J. Mckay, June 1962; WAM P. 12667, 74.2 mm SL, Houtman Abrolhos Islands, Western Australia, R.J. Mckay, Mar. 1963; WAM P. 25761-004, 84.6 mm SL, Rottnest Island, Western Australia, J.B. Hutchins, 11 Mar. 1977; WAM P. 27645-003, 55.5 mm SL, Meelup Beach, Western

Australia, 33°34'S, 115°04'E, J.B. Hutchins, 1 July 1982; WAM P. 15680.001, 64.7 mm SL, Augusta-Margaret River, Western Australia, 34°19'S, 115°09'E, K. Marshall, Jan. 1967.

Diagnosis. A species of *Centropogon* with the following combination of characters: XVI, 8–9 (usually 8) dorsal-fin rays; III, 5 anal-fin rays; 13 pectoral-fin rays; snout rounded; interorbital width large, 8.9–11.4% of SL; interorbital space from snout to occiput scarcely any concavity; interorbital ridge prominent; occipital pit large and deep; preocular and sphenotic spines absent; gill rakers 6–9; a broad naked area above lateral line from first to sixth dorsal-fin spine; posterior margin of maxilla short of vertical through middle of orbit; 3 vertical dark bands present, 2 on body and a narrow band on caudal-fin base.

Distribution. Currently known only from Western Australia, Australia [based on collected specimens (Fig. 20)].

Remarks. *Centropogon latifrons* was originally described by Mees (1962) on the basis of four specimens collected from Cheyne Beach, Albany, south-western Australia (WAM P. 5140; WAM P. 4871-001, original 2, now 1) and Geraldton (WAM P. 4872) as subspecies of *C. australis*. The species resembled *C. australis*, but differed in having 2 dark bands (vs. 3 dark bands, in *C. australis*) on body, wider interorbital (0.8 vs. 0.5 in orbit diameter), interorbital ridges well developed (vs. hardly developed), interorbital space scarcely concave (vs. interorbital space concave between eyes). Subsequently, Gomon (1994) regarded *C. latifrons* as a valid species.

Centropogon latifrons is easily distinguished from *C. australis* by having 13 pectoral-fin rays [vs. 13–14 (usually 14) in the latter], snout profile rounded (vs. snout angular), interorbital region wide (vs. interorbital region narrow), interorbital ridges well developed (vs. weakly developed), body and caudal fin with 3 dark bands (vs. body and caudal fin with 5 dark bands).

***Centropogon marmoratus* Günther 1862**

(English name: Marbled Fortescue, Bullrout, Cobbler) (Figs. 19, 20; Table 10)

Centropogon marmoratus Günther 1862: 190, pl. 27 (fig. B) (type locality: Moreton Bay, Queensland, Australia); McCulloch 1929: 388 (Moreton Bay, Queensland, Australia; listed); Poss 1999: 2308 (Australia); Johnson 1999: 727 (eastern Australia; listed); Allen et al. 2006: 898 (Moreton Bay, Queensland, Australia; listed).

Centropogon australis (not of Mees): Paxton et al. 1989: 439 (Australia; listed).

Tetraroge vestitus De Vis 1884: 446 (type locality: South Seas): Chungthanawong and Motomura 2018: 120 (South Seas).

Holotype: BMNH 1862.1.6.44, holotype of *C. marmoratus*, 55.6 mm SL, Moreton Bay, Queensland; QM I. 1597, holotype of *Tetraroge vestitus*, 57.2 mm SL, South Sea.

Other materials. 16 specimens, 13.6–67.2 mm SL. **AUSTRALIA:** AMS I. 12643, 66.0 mm SL, AMS I. 12644, 57.1 mm SL, Tweed River Heads, Queensland, 28°10'S, 153°33'E; AMS IA. 4214, 3, 50.2–54.1 mm SL; Port Curtis, Queensland, 23°55'12"S, 151°22'48"E, M. Ward and W. Boardman; QM I. 365, 67.2 mm SL, Woody Point, Moreton Bay, Queensland, 27°16'S, 153°06'E, J. Jamison, 2 Apr. 1912; QM I. 13106, 2, 40.6–47.9 mm SL, Moreton Bay, Queensland, 27°13'S, 153°15'E, trawl, R.J. McKay, 23 Apr. 1975; QM I. 13367, 4, 13.6–31.5 mm SL, Toorbul, Moreton Bay, Queensland, 27°01'12"S, 153°03'36"E, V. Wadley, 1 Oct. 1974; QM I. 14305, 50.2 mm SL, Moreton Bay, Queensland, 27°17'S, 153°06'E, trawl, W. Croft, Nov. 1977; QM I. 20635, 63.2 mm SL, Moreton Bay, Queensland, 27°13'S, 153°15'E, trawl, R.J. McKay, 23 Apr. 1975; QM I. 32241, 17.2 mm SL, Hervey Bay, Queensland, 25°15'S, 152°50'E, 0.2–0.4 m depth, rotenone, J. Johnson, 19 Nov.

1995; QM I. 32455, 17.1 mm SL, Bargara, Queensland, 24°50'S, 152°28'E, 0.1–1.2 m, seine net, J. Johnson and A. Gill, 12 Oct. 2000.

Diagnosis. A species of *Centropogon* with the following combination of characters: XVI–XVII, 7–8 (usually XVI, 8) dorsal-fin rays; III, 5 anal-fin rays; 13–14 pectoral-fin rays; snout angular; interorbital width narrow, 5.4–8.2% of SL; interorbital space from snout to occiput narrow between eyes; interorbital ridge weakly developed; occipital pit narrow and shallow; preocular and sphenotic spines absent; gill rakers 8–13; lack of broad naked area between the basis of the spinous dorsal fin and the lateral line; posterior margin of maxilla reaching to vertical through middle of orbit; marbled or mottled pattern on head and body.

Distribution. Currently known only from Queensland, Australia and South Sea [based on collected specimens (Fig. 20)].

Remarks. *Tetraroge vestitus* was originally described by De Vis (1884) based on single specimen collected from South Seas. Subsequently, it was regarded as junior synonym of *Ablabys taenianotus*. However, the comparison between *T. vestitus* and *C. marmoratus* indicated that *T. vestitus* identical to *C. marmoratus* (Table 10) (Chungthanawong and Motomura 2018, this study). Comparisons between *T. vestitus* and *A. taenianotus* were given in Remarks of *A. taenianotus*.

Centropogon marmoratus is easily distinguished from others congeners by lack of broad naked area between the basis of the spinous dorsal fin and the lateral line (vs. broad naked area present, in *C. australis* and *C. latifrons*), including body with marbled or mottled pattern (vs. body and caudal-fin with 5 and 3 dark bands, respectively).

Genus *Coccotropsis* Barnard 1927

Coccotropsis Barnard 1927: 75 (type species: *Tetraroge gymmoderma* Gilchrist 1906, by original designation and monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XIV–XVI, 5–6 (usually XV, 5) dorsal-fin rays; its origin anterior to posterior margin of orbit; dorsal fin continuous, without deeply incised membrane between third and fourth dorsal-fin spines; membrane of last dorsal-fin soft ray posteriorly connected to dorsal body but not extending onto base of caudal fin; I, 3 pelvic-fin rays; III, 3–4 (4) anal-fin rays; 11–12 (11) pectoral-fin rays, lowermost four pectoral-fin rays not detached; head profile oblique, slightly convex; orbit diameter 8.7–12.9% of SL; nape flattened; cleithral spine present; head with papillae; body without scales, cirri or papillae; mouth large, 41.7–47.3% of HL; palatine teeth absent; lateral line well separated from dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length; caudal depth narrow, its depth 3.0–4.6 in body depth. Head lack of scales; papillae present on orbital rim, interorbital ridge, parietal and nuchal ridges; nasal openings with skin flaps. Body and fins without scales, tentacles, cirri or skin flaps. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Snout profile oblique and slightly convex. Two pairs of nasal openings, subequal in diameter; anterior nostril tubular with dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 3.2–4.4 in head length. Snout slightly short, its length less than orbit diameter. Bony rim of orbit without spines.

Ascending process of premaxilla well developed. Interorbital ridges prominent, converging at the horizontal level of orbit and diverging posteriorly; median interorbital ridge absent.

Interorbital region from snout to occiput scarcely any concavity, slightly wide, its length 1.2–1.5 in orbit diameter. Nasal spines absent. Supracleithral spine long, sharp. Suborbital ridge moderately developed; connected posteriorly to base of uppermost preopercular spine; without spine on suborbital ridge. Preopercle with 5 simple spines; 4 uppermost sharp and protruding, with broad base, their length progressively shorter from uppermost downward to lowermost; posterior tip of uppermost spine almost reaching to opercular margin; lowermost spine hidden under skin. Opercle with smooth V-shaped crests, ending with blunt spines.

Upper end of gill opening reaching or above horizontal line through middle of eye. Cleithral spine sharp and strong. Lacrimal with 2 broad, simple spines; anterior lacrimal spine shorter, directed posteroventrally; posterior lacrimal spine long, directed backward, its posterior tip reaching to (or beyond) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, its length 1.9–2.4 in head length, terminal, oblique; posterior margin of maxilla reaching to vertical through middle of pupil. Bands of villiform teeth on jaws and vomer; lack on palatines. Lips thick; symphyseal knob absent. No slit behind last gill arch; gill rakers 7–11, short, knob-like shape.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin anterior to posterior margin of orbit, first dorsal-fin spine shortest, its length 1.7–2.4 in second spine length; third spine longest, slightly longer than second spine; last spine slightly longer than penultimate spine but shorter than first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised, generally half of fin length; membrane of last dorsal-fin ray posteriorly connected to dorsal edge of body, but not extending onto basis of caudal fin. Anal-fin base short, origin of anal fin anterior to penultimate dorsal-fin spine; first anal-fin spine shortest, third anal-fin spine longest, its length 0.6–0.8 in second anal-fin spine;

membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, without free rays; fin origin level with vertical through fourth dorsal-fin spine base; moderate in size, its length slightly shorter than head length; posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.4–2.0 in pectoral-fin length, posterior tip of depressed fin short of anus; its origin level with vertical through lower end of pectoral-fin base; three-fourth of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.0–1.2 in pectoral fin length; posterior margin of fin rounded.

Color of preserved specimens: Head light brownish with dark spots scattered; body brownish with whitish semicircular blotch above pelvic fin and broad whitish band on caudal region, brownish narrow triangular blotch on caudal-fin base; fins light brown with marbled dark pattern.

Remark. *Coccotropsis gymnoderma* was originally described by Gilchrist (1906) on the basis of nine lots of specimens collected from Cape St. Blaize, Great Fish Point Lighthouse, Bird Island Lighthouse, False Island, Rockland Point, Seal Island, Bakoven Rock, Swart Klip, Fish Hoek Bay, South Africa, during 22 Oct. 1900–24 Dec. 1902, as a species of *Tetraroge* on the basis of having head and body compressed, lack of scales; preorbital and preopercular with spines; dorsal fin continuous with 12–17 spines, no pectoral-fin appendages; teeth on jaws, vomer, and generally on palatine; no cleft behind fourth gill arch. Subsequently, Barnard 1927 recognized that *T. gymnoderma* differed from *Trtraroge* in having I, 3 pectoral-fin rays (vs. I, 5, pectoral-fin rays, in the latter); no teeth on palatine (vs. teeth on palatine), and placed the species in his new genus *Coccotropsis*.

***Coccotropsis gymnoderma* (Gilchrist 1906)**

(English name: Smoothskin Scorpionfish) (Figs. 21, 22; Table 11)

Tetraroge gymnodeerma Gilchrist 1906: 147, pl. 37 (top) (type localities: Cape St. Blaize, Great Fish Point Lighthouse, Bird Island Lighthouse, False Island, Rockland Point, Seal Island, Bakoven Rock, Swart Klip, Fish Hoek Bay, South Africa).

Coccotropsis gymnodeerma: Poss 1986: 479, fig. 150.2 (type locality: South Africa).

Syntypes. BMNH 1930.1.14.6, syntypes of *Tetraroge gymnodeerma*, 2, 23.9–28.7 mm SL, Cape St. Blaize, South Africa, 71 m depth, large dredge, 22 Oct. 1900.

Other materials. 18 specimens, 10.7–29.1 mm SL. **SOUTH AFRICA:** CAS 48416, 17.5–29.1 mm SL, off Storms river mouth, Cape Province, 34°2'1"S, 23°54'48"E, M. Smith and P. Heemstra, 1–30 June 1980.

Diagnosis. A species of *Coccotropsis* with the following combination of characters: XIV–XVI, 5–6 (usually XV, 5) dorsal-fin rays; III, 3–4 (4) anal-fin rays, 11–12 (11) pectoral-fin rays; I, 3 pelvic-fin rays; body naked; 7–10 (8) lateral-line pores; head profile slightly convex; dorsal-fin continuous; first dorsal fin origins anterior to posterior margin of orbit; no teeth on palatines; symphyseal knob absent; no slit behind last gill arch.

Distribution. Currently known only from South Africa [based on collected specimens (Fig. 22)].

Remarks. *Coccotropsis gymnodeerma* was described by Gilchrist (1906) on the basis of nine lots of specimens collected from South Africa. Because additional specimens have never been reported, non-type specimens reported in this study represent the second record of the species. I, 3 pelvic-fin rays is the unique character of *C. gymnodeerma* among its congeners.

Genus *Cottapistus* Bleeker 1876a

Cottapistus Bleeker 1876a: 298 (type species: *Perca cottoides* Linnaeus 1758, by monotypic).

Sibogapistus de Beaufort 1949: 68 (type species: *Paracentropogon cynocephalus* Weber 1913).

Vadesuma Whitley 1933: 94 (type species: *Paracentropogon scorpio* Ogilby 1910).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XIV–XV, 5 (usually XIV) dorsal-fin rays; its origin vertical through anterior margin of orbit; dorsal fin continuous; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto base of caudal fin; I, 4 pelvic-fin rays; III, 5–6 (6) anal-fin rays; 14 pectoral-fin rays, lowermost four pectoral-fin rays not detached; head profile oblique, slightly convex; orbit diameter 9.1–10.7% of SL; nape flattened; cleithral spine absent; body with small embedded cycloid scales; head without scales, cirri or papillae; mouth large, 51.9–53.0% of HL; palatine teeth present; lateral line well separated from dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head without scales, tentacles, cirri or skin flaps, except at nasal openings. Body covered with small, non-imbricated, embedded cycloid scale; a broad naked area on anterior half of body above lateral line; lack of scale on the basis of dorsal fin, pectoral fin, pelvic fin, and anal fin. Lateral line complete, continuous, extending from above dorsal margin of gill opening to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Snout profile oblique and convex. Pairs of nasal openings, subequal in diameter; anterior nostril tubular with dermal flap; posterior nostril a simple rounded pore without raised rim on anteroventral margin of orbit. Mouth large, its length 1.9 in head length, terminal, oblique; posterior margin of maxilla reaching to vertical through middle of pupil. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. Orbit diameter 3.8–4.1 in head length. Snout slightly short, its length subequal to orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla well developed. Interorbital region from snout to occiput scarcely any concavity, wide, its width 0.8–0.9 in orbit diameter. Interorbital ridges weakly developed; median interorbital ridge absent. Head smooth, without ridges and spines, only spines on lacrimal and preopercle present. Lacrimal with 2 sharp spines, directed backward; anterior lacrimal spine short; posterior spine long, its posterior tip reaching to (or beyond) vertical through middle of orbit; lateral lacrimal spines absent. Preopercle with 5 simple spines; 4 uppermost sharp and protruding, with narrow base, their length progressively shorter from uppermost downward to lowermost; posterior tip of uppermost spine almost reaching to opercular margin; lowermost spine hidden under skin. Opercle without spines. Cleithral spine absent. Upper end of gill opening almost reaching horizontal line through middle of eye. Slit behind last gill arch close; gill rakers 20–24, long and slender.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin anterior to vertical through middle of orbit, first dorsal-fin spine shortest, third spine longest, its length 0.6–0.7 in second spine length; fourth to eleventh or twelfth spines subequal in length; three last spines progressively longer, last spine slightly longer than first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised, almost base of the next spine; membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin. Anal-fin base short, its length

3.0–3.8 in dorsal-fin base length; first anal-fin spine shortest, third anal-fin spine longest; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, without free rays; fin origin level with vertical through fourth dorsal-fin spine base; moderate in size, its length slightly shorter than head length; posterior tip of fin reaching vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.3–1.5 in pectoral-fin length, posterior tip of depressed fin reaching anus; its origin level with vertical through lower end of pectoral-fin base; almost last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pectoral fin length; posterior margin of fin rounded.

Color of preserved specimens: Head creamy; body creamy with brownish diffuse spots dorsally, creamy ventrally; fins creamy with brown vermiculated marking.

Remarks. *Cottapistus cottoides* was originally described by Linnaeus (1758) as a species of *Perca* on the basis of dorsal fin continuous and caudal fin rounded. Subsequently, Bleeker (1876a) placed it in his Genus *Cottapistus* on the basis of dorsal profile convex, palatine without teeth, dorsal spine origin above eyes.

de Beaufort (1949) proposed a new genus, *Sibogapistus*, for *Paracentropogon cynocephalus* Weber 1913 on the basis of lacking teeth on palatine; 13–15 pectoral-fin rays (vs. 9–10, in genus *Paracentropogon*), rays usually unbranched (vs. usually branched), 6 anal-fin soft rays (vs. 5). However, *P. cynocephalus* has been regarded as junior synonym of *C. cottoides*, *Sibogapistus* is considered a junior synonym of *Cottapistus*.

Although *P. scorpio* was recognized by Whitley (1933) that the species more closely related to *Liocranium* Ogilby 1903 than *Paracentropogon*, *P. scorpio* has been placed into a new genus *Vadesuma* on the basis of being more elongate; diameter of orbit less than width of interorbital space; gill racker on first gill arch long, slender, and flattened. Since *Vadesuma*

is considered a junior synonym of *Cottapistus*, *P. scorpio* has been regarded as junior synonym of *C. cottoides*.

***Cottapistus cottoides* (Linnaeus 1758)**

(English name: Yellow Waspfish, Marbled Stingfish) (Figs. 23, 24; Table 12)

Perca cottoides Linnaeus 1758: 291 (type locality: unknown).

Paracentropogon scorpio Ogilby 1910: 115 (type locality: 14 miles southeast, off Cape Capricorn, Queensland, Australia); McCulloch 1929: 390 (off Cape Capricorn, Queensland, Australia; listed); Paxton et al. 1989: 440 (Queensland, Australia; listed); Hutchins 2001: 27 (Queensland, Australia; listed); Allen et al. 2006: 898 (Queensland, Australia; listed).

Paracentropogon cynocephalus Weber 1913: 501, fig. 103 (type localities: Molo Strait, Siboga station 51, depth 90–54 m; Flores Sea, 8°30'S, 119°07.5'E, station 310, depth 73 meters).

Cottapistus cottoides: Paxton et al. 1989: 440 (Queensland, Australia; listed); Poss 1999: 2312, unnumbered fig. (China, Vietnam, Thailand, Singapore, Indonesia, New Guinea, northwestern Australia); Poss in Randall and Lim 2000: 605 (South China Sea; listed); Hutchins 2001: 27 (Western Australia, Australia; listed); Allen et al. 2006: 898 (Queensland, Australia; listed); Larson et al. 2013: 83 (Northern Territory, Australia; listed).

Holotype. AMS E. 2945, holotype of *Paracentropogon scorpio* Ogilby 1910, 57.1 mm SL, Cape Capricorn, Queensland, Australia, 23°36'S, 151°27'E, 24 m depth, FIS Endeavour, 29 July 1910.

Paratype. AMS E. 2681, paratype of *P. scorpio*, 62.4 mm SL, Bowen, Queensland, Australia, 20°01'S, 148°15'E, trawl, FIS Endeavour, 1909; QM I. 1578, paratype of *P. scorpio*, 68.6 mm SL, North East Island, Queensland, Australia, 21°40'00"S, 150°19'60"E.

Other materials. MALAYSIA: KAUM–I. 17161, 54.6 mm SL, local fishing port, Kampung Raja, Terengganu, trawl, M. Matsunuma, 5 Jan. 2009.

Diagnosis. A species of *Cottapistus* with the following combination of characters: XIV–XV, 5 (usually XIV) dorsal-fin rays; III, 5–6 (5) anal-fin rays; 14 pectoral-fin rays; I, 4 pelvic-fin rays; body covered with small, non-imbricated, embedded cycloid scales; head profile slightly convex; dorsal fin continuous, origin of first dorsal fin anterior to vertical through middle of orbit; symphyseal knob absent; teeth on palatines; gill raker long and slender, no slit behind fourth gill arch.

Distribution. The species is distributed from Malaysia to Australia [based on collected specimens (Fig. 24)].

Remarks. *Cottapistus cottoides* easily confused with the Genus *Paracentropogon* in having I, 4 pelvic fin rays, fourth to penultimate dorsal-fin spines usually subequal in length, membranes of spinous portion of dorsal fin deeply incised. However, it easily distinguished from *Paracentropogon* by having dorsal fin origin vertical through anterior margin of orbit (vs. dorsal fin origin posterior to anterior margin of orbit), head without tentacle (vs. head with tentacles), gill rake long and slender (vs. gill raker stubby and stout), preopercular with 4 uppermost spines prominent (vs. preopercular with uppermost spine prominent).

Paracentropogon cynocephalus was originally described by Weber (1913) on the basis of four specimens collected from Molo Strait, Flores Sea. Although lacking of opportunity to examine those type specimens, original description and figure of *P. cynocephalus* agreed well with the specimens considered in this study as *C. cottoides* in having XVI, 6 dorsal-fin rays; III, 6–7 anal-fin rays, 14 pectoral-fin rays; I, 4 pelvic-fin rays;

body with embedded small scales; snout profile slightly convex; 2 lacrimal spines; 5 short preopercular spine, no cleft behind fourth gill arch; dorsal fin inserted above orbit; third dorsal- and anal-fin spine longest.

Genus *Glyptauchen* Günther 1860

Glyptauchen Günther 1860: 121 (type species: *Apistes panduratus* Richardson 1850, by monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XVII, 6–7 (usually 7) dorsal-fin rays; its origin distinctly posterior to posterior margin of preopercle; dorsal fin continuous, without deeply incised membrane between third and fourth dorsal-fin spines; membrane of last dorsal-fin soft ray not connected posteriorly to upper caudal-fin base; I, 5 pelvic-fin rays; III, 5 anal-fin rays; 13–14 pectoral-fin rays (rarely 13), four lowermost rays not detached; head and snout profile vertical, squarish; head large, its width 26.8–31.5% of SL; orbit diameter 11.9–13.4% of SL; nape concave; cleithral spine present; body covered with small imbricate cycloid scales; cirri and papillae absent on head and body; mouth small, its length 22.7–29.2% of HL, small conical teeth on palatines; lateral line complete, not close to dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. The description and data for the holotypes are presented first, followed by those of other materials data in parentheses when different. Body somewhat elongated and wide, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Caudal-peduncle depth 3.6–5.5 in body depth. Body covered with small, imbricate cycloid scales, arranged in regular series; scales absent on head, pre-dorsal-fin area, pectoral-fin base, pelvic-fin base; a broad naked area along dorsal-fin base. No

tentacles, cirri or skin flaps on head, body or fins, except at nasal openings. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Head profile vertical over mouth, subhorizontal above eyes, with a deep squarely concave on occipital region; dorsal margin of orbit rough, without spines. Two pairs of nasal large openings, subequal in diameter; anterior nostril tubular with dermal flap; posterior nostril a simple rounded pore with raised rim on anteroventral margin of orbit. Orbit diameter 3.2–3.4 in head length. Snout slightly short, 3.2–4.7 in head length. Bony rim of orbit rough but not forming spines. Ascending process of premaxilla well developed. Interorbital region wide, subequal to orbit diameter. Interorbital ridges well developed, median interorbital ridge absent. Occipital pit wide and deep, saddle-like impression. Nasal spines large, blunt. Parietal and nuchal forming ridges with blunt spines. Pterotic and posttemporal forming ridges with blunt spines. Supracleithral spine blunt. Suborbital ridge well developed, connected posteriorly to base of uppermost preopercular spine, a spine on the anterior of suborbital ridge. Preopercle with 5 simple spines; all sharp and projecting from skin; uppermost longest, its posterior tip not reaching to opercular margin; second to fifth short. Opercle with smooth V-shaped crests and sharp spines, directed upward. Upper end of gill opening reaching or above horizontal line through middle of eye. Cleithral spine sharp and strong. Lacrimal with 2 sharp simple spines; anterior lacrimal spine short, directed posteroventrally; posterior lacrimal spine longer, directed backward, its posterior tip not reaching to vertical through middle of orbit; lateral lacrimal spines absent. Mouth small, its length 2.4–4.3 in head length, terminal, slightly oblique; posterior margin of maxilla short of vertical through middle of pupil. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. Gill rakers 5–10, short, obtuse.

Dorsal fin continuous, with notch between spinous and soft dorsal; origin of first dorsal fin posterior to posterior margin of preopercle; first dorsal-fin spine shortest, first to seventh spines progressively longer, eight to last spine progressively shorter, last spine slightly shorter than penultimate spine. Membranes of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth of spine length; membrane of last dorsal-fin ray posteriorly connected to dorsal edge of body, but not extending onto base of caudal fin. Origin of anal fin level with vertical through fourteenth dorsal-fin spine; first anal-fin spine shortest; second spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin somewhat notched; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin moderate, its length 1.5–1.8 in dorsal-fin base length, all rays branched, without free rays; fin origin level with vertical through second dorsal-fin spine base; posterior tip of fin extending beyond vertical through anus, but not reaching to anal-fin insertion; posterior margin of fin rounded. Pelvic fin slightly shorter than pectoral fin, its origin level with vertical through lower end of pectoral-fin base; second soft ray longest, posterior tip of depressed fin reaching to anus; half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pelvic fin; posterior margin of fin rounded.

Color of preserved specimens: Head and thorax light brown with brown marbled or mottled pattern; body dark brown with whitish marbled pattern, caudal peduncle whitish; dorsal fin dark brown with whitish irregular spots scattered anteriorly, posterior half of soft dorsal-fin whitish; anal fin dark brown, posterior half of soft anal fin whitish; pectoral fin and pelvic fin dark brown with whitish marbled pattern; caudal fin light brown.

Remark. *Glyptauchen panduratus* was originally described by Richardson (1850) as a species of *Apistes*, based on having dorsal fin continuous, teeth on palatines, spines on lacrimal and preoperculum, scales on body. Subsequently, Günther (1860) recognized that *A.*

panduratus differed from *Apistes* in having crown of the head with a deep saddle-like impression (vs. no deep saddle-like impression, in the latter). Therefore, he placed the species in his new genus *Glyptauchen*.

The genus *Glyptauchen* is easily distinguished from all other congeners by forehead vertical, mouth small, occipital region with a deep saddle-like impression.

***Glyptauchen panduratus* (Richardson 1850)**

(English name: Goblinfish, Goblin Fish, Saddle Head, Saddle-headed Goblin Fish) (Figs. 25, 26; Table 13)

Apistes panduratus Richardson 1850: 58, pl. 1, figs. 3–4 (type locality: King George Sound, Western Australia, Australia); Castelnau 1872: 244 (southern Australia); Castelnau 1873: 62(southern Australia); McCulloch 1929: 391 (King George Sound, Western Australia, Australia; listed).

Glyptauchen panduratus deruptus Whitley 1931: 117 (type locality: St. Vincent Gulf, South Australia); Gomon et al. 1994: 479 (southern Australia); Allen et al. 2006: 899 (South Australia, Australia; listed).

Glyptauchen insidiator Whitley 1931: 118, pl. 14 (type locality: Kurnell, Botany Bay, New South Wales, Australia); Gomon et al. 1994: 479 (southern Australia); Allen et al. 2006: 899 (South Australia, Australia; listed).

Glyptauchen insidiator mirandus Whitley 1931: 120 (type locality: Tasmania, Australia); Gomon et al. 1994: 479 (southern Australia); Allen et al. 2006: 899 (South Australia, Australia; listed).

Glyptauchen panduratus: Castelnau 1873: 62 (South Australia); Kuitert 1993: 117 unnumbered fig. (south-eastern Australia); Gomon et al. 1994: 479 (southern Australia);

Hutchins 2001: 27 (Western Australia, Australia; listed); Allen et al. 2006: 899 (Western Australia, South Australia, New South Wales, Victoria, and Tasmania, Australia; listed); Johnson and Motomura 2008: 500, unnumbered fig. (southern Australia).

Holotype. AMS IA. 4634, holotype of *Glyptauchen insidiator*, 100.9 mm SL, Botany Bay, New South Wales; AMS B. 5786, holotype of *Glyptauchen insidiator mirandus*, 150.9 mm SL, Tasmania, Australia.

Other materials. 6 specimens, 37.3–119.8 mm SL. **AUSTRALIA:** AMS A. 12900, 119.8 mm SL, Portsea pier, Victoria, 38°19'S, 144°43'E, 1 Sep. 1976; AMS I. 2103, 115.4 mm SL, Port Jackson, New South Wales, 33°50'S, 151°10'E; AMS I. 14477, 99.53 mm SL, Port Jackson, Balmoral Beach, New South Wales, Aug. 1918; AMS I. 19359-002, 37.3 mm SL, Watsons bay, Sydney, New South Wales, 33°51'S, 151°32'E, 1903; AMS I. 20526-001, 95.0 mm SL, Port Jackson, New South Wales, 33°51'S, 151°17'E, 1888, Manly Aquarium Co.; WAM P. 26006.008, 60.7 mm SL, Mondrain Island, Western Australia, 34°07'S, 122°16'E, rotenone, J.B. Hutchins, 19 Mar. 1978.

Diagnosis. A species of *Glyptauchen* with the following combination of characters: XVII, 6–7 (usually, 7) dorsal-fin rays; III, 5 anal-fin rays; 13–14 (14) pectoral-fin rays; I, 5 pelvic-fin rays; body covered with small embedded, imbricate cycloid scales; head profile almost vertical, subhorizontal above eyes, occipital region deep squarely concave; symphyseal knob absent; teeth on palatines; dorsal fin continuous, origin of first dorsal fin posterior to posterior margin of preopercle; gill raker long and slender, slit behind fourth gill arch.

Distribution. Currently known only from Australia from Western Australia east to New South Wales and Tasmania [based on collected specimens (Fig. 26)].

Remarks. *Glyptauchen panduratus* was originally described as *Apistes panduratus* by Richardson (1850) based on a single specimen collected from King George Sound, Western Australia. Although lacking of opportunity to examined the holotype of *A. panduratus*, the specimen examined in this study is identical to original description and figure in having large occipital pit; head profile vertical and squarish; ctenoid scales on body; mouth small; teeth on palatine; slit behind fourth gill arch; head armed with several strong spines, including lacrimal and preopercular spines; dorsal-fin origin posterior to posterior margin of occipital pit; last dorsal-fin spine about half of first soft ray; all pectoral-fin rays branched (Richardson 1850, pl. 1, figs. 3–4).

Whitley (1931) recognized single specimen collected from St. Vincent Gulf, South Australia, described by Castelnau's (1873: 62), differed from the Western Australia population (Richardson 1850) in having dorsal fin length two-third of body depth, soft dorsal-fin base not one-fifth of spinous portion base, pectoral fin 2.5 times in total length. According from minute differences, Whitley placed *G. panduratus* into new subspecies *Glyptauchen panduratus deruptus*. However, *G. p. deruptus* was regarded here as junior synonym of *G. panduratus*.

Glyptauchen insidiator was originally described by Whitley (1931) based on single specimen collected from Kurnell, Botany Bay, New South Wales, Australia. *Glyptauchen insidiator* differed from Richardson's (1850, pl. 1, figs. 3–4) illustration in more arched back, deeper body, shorter anterior dorsal spines, fewer and smaller preopercular spines, longer supraorbital ridge, wilder head, ninth dorsal-fin spine longest (vs. seventh dorsal-fin spine longest, in *G. panduratus*), and different color pattern. As well as *Glyptauchen insidiator mirandus*, was originally described as subspecies of *G. insidiator* by Whitley (1931), based on single specimen collected from Tasmania, Australia, on the basis of caudal-fin rays forked but not so much branched (vs. much branches, in *G. insidiator*), rosy patch on the gill-covers

extending well into occipital region, more whitish blotches on dorsal and pectoral fins, two large white blotches below first dorsal fin. However, examination of the holotypes of *G. insidiator* and *G. i. mirandus* in this study showed them to be junior synonym of *G. panduratus* (Fig. 25).

Genus *Gymnapistes* Swainson 1839

Gymnapistes Swainson 1839: 65, 180, 265 (type species: *Apistus marmoratus* Cuvier 1829, by subsequent designation).

Pentaroge Günther 1860: 132 (type species: *Apistus marmoratus* Cuvier 1829, by monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XIII, 8–9 (usually 8) dorsal-fin rays; its origin above posterior margin of preopercle; dorsal fin continuous with deeply incised membrane between second and third fin spines, about two-third of fin length; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 5 anal-fin rays; 11–12 (11) pectoral-fin rays, lowermost four pectoral-fin rays not detached; head profile oblique, slightly convex; orbit diameter 10.9–14.0% of SL; nape flattened; cleithral spine present; head and body without scales, cirri or papillae; mouth large, 40.8–42.4% of HL; palatine teeth present; lateral line well separated from dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head, body, and fins without scales, tentacles, cirri or skin flaps, except at nasal openings. Lateral line complete,

continuous, extending from behind supracleithral spine to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Snout profile oblique and slightly convex. Two pairs of nasal openings, subequal in diameter; anterior nostril tubular with dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 3.0–3.8 in head length. Snout slightly short, its length less than orbit diameter. Bony rim of orbit without spines. Interorbital region somewhat narrow between eyes, its length 1.8–2.1 in orbit diameter. Ascending process of premaxilla well developed. Interorbital ridges weakly developed; median interorbital ridge absent. Nasal spines sharp, minute. Supracleithral spine sharp. Suborbital ridge well developed; connected posteriorly to base of uppermost preopercular spine; a minute spine on suborbital ridge, origin below vertical through middle of eye. Preopercle with 5 simple spines; uppermost longest, sharp and projecting from skin, with narrow base, its posterior tip almost reaching to opercular margin; second to fifth minute, sharp. Opercle with smooth V-shaped crests, no spines projecting from skin. Upper end of gill opening reaching or above horizontal line through middle of eye. Cleithral spine sharp and strong. Lacrimal with 2 sharp simple spines; anterior lacrimal spine short, directed posteroventrally; posterior lacrimal spine longer, directed backward, its posterior tip reaching to (or beyond) vertical through middle of orbit; lateral lacrimal spines absent. Mouth large, its length 2.4–2.5 in head length, terminal, oblique; posterior margin of maxilla reaching to vertical through middle of pupil. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. Slit behind last gill arch; gill rakers 8–13, short and blunt.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin above vertical through preopercular margin, first dorsal-fin spine shortest, its length 1.7–1.9 in second spine length; third spine longest, slightly longer than fourth spine; third to

penultimate spines progressively shorter; last spine slightly longer than penultimate spine but shorter than first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised between second and third fin spines, about two-third of fin length; shallower from fourth to penultimate fin spine; membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto upper margin of caudal fin. Anal-fin base short, its length 3.9–4.0 in dorsal-fin base length. Origin of anal fin level with vertical through penultimate dorsal-fin spine; first anal-fin spine shortest, 1.3–1.7 in second spine length; second anal-fin spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, without free rays; fin origin level with vertical through fourth dorsal-fin spine base; moderate in size, its length slightly shorter than head length; posterior tip of fin extending beyond vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.21.3 in pectoral-fin length, posterior tip of depressed fin beyond anal-fin origin; its origin level with vertical through lower end of pectoral-fin base; three-fourth of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pectoral-fin length; posterior margin of fin rounded.

Color of preserved specimens: Head and body brown dorsally with broad irregular dark brown patches, three prominent blotches below fifth to tenth dorsal-fin base, middle of body, and below base of dorsal-fin soft rays; ventral paler with dark brown vermiculated marking or diffuse spots, narrow dark brown band running slightly vertically from middle of interorbital space through eye to posterior margin of lower jaw; dorsal fin with a distinguish dark blotch on fifth to eighth dorsal fin membrane. Fins paler with 2 distinguish dark blotches on fifth to eighth dorsal fin membrane and near base of pectoral fin; 3 dark bands on caudal-fin base, posterior margin of pectoral fin, and posterior margin of caudal fin.

Remark. *Gymnapistes marmoratus* was originally described by Cuvier (1829) as a species of *Apistus* on the basis of having teeth on palatine, long pectoral fin, and all rays branched. Subsequently, Swainson (1839) recognized that *A. marmoratus* differed from *Apistus* in having body naked (vs. body scaly, in the latter), pectoral fin without detached ray (vs. pectoral fin with detached ray), III anal-fin spines (vs. III–IV anal-fin spines), and placed the species in his new genus *Gymnapistes*.

Günther (1860) proposed a new genus, *Pentaroge*, for *Apistus marmoratus* on the basis of having cleft behind fourth gill arch. However, *Pentaroge* is regarded as an objective junior synonym of *Gymnapistes*, the type species of the two genera being the same.

***Gymnapistes marmoratus* (Cuvier 1829)**

(English name: Cobbler, Devilfish, Soldier, Soldierfish, South Australian Cobbler) (Figs. 27, 28; Table 13)

Apistus marmoratus Cuvier in Cuvier and Valenciennes 1829: 416 (type locality: Timor, southern Malay Archipelago); Blanc and Hureau 1968: 6 (Timor; listed).

Apistes tasmanensis Gray 1838: 111 (type locality: Tasmania, Australia); McCulloch 1929: 388 (Tasmania, Australia; listed); Allen et al. 2006: 899 (Tasmania, Australia; listed).

Pentaroge marmorata: Günther 1860: 132 (Timor, southern Malay Archipelago); Macleay 1881: 439 (New South Wales, Australia).

Gymnapistes marmoratus: McCulloch 1929: 388 (Timor; listed); de Beaufort and Briggs 1962: 65, fig. 15 (Timor, southern Malay Archipelago); Kuitert 1993: 117, unnumbered fig. (southern Australia from Sydney to Perth, including Tasmania); Hutchins 2001: 27 (Western Australia, Australia; listed); Allen et al. 2006: 899 (Timor; listed); Johnson

and Motomura 2008: 501, unnumbered fig. (from New South Wales, Southern Australia to Western Australia, Australia).

Syntype. MNHN 0000-6523, 2, syntype of *Apistus marmoratus*, 98.1–115.1 mm SL, Timor, southern Malay Archipelago.

Other materials. 3 specimens, 68.7–87.4 mm SL. **AUSTRALIA:** AMS I. 26833-009, 69.3 mm SL, Fremantle, Cockburn Sound, Western Australia, 32°11'S, 115°43'E, N. Coleman, 19 Mar. 1971; CAS-ICH 028249, 68.6 mm SL, Western Port Bay, Victoria, 2 May 1961; CAS-SU 031909, 87.4 mm SL, New Castle Bay, Perth, Western Australia, Western Australian Museum Team.

Diagnosis. A species of *Gymnapistes* with the following combination of characters: XIII, 8–9 (usually, 8) dorsal-fin rays; III, 5 anal-fin rays; 11–12 (11) pectoral-fin rays; I, 5 pelvic-fin rays; body scaleless; head profile slightly convex; dorsal-fin continuous; origin of dorsal fin level with vertical through posterior margin of preopercle; teeth on palatines; symphyseal knob absent; slit behind last gill arch.

Distribution. Currently known only from Timor south to Victoria and Western Australia, Australia [based on collected specimens (Fig. 28)].

Remarks. *Apistes tasmanensis* was originally described by Gray (1838), based on a single specimen of *Apistes* collected from Tasmania, Australia, on the basis of lead colored when dry, body without scale, suborbital and preopercular spines very long and produced, middle of dorsal fin with a large black spot, palatine teeth velvet-like. According to Gray's (1838) description, *A. tasmanensis* agrees closely with specimens considered here as *G. marmoratus*.

Gymnapistes marmoratus is similar to *C. marmoratus* in color pattern. However, it is easily distinguished by body entirely lack of scales (vs. body cover with ctenoid scale in the

latter), head profile slightly convex (vs. angular, with a deep concavity in front of eye), dorsal margin of orbit not protruding above dorsal profile (vs. dorsal margin of orbit protruding above dorsal profile), bone rim of orbit lack of spines (vs. supraocular and postocular spines present), opercle lack of spines (vs. upper and lower opercular spines present), and dorsal fin without notch between spinous and soft dorsal (vs. dorsal fin with notch between spinous and soft dorsal).

Gymnapistes marmoratus was originally described as *A. marmoratus* by Cuvier in Cuvier and Valenciennes (1829), based on two specimens collected from Timor. However, from currently reports, no specimens of this species have been reported out of Australia, (Kuitert 1993; Hutchins 2001; Johnson and Motomura 2008; this study). Therefore, the type locality of the nominal species is seemed to be an error.

Genus *Liocranium* Ogilby 1903

Liocranium Ogilby 1903: 23 (type specie: *Liocranium praepositum* Ogilby 1903, by monotypic).

Abcichthys Whitley 1927: 304 (Unnecessary replacement for *Liocranium*).

Diagnosis. A genus of the family Tetraogidae with the following combination of characters: XIII–XIV, 6–8 dorsal-fin rays; its origin distinctly posterior to anterior margin of orbit; three anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 4 pelvic-fin rays; III, 5–6 anal-fin rays; 13–15 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, slightly straight; orbit diameter 12.3–15.7% of SL; nape flattened; cleithral spine absent; body covered with small embedded

cycloid scales; cirri, papillae, or tentacles absent from head and body; mouth large, its length 41.6–45.9% of HL, palatine teeth absent; lateral line not close to dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head without scales, cirri, papillae, tentacles, or skin flaps, except on nasal openings. Body covered with small, non-imbricated, embedded cycloid scales; lack of scale on anterior basis of dorsal fin. Lateral line complete, continuous, extending from above tip of gill opening to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Snout profile oblique, straight, slightly steep. Two pairs of nasal openings, subequal in diameter, anterior nostril tubular with dermal flap, posterior nostril a simple rounded pore on anteroventral margin of orbit. Mouth large, its length 2.2–2.4 in head length, terminal, oblique; posterior margin of maxilla short of posterior margin of orbit. Bands of villiform teeth on jaws and vomer; without teeth on palatines. Lips thick; symphyseal knob minute. Eye moderate, orbit diameter 2.9–3.3 in head length. Snout slightly short, its length shorter than orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla weakly developed. Interorbital region narrow, its width 2.0–2.2 in orbit diameter. Interorbital ridges scarcely developed, converging anterior to first dorsal-fin spine; median interorbital ridge absent. Head spines weakly develop; supracleithral spines absent. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed posteroventrally; posterior spine longer, directed posteriorly, its posterior tip reaching to (or short of) vertical through middle of orbit. Suborbital ridge weakly developed. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip short of opercular margin; lower spines short, equal in shape, hidden under skin. Opercle without spines. Cleithral spine absent. Tip of gill opening reaching to a

horizontal line through middle of eye. Slit behind last gill arch close; gill rakers short, flattened.

Dorsal fin continuous, spinous portion of dorsal-fin without notch between spinous and soft dorsal; origin of first dorsal fin vertical through middle of orbit; dorsal-fin not different in lengths, first dorsal-fin spine shortest, its length 1.7–2.8 in second spine length; third spine longest; fifth to the last spines progressively longer; penultimate spine subequal to last spine length; first soft ray longer than last dorsal-fin spine. Membranes of spinous portion of dorsal fin deeply incised about half of the length; dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin, posterior margin of fin rounded. Anal-fin base short, its length 3.5–4.2 in dorsal-fin base length. Origin of anal fin anterior to last dorsal-fin spine; first anal-fin spine shortest, 1.2–1.8 in second spine length; third anal-fin spine longest, 0.7–0.9 in second spine; membranes of spinous portion of anal fin deeply incised; half of last anal-fin soft ray membrane posteriorly adnate to caudal peduncle but not extending to caudal-fin base; posterior margin of fin rounded. Pectoral fin without free rays; fin origin posterior to fourth dorsal-fin spine; moderate in size, its length shorter than head length; posterior tip of fin beyond vertical through anal-fin origin. Pelvic fin moderate, second soft ray longest, 1.1–1.5 in pectoral-fin length, posterior tip of depressed fin reaching to (or short of) anal-fin origin; its origin level with vertical through lower end of pectoral-fin base; two-third of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.0–1.2 in pectoral fin length; posterior margin of fin rounded.

Remark. Ogilby (1903) proposed the genus *Liocranium* for his new species *L. praepositum*, collected from Coast of Queensland, Australia. subsequently, Whitley (1927) re-named it with *Abcichthys* because he thought that *Liocranium* was preoccupied by *Liocranium* Koch 1866, a genus of spider. Since, the spelling of each genus is distinct, *Abcichthys* has been regarded as objective synonym of *Liocranium* (Motomura et al. 2008).

Key to the species of *Liocranium*.

- 1a. Anal-fin soft rays 5–6 (usually 6); pectoral-fin rays 14–15 (usually 14); pelvic fin length 26.4–28.8% (mean 27.4%) of SL; 2 dark blotches on body, a relatively small rounded blotch behind opercle and a small dot at base of first dorsal-fin soft ray *L. pleurostigma*
- 1b. Anal-fin soft rays 5–6 (usually 5); pectoral-fin rays 14–15 (usually 15); pelvic fin length 20.9–25.4% (mean 24.0%) of SL; 3 dark blotches on body, a large vertical ellipse blotch behind opercle, a relatively small rounded blotch at base of first dorsal-fin soft ray extending onto dorsal-fin membrane, and small blotch on lateral line below middle of dorsal-fin soft ray portion *L. praepositum*

***Liocranium pleurostigma* Weber 1913**

(English name: Western Blackspot Waspfish, Papuan Waspfish) (Figs. 29, 31; Table 14)

Paracentropogon pleurostigma Weber 1913: 499, fig. 102 (type locality: Near New Guinea, 1°42.5'S, 130°47.5'E, Siboga station 164); Nijssen et al. 1982: 82 (New Guinea; listed); Motomura et al. 2008: 31, 32 (New Guinea and Australia).

Liocranium praepositum pleurostigma: Mees 1964: 7 (New Guinea).

Liocranium praepositum (not of Ogilby): Sainsbury et al. 1985: 94, unnumbered fig. (northern and north-western Australia).

Liocranium pleurostigma: Motomura et al. 2008: 27 (New Guinea and Australia); Allen and Erdmann 2012: 247, unnumbered fig. (West Papua, Indonesia); Larson et al. 2013: 84 (Northern Territory, Australia; listed).

Material examined. 5 specimens, 28.6–90.4 mm SL. **AUSTRALIA:** QM I. 17045, 56.1 mm SL, Torres Strait, Queensland, 21.9–23.8 m depth, trawl, Queensland Fisheries Service, 8 Nov. 1974; QM I. 23557, 90.4 mm SL, Gulf of Carpentaria, 16°00'S, 140°00'E, Queensland Fisheries Service, 20 Oct. 1983; QM I. 38512, 2, 28.6–29.8 mm SL, south of Darnley Island, Queensland, 9°49'S, 143°48'E, 65 m, dredge, Great Barrier Reef Seabed Biodiversity Survey Team, 28 Mar. 2005; QM I. 38529, 29.9 mm SL, Sue Island, Queensland, 10°12'12"S, 142°54'36"E, 22 m, Great Barrier Reef Seabed Biodiversity Survey Team, 27 Mar. 2005.

Diagnosis. A species of *Liocranium* with the following combination of characters: anal-fin soft rays 5–6 (usually 6); pectoral-fin rays 14–15 (14); pelvic fin length 26.4–28.8% (mean 27.4%) of SL; 2 dark blotches on body, a relatively small rounded blotch behind opercle and a small dot at base of first dorsal-fin soft ray.

Distribution. Currently known only from Australia [based on collected specimens (Fig. 31)].

Remarks. Weber (1913) originally described *L. pleurostigma* on the basis of seven specimens collected from near New Guinea as a species of *Paracentropogon* because having XII–XIV, 8–9 dorsal-fin rays; dorsal fin origins above orbit; dorsal fin not united with caudal fin; I, 4 pelvic-fin rays, head profile oblique, lacking of slit behind fourth gill arch. It was regarded as a subspecies of *L. praepositum* by Mees (1964). Subsequently, it was regarded as junior synonym of *L. praepositum* (Sainsbury et al. 1985). Motomura et al. (2008) examined the type series of *L. praepositum*, *L. pleurostigma*, including non-type material of *Liocranium* and treated *L. pleurostigma* as a valid species.

***Liocranium praepositum* Ogilby 1903**

(English name: Blackspot Waspfish) (Figs. 30, 31; Table 14)

Liocranium praepositum Ogilby 1903: 25 (type locality: Coast of Queensland, Australia) Motomura et al. 2008: 33, 37 (Queensland, Australia); McCulloch 1929: 388 (Coast of Queensland, Australia; listed).

Cottapistus praepositus (Ogilby 1903): Paxton et al. 1989: 440 (Queensland, Australia; listed); Allen 1997: 76, fig. 12 (Indonesia and Australia); Johnson 1999: 727 (Queensland, Australia; listed); Hutchins 2001: 27 (Western Australia, Australia; listed).

Liocranium praepositum: Poss 1999: 2318, unnumbered fig. (northern coast of Australia to Queensland and New Guinea); Allen et al. 2006: 900 (Western Australia, North territory, Queensland, Australia; listed); Motomura et al. 2008: 33 (Queensland, Australia).

Lectotype. QM I. 1582, lectotype of *L. praepositum*, 61.9 mm SL, Coast of Queensland, Australia.

Paralectotype. QM I. 509, paralectotype of *L. praepositum*, 81.7 mm SL, Coast of Queensland, Australia.

Other materials. 4 specimens 27.4–86.5 mm SL. **AUSTRALIA:** QM I. 32346, 86.5 mm SL, Noosa Heads, Queensland, 26°20'S, 153°05'E, 20 m depth, J. Johnson, 13 Oct. 1999; QM I. 37831, 27.4 mm SL, Pombey Reef, Queensland, 20°41.7'S, 150°54.9'E, 33 m, dredge, Great Barrier Reef Seabed Biodiversity Survey Team, 23 Nov. 2005; QM I. 40056, 2, 31.7–55.0 mm SL, Riptide Cay, Queensland, 21°21.9'S, 151°37.5'E, 61 m, Great Barrier Reef Seabed Biodiversity Survey Team, 30 Oct. 2005.

Diagnosis. A species of *Liocranium* with the following combination of characters: anal-fin soft rays 5–6 (usually 5); pectoral-fin rays 14–15 (15); pelvic fin length 20.9–25.4% (mean 24.0%) of SL; 3 dark blotches on body, a large vertical ellipse blotch behind opercle, a

relatively small rounded blotch at base of first dorsal-fin soft ray extending onto dorsal-fin membrane, and small blotch on lateral line below middle of dorsal-fin soft ray portion.

Distribution. Currently known only from Australia [based on collected specimens (Fig. 31)].

Remarks. *Liocranium praepositum* was originally described by Ogilby (1903) on the basis of specimens collected from Coast of Queensland, Australia. It is easily distinguished from *L. pleurostigma* in having 5–6 (usually 6) anal-fin soft rays [vs. 5–6 (5), in the latter]; 14–15 (14) pectoral-fin rays [vs. 14–15 (15)]; 3 dark blotches on body (vs. 2 relatively small blotches behind gill opening).

Genus *Neovespicula* Mandrytsa 2001

Neovespicula Mandrytsa 2001: 141, 263 (type species: *Apistes depressifrons* Richardson 1848, by original designation and monotypic).

Diagnosis. A genus of the family Tetraogidae with the following combination of characters: XIII, 6–8 (usually 7) dorsal-fin rays; its origin vertical through preopercular margin; dorsal fin continuous with deeply incised membrane between third and fourth dorsal-fin spines (almost to dorsal-fin base); membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 5–6 (5) anal-fin rays; 10–12 (11) pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, slightly straight; orbit diameter 8.5–13.4% of SL; nape flattened; cleithral spine absent; body covered with small embedded cycloid scales; cirri, papillae, or tentacles absent from head and body; mouth large, its length 37.9–44.0% of

HL, palatine teeth present; lateral line complete, well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head with scales on preopercle; lack of cirri, papillae, tentacles, or skin flaps. Body covered with small, non-imbricated, embedded cycloid scales; lack of scale on anterior basis of dorsal fin. Lateral line complete, continuous, extending from above supracleithral spine to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed downward; lateral line adjacent to dorsal-fin base.

Snout profile oblique, pointed, slightly straight. Two pairs of nasal openings, subequal in diameter, anterior nostril tubular with low raised rim, posterior nostril a simple rounded pore on anteroventral margin of orbit. Mouth large, its length 2.2–2.8 in head length, terminal, oblique; posterior margin of maxilla reaching to (or short of) posterior margin of orbit, lower jaw protruding anteriorly. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present (absent in some specimens). Eye small, orbit diameter 3.2–4.8 in head length. Snout slightly short, its length subequal to orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla weakly developed. Interorbital region concave, narrow, its width 1.7–2.4 in orbit diameter. Interorbital ridges scarcely developed, converging anterior to first dorsal-fin spine; median interorbital ridge absent. Head spines weakly develop; parietal, nuchal, pterotic, posttemporal, and supracleithral forming smooth and shallow ridge, supracleithral spines present. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed posteroventrally; posterior spine longer, directed backward, its posterior tip reaching to (or short of) vertical through middle of orbit. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip short of opercular margin; 3 lower spines short, sharp, equal in shape; last spine blunt, hidden under skin. Opercle without

spines. Cleithral spine absent. Gill opening curve upward, its tip almost reaching to dorsal-fin base. Slit behind last gill arch close; gill rakers short, tuberculated.

Dorsal fin continuous, third spine slightly remote from fourth spine; spinous portion of dorsal-fin with deeply incised membrane between third and fourth dorsal-fin spines (almost to dorsal-fin base), without notch between spinous and soft dorsal; origin of first dorsal fin vertical through preopercular margin; dorsal-fin not different in lengths, first dorsal-fin spine shortest, its length 1.2–1.7 in second spine length; second and third spines subequal in length; fourth to the last spines progressively longer; last spine slightly shorter than first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised between fourth to sixth spine, about two-third of the length; membrane from sixth to last spine incised about one-fourth of the length; dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin, posterior margin of fin rounded. Anal-fin base short, its length 3.3–5.2 in dorsal-fin base length. Origin of anal fin anterior to penultimate dorsal-fin spine; first anal-fin spine shortest, 1.4–2.2 in second spine length; third anal-fin spine longest, 0.7–0.9 in second spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly adnate to caudal peduncle but not extending to caudal-fin base; posterior margin of fin rounded.

Pectoral fin without free rays; fin origin posterior to third dorsal-fin spine; moderate in size, its length subequal to head length; posterior tip of fin beyond vertical through anal-fin origin.

Pelvic fin moderate, second soft ray longest, 1.1–1.4 in pectoral-fin length, posterior tip of depressed fin reaching to (or short of) anal-fin origin; its origin level with vertical through lower end of pectoral-fin base; two-third of last soft ray adnate to abdomen via membrane.

Caudal fin moderate, its length 1.0–1.3 in pectoral fin length; posterior margin of fin rounded.

Color of preserved specimens: Head, body, and fins (except caudal fin) broad brown or with mottled light brown and brown spots; caudal fin translucent with dark brown bands on posterior margins.

Remark. *Neovespicula depressifrons* was originally described by Richardson (1848) as the species of *Apistes* because the species resembled to *Apistes trachinoides* and *A. dracaena* in having three anterior dorsal-fin rays being stouter, pectoral fin with 5 rays, preopercular spine and lacrimal spine present. Subsequently, Mandrytsa (2001) proposed a new genus, *Neovespicula*, for *A. depressifrons* on the basis of having I, 5 pelvic-fin rays; pleural ribs origins from seventh vertebra; basisphenoid with 1 process.

***Neovespicula depressifrons* (Richardson 1848)**

(English name: Leaf Goblinfish) (Figs. 32, 33; Table 15)

Apistes depressifrons Richardson 1848:1, pl. 3, figs. 1–2 (type locality: Sea of Japan).

Apistus binotopterus Bleeker 1850: 26 (type locality: Jakarta, Java, Indonesia); Kottelat 2013: 315 (Jakarta, Java, Indonesia; listed).

Apistus plagiometopon Bleeker 1853: 744, 753 (type locality: Bulucomba, Sulawesi, Indonesia); Kottelat 2013: 315 (Sulawesi, Indonesia; listed); Miesen et al. 2016: 88 (Sulawesi, Indonesia; listed).

Vespacula depressifrons: de Beaufort and Briggs 1962: 74, fig. 17 (Sumatra, Nias, Java, Celebes, Batjan, Buru, Ambon, New Guinea, Indonesia; Philippines); Kottelat et al. 1993: 102 (Sulawesi, Indonesia; listed); Poss 1999: 2352, unnumbered fig. (Indonesia, Philippines, Papua New Guinea).

Neovespicula depressifrons: Mandrytsa 2001: 278 (Indonesia); Kottelat 2013: 315 (Sulawesi, Indonesia; listed); Miesen et al. 2016: 88 (Sulawesi, Indonesia; listed).

Material examined. 34 specimens, 8.7–54.8 mm SL. **INDONESIA:** QM I. 29345, 3, 25.7–29.3 mm SL, imported via aquarium trade; USNM 391592, 8, Laguna Rantau Stalang, Kabupaten Aceh Selatan, Privine of Nanggroe Aceh Darussalam, 03°00'58.8"S, 97°21'43.20"E, 12 July 2006. **PAPUA NEW GUINEA:** QM I. 40708, 2, 47.8–51.4 mm SL, Bougainville Island, R. Powell. **PHILIPPINES:** CAS-SU 028387, 5 of 6, 31.4–45.0 mm SL, Cotabato, Mindanao, A. Herre, 20 July 1931; USNM 99670, 54.8 mm SL, Abuyog Leyte, Between Samar and Leyte, AV *Albatross*, 26 July 1909; USNM 122596, 2, 32.3–34.2 mm SL, Cotabato, Mindanao, Maguindanao, 2 m depth, RV *Albatross*, 20 May 1908; USNM 136421, 50.7 mm SL, Gulf of Davao, Mindanao, 2 m, RV *Albatross*, 16 May 1908; USNM 168200, 43.5 mm SL, Cotabato, Maguindanao, 2 m. RV *Albatross*, 20 May 1908; USNM 168206, 2, 31.5–40.5 mm SL, Gulf of Davao, Mindanao, 2 m, RV *Albatross*, 16 May 1908; USNM 396233, 33.4 mm SL, East coast of Luzon, San Bernardino Strait to San Miguel Bay, 13°35'N, 123°40'E, RV *Albatross*, 17 June 1909. **LOCALITY UNKNOWN:** CAS-ICH 48612, 15.8 mm SL; CAS-ICH 48645, 3, 25.5–30.7 mm SL, probably from Philippines aquarium dealer; CAS-ICH 214258, 2, 44.3–46.4 mm SL, CAS-ICH 214315, 2, 21.4–22.7 mm SL, Steinhart Aquarium via wholesale fish dealer;

Diagnosis. A species of *Neovespicula* with the following combination of characters: XIII, 6–8 (usually 7) dorsal-fin rays; III, 5–6 (5) anal-fin rays, 10–12 (11) pectoral-fin rays; I, 5 pelvic-fin rays; body covered with small, non-imbricated, embedded cycloid scales; head profile oblique, pointed; dorsal-fin continuous, spinous portion of dorsal-fin with deeply incised membrane between third and fourth dorsal-fin spines (almost to dorsal-fin base); first dorsal fin origin vertical through preopercular margin; teeth on palatines; no slit behind last gill arch.

Distribution. Currently known from Indonesia, Papua New Guinea, and Philippines [based on collected specimens (Fig. 33)].

Remark. *Neovespicula depressifrons* Richardson (1848) was originally described as *A. depressifrons*, based on the single specimen collected from Sea of Japan. Although whereabouts of the holotype unknown, examination of the original description and figure (Richardson 1848: 1, pl. 3, figs. 1–2) of *A. depressifrons* showed it to be identical with specimens considered here as conspecific, the former having three anterior dorsal rays remote from the rest; XIII, 7 dorsal-fin rays; III, 5 anal-fin rays; 10 pectoral-fin rays; I, 5 pelvic-fin rays; head profile depress; lower jaw protruding; symphyseal knob present; 2 lacrimal spines; 4 preopercular spines protruding; teeth on palatine; body with small, embedded scales.

Apistes binotopterus Bleeker (1850) was originally described based on the single specimen collected from Java, Indonesia. The holotype, registered as RMNH 5886 (Frick et al. 2020), are deposited at Naturalis Biodiversity Center, Leiden, the Netherlands. Because the Naturalis fish collection has long been inaccessible due to building renovations (and currently the covid-19 pandemic), the holotype was unavailable for the present study. However, examination of the original description of *A. binotopterus* agrees closely with specimens considered here as *N. depressifrons* in having XIII dorsal-fin spines; III, 5 anal-fin rays; 11 pectoral-fin rays; I, 5 pelvic-fin rays; 2 lacrimal spines preopercular spines present; lower jaw projecting; wide space between third and fourth dorsal-fin spines.

Apistus plagiometopon was originally described by Bleeker (1853) on the basis of single specimens collected from Bulucomba, Sulawesi, Indonesia. Although the specimen no longer exists and no illustrations of the nominal species were given, the original description indicated that *A. plagiometopon* is identical to *N. depressifrons* in having XIII dorsal-fin spines; III, 5 anal-fin rays; 10 pectoral-fin rays; I, 5 pelvic-fin rays; head profile flat; mouth oblique, lower jaw protruding; teeth on palatine; head with 2 lacrimal spines and 4

preopercular spines; dorsal fin origins posterior to posterior margin of orbit, spinous portion between third and fourth spines deeply incised with long distance. *Apistus plagiometopon* has been regarded here as a junior synonym of *N. depressifrons*.

Although *N. depressifrons* is similar to *Trichosomus trachinoides* in having wide space between third and fourth dorsal-fin spines, head point, lower jaw protruding. It easily distinguished from the latter by having XIII (vs. III + XII–XIII, in the latter) dorsal-fin spines, 5 (vs. 4) pelvic-fin soft rays, membrane from third spine adnate to base of fourth spine (vs. membrane from third spine not adnate base of fourth spine), lateral line well separated from dorsal-fin base (vs. lateral line close to dorsal-fin base), tip of gill opening well separated from dorsal-fin base (vs. tip of gill opening close to dorsal-fin base).

According to currently reports, no specimens of this species have been reported from Japan, (Poss, 1999; this study). Therefore, the type locality of the nominal species is seemed to be an error.

Genus *Notesthes* Ogilby 1903

Notesthes Ogilby 1903: 8, 17 (type species: *Centropogon robustus* Günther 1860, by monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XV, 8–9 (usually 9) dorsal-fin rays; its origin posterior to posterior margin of preopercular margin; dorsal fin continuous; membrane of last dorsal-fin soft ray not connected posteriorly to upper caudal-fin base; I, 5 pelvic-fin rays; III, 4–5 anal-fin rays; 11–12 (usually 12) pectoral-fin rays, four lowermost rays not detached; head and snout profile obliquely linear; orbit diameter 7.7–11.6% of SL; nape flattened; cleithral spine present; body

covered with small imbricate ctenoid scales; cirri and papillae absent on head and body; mouth large, its length 39.5–44.9% of HL, small conical teeth on palatines; lateral line complete, not close to dorsal-fin base; opercular tip well separated from dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Caudal-peduncle depth 2.6–3.6 in body depth. Body covered with small, imbricate ctenoid scales, arranged in regular series; scales absent on head, pre-dorsal-fin area, pectoral-fin base, and pelvic-fin base. No tentacles, cirri or skin flaps on head, body or fins, except at nasal openings. Lateral line complete, continuous, extending from behind supracleithral spine to caudal-fin base, no lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Head profile obliquely linear; snout short and broad, 3.9–4.2 in head length. Two pairs of nasal slightly large openings, subequal in diameter; anterior nostril tubular with small dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 3.5–4.8 in head length. Bony rim of orbit with preocular spine, supraocular spine, postocular spine. Ascending process of premaxilla well developed. Interorbital region from snout to occiput scarcely any concavity, 1.1–1.4 (1.8 in *T. bellona*) in orbit diameter. Interorbital ridges weakly developed, converging at the horizontal level of orbit and diverging posteriorly, median interorbital ridge absent. Nasal spines minute. Parietal and nuchal forming ridges with minute spines. Pterotic and posttemporal forming ridges with sharp spines. Supracleithral spine short, sharp. Suborbital ridge developed, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines, sharp and projecting from skin; uppermost longest, its posterior tip not reaching to opercular margin; second to fifth progressively shorter. Opercle with smooth V-shaped crests and sharp spines, directed upward. Upper end of gill opening reaching or above horizontal

line through middle of eye. Cleithral spine patent, sharp. Lacrimal with 3 sharp simple spines; anterior lacrimal spine short, directed posteroventrally; posterior lacrimal spine longer, directed backward, its posterior tip not reaching to vertical through middle of orbit; lateral lacrimal spines present, directed upward. Mouth slightly large, its length 2.2–2.4 in head length, terminal, slightly oblique; posterior margin of maxilla short of vertical through middle of pupil. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob absent. Slit behind last gill arch; gill rakers short, slightly tubercle.

Dorsal fin continuous, with notch between spinous and soft dorsal; origin of first dorsal fin posterior to posterior margin of preopercular margin, first dorsal-fin spine shortest, its length 1.8 in second spine length; fourth spine longest, slightly longer than fifth spine; fourth to penultimate spines progressively shorter; last spine slightly longer than penultimate spine, its length obviously shorter than first soft ray. Membranes of spinous portion of dorsal fin slightly incised, membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto upper margin of caudal fin. Anal-fin base short, its length 4.5–5.0 in dorsal-fin base length. Origin of anal fin level with vertical through penultimate dorsal-fin spine; first anal-fin spine shortest; third anal-fin spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin slightly notched; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, moderate, its length 2.3–2.4 in dorsal-fin base length, without free rays; fin origin level with vertical through second dorsal-fin spine base; posterior tip of fin not reaching to anus; posterior margin of fin rounded. Pelvic fin slightly shorter than pectoral fin, its origin distinctly posterior to lower end of pectoral-fin base; second soft ray longest, posterior tip of depressed fin reaching to anus; last soft ray narrowly adnate to abdomen via membrane. Caudal fin moderate, its length slightly longer than pelvic fin; posterior margin of fin truncated.

Color of preserved specimens: Head and body brownish with dark brown or blackish marbled pattern, broad blackish band on anal-fin base vertical to dorsal-fin base. Fins brownish with marbled pattern and irregular blotches; dorsal fin with a large dark blotch on the middle of spinous portion; caudal fin with 2 vertical dark bands, a narrow band across caudal-fin base, a broad band on posterior half of the fin.

Remarks. *Notesthes robusta* was originally described by Günther (1860) as a species of *Centropogon* on the basis of having compressed head and body; scale present, no groove on the occiput; preorbital and preoperculum armed with spines; dorsal fin continuous with XIV–XV spines; pectoral fin without appendages; villiform teeth on jaws, vomer, and palatine; no cleft behind fourth gill arch. Subsequently, Ogilby (1903) placed *C. robusta* into his new genus, *Notesthes*, since having slit behind fourth gill arch, eye smaller, elongated preopercular spines, 12 pectoral-fin rays.

***Notesthes robusta* Günther 1860**

(English name: Bullrout, Freshwater Bullrout, Freshwater Stonefish, Kroki) (Figs. 34, 35, Table 15)

Centropogon robustus Günther 1860: 128 (New South Wales, Australia); McCulloch 1929: 387 (New South Wales, Australia; listed).

Centropogon troschelii Steindachner 1866: 440, Pl. 4, figs. 1–1a (type locality: Port Jackson, New South Wales, Australia); McCulloch 1929: 387 (Port Jackson, New South Wales, Australia; listed); Paxton et al. 1989:445 (New South Wales, Australia; listed); Allen et al. 2006: 901 (New South Wales, Australia; listed).

Centropogon nitens De Vis 1884: 459 (type locality: Queensland, Australia); McCulloch 1929: 387 (Queensland, Australia; listed); Paxton et al. 1989: 445 (Queensland, Australia; listed); Allen et al. 2006: 901 (Queensland, Australia; listed).

Tetraroge bellona De Vis 1884: 460 (type locality: Queensland coast, Australia); McCulloch 1929: 388 (Queensland coast, Australia; listed); Paxton et al. 1989: 439 (Queensland coast, Australia; listed).

Notesthes robusta: Paxton et al. 1989: 445 (Queensland and New South Wales, Australia; listed); Pollard and Parker in McDowall 1996: 144 (Queensland and New South Wales, Australia); Johnson 1999: 727 (eastern Australia; listed); Poss 1999: 2324, unnumbered fig. (Queensland and New South Wales, Australia); Allen et al. 2002: 178 (Queensland and New South Wales, Australia); Allen et al. 2006: 900 (Queensland and New South Wales, Australia; listed); Pusey et al. 2017: 47 (Queensland, Australia).

Holotype. QM I. 954, holotype of *Centropogon nitens*, 167.7 mm SL, Queensland coast, Australia; QM I.1598, holotype of *Tetraroge bellona* 26.6 mm SL, Queensland coast, Australia.

Syntypes. NMW 78424, syntype of *Centropogon troschellii*, 186.6 mm SL, Port Jackson, New South Wales, Australia; NMW 12094, 202.3 mm SL, syntype of *Centropogon troschellii*, Port Jackson, New South Wales, Australia.

Diagnosis. A species of *Notesthes* with the following combination of characters: XV, 8–9 (usually 9) dorsal-fin rays; III, 4–5 (5) anal-fin rays, 11–12 (12) pectoral-fin rays; I, 5 pelvic-fin rays; body covered with small embedded, imbricate ctenoid scales; head profile obliquely linear; dorsal-fin continuous, origin of first dorsal fin posterior to posterior margin of preopercular margin; teeth on palatines; slit behind fourth gill arch.

Distribution. Currently known only from Australia from Queensland to New South Wales [based on collected specimens (Fig. 35)].

Taxonomic status of *T. bellona*

Tetraroge bellona, originally described by De Vis (1884) on the basis of single specimen from Queensland coast, Australia, has been regarded as a junior synonym of *C. australis* (Fricke et al. 2020). However, examination of the holotype of *T. bellona* (QM I. 1598, 26.6 mm SL; Fig. 34d) during this study revealed that it differed from the genus *Centropogon* in having XV dorsal-fin spines (vs. XVI or XVII in the latter; this study); dorsal-fin origin distinctly posterior to preopercular margin (vs. dorsal-fin origin vertical through preopercular margin); third anal-fin spine longest (vs. second anal-fin spine longest). In addition, the holotype of *T. bellona* having following characters: XV, 9 dorsal-fin rays; III, 5 anal-fin rays; body with scales; dorsal fin origin distinctly far from posterior margin of preopercle; membrane of last dorsal-fin soft ray not reach basal caudal fin. These characters agreed well with original description of *Centropogon robustus* Günther 1860, the holotype of *Centropogon nitens* (QM I. 954, 167.7 mm SL), and the syntypes of *Centropogon troschelii* Steindachner 1866 (NMW 78424, 186.6 mm SL; NMW 12094, 251.0 mm SL; Figs. 34a–b) examined in this study. Accordingly, *T. bellona* has been regarded here as junior synonym of *Notesthes robusta*.

Remarks. *Centropogon troschelii* was originally described by Steindachner (1866), based on two specimens collected from Port Jackson, New South Wales, Australia, as a species of *Centropogon* since having body scaly, head without scale, lacrimal and preopercular spines present. The examination on syntypes of *C. troschelii* agreed well with original description of *C. robustus* Günther (1860). Therefore, *C. troschelii* was regarded here a junior synonym of *N. robusta*.

De Vis (1884) described *C. nitens*, based on the single specimen collected from Queensland, Australia. Although the specimen was not in a good condition, it agreed well with Günther's (1860) description of *C. robustus* (Fig. 34c). *Centropogon nitens* was regarded here a junior synonym of *N. robusta*.

Genus *Ocosia* Jordan and Starks 1904

Ocosia Jordan and Starks 1904: 162 (type species: *Ocosia vespa* Jordan and Starks 1904, by original designation and monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XIV–XVII, 6–9 dorsal-fin rays; its origin distinctly anterior to posterior margin of orbit; dorsal fin continuous, anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 4–6 anal-fin rays; 11–13 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, straight; orbit diameter 9.1–13.0% of SL; nape flattened; cleithral spine absent; body not covered with scales; lack of cirri, papillae and tentacles on eye, head, and body; mouth large, its length 31.2–41.8% of HL, small conical teeth on palatines; lateral line well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length; caudal depth narrow, its depth 3.0–4.3 in body depth. Head lack of scales; papillae present on orbital rim, interorbital ridge, parietal and nuchal ridges. Body and fins without scales, tentacles, cirri or skin flaps. Lateral line complete, continuous, extending from above upper end of gill opening to caudal-

fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore normally directed upward; lateral line well separated from dorsal-fin base.

Head profile angular, pointed, with concavity in front of eyes. Two pairs of nasal openings, subequal in diameter; anterior nostril tubular; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 2.9–4.3 in head length. Snout slightly short. Bony rim of orbit forming shallow ridge. Ascending process of premaxilla well developed. Interorbital ridges weakly developed; narrow, its length 1.6–3.3 in orbit diameter; converging at the horizontal level of orbit and diverging posteriorly; each ending with a small lump in front of dorsal-fin spine origin; median interorbital ridge absent. Nasal spines absent. Supracleithral spine minute, sharp, sometimes covered with skin. Suborbital ridge moderately developed; connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip of uppermost spine not reaching to opercular margin; lowermost spine progressive shorter, lowermost spine hidden under skin. Opercle with smooth V-shaped crests, ending with spines. Upper end of gill opening reaching or above horizontal line through middle of eye. Cleithral spine absent. Lacrimal with 2 broad, simple spines; anterior lacrimal spine shorter, directed posteroventrally; posterior lacrimal spine long, directed backward, its posterior tip short of (rarely reaching to) vertical through middle of orbit. Mouth large, its length 2.5–3.2 in head length, terminal, oblique; posterior margin of maxilla short of vertical through middle of pupil. Bands of villiform teeth on jaws, vomer and palatine. Lips thick; symphyseal knob minute, hidden under thick skin. No slit behind last gill arch; gill rakers 7–17, short, tubercular.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin anterior to posterior margin of orbit, first dorsal-fin spine shortest, its length 2.0–5.1 in second spine length; last dorsal-fin spine shorter than first dorsal-fin soft ray.

Membranes of last dorsal-fin ray posteriorly connected to dorsal edge of body, but not extending onto basis of caudal fin. Anal-fin base short, its length 3.3–4.9 in dorsal-fin base length; first anal-fin spine shortest, third anal-fin spine longest, its length 0.6–0.9 in second anal-fin spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, without free rays; fin origin anterior to vertical through fifth dorsal-fin spine base; moderate in size, its length 1.2–1.5 in head length; posterior tip of fin short of (rarely reaching to) vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.1–1.5 in pectoral-fin length, posterior tip of depressed fin short of anus; its origin level with vertical through lower end of pectoral-fin base; half to three-fourth of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.0–1.2 in pectoral fin length; posterior margin of fin truncated.

Remarks. Jordan and Starks (1904) proposed genus *Ocosia* for their new species, *Ocosia vespa*, on the basis of body compressed, elevated, scaleless; head pointed, rather small; mouth small, oblique; teeth on vomer and palatine; lacrimal with long spine; small spines on head; preopercle with 4 spines; dorsal-fin spines origin above orbit, continuous; I, 5 pelvic-fin rays; pectoral fin without free rays. It is widely distributed in Indo-West Pacific.

Key to the species of *Ocosia*.

- 1a. Papillae on upper and lower jaw, membrane of spinous portion of dorsal fin (at middle of spinous dorsal) not incised *O. vespa*
- 1b. No papillae on premaxillary, membrane of spinous portion of dorsal fin not incised2
- 2a. Lateral-line pores 26–27 *O. sphex*
- 2b. Lateral-line pores less than 253
- 3a. Snout length shorter or subequal to orbit diameter; supraocular spine absent4

3b. Snout length longer than orbit diameter; supraocular spine present	5
4a. Second dorsal-fin spine length 20.4–28.1% (mean 23.3%) of SL; fourth dorsal-fin spine length 77.3–96.8% (88.1%) of third dorsal-fin spine length	<i>O. fasciata</i>
4b. Second dorsal-fin spine length 26.9–38.0% (31.7%) of SL; fourth dorsal-fin spine length 69.9–85.0% (76.1%) of third dorsal-fin spine length	<i>O. zaspilota</i>
5a. Spine on lateral surface of lacrimal and spine on suborbital ridge absent	6
5b. Spine on lateral surface of lacrimal and spine on suborbital ridge present	7
6a. Second dorsal-fin spine distinctly longer than third dorsal-fin spine; parietal, nuchal, posttemporal forming ridges with spines	<i>O. possi</i>
6b. Second dorsal-fin spine length nearly equal to third dorsal-fin spine length; parietal, nuchal, pterotic, posttemporal forming ridges without spines	<i>O. ramaraoi</i>
7a. Second dorsal-fin spine distinctly longer than third dorsal-fin spine	<i>O. apia</i>
7b. Second dorsal-fin spine length nearly equal to third dorsal-fin spine length	8
8a. Second dorsal-fin spine length 19.5–26.5% (23.4%) of SL	<i>O. spinosa</i>
8b. Second dorsal-fin spine length 28.1–33.6% (30.5%) of SL	<i>Ocosia</i> sp.

***Ocosia apia* Poss and Eschmeyer 1975**

(English name: Stoutspine Waspfish) (Figs. 36, 43; Table 16)

Ocosia apia Poss and Eschmeyer 1975: 8, figs. 2D, 6 (type locality: Raoul Island, Kermadec Islands, New Zealand); Paulin 1982: 447, fig. 11 (Raoul Island, Kermadec Islands, New Zealand); Francis 1993: 159 (Raoul Island, Kermadec Islands, New Zealand; listed); Poss 1999: 2324, unnumbered fig. (Raoul Island, Kermadec Islands, New Zealand); Fricke et al. 2011: 380 (Chesterfield Islands, New Caledonia; listed); Duffy and Ahyong 2015: 112

(Raoul Island, Kermadec Islands, New Zealand; listed); Fricke et al. 2015: 5, fig. 9 (New Zealand); Struthers 2015: 1102 (New Zealand); Fricke 2017: 7 (New Zealand).

Paratypes. AMS I. 18496-001, 49.5 mm SL, USNM 214814, 49.7 mm SL, Raoul Island, Kermadec Islands, New Zealand, 29°15'S, 177°57'W, 83 m depth, trawl, 3 Mar. 1952.

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 17; supraocular spine present; parietal, nuchal, pterotic, posttemporal forming ridges with spines; spine on lateral surface of lacrimal and spine on suborbital ridge present; second dorsal-fin spine longest, distinctly longer than third dorsal-fin spine, its length 32.2–35.4% (mean 33.8%) of SL; fourth dorsal-fin spine length 84.0–86.7% (85.4%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about half of spine length.

Distribution. Currently known from Raoul Island, Kermadec Islands, New Zealand [based on collected specimens (Fig. 43)].

Remarks. *Ocosia apia* distinguished from other congeners in having second dorsal-fin spine remarkably longer than third dorsal-fin spine, spine on lateral surface of lacrimal and spine on suborbital ridge.

***Ocosia fasciata* Matsubara 1943**

(English name:-) (Figs. 37, 43; Table 16)

Ocosia fasciata Matsubara 1943: 443, fig. 147 (type locality: Kumano-Nada, Kii Peninsula, Japan); Poss and Eschmeyer 1975: 5, fig. 4 (Formosa strait); Nakabo in Masuda et al. 1984: 319, pl. 285-E (Kumanonada Sea to off Kochi, Japan); Nakabo 2000: 600 (off Kochi, Japan; key); Poss in Randall and Lim 2000: 605 (South China Sea; listed); Shinohara

et al. 2001: 314 (Tosa Bay, Japan; listed); Nakabo 2002: 600 (off Kochi, Japan; key); Shinohara et al. 2005: 424 (Ryukyu Islands, Japan; listed); Fricke 2017: 7 (Japan); Sonoyama et al. 2020: 46 (off Yamaguchi, Japan).

Ocosia gracile Fowler 1943: 70, fig. 14 (Off Ose Saki Light, Goto Islands, Japan): Poss and Eschmeyer 1975: 4 (Goto Islands, Japan).

Holotype. USNM 99513, holotype of *Ocosia gracile* Fowler 1943, 36.4 mm SL, Off Ose Saki Light, Goto Islands, Japan, 32°31'10"N, 128°33'20"E, 254 m depth.

Paratype. USNM 99513, paratype of *Ocosia gracile* Fowler 1943, 29.3 mm SL, collected with holotype.

Other materials. 19 specimens, 31.0–43.7 mm SL. **JAPAN:** NSMT-P 61707, 42.8 mm SL, East China Sea, 31°27.6'N, 126°59.4'E, 104–107 m, trawl, G. Shinohara and H. Saito, 10 Oct. 2001; NSMT-P 64365, 2 specimens, 35.6–39.8 mm SL, East China Sea, 27°57.8'N, 125°56.6'E, 117 m, trawl, G. Shinohara and H. Saito, 20 Oct. 2001; NSMT-P 101405, 32.1 mm SL, Tanabe, Wakayama, 33°40.27'N, 135°12.09'E, 119–120 m, beam trawl, RV *Tensei-maru*, 2 Sep. 1984; USNM 122289, 33.6 mm SL, Nomo Zaki, 32°26' N, 129°27'E, 130 m, RV *Albatross*, 8 Aug. 1906; USNM 135658, 31.0 mm SL, Honshu Island, Goto Islands, 77–99 m, VR *Albatross*, 22 May 1900; USNM 231702, 37.4 mm SL, Goto Islands, 32°31'10" N, 128°33'20"E, 0–139 m, VR *Albatross*, 10 Aug. 1906. **HONGKONG:** USNM 136422, 10 specimens, 35.0–43.7 mm SL, 21°33'N, 116°13'E, 183 m, VR *Albatross*, 4 Nov. 1908. **LOCALITY UNKNOWN:** URM-P 33185, 41.1 mm SL; USNM 135663, 34.3 mm SL.

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 13–17 (usually 15); supraocular spine absent; parietal and pterotic forming ridges without spines; nuchal and posttemporal forming ridges

with minute spines; spine on lateral surface of lacrimal and spine on suborbital ridge absent; second dorsal-fin spine longest, its length 20.4–28.1% (mean 23.3%) of SL, nearly equal to third dorsal-fin spine length; fourth dorsal-fin spine length 77.3–96.8% (87.0%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about half of spine length.

Distribution. Currently known from Japan and Hongkong [based on collected specimens (Fig. 43)].

Remarks. Although *O. gracile* was originally described by Fowler (1943) in the same year as *O. fasciata*, it has been regarded as junior synonym of *O. fasciata* since *O. fasciata* was published in March while *O. gracile* was published in July (Poss and Eschmeyer 1975).

***Ocosia possi* Mandrytsa and Usachev 1990**

(English name:-) (Figs. 38, 43; Table 17)

Ocosia possi Mandrytsa and Usachev 1990: 130, unnumbered fig. (type locality: Saya de Malha Bank, Western Indian Ocean); Mandrytsa 2001: 278 (Western Indian Ocean, Saya de Malha Bank, Seychelles) Fricke 2017: 7 (Western Indian Ocean, Saya de Malha Bank, Seychelles).

Holotype. ZIN 48785, 67.4 mm SL, Seychelles, 10°50'S to 12°04'S, 60°40'E to 62°30'E, 170–230 m depth.

Paratypes. ZIN 48786, 3, 63.8–76.7 mm SL, collected with holotype.

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 17–18 (usually 17); supraocular spine present; parietal, nuchal, posttemporal forming ridges with spines; spine on lateral surface of lacrimal

and spine on suborbital ridge absent; second dorsal-fin spine longest, distinctly longer than third dorsal-fin spine, its length 30.4–34.9% (mean 32.8%) of SL; fourth dorsal-fin spine length 86.3–97.2% (91.8%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth to one-third of spine length.

Distribution. Currently known from Saya de Malha Bank, Western Indian Ocean [based on collected specimens (Fig. 43)].

Remarks. *Ocosia possi* was originally described by Mandrytsa and Usachev (1990) based on four specimens collected from Malha Bank, Western Indian Ocean as a species of *Ocosia*. Although *O. possi* resembles to *O. apia* in having elongated second dorsal-fin spine, it is easily distinguished from the latter in lack of spines on lateral surface of lacrimal and on suborbital ridge. The species was being known to date only from the type specimen.

***Ocosia ramaraoi* Poss and Eschmeyer 1975**

(English name:-)

Ocosia ramaraoi Poss and Eschmeyer 1975: 7, figs. 2C, 5 (type locality: Quilon coast, India); Manilo and Bogorodsky 2003: S102 (Quilon coast, India), Fricke 2017: 7 (Quilon coast, India).

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 15–18; supraocular spine present; parietal, nuchal, pterotic, posttemporal forming ridges without spines; spine on lateral surface of lacrimal and spine on suborbital ridge absent; second dorsal-fin spine length nearly equal to third dorsal-

fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth to one-third of spine length.

Distribution. Currently known from off southwestern India [based on original description].

Remarks. *Ocosia ramaraoi* was originally described by Poss and Eschmeyer (1975) based on three specimens collected from Quilon coast, India, the species being known to date only from the type specimen.

***Ocosia sphex* Fricke 2017**

(English name: Bismarck Waspfish)

Ocosia sphex Fricke 2017: 3, figs. 1–2 (New Ireland Province, Papua New Guinea); Fricke et al. 2019: 105 (New Ireland Province, Papua New Guinea; listed).

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 26–27; supraocular spine present; parietal, nuchal, pterotic forming ridges with minute spines; spine on lateral surface of lacrimal and spine on suborbital ridge absent; third dorsal-fin spine longest, its length nearly equal to second dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth of spine length.

Distribution. Currently known from New Ireland Province, Papua New Guinea [based on original description].

Remarks. *Ocosia sphex* was originally described by Fricke (2017) based on single specimen collected from New Ireland Province, Papua New Guinea, the species being known to date only from the type specimen.

***Ocosia spinosa* Chen 1981**

(English name:-) (Figs. 39, 43; Table 17)

Ocosia spinosa Chen 1981: 41, figs. 4, 28 (type locality: Off Tung-kang, Taiwan); Poss 1999: 2308 (Taiwan); Poss in Randall and Lim 2000: 605 (South China Sea; listed); Mandrytsa 2001: 278 (Taiwan); Ho and Shao 2011: 40 (Taiwan; listed); Fricke 2017: 7 (Taiwan).

Material examined. 7 specimens, 30.2–101.8 mm SL. **JAPAN:** BSKU 51541, 72.0 mm SL, Tosa Bay, Kochi, 13 Apr. 2000; BSKU 77926, 30.2 mm SL, Tosa Bay, Kochi, 33°15'N, 133°36'E, 149–151 m depth; FAKU 1861, 76.5 mm SL, off Owase, Mie, 1 May 1936; FAKU 1887, 51.7 mm SL, off Owase, Mie, Japan, K. Matsubara, 27 May 1936; FAKU 3041, 69.9 mm SL, off Miya, Aichi, K. Matsubara, 7 Nov. 1937; KAUM-I. 133238, 70.4 mm SL, off Miya, Aichi, K. Matsubara, 7 Nov. 1937. **TAIWAN:** KAUM I. 43828, 101.8 mm SL, Tongkang, Pingtung.

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 15–18 (usually 17); supraocular spine present; parietal, nuchal, pterotic, posttemporal forming ridges with spines; spine on lateral surface of lacrimal and spine on suborbital ridge present (absent in large specimen); second dorsal-fin spine longest, nearly equal to third dorsal-fin spine, its length 19.5–26.5% (mean 23.4%) of SL; fourth dorsal-fin spine length 78.4–89.5% (83.0%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-fourth to one-third of spine length.

Distribution. Currently known from Taiwan and Japan [based on collected specimens (Fig. 43)].

Remarks. *Ocosia spinosa* was reported only from Taiwan. non-type specimens reported in this study represent the first record of the species out of type locality [based on collected specimens (Fig. 43)].

***Ocosia vespa* Jordan and Starks 1904**

(English name:-) (Figs. 40, 43; Table 18)

Ocosia vespa Jordan and Starks 1904: 162, fig. 17 (Sagami Bay, Japan); Shinohara and Williams 2006: 555 (Sagami Bay, Japan); Poss and Eschmeyer 1975: 4, fig. 3 (Sagami Bay, Japan); Nakabo in Masuda et al. 1984: 319 (Sagami Bay, Japan); Nakabo 2000: 600 (Sagami Bay southward to Kochi, Japan); Mandrytsa 2001: 278 (Sagami Bay, Japan); Shinohara et al. 2001: 314 (Tasa Bay, Japan; listed); Nakabo 2002: 600 (Sagami Bay southward to Kochi, Japan); Shao et al. 2008: 246 (Taiwan); Fricke 2017: 7 (Sagami Bay, Japan).

Holotype. USNM 50911, 37.8 mm SL, Sagami Bay, Japan, 73–91 m depth, dredged, VR *Albatross*.

Other materials. 30 specimens, 34.0–71.7 mm SL. **JAPAN:** BSKU 19067, 58.4 mm SL, off Shimokoshiki-jima island, Koshiki Islands, Kagoshima, 51°24'N, 129°37'E, 126 m, RV *Soyo-maru*, 8 Feb. 1959; BSKU 85819, 50.2 mm SL, Kuro-shima Bank, 34°40'N, 130°06'E, 133 m, 3 June 1996; FAKU 1882, 63.8 mm SL, FAKU 1888, 46.9 mm SL, KAUM–I. 133239, 56.2 mm SL, off Owase, Mie, 27 May 1936; FAKU 3040, 65.9 mm SL, FAKU 3046, 50.3 mm SL, off Miya, Aichi, 7 Nov. 1937; FAKU 4946, 51.3 mm SL, Kumano-nada, Mie, 16 Nov. 1937; NSMT-P 94549, 39.3 mm SL, Takase, Sagami Bay, Wakayama, 85 m, mono-coloured dredge, RV *Tensei-maru*, 13 Feb. 1978; NSMT-P 94698,

21 specimens, 34.0–45.7 mm SL, Izu-Oshima, Tokyo, 34°48.2'N to 34°48.4'N, 139°23.7'E to 139°23'E, 109–116 m, 2 m Beam trawl, RV *Tensei-maru*, 26 Oct. 1973.

Diagnosis. A species of *Ocosia* with the following combination of characters: papillae on upper and lower jaw; lateral-line pores 10–14 (usually 12); supraocular spine present; parietal, nuchal, pterotic, posttemporal forming ridges with spines; spine on lateral surface of lacrimal present, spine on suborbital ridge absent; second dorsal-fin spine longest, nearly equal to third dorsal-fin spine, its length 20.3–27.2% (mean 23.5%) of SL; fourth dorsal-fin spine length 79.5–100.4% (89.3%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) not incised.

Distribution. Currently known only from Japan [based on collected specimens (Fig. 43)].

Remarks. *Ocosia vespa* was originally described by Jordan and Starks (1904) based on four specimens collected from Sagami Bay, Japan, the species being known to date only from Taiwan and Japan. *Ocosia vespa* is easily distinguished from other congeners in having small papillae on upper and lower jaws and membrane of spinous portion of dorsal-fin not incised.

***Ocosia zaspilota* Poss and Eschmeyer 1975**

(English name: Polka Dot Waspfish, Bolinhas Waspfish) (Figs. 41, 43; Table 18)

Ocosia zaspilota Poss and Eschmeyer 1975: 9, figs. 2E, 7 (type locality: Batangas, Balayan Bay, Luzon Island, Batangas, Philippines); Poss 1999: 2325, unnumbered fig. (Batangas, Balayan Bay, Luzon Island, Batangas, Philippines); Mandrytsa 2001: 278 (Batangas, Balayan Bay, Luzon Island, Batangas, Philippines); Fricke 2017: 7 (Batangas, Balayan Bay, Luzon Island, Batangas, Philippines).

Holotype. CAS 33069, 69.5 mm SL, South of Barrio Salong, Balayan Bay, Batangas, Luzon Island, Batangas, Philippines, 13°48'11.58"N, 120°47'54.07"E, 229–247 m depth, trawl, J.E. Norton, 18 July 1966.

Paratypes. CAS 33321, 69.3 mm SL, CAS 33063, 59.0 mm SL, South of Barrio Salong, Balayan Bay, Batangas, Philippines, 13°48'11.58"N, 120°47'54.07"E, trawl, 208–219 m, J.E. Norton, 18 July 1966; CAS 33320, 46.4 mm SL, Pagapas Bay, Batangas, Philippines, 13°41'18.3"N, 120°59'43.68"E, 192–207 m, trawl, J.E. Norton, 21 July 1966.

Material examined. 14 specimens, 46.7–95.3 mm SL. **PHILIPPINES:** CAS 34024, 68.9 mm SL, Batangas Bay, Batangas; CAS 235825, 64.6 mm SL, between Luzon Island and Mindoro Island, 13°29'56"N to 14°00'52"N, 120°19'46" to 120°21'09"E, 190–201 m, beam trawl, the Philippines' Bureau of Fisheries and Aquatic Resources, 3 June 2011; MNHN 2005-1300, 4, 70.5–95.3 mm SL, Sibuyan, Luzon, 14°00'00"N, 120°16'58.8"E, 190–198 m, RV *Coriolis*, 2 June 1985; MNHN 2005-1280, 7, 46.7–83.7 mm SL, Sibuyan, Luzon, 14°01'01.2"N, 120°17'09.6"E, 188–195 m, RV *Coriolis*, 2 June 1985.

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 14–17 (usually 16); supraocular spine absent; parietal forming ridge with minute spine; nuchal, pterotic, posttemporal forming ridges without spines; spine on lateral surface of lacrimal and spine on suborbital ridge absent; second dorsal-fin spine longest, slightly longer than third dorsal-fin spine, its length 26.9–38.0% (31.7%) of SL; fourth dorsal-fin spine length 69.9–85.0% (76.1%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-third to half of spine length.

Distribution. Currently known from Batangas, Balayan Bay, Luzon Island, Batangas, Philippines [based on collected specimens (Fig. 43)].

Remarks. *Ocosia zaspilota* was originally described by Poss and Eschmeyer (1975) based on four specimens collected from Batangas, Balayan Bay, Luzon Island, Batangas, Philippines. Because additional specimens have never been reported, non-type specimens reported in this study represent the second record of the species. *Ocosia zaspilota* is easily distinguished from other congeners in having second and third dorsal-fin spines notably elongated including spine on lateral surface of lacrimal and spine on suborbital ridge absent.

***Ocosia* sp.**

(Figs. 42, 43; Table 18)

Material examined. 53 specimens, 26.8–128.2 mm SL. **AUSTRALIA:** QM I. 21499, 2, 86.7–87.5 mm SL, Swain Reefs, Queensland, 22°00'S, 153°31'E, 270 m depth, trawl, 1 Jan. 1983; QM I. 23903, 76.5 mm SL, Swain Reefs, 22°57'S, 153°25'E, 330 m, trawl; QM I. 34221, 48.9 mm SL, Cape Moreton, Queensland, 26°51'S, 153°36'E, 140 m, trawl; QM I. 34263, 45.6 mm SL, Caloundra, Queensland, 26°48'00"S, 153°36'60"E, 165 m, trawl, Queensland Fisheries Services, 17 July 2002. **NEW CALEDONIA:** MNHN 2002-1301, 2, 91.7–98.0 mm SL, Chesterfield Island, 23°09'00"S, 159°31'01.2"E, 280 m, RV *Coriolis*, 11 Oct. 1986; MNHN 2002-3244, 2, 104.4–110.4 mm SL, Chesterfield Island, 25°09'00"S, 159°55'01.2"E, 295 m, RV *Coriolis*, 7 Oct. 1986; MNHN 2003-1825, 2, 44.5–45.9 mm SL, 19°07'01.2"S, 163°28'58.8"E, 215 m, RV *Vauban*, 19 Sep. 1985; MNHN 2003-1836, 2, 108.2–127.2 mm SL, Chesterfield Island, 22°16'58.8"S, 159°25'01.2"E, 315–320 m, RV *Coriolis*, 12 Oct. 1986; MNHN 2003-1837, 37 mm SL, Chesterfield Island, 22°25'01.2"S, 159°13'01.2"E, 315 m, RV *Coriolis*, 13 Oct. 1986; MNHN 2003-1849, 31.1 mm SL, 22°39'00"S, 167°07'58.8"E, 215 m, RV *Vauban*, 28 Sep. 1985; MNHN 2003-1851, 110.7 mm SL, Chesterfield Island, 22°25'01.2"S, 159°24'00"E, 330 m, RV *Coriolis*, 13 Oct. 1986;

MNHN 2003-1853, 3, 102.2–128.2 mm SL, MNHN 2010-0521, 2, 29.7–40.0 mm SL, 19°07'01.2''S, 163°28'58.8''E, 215 m, RV *Vauban*, 19 Sep. 1985; MNHN 2011-0164, 3, 33.1–47.6 mm SL, 23°22'44.4''S, 168°01'58.8''E, 240 m, RV *Coriolis*, 1 Nov. 2003; MNHN 2014-1022, 8, 26.8–43.4 mm SL, 18°30'43.1964''S, 163°06'09.6''E, 240 m, RV *Alis*, 7 May 2008; MNHN 2014-2243, 4, 57.0–65.1 mm SL, Chesterfield Island, Coral Sea, 19°42'40.7''S, 158°26'28.5''E, 225–239 m, RV *Alis*, 17 Oct. 2005; MNHN 2014-2353, 3, 87.8–103.8 mm SL, Chesterfield Island, 22°45'49.2''S, 159°20'19.2''E, 315–325 m, RV *Alis*, 9 Oct. 2005; MNHN 2014-2488, 106.8 mm SL, Chesterfield Island, Coral Sea, 22°17'17.6''S, 159°25'16.6''E, 323–331 m, RV *Alis*, 10 Oct. 2005; MNHN 2014-2577, 100.9 mm SL, Chesterfield Island, 24°43'42''S, 159°41'30.6''E, 285–545 m, RV *Alis*, 6 Oct. 2005; MNHN 2014-2606, 12, 62.4–119.0 mm SL, Chesterfield Island, 22°20'04.2''S, 159°24'18''E, 320–315 m, RV *Alis*, 10 Oct. 2005

Diagnosis. A species of *Ocosia* with the following combination of characters: no papillae on premaxillary; lateral-line pores 16–19 (usually 17); supraocular spine present; parietal, nuchal, pterotic, posttemporal forming ridges with spines; spine on lateral surface of lacrimal and spine on suborbital ridge present; second dorsal-fin spine longest, slightly longer than third dorsal-fin spine, its length 27.9–42.8% (34.2%) of SL; fourth dorsal-fin spine length 75.5–96.5% (87.1%) of third dorsal-fin spine length; membrane of spinous portion of dorsal fin (at middle of spinous dorsal) incised for about one-third of spine length.

Distribution. Currently known from Queensland, Australia [based on collected specimens (Fig. 43)].

Remarks. *Ocosia* sp. was collected from Queensland, Australia. It is similar to *O. apia* in having spine on lateral surface of lacrimal and spine on suborbital ridge but it differs from the latter in having second and third dorsal-fin spine nearly equal in length (vs. second dorsal-fin spine remarkably elongated than third dorsal-fin spine, in the latter) and second dorsal-fin

spine not remarkably elongated than fourth dorsal-fin spine (vs. second dorsal-fin spine remarkably elongated than fourth dorsal-fin spine).

Genus *Paracentropogon* Bleeker 1876b

Paracentropogon Bleeker 1876b: 5, 66 (type species: *Apistus longispinis* Cuvier 1829, by original designation).

Hypodytes Gistel 1848 (type species: *Apistus alatus*).

Daia Ogilby 1903: 9 (type species: *Centropogon indicus* Day 1875).

Diagnosis. A genus of the family Tetraogidae with the following combination of characters: XIV–XV, 6–7 dorsal-fin rays; its origin distinctly anterior to posterior margin of orbit; dorsal fin continuous, anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 4 pelvic-fin rays; III, 4–5 anal-fin rays; 10–11 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, straight; orbit diameter 10.9–13.7% of SL; nape flattened; cleithral spine absent; body covered with small, embedded, cycloid scales; lack of cirri, papillae and tentacles on body; mouth large, its length 30.4–38.9% of HL, small conical teeth on palatines; lateral line well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length; caudal depth narrow, its depth 2.8–4.1 in body depth. Head lack of scales; body and fins without scales, tentacles, cirri or skin flaps. Lateral line complete, continuous, extending from above upper end of gill opening to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube

associated with each lateral-line pore normally directed upward; lateral line well separated from dorsal-fin base.

Head profile angular, pointed, with concavity in front of eyes. Two pairs of nasal openings, subequal in diameter; anterior nostril tubular with skin flaps; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 2.9–3.5 in head length. Snout slightly short. Bony rim of orbit forming shallow ridge, supraocular tentacle present. Ascending process of premaxilla weakly developed. Interorbital space narrow, its length 1.6–2.6 in orbit diameter; Interorbital ridges developed, converging at the horizontal level of orbit and diverging posteriorly; each ending with a tentacle in front of dorsal-fin spine origin; median interorbital ridge absent. Nasal spines absent. Nuchal, pterotic and posttemporal forming ridge without spines; supracleithral spine absent. Suborbital ridge moderately developed, lack of spines; connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip of uppermost spine reaching to opercular margin; lowermost spine progressive shorter, lowermost spine hidden under skin. Opercle with smooth V-shaped crests, without spines. Upper end of gill opening reaching to horizontal line through middle of eye. Cleithral spine absent. Lacrimal with 2 broad, simple spines; anterior lacrimal spine shorter, directed posteroventrally; posterior lacrimal spine long, directed backward, its posterior tip reaching to (or almost reaching to) posterior margin of orbit. Mouth large, its length 2.6–3.3 in head length, terminal, oblique; posterior margin of maxilla short of vertical through middle of pupil. Bands of villiform teeth on jaws, vomer and palatine. Lips thick; symphyseal knob minute, hidden under thick skin. No slit behind last gill arch; gill rakers 7–10, short, tubercular.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin anterior to posterior margin of orbit, first dorsal-fin spine shortest, its length 1.5–

2.9 in second spine length; second and third spines subequal in length; last dorsal-fin spine subequal to first dorsal-fin soft ray. Membranes of last dorsal-fin ray posteriorly connected to dorsal edge of body, but not extending onto basis of caudal fin. Anal-fin base short, its length 3.4–4.9 in dorsal-fin base length; first anal-fin spine shortest, its origin level with vertical through last dorsal-fin spine base; third anal-fin spine longest, its length slightly longer than second anal-fin spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, without free rays; fin origin level with vertical through fifth dorsal-fin spine base; moderate in size, its length 1.0–1.4 in in head length; posterior tip of fin reaching to (or beyond) vertical through anal-fin origin; posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.1–1.5 in pectoral-fin length, posterior tip of depressed fin reaching to (or beyond) anus; its origin level with vertical through lower end of pectoral-fin base; half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.0–1.2 in pectoral fin length; posterior margin of fin rounded.

Remarks. *Paracentropogon longispinis* was originally described by Cuvier (1829) as a species of *Apistus* on the basis of having head profile angular, spines on lacrimal and preopercle, membrane of last dorsal-fin soft ray not connected to caudal fin. Subsequently, Bleeker (1876b) placed the species in his new genus, *Paracentropogon*, on the basis of having dorsal fin origin above orbit, dorsal-fin membrane not united with caudal fin, head oblique, teeth on palatine.

Key to the species of *Paracentropogon*.

1a. Membrane between second and third dorsal-fin spines deeply incised, more than two-third of spine length ; only uppermost preopercular spines protruding *P. rubipinnis*

- 1b. Membrane between second and third dorsal-fin spines incised about half to less than half of spine length; 5 preopercular spine, uppermost long and protruding, lower four spines small, protruding 2
- 2a. Dorsal-fin spines XV, pectoral-fin rays 11 *P. zonatus*
- 2b. Dorsal-fin spines XIV–XV (usually XIV), pectoral-fin rays 10 3
- 3a. Membrane between third and fourth dorsal-fin spines incised about two-third of spine length, second dorsal-fin spine length 16.0–25.2% (mean 20.8%) of SL, third dorsal-fin spine length 19.9–24.4% (22.4%) of SL *P. vespa*
- 3b. Membrane between third and fourth dorsal-fin spines incised about half of spine length, second dorsal-fin spine length 22.7–30.9% (26.2%) of SL, third dorsal-fin spine length 21.5–32.0% (26.4%) of SL *P. longispinis*

***Paracentropogon longispinis* (Cuvier 1829)**

(English name: Long-spine Waspfish, Wispy Waspfish, Whiteface Roguefish, Whiteface Waspfish) (Figs. 44, 47; Table 19)

Apistus longispinis Cuvier in Cuvier and Valenciennes 1829: 408 (type locality: Ambon Island, Molucca Islands, Indonesia); Bleeker 1876b: 67 (Ambon Island, Molucca Islands, Indonesia); Blanc and Hureau 1968: 6 (Ambon Island, Molucca Islands, Indonesia; listed); Paepke and Fricke 1992: 268 (Ambon Island, Molucca Islands, Indonesia; listed).

Scorpaena spinosa Gmelin (ex Linck) 1789: 1220 (type locality: locality unknown) (possibly Indonesia).

Apistus bougainvillii Cuvier in Cuvier and Valenciennes 1829: 411 (type locality: Unknown); Blanc and Hureau 1968: 5–6 (Unknown; listed); Kottelat 2013: 315 (Unknown; listed).

Apistus fuscovirens Cuvier (ex Quoy and Gaimard) in Cuvier and Valenciennes 1829: 409 (type locality: Ambon Island, Molucca Islands, Indonesia); Bleeker 1876b: 68 (Ambon Island, Molucca Islands, Indonesia); Kottelat 2013: 315 (Ambon Island, Molucca Islands, Indonesia; listed).

Apistus multicolor Richardson 1848: 3, pl. 4, figs. 3–4 (type locality: Sea of China); Bleeker 1876b: 68 (Sea of China); Kottelat 2013: 315 (Sea of China; listed).

Apistus hypselopterus Bleeker 1851: 238 (type locality: Banda Neira, Banda Islands, Indonesia); Bleeker 1876b: 68 (Banda Neira, Banda Islands, Indonesia); Kottelat 2013: 315 (Banda Neira, Banda Islands, Indonesia; listed).

Apistus leucoprosopos Bleeker 1856: 35 (type locality: Ambon Island, Molucca Islands, Indonesia); Bleeker 1876b: 69 (Ambon Island, Molucca Islands, Indonesia); de Beaufort and Briggs 1962: 83 (Ambon Island, Molucca Islands, Indonesia); Kottelat 2013: 315 (Ambon Island, Molucca Islands, Indonesia; listed).

Centropogon indicus Day 1875: 155, pl. 38, fig. 2 (type locality: Madras, India); Menon and Yazdani 1968: 154 (Madras, India); Whitehead and Talwar 1976: 159 (Madras, India); Kottelat 2013: 315 (Madras, India; listed).

Tetraroge bougainvillii: Sauvage 1878: 133 (locality unknown).

Paracentropogon indicus: Jordan and Richardson 1910: 52 (Philippines; listed)

Paracentropogon longispinis: Jordan and Richardson 1910: 52 (Philippines; listed); de Beaufort and Briggs 1962: 80, fig. 20 (Singapore, Indonesia, Philippines, China); Poss 1999: 2325, unnumbered fig. (India, Taiwan to China, south to Indonesia and Philippines, New Caledonia); Poss in Randall and Lim 2000: 605 (South China Sea; listed); Kimura and Peristiwady in Matsuura and Peristiwady 2000: 177 (Lombok, Indonesia); Hutchins 2001: 27 (Western Australia, Australia; listed); Allen and Adrim 2003: 29 (Moluccas to Sumatra, Indonesia); Kimura et al. in Kimura and Matsuura 2003: 38 (Bitung, Sulawesi, Indonesia);

Randall 2005: 129 (New Caledonia); Allen et al. 2006: 901 (North Western Australia, Territory, Queensland, Australia; listed); Shao et al. 2008: 246 (Taiwan); Fricke et al. 2011: 380 (New Caledonia; listed); Allen and Erdmann 2012: 247, 3 unnumber figs. (Indonesia, Philippines, Taiwan, China); Larson et al. 2013: 84 (Northern Territory, Australia; listed); Kottelat 2013: 315 (Ambon Island, Molucca Islands, Indonesia; listed); Motomura et al. 2017: 69 (Panay Island, Philippines).

Paracentropogon longispinus [sic]: Paxton et al. 1989: 446 (Ambon Island, Molucca Islands, Indonesia; listed).

Syntype. ZMB 810, syntype of *A. longispinis*, 52.8 mm SL, Ambon Island, Molucca Islands, Indonesia; ZSI F1734, holotype of *C. indicus*, Madras, India.

Material examined. 9 specimens, 24.6–70.5 mm SL. **INDONESIA:** FRLM 15745, 25.3 mm SL, FRLM 20344, 24.6 mm SL, Gerupuk, Lombok; FRLM 35715, 70.5 mm SL, FRLM 35716, 69.3 mm SL, Ambon bay, Tanjung Tiram, Ambon, Maluku; FRLM 35730, 65.1 mm SL, FRLM 35731, 64.4 mm SL, Ambon bay, Halong Baru, Ambon, Maluku; FRLM 50309, 58.4 mm SL, Kotania Bay, Seram, Maluku. **PHILIPPINES:** KAUM–I. 80615, 52.6 mm SL, Oton, Panay Island. **SINGAPORE:** KAUM–I. 132445, 68.0 mm SL, South China Sea, 01°13.2'N, 103°51.2'E, 0–1 m depth, seine net, K Irsayd et al, 9 Aug 2019.

Diagnosis. A species of *Paracentropogon* with the following combination of characters: XIV–XV, 6–7 (usually XIV, 7) dorsal-fin rays; 10 pectoral-fin rays; membrane between second and third dorsal-fin spines incised about one-third of spine length; membrane between third and fourth dorsal-fin spines incised about half of spine length; second dorsal-fin spine length 22.7–30.9% (26.2%) of SL, third dorsal-fin spine length 21.5–32.0% (26.4%) of SL; 5 preopercular spines protrude, uppermost long, lower four spines small and protrude.

Distribution. Currently known only from Singapore, Indonesia, and Philippines [based on collected specimens (Fig. 47)].

Remarks. *Paracentropogon longispinis* was originally described as *Scorpaena spinosa* by Gmelin (1789) based on “*Scorpaena, capite spinoso*” of Linck’s (1783) description. Since it was unused senior synonym of *A. longispinis*, *S. spinosa* was regarded as *nomen oblatum* (Frick et al. 2020).

Apistus bougainvillii and *A. fuscovirens* were originally described by Cuvier in Cuvier and Valenciennes (1829) based on the specimens collected from unknown location and Ambon Island, Molucca Islands, Indonesia, respectively. Although both species have been originally treated as different species, Bleeker (1876b) revised and recognized that they were junior synonyms of *A. longispinis*, including corrected the number of pelvic-fin rays from I, 5 to I, 4. Both species are regarding here as junior synonyms of *P. longispinis*.

Richardson (1848) described *A. multicolor* based on two specimens collected from Sea of China. Although whereabouts of syntypes have never been stated, Richardson’s (1848) description and illustration agreed well with original description of *P. longispinis* (Cuvier 1829), *A. multicolor* considered here as *P. longispinis*.

Apistus hypselopterus was originally described by Bleeker (1851) based on the specimen collected from Banda Neira, Banda Islands, Indonesia. *Apistus leucoprosopos* was also originally described by Bleeker (1856) based on a single specimen collected from Ambon Island, Molucca Islands, Indonesia. According to type specimens were deposited at Naturalis Biodiversity Center, Leiden, the Netherlands, has long been inaccessible due to building renovations, the specimens were unavailable for the present study. However, *A. hypselopterus* is questionably here a synonym of *P. longispinis* because Bleeker’s (1851) description indicated different characters of *A. hypselopterus* viz., pectoral-fin rays 12 (vs. 10, in *P. longispinis*) and lacking of cirri (vs. cirri on head). de Beaufort and Briggs’s (1962)

description and Bleeker's (1877) illustration of *A. leucoprosopos* also different from *P. longispinis* in having first dorsal-fin spine more than half length of second spine (vs. first dorsal-fin spine not more than half length of second spine, in the latter), second dorsal-fin spine longest (vs. second spine subequal to third spine length), membrane of spinous portion of dorsal-fin not incised (vs. membrane of spinous portion of dorsal-fin deeply incised, see Bleeker 1877). However, the type specimens should be further examined.

Centropogon indicus was originally described by Day (1875) on the basis of single specimen collected from Madras, India. Although the holotype deposited at Zoological Survey of India, Kolkata, India, is not in a good condition (Fig. 44c), Day's (1875) description and illustration indicated that the specimen agreed well with original description of *P. longispinis* (Cuvier 1829) and the specimens considered here as *P. longispinis*.

***Paracentropogon rubripinnis* (Temminck and Schlegel 1843)**

(English name: Redfin Velvetfish) (Figs. 45, 47; Table 19)

Apistus rubripinnis Temminck and Schlegel 1843: 49, pl. 22, fig. 2 (type locality: Nagasaki, Japan); Boeseman 1947: 59 (Nagasaki, Japan); Paepke and Fricke 1992: 276 (Nagasaki, Japan; listed); Paepke 2001: 331 (Nagasaki, Japan).

Tetraroge longispinis nuda var. Günther 1880: 66 (type locality: Kobe, Japan).

Hypodytes rubripinnis: Nakabo in Masuda et al. 1984: 319 pl. 285-F (southern Japan); Motomura and Iwatsuki 1997: 132 (Miyazaki, Japan); Nakabo 2000: 600 (southern Japan and souther Korea); Shinohara et al. 2000: 177 (Ishima Island, Tokushima, Japan); Shimizu 2001: 26 (Iyo City, Ehime, Japan); Nakabo 2002: 600 (southern Japan and Souther Korea); Kwun et al. 2017: 141 (Jeju Island, Korea; listed).

Paracentropogon rubripinnis: Mandrytsa 2001: 277 (Nagasaki, Japan); Ogihara and Motomura 2012: 142, figs. 4-5 (Kagoshima, Japan); Sonoyama et al. 2020: 46 (Yamaguchi, Japan).

Material examined. 12 specimens, 33.6–72.7 mm SL. **Japan:** KAUM–I. 1361, 49.07 mm SL, Off east of Sakinoyama, Kataura, Kasasa, Minamisatsuma, Kagoshima, Japan, 31°25.4'N, 130°11.5'E, 27 m depth, set net, M Ito, 12 Dec. 2006; KAUM–I. 5963, 43.2 mm SL, Ibusuki, Kagoshima, 31°16.4'N, 130°40.2'E, 25 m, set net, Orita fishery, 8 Aug. 2007; KAUM–I. 21120, 72.7 mm SL, KAUM–I. 21134, 57.0 mm SL, Yatsushiro Bay, Nagashima, Kagoshima, 32°13.23'N, 130°10.32'E, 12 m, hand net, G. Ogihara and S. Dewa, 30 June 2009; KAUM–I. 21122, 67.7 mm SL, Off Shoura, Nagashima, Kagoshima, 32°13.23'N, 130°10.32'E, 12 m, hand net, G. Ogihara and S. Dewa, 30 June 2009; KAUM–I. 22773, 48.8 mm SL, Kasasa, Kagoshima, 31°25.44'N, 130°11.49'E, 27 m, set net, M. Ito, 29 May 2009; KAUM–I. 99265, 33.6 mm SL, Uchinoura Bay, Kimotsuki, Kimotsuki-gun, Kagoshima, 31°17'N, 131°05'E, 30–35 m, set net, M. Ryohei et al., 14 Apr. 2017; KAUM–I. 99947, 50.2 mm SL, off east of Sakinoyama, Kataura, Kasasa, Minamisatsuma, Kagoshima, 31°25.44'N, 130°11.49'E, 27 m, set net, M. Ryohei et al., 15 May 2017; KAUM–I. 112913, 43.7 mm SL, Uchinoura Bay, Kimotsuki, Kimotsuki-gun, Kagoshima, Japan, 31°17'N, 31°17'N, 30–35 m, set net, K. Koeda et al., 22 Feb. 2018; KAUM–I. 115740, 40.7 mm SL, Uchinoura Bay, Kimotsuki, Kimotsuki-gun, Kagoshima, 31°16.55'N, 131°04.49'E, 30–35 m, set net, M. Yamada, 25 May 2017; KAUM–I. 131457, 45.7 mm SL, KAUM–I. 131459, 47.3 mm SL, off east of Sakinoyama, Kataura, Kasasa, Minamisatsuma, Kagoshima, 31°25.44'N, 130°11.49'E, 27 m, set net, M. Itou, 25 May 2019; KAUM–I. 151038, 54.4 mm SL, Haruno Port, Haruno, Kochi, Kochi, 33°28.08'N, 133°30.19'E, 1 m, hand net, M. Matsunuma, 10 June 2017.

Diagnosis. A species of *Paracentropogon* with the following combination of characters: XIV–XV, 6–7 (usually XIV, 7) dorsal-fin rays; 10–11 (11) pectoral-fin rays; membrane between second to fifth dorsal-fin spines deeply incised, more than two-third of spine length, second dorsal-fin spine length 17.3–32.7% (mean 22.9%) of SL, third dorsal-fin spine length 18.5–32.2% (23.7%) of SL; uppermost preopercular spines protrude, lower four spines short and hidden under skin.

Distribution. Currently known only from Japan [based on collected specimens (Fig. 47)].

Remarks. *Paracentropogon rubripinnis* was originally described by Temminck and Schlegel (1843), based on seven specimens collected from Nagasaki, Japan, deposit at Burger and Von Siebold's fish collection, as a species of *Apistus*. Boeseman (1947) revised the collection and designated specimen number 716a as a lectotype and others six specimens became paralectotypes. The examination of paralectotype number ZMB 815 (42.3 mm SL) represented that the specimen belongs to *Minous pusillus* (Fig. 45a).

According to others type specimens were deposited at Naturalis Biodiversity Center, Leiden, the Netherlands, has long been inaccessible due to building renovations, the specimens were unavailable for the present study. However, original description and illustration of *A. rubripinnis* agrees well with specimens considered here as *P. rubripinnis* in having XIV, 7 dorsal-fin rays; III, 4 anal-fin rays; 11 pectoral-fin rays; I, 4 pelvic-fin rays; tip of posterior lacrimal spine reaching to posterior margin of orbit; teeth on palatines; dorsal fin continuous, dorsal-fin spine origin anterior to posterior margin of orbit; a dark blotch on sixth to ninth dorsal-fin membrane.

Although Gistel (1848) proposed *Hypodytes* as a replacement for *Apistes* Cuvier 1829, *Hypodytes* has been treated as junior synonym of *Apistus* Cuvier 1829 (Jordan 1919).

Paracentropogon rubripinnis is easily distinguished from other congeners in having membrane of spinous portion of dorsal-fin extremely incised.

***Paracentropogon vespa* Ogilby 1910**

(English name: Wasp Roguefish, Spot-fin Waspfish) (Figs. 46, 47; Table 20)

Paracentropogon vespa Ogilby 1910: 116 (type locality: off Cape Capricorn, Queensland, Australia); McCulloch 1929: 388 (off Cape Capricorn, Queensland, Australia; listed).

Paracentropogon vespa livingstonei Whitley 1933: 94, pl. 13, fig. 1 (type locality: between Broome and Cape Bossutt, Western Australia, Australia); Paxton et al. 1989: 446 (between Broome and Cape Bossutt, Western Australia, Australia; listed); Allen et al. 2006: 901, 3 unnumbered figs. (Sulawesi, Indonesia; listed).

Paracentropogon vespa Ogilby 1910: Allen and Swainston 1988: 48 (north-western Australia); Paxton et al. 1989: 446 (North territory, Queensland, Western Australia, Australia; listed); Allen 1997: 76, fig. 14 (north Australia); Hutchins 2001: 27 (Western Australia, Australia; listed); Allen et al. 2006: 901 (North territory, Queensland, Western Australia, Australia; listed).

Holotypes. AMS IA. 4236, holotype of *Paracentropogon vespa livingstonei*, 59.0 mm SL, Between Broome and Cape Bossutt, Western Australia, Australia, A.A. Livingstone; AMS E. 2932, holotype of *Paracentropogon vespa*, 66.9 mm SL, Cape Capricorn, Queensland, Australia, 24 m depth, trawl;

Material examined. 4 specimens, 30.4–73.2 mm SL. **AUSTRALIA:** QM I. 35818, 30.4 mm SL, Gloucester Island, Queensland, 19°56'01"S, 148°39'09"E, dredge, 7 Dec. 1903;

QM I. 35951, 73.2 mm SL, Cape Bowling Green, Queensland, 19°24'03"S, 147°41'01"E, 25 m, dredge, 24 Nov. 2003; QM I. 37374, 2 specimens, 47.0–52.7 mm SL, Princess Charlotte Bay, Queensland, 14°20'07"S, 144°02'07"E, 9 m, dredge, 20 Jan. 2005.

Diagnosis. A species of *Paracentropogon* with the following combination of characters: XIV, 7 dorsal-fin rays; 10 pectoral-fin rays; membrane between second and third dorsal-fin spines incised about half of spine length; membrane between third and fourth dorsal-fin spines incised about two-third of spine length; second dorsal-fin spine length 16.0–25.2% (mean 20.8%) of SL, third dorsal-fin spine length 19.9–24.4% (22.4%) of SL; 5 preopercular spine protrude, uppermost longest, lower four spines small.

Distribution. Currently known only from Australia [based on collected specimens (Fig. 47)].

Remarks. *Paracentropogon vespa* resemble to *P. longispinnis* in sharing XIV–XV, 6–7 (usually XIV, 7) dorsal-fin rays; 3–5 (4) anal-fin soft rays; 10 pectoral-fin rays; body oblong; long supraocular tentacles and tentacles on posterior end of interorbital ridge present. However, it can be distinguished from the latter in having shorter dorsal-fin spines, and membrane of spinous portion of dorsal-fin deeper incised.

***Paracentropogon zonatus* (Weber 1913)**

(English name: Bandtail Waspfish)

Prosopodasys zonatus Weber 1913: 502, pl. 10, fig. 8 (type locality: Sarasa Island, Postillon Islands and North Ubian, Sulu Archipelago, Philippines); Nijssen et al. 1982: 82 (Sarasa Island, Postillon Islands and North Ubian, Sulu Archipelago, Philippines; listed).

Paracentropogon zonatus (Weber 1913): de Beaufort and Briggs 1962: 82 (Postillion Islands, Sulu Archipelago, Philippines); Poss 1999: 2308 (key only); Allen and Erdmann 2012: 248, 2 unnumbered figs. (Raja Ampat Islands, West Papua, Indonesia and Philippines).

Diagnosis. A species of *Paracentropogon* with the following combination of characters: XV, 6 dorsal-fin rays; 11 pectoral-fin rays; membrane between second and third dorsal-fin spines incised about half to less than half of spine length; 5 preopercular spine protrude, uppermost longest, lower four spines small.

Distribution. Currently known only from Philippines and Papua New Guinea [based on original description; Allen and Erdmann (2012)].

Remarks. *Paracentropogon zonatus* was originally described by Weber (1913) based on two specimens collected from Philippines, as a species of *Prosopodasys* on the basis of having few numbers of pectoral-fin rays, a long moveable spine on infraorbital bone, and spines on preopercle. De Beaufort and Briggs (1962) commented that the species was similar to *P. longispinis*, but differed in having anterior lacrimal spine directed downward (vs. directed backward, in the latter), head profile blunter, and color pattern. The species was treated as a valid species of *Paracentropogon* (de Beaufort and Briggs 1962, Poss1999).

Genus *Pseudovespicula* Mandrytsa 2001

Pseudovespicula Mandrytsa 2001: 263 (type species: *Apistus dracaena* Cuvier in Cuvier and Valenciennes 1829, by original designation and monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XII–XIV, 6–8 dorsal-fin rays; its origin distinctly anterior to preopercular margin;

dorsal fin continuous with deeply incised membrane between third and fourth dorsal-fin spines (almost to dorsal-fin base); membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 5–6 anal-fin rays; 11–14 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, slightly straight; orbit diameter 11.1–14.5% of SL; nape flattened; cleithral spine absent; body covered with small embedded cycloid scales; lack of cirri, papillae and tentacles on head and body (head with cirri in *Pseudovespicula cypho*); mouth large, its length 38.3–51.9% of HL, small conical teeth on palatines; lateral line well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Body covered with small, non-imbricated, embedded cycloid scales; lack of scale on anterior basis of pectoral and pelvic fins. Lateral line complete, continuous, extending from above supracleithral spine to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed downward; lateral line well separated from dorsal-fin base.

Snout profile oblique. Two pairs of small nasal openings, subequal in diameter, anterior nostril tubular with moderated raised rim, posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Mouth large, terminal, oblique; lower jaw slightly protruding anteriorly; posterior margin of maxilla reaching to (or beyond) vertical through middle of pupil. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick. Eye small, orbit diameter 3.0–3.6 in head length. Snout short, its length shorter than orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla weakly developed. Interorbital region narrow, its width 1.9–2.7 in orbit diameter. Interorbital ridges scarcely developed, median interorbital ridge absent. Lacrimal with 2 sharp spines; anterior lacrimal spine short, directed posteroventrally; posterior spine longer, direct backward, its

posterior tip reaching to (or short of) vertical through middle of orbit. Preopercle with 5 simple spines; uppermost sharp and longest, its tip reaching to posterior margin of opercle. Opercle with smooth V-shaped crests. Cleithral spine absent. Tip of gill opening reaching to horizontal line through dorsal margin of eye but short of dorsal-fin base. Slit behind last gill arch close; gill rakers short, tuberculated.

Dorsal fin continuous, without notch between spinous and soft dorsal, origin of first dorsal fin vertical through posterior margin of orbit; dorsal-fin spines not different in lengths, first dorsal-fin spine shortest, second spine subequal to third spine, their length 0.6–0.9 in fourth spine length; penultimate and last spine subequal in length, slightly shorter than first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised; membrane between fourth to sixth spine about half of the length, membrane from sixth to last spine incised about one-third of the length; dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin, posterior margin of fin rounded. Anal-fin base short, its length 3.2–4.0 in dorsal-fin base length. Origin of anal fin anterior to penultimate dorsal-fin spine base; first anal-fin spine shortest, 1.3–1.6 in second spine length; third anal-fin spine longest, 0.8–0.9 in second spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly adnate to caudal peduncle but not extending to caudal-fin base; posterior margin of fin rounded. Pectoral fin without free rays; fin origin anterior to fourth dorsal-fin spine base; moderate in size, its length slightly longer than head length; posterior tip of fin beyond vertical through anal-fin origin, posterior margin of fin rounded. Pelvic fin moderate, second soft ray longest, 1.3–1.6 in pectoral-fin length, posterior tip of depressed fin not reaching to anus; its origin level with vertical through lower end of pectoral-fin base; half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 1.1–1.4 in pectoral-fin length; posterior margin of fin rounded.

Color of preserved specimens: Head and body uniformly light brown or brown; dorsal, anal, and caudal fins light brown or brown with reticulated dark pattern, pectoral and pelvic fin uniformly dark brown.

Taxonomic status of *Vespicula* and *Pseudovespicula*.

Vespicula was originally proposed by Jordan and Richardson (1910) as a new monotypic genus for *Prosopodasys gogorzae* Jordan and Seale 1905, originally described on the basis of a single specimen from the Philippines. Jordan and Richardson (1910) also distinguished *Vespicula* from *Prosopodasys* Cantor 1849 on the basis of the dorsal fin with the three anteriormost spines forming an almost completely separated fin (vs. not forming a separate fin in the latter). Recently, Mandrytsa (2001) regarded *Prosopodasys* as an objective synonym of *Apistus* Cuvier 1829 (Apistidae). Previously, Dor (1984) and Randall (1995) had treated *Apistus bottae* Sauvage 1878 and *Apistus dracaena* Cuvier 1829 as members of *Vespicula*, and Poss (1999) had included *Prosopodasys cypho* Fowler 1938 (type locality: Philippines), *Apistes depressifrons* Richardson 1848 (Japan), *Apistus trachinoides* Cuvier 1829 (Indonesia), and *Apistus zollingeri* Bleeker 1848 (Indonesia) in the genus *Vespicula*. Due to *A. depressifrons*, *A. dracaena*, and *A. trachinoides* being recently placed into three monotypic genera, *Neovespicula*, *Pseudovespicula*, and *Trichosomus*, respectively (Mandrytsa 2001; Kottelat 2013), and *V. bottae* and *V. gogorzae* being regarded as junior synonyms of *Trichosomus trachinoides* (Kottelat 2013; this study), only two species, *V. cypho* and *V. zollingeri*, are currently regarded as members of *Vespicula*.

Pseudovespicula was proposed by Mandrytsa (2001) for *A. dracaena* following comparison with *A. trachinoides*, which he regarded as belonging to *Vespicula* (but later placed in *Trichosomus* – see above). Although Mandrytsa (2001) did not compare *P. dracaena* with either *V. cypho* or *V. zollingeri*, the three species are herein regarded as belonging to a single genus due to their sharing the following major generic characters:

dorsal-fin membrane between third and fourth spines deeply incised, forming a nearly separate fin; dorsal-fin origin directly above posterior margin of orbit; 5 pelvic-fin soft rays; pectoral-fin rays not detached; body with small cycloid scales, without cirri or papillae; lateral line well separated from dorsal-fin base; teeth on palatine; head profile oblique, straight; and nape flattened.

Because *P. gogorzae*, the type species of *Vespicula*, has been regarded as a junior synonym of *Trichosomus trachinoides*, *Vespicula* is considered a junior synonym of *Trichosomus*. Therefore, *V. cypho* and *V. zollingeri* are regarded herein as species of *Pseudovespacula*.

Key to the species of *Pseudovespacula*.

- 1a. Pectoral-fin rays 11*P. zollingeri*
- 1b. Pectoral-fin rays more than 112
- 2a. XIII–XIV, 6–7 (usually XIV, 6) dorsal-fin spines; head profile convex; cirri on head and eye; scales on preopercle; 4 preopercular spines protruding; symphyseal knob present; parietal, nuchal, pterotic, posttemporal forming shallow ridge without spines; supracleithral spine minute; upper-jaw 46.5–51.9% (48.9%) of HL; body depth 32.1–36.3% (33.6%) of SL *P. cypho*
- 2b. XII–XIII, 6–7 (XII,7) dorsal-fin spines; head profile straight; head without cirri or scales; 1 preopercular spines protruding, lower blunt and hidden under skin; symphyseal knob absent; parietal, nuchal, pterotic, posttemporal not forming ridge; supracleithral spine absent; upper-jaw 35.7–42.3% (39.6%) of HL; body depth 34.4–41.9% (37.8%) of SL ... *P. dracaena*

***Pseudovespacula cypho* (Fowler 1938)**

(English name: Hunchbacked Goblinfish) (Figs. 48, 50, Table 20)

Prosopodasys cypho Fowler 1938: 86, fig. 39 (type locality: Davao, Mindanao Island, Philippines).

Vespacula cypho: Poss 1999: 2351 unnumbered fig. (Davao, Mindanao Island, Philippines).

Holotypes. USNM 98902, holotype of *Prosopodasys cypho*, 32.0 mm SL, Davao, Mindanao Island, Philippines.

Other materials. 4 specimens, 38.3–47.1 mm SL. **PAPUA NEW GUINEA:** CSIRO A160, 47.1 mm SL, 08°04'S, 148°02'E. **PHILIPPINES:** USNM 102624, 46.2 mm SL, Cebu, 13 Jan. 1927; USNM 136396, 2, 38.3–43.3 mm SL, Cabato, Mindanao, 29 May 1908.

Diagnosis. A species of *Pseudovespicula* with the following combination of characters: XIII–XIV, 6–7 (usually XIV,6) dorsal-fin rays; 12–13 (12) pectoral-fin rays; head profile convex, cirri on head and eye; four preopercular spines protruding; symphyseal knob present; parietal, nuchal, pterotic, posttemporal forming shallow ridge without spines; supracleithral spine minute; upper-jaw 46.5–51.9% (48.9%) of HL; body depth 32.1–36.3% (33.6%) of SL.

Distribution. Currently known only from Philippines and Papua New Guinea [based on collected specimens (Fig. 50)].

Remarks. *Pseudovespicula cypho* was described by Fowler (1938) based on single specimen collected from Mindanao, Philippines. Because additional specimens have never been reported, non-type specimens collected from Papua New Guinea reported in this study represent the second record of the species.

***Pseudovespicula dracaena* (Cuvier 1829)**

(English name: Draco Waspfish) (Figs. 49, 50, Table 20)

Apistus dracaena Cuvier in Cuvier and Valenciennes 1829: 403 (type locality: Malabar coast, India); Blanc and Hureau 1968: 6 (Malabar coast, India; listed); Paepke and Fricke 1992: 268 (Malabar coast, India; listed).

Apistus belengerii Cuvier in Cuvier and Valenciennes 1829: 412 (type locality: Mahé, Malabar coast, India).

Apistus belangerii [sic]: Blanc and Hureau 1968: 5 (Malabar coast, India; listed).

Apistus dracaena [sic]: Weber 1998: 12 (Malabar coast, India).

Prosopodasys dracaena: Sauvage 1878: 130 (Malabar, India).

Tetraroge belangerii[sic]: Sauvage 1878: 133 (Mahé, India).

Vespicula dracaena [sic]: Randall 1995: 112, unnumbered fig. (Oman); Carpenter et al. 1997: 138, unnumbered fig. (Bahrain); Manilo and Bogorodsky 2003: S102 (Arabian Sea).

Pseudovespicula dracaena: Mandrytsa 2001: 278 (Malabar coast, India); Eagderi et al. 2019:130 (Persian Gulf; listed).

Syntypes. MNHN 0000-6522, 2 specimens, syntypes of *A. belengerii*, 46.8–47.5 mm SL, Mahé, Malabar coast, Kerala, India, 11°40'58.8"N, 75°31'01.2"E, M. Belenger; MNHN 0000-5743, 2, 39.6–41.9 mm SL, MNHN 0000-7306, 2, 33.2–35.1 mm SL, SMF 389, 45.4 mm SL, ZMB 807, syntype of *A. dracaena*, 38.3 mm SL, Malabar coast, India.

Other materials. 4 specimens, 37.8–49.0 mm SL. **BAHRAIN:** BPBM 21185, 2, 37.8–40.4 mm SL, Persian Gulf. **INDIA:** ZSI 1738, 2, 44.1–49.0 mm SL, Malabar.

Diagnosis. A species of *Pseudovespicula* with the following combination of characters: XII–XIII, 6–7 (usually XII,7) dorsal-fin rays; 12–14 (13) pectoral-fin rays; head profile straight; head without cirri or scales; uppermost preopercular spines protruding, lower four blunt and hidden under skin; symphyseal knob absent; parietal, nuchal, pterotic,

posttemporal not forming ridge; supracleithral spine absent; upper-jaw 35.7–42.3% (39.6%) of HL; body depth 34.4–41.9% (37.8%) of SL.

Distribution. Currently known only from Bahrain east to India [based on collected specimens (Fig. 50)].

Remarks. *Apistus belengerii* was originally described by Cuvier in Cuvier and Valenciennes (1829), based on two specimens collected from Mahé, Malabar coast, India, on the basis of having body depth 3.0 in body length, deepest at middle of body; pectoral-fin rays 13; large space between third and fourth dorsal-fin spine; a dark blotch on fifth to eighth dorsal-fin spines. However, examination of the syntypes of *A. belengerii* in this study showed them to be junior synonyms of *P. dracaena* (Table 49).

***Pseudovespicula zollingeri* (Bleeker 1848)**

(English name: -)

Apistus zollingeri Bleeker 1848: 636 (type locality: Bima, Sumbawa Island, Lesser Sunda Islands, Indonesia).

Vespacula zollingeri: de Beaufort and Briggs 1962: 72 (Sumbawa, Indonesia); Poss 1999: 2308 (Bima, Sumbawa Island, Lesser Sunda Islands, Indonesia).

Diagnosis. A species of *Pseudovespicula* with the following combination of characters: XIV, 7 dorsal-fin rays; 11 pectoral-fin rays; head without cirri or scales; 4 preopercular spines protruding (Bleeker 1848; de Beaufort and Briggs 1962).

Distribution. Currently known only from Sumbawa, Indonesia (Bleeker 1848; de Beaufort and Briggs 1962).

Remarks. *Pseudovespicula zollingeri* was described by Bleeker (1848) based on two specimens collected from Sumbawa, Indonesia, the species being known to date only from the type specimens.

Genus *Richardsonichthys* Smith 1958

Richardsonichthys Smith 1958: 169 (type species: *Apistes leucogaster* Richardson 1848, by original designation and monotypic).

Diagnosis. A genus of the family Tetraogidae with the following combination of characters: XII–XIII, 6–7 (usually XIII, 6) dorsal-fin rays; its origin anterior to posterior margin of orbit; dorsal fin continuous, three anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray not connected posteriorly to upper caudal-fin base; I, 5 pelvic-fin rays; III, 5–7 anal-fin rays (6); 14–17 (15) pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, convex; eye large, orbit diameter 11.6–17.7% (mean 14.6%) of SL; nape flattened; cleithral spine absent; body naked; 3–5 tentacles on eyes; mouth large, its length 46.1–56.5% (50.9%) of HL, small conical teeth on palatines; lateral line complete, running close to dorsal-fin base; opercular tip adjacent to dorsal-fin base.

Description. The description and data for the holotype are presented first, followed by those of other material data in parentheses when different. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Caudal-peduncle depth 3.1–4.4 in body depth. Head and body naked; lack of cirri or skin flaps on head, except on flaps on anterior nostril; 3–5 tentacles on eyes, above pupil. Lateral line complete, continuous, extending from above opercular tip straight to dorsal

of caudal-fin base, a lateral-line pore normally present on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line adjacent to dorsal-fin base.

Head profile oblique, convex; dorsal margin of orbit slightly intruding on the profile, snout short, its length 4.3–8.2 in head length. Two pairs of nasal slightly large openings, subequal in diameter; anterior nostril tubular with small dermal flap; posterior nostril a simple rounded pore on anteroventral margin of orbit. Eyes large, orbit diameter 2.6–3.3 in head length. Bony rim of orbit tough, rough, without spines. Interorbital region from snout to occiput scarcely any concavity, wide, 1.4–2.7 in orbit diameter. Ascending process of premaxilla weakly developed. Interorbital ridges weakly developed, converging at the horizontal level of orbit and diverging posteriorly, median interorbital ridge absent. Suborbital ridge developed, without spines, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost longest, sharp and project from skin, its posterior tip not reaching to opercular margin; second to fifth short, hidden under skin. Opercle with smooth weak V-shaped crests, uppermost directed upward. Gill opening curves dorsally, its tip almost reaching to dorsal-fin base. Cleithral spine absent. Lacrimal with 2 sharp simple spines; anterior lacrimal spine short, directed downward; posterior lacrimal spine longer, directed backward, its posterior tip reaching to vertical through middle of orbit. Mouth large, its length 1.8–2.2 in head length, terminal, slightly oblique; posterior margin of maxilla reaching to vertical through posterior margin of orbit. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present with 2 small knobs on the lateral side. No cleft behind last gill arch; gill rakers short, tubercle.

Origin of first dorsal fin anterior to posterior margin of orbit, first dorsal-fin spine shortest, its length 1.4–2.5 in second spine length; third spine longest, slightly longer than fourth spine; third to fifth spines progressively shorter; sixth to penultimate spines progressively longer, the last spine slightly longer than penultimate spine, its length subequal

to first soft ray. Membranes of spinous portion of dorsal fin deeply incised, almost reach dorsal-fin base; membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto upper margin of caudal fin. Anal-fin base moderate, its length 2.4–3.1 in dorsal-fin base length. Origin of anal fin about middle of body; first anal-fin spine shortest; third anal-fin spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin notched; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, moderate, its length 2.2–3.1 in dorsal-fin base length, wing-like shape, without free rays; fin origin level with vertical through fourth dorsal-fin spine base; posterior tip of fin beyond anal-fin insertion. Pelvic fin slightly shorter than pectoral fin, its origin distinctly posterior to lower end of pectoral-fin base; second soft ray longest, posterior tip of depressed fin reaching to anus; half of last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length slightly longer than pelvic fin; posterior margin of fin rounded.

Color when fresh: Head mottled dark brown and radish; body mottled dark brown dorsally with white round blotches, middle of body radish with white round blotches, ventral white; dorsal fin mottled dark brown with white round blotches and large black blotch on the middle of spinous portion; anal fin radish with white on base; pectoral and pelvic fins radish with mottled dark brown, white on bases; caudal fin translucent with mottled dark brown and radish.

Color of preserved specimens: same as color when fresh but paler and radish faded.

Remarks. *Richardsonichthys leucogaster* was originally described by Richardson (1848) as a species of *Apistes* on the basis of having teeth on palatine, preopercular and lacrimal spines present. Subsequently, Smith (1958) recognized that *A. leucogaster* differed from *Apistus* in having dorsal-fin origin above eyes (vs. dorsal-fin origin distinctly posterior to posterior margin of orbit, in the latter); membrane between third and fourth dorsal-fin

spines deeply incised (vs. membrane between third and fourth dorsal-fin spines shallow incised); no notch between spinous and soft dorsal (vs. notch between spinous and soft dorsal), and placed the species in his new genus *Richardsonichthys*.

***Richardsonichthys leucogaster* (Richardson 1848)**

(English name: Rouge Fish, Torres Strait Soldier Fish, White-bellied Rougefish, Whiteface Waspfish) (Figs. 51, 52, Table 21)

Apistes leucogaster Richardson 1848: 5, pl. 5, figs. 1–2 (type locality: Sea of China).

Tetraroge darnleyensis Alleyne and Macleay 1877: 278, pl. 6, fig. 1 (type locality: Erub Island, Torres Strait, Queensland, Australia); McCulloch 1929: 390 (Darnley Islands, Torres Strait, Queensland, Australia; listed).

Richardsonichthys leucogaster: Paxton et al. 1989: 447 (Indo-West Pacific; listed); Randall et al. 1990: 80 (Queensland, Australia); Allen 1997: 78 (Indo-West Pacific); Randall et al. 1997: 80 (India to northern Australia and Melanesia); Poss 1999: 2333, unnumbered fig. (Zanzibar, Madagascar, and Seychelles eastward to northern Queensland, Australia and Philippines); Poss in Randall and Lim 2000: 605 (South China Sea; listed); Hutchins 2001: 27 (Western Australia, Australia; listed); Allen and Adrim 2003: 30 (Sulawesi, Indonesia); Adrim et al. 2004: 119 (Anambas and Natuna Islands, South China Sea); Allen et al. 2006: 902 (Indo-west-central Pacific; listed); Prokofiev 2008: 304, figs. 3b–c (Nha Trang Bay, Vietnam); Motomura 2009: 70, unnumbered fig. (Andaman Sea, Thailand); Fricke et al. 2011: 380 (New Caledonia; listed) Larson et al. 2013: 84 (Northern Territory, Australia; listed).

Holotype. AMS I. 16352-001, holotype of *Tetraroge darnleyensis*, 42.3 mm SL, Erub Island, Torres Strait, Queensland, Australia, 09°35'S, 143°46'E.

Other materials. 20 specimens, 18.1–73.6 mm SL. **AUSTRALIA:** AMS I. 20751-034, 2 specimens, 34.0–55.6 mm SL, Lizard Island, Queensland; AMS I. 22832-013, 2, 39.6–41.2 mm SL, Port Hedland, Western Australia, 19°S, 117°E, 50 m depth; QM I. 34377, 43.6 mm SL, South Barnard Island, Queensland, 17°46'30"S, 146°18'18"E, dredge; QM I. 34939, 39.4 mm SL, Magnetic Island, Queensland, 18°48'54"S, 146°57'18"E, dredge; QM I. 35086, 59.3 mm SL, Magnetic Island, Queensland, 18°45'18"S, 146°57'18"E, dredge; QM I. 36069, 41.0 mm SL, Darley Reef, Queensland, 19°08'06"S, 148°14'42"E, 38 m, dredge.

MALAYSIA: KAUM–I. 16949, port Pelabuhan Cendring, Kuala Terengganu, trawl; KAUM–I. 49277, 48.8 mm SL, KAUM–I. 49278, 47.3 mm SL, purchased at Kota Kinabalu Central Fish Market, Sabah. **NEW CALEDONIA:** BPBM 33835, 2, 17.1–37.2 mm SL, Chesterfield Islands, 20°44'48"S, 158°57'36"E, beam trawl. **THAILAND:** KAUM–I. 33274, 73.6 mm SL, KAUM–I. 33275, 72.0 mm SL, KAUM–I. 33276, 61.0 mm SL, KAUM–I. 33277, 57.0 mm SL, KAUM–I. 33278, 53.7 mm SL, KAUM–I. 33279, 48.1 mm SL, KAUM–I.105499, purchased at Pak Nam Ranong fishing port, Ranong.

Diagnosis. A species of *Richardsonichthys* with the following combination of characters: XII–XIII, 6–7 (usually XIII, 6) dorsal-fin rays; III, 5–7 (6) anal-fin rays; 14–17 (15) pectoral-fin rays; I, 5 pelvic-fin rays; body naked, 3–5 tentacles on eyes; lateral line adjacent to dorsal-fin base; head profile relatively convex; symphyseal knob present with 2 small knobs on the lateral side; teeth on palatines; dorsal fin continuous, origin of first dorsal fin anterior to posterior margin of orbit; no slit behind fourth gill arch; gill opening curves dorsally, its tip almost reaching to dorsal-fin base.

Distribution. From Thailand south to Malaysia, New Caledonia, and Australia [based on collected specimens (Fig. 52)]

Remarks. *Tetraroge darnleyensis* was originally described by Alleyne and Macleay (1877) based on a single specimen collected from Erub Island, Torres Strait, Queensland, Australia, as a new species of *Tetraroge* since body naked, preorbital and preoperculum with spines. The examination of holotype of *T. darnleyensis* agreed well with Richardson's (1848) description and illustration of *A. leucogaster*. Therefore, *T. darnleyensis* regarding here as junior synonym of *R. leucogaster*.

Richardsonichthys leucogaster is easily distinguished from all other congeners in having body naked; head convex; gill opening curves dorsally with its tip almost reach dorsal-fin base; tentacle on eyes, above pupil, and spinous portion of fin membrane deeply incised.

Genus *Snyderina* Jordan and Starks 1901

Snyderina Jordan and Starks 1901: 381 (type species: *Snyderina yamanokami* Jordan and Starks 1901, by monotypic).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XII–XIII, 9–11 dorsal-fin rays; its origin distinctly anterior to posterior margin of orbit; three anteriormost dorsal-fin spines not forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 5–6 anal-fin rays; 13–16 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, straight; cleithral spine absent; nape flattened; body covered with small embedded cycloid scales; cirri and papillae absent on head and body; orbit diameter 9.9–15.7% of SL; mouth large, 34.6–51.1% of HL; teeth on palatines absent; lateral line complete, well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body robust, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Caudal-peduncle depth 3.8–5.1 in body depth. Body covered with small embedded, non-imbricate cycloid scales; scales absent on head, pre-dorsal-fin area, pectoral-fin base, and pelvic-fin base. No tentacles, cirri or skin flaps on head, body or fins, except at nasal openings. Lateral line complete, continuous, extending from above upper end of gill opening to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed upward; lateral line well separated from dorsal-fin base.

Head profile obliquely linear; snout short and broad, 3.8–4.6 in head length. Two pairs of nasal slightly large openings, subequal in diameter; anterior nostril tubular with small dermal flap; posterior nostril a simple rounded pore with low raised rim on anteroventral margin of orbit. Orbit diameter 2.9–4.2 in head length. Bony rim of orbit without spines. Ascending process of premaxilla weakly developed, small papillae usually present. Interorbital region from snout to occiput somewhat narrow, 1.4–2.1 in orbit diameter. Pair of interorbital ridges well developed, forming narrow and deep space between them, converging in front of first dorsal-fin spine; median interorbital ridge and nasal spines absent. Parietal, nuchal, pterotic and posttemporal forming ridges without spines. Supracleithral spine short, blunt, hidden under skin. Suborbital ridge developed, connected posteriorly to base of uppermost preopercular spine. Preopercle with 5 simple spines; uppermost longest, projecting from skin, its posterior tip not reaching to opercular margin; second to fifth short. Opercle with smooth V-shaped crests, not forming spines. Upper end of gill opening reaching horizontal line through middle of eye. Cleithral spine short, not protruding from skin. Lacrimal with 2 simple spines; anterior lacrimal spine short, directed posteroventrally; posterior lacrimal spine longer, directed backward, its posterior tip not reaching to vertical through middle of orbit. Mouth slightly large, its length 2.4–2.9 in head length, terminal,

slightly oblique; posterior margin of maxilla reaching to (or short of) vertical through middle of pupil. Bands of villiform teeth on jaws and vomer, palatine without teeth. Lips thick; symphyseal knob absent. No slit behind last gill arch; gill rakers short, flattened.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of first dorsal fin above vertical through middle of orbit, first dorsal-fin spine shortest, its length 1.7–3.6 in second spine length; third spine longest, slightly longer than fourth spine; fourth to eighth spines progressively shorter; eighth to last spine progressively longer, length of penultimate spine subequal to last spine but shorter than first soft ray. Membranes of spinous portion of dorsal fin slightly incised, about one-fourth of spine length, membrane of last dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto upper margin of caudal fin. Anal-fin base short, its length 3.7–4.4 in dorsal-fin base length. Origin of anal fin level with vertical through last dorsal-fin spine; first anal-fin spine shortest; third anal-fin spine longest, slightly longer than third anal-fin spine; membranes of spinous portion of anal fin slightly notched; membrane of last anal-fin soft ray posteriorly separated from caudal peduncle; posterior margin of fin rounded. Pectoral fin, moderate, its length 1.8–2.6 in dorsal-fin base length, without free rays; fin origin level with vertical through fifth dorsal-fin spine base; posterior tip of fin beyond anal-fin origin; posterior margin of fin rounded. Pelvic fin shorter than pectoral fin, its length 1.2–1.6 in pectoral-fin length, origin distinctly posterior to lower end of pectoral-fin base; second soft ray longest, posterior tip of depressed fin beyond anus; last soft ray narrowly adnate to abdomen via membrane. Caudal fin moderate, its length subequal to pectoral-fin length; posterior margin of fin rounded.

Remarks. *Snyderina yamanokami* was originally described by Jordan and Starks (1901) as a monotypic genus on the basis of following characters: body with non-imbricated scale; head without cranial spines; head angulated; preorbital and preopercular with sharp spines; palatine without teeth; no slit behind fourth gill arch; 7 branchiostegal rays; XIII, 10

dorsal-fin rays, origins above orbit; III anal-fin spines; I, 5 pelvic-fin rays; pectoral-fin rays without free rays; fin scaleless. Subsequently, *Tetraroge guentheri* Boulenger 1889 was placed in the genus on the basis of lacking of teeth on palatine, body scaly, entirely of body without cirri, papillae, or tentacles.

Key to the species of *Snyderina*.

- 1a. XII dorsal-fin spines, 15–16 (usually 16) pectoral-fin rays, sharp spine on lateral surface of lacrimal and suborbital ridge *Snyderina* sp.
- 1b. XIII dorsal-fin spines, 13–15 pectoral-fin rays, without sharp spine on lateral surface of lacrimal and suborbital ridge 2
- 2a. Pectoral-fin rays 13–14 (13); a prominent dark blotch on dorsal-fin membrane of sixth to eighth dorsal-fin spines; body with 2 faded dark blotch along lateral-line at posterior margin of opercle and middle of body; no scale rows above lateral line *S. guentheri*
- 2b. Pectoral-fin rays 13–15 (14); 4 prominent dark blotches along lateral line from posterior margin of opercle, middle of body, below soft portion of dorsal fin, and caudal peduncle, 0–9 scale rows above lateral line *S. yamanokami*

***Snyderina guentheri* Boulenger 1889**

(English name: Günther's Waspfish) (Figs. 53, 56; Table 23)

Tetraroge guentheri Boulenger 1889: 239, pl. 25 (type locality: Muscat, Oman, Gulf of Oman).

Snyderina guentheri: Norman, 1939: 95 (Gulf of Aden); Talwar, 1977: 580, fig. 1 (Quilon, India, Arabian Sea); Randall 1995: 112, fig. 245 (Muscat, Oman, Gulf of Oman); Mandrytsa 2001: 279 (Muscat, Oman, Gulf of Oman); Manilo and Bogorodsky 2003: S102

(Arabian Sea); Psomadakis et al. 2015: 186, unnumbered fig. (Pakistan); Naranji and Kandula 2017: 10130, image 1 (Visakhapatnam, Andhra Pradesh, India); Psomadakis et al. 2020: 364, unnumbered fig. (Myanmar).

Holotype. BMNH 1888.12.29.145, holotype of *Tetraroge guentheri*, 164.2 mm SL, Muscat, Oman, Gulf of Oman.

Other materials. 15 specimens, 46.9–152.9 mm SL. **OMAN:** BMNH 1901.1.30.18, 96.8 mm SL, F. Townsend; CAS 48621, 3 specimens, 80.0–106.0 mm SL, Gulf of Oman, Intl Indian Ocean Exped, 3 Dec. 1963. **INDIA:** CAS 14651, 54.6 mm SL, Bay of Bengal, Hugli river, A.W. Herre; CAS 36688, 113.7 mm SL, ZSI F 7181/2, 4, 118.5–152.9 mm SL, off Quinlon, Kerala, Arabian Sea, 08°45'N, 75°50'E, 300 m depth, P.K. Talwar, 13 Mar. 1975. **SOMALIA:** BMNH 1939.524.1556–1559, 4, 46.9–137.8 mm SL, Gulf of Aden, Committee John Murray Exp. 1933–34; BMNH 1992.1.9.1, 142.0 mm SL, Indian Ocean, 14°08'02"N, 48°40'06"E, S. Mandrytza, 25 Nov. 1986.

Diagnosis. A species of *Snyderina* with the following combination of characters: XIII, 10–11 (usually 10) dorsal-fin rays; 13–14 (13) pectoral-fin rays; without sharp spine on lateral surface of lacrimal and suborbital ridge; a prominent dark blotch on dorsal-fin membrane of sixth to eighth dorsal-fin spines; body with 2 faded dark blotches along lateral-line at posterior margin of opercle and middle of body; no scale rows above lateral line.

Distribution. Currently known only from Indian Ocean from Somalia north to Oman and east to India [based on collected specimens (Fig. 56)].

Remarks. *Snyderina guentheri* was originally described by Boulenger (1889), based on single specimen collected from Muscat, Oman, Gulf of Oman, as a species of *Tetraroge* on the basis of having teeth on vomer and palatine; preorbital and preopercular with spines, no cleft behind fourth gill arch. Subsequently, Norman (1937) recognized that Boulenger

(1889) was error in stating teeth on palatine in this species and *T. guentheri* closely related to *S. yamanokami*. Therefore, he treated *T. guentheri* as a species of *Snyderina*.

***Snyderina yamanokami* Jordan and Starks 1901**

(English name:-) (Figs. 54, 56; Table 23)

Snyderina yamanokami Jordan and Starks 1901: 381, pl. 20 (type locality: Kagoshima, Japan); Yamakawa 1976: 60, fig. 1 (Amami-Oshima, Kagoshima, Japan); Nakabo in Masuda et al. 1984: 319, pl. 285-G (Sagami Bay to Amami-Oshima, Japan); Motomura and Iwatsuki 1997: 133 (Miyazaki, Japan); Nakabo 2000: 600 (Sagami Bay to Amami-Oshima, Japan); Poss in Randall and Lim 2000: 606 (South China Sea; listed); Mandrytsa 2001: 279 (Kagoshima, Japan); Nakabo 2002: 600 (Sagami Bay to Amami-Oshima, Japan); Kim et al. 2010: 257 (Korea).

Holotype. CAS-SU 106433, holotype of *S. yamanokami*, 162.5 mm SL, Kagoshima, Japan.

Other materials. 8 specimens, 92.6–159.2 mm SL. **JAPAN:** KAUM–I. 64285, 159.0 mm SL, East China Sea, 31°55'06"N, 120°05'54"E, 152 m depth, trawl, M. Okamoto, 4 June 2014. **TAIWAN:** KAUM–I. 17754, 92.6 mm SL, Tashi, Yi-lan; KAUM–I. 17770, 159.2 mm SL, KAUM–I. 17771, 130.8 mm SL, KAUM–I. 17772, 144.7 mm SL, KAUM–I. 17773, 134.1 mm SL, KAUM–I. 17774, 134.5 mm SL, Nanfangao, Yi-lan, trawl, H.-C. Ho, 22 Feb. 2009; KAUM–I. 20433, 153.9 mm SL.

Diagnosis. A species of *Snyderina* with the following combination of characters: XIII, 9–10 (usually 10) dorsal-fin rays, 13–15 (14) pectoral-fin rays, without sharp spine on lateral surface of lacrimal and suborbital ridge; 4 prominent dark blotches along lateral line from

posterior margin of opercle, middle of body, below soft portion of dorsal fin, and caudal peduncle, 0–9 scale rows above lateral line.

Distribution. Currently known only from Japan and Taiwan [based on collected specimens (Fig. 56)].

Remarks. *Snyderina yamanokami* can be distinguished from *S. guentheri* in having 0–9 (vs. 0) scale rows above lateral line, 0–13 (vs. 0–3) scale rows between sixth dorsal-fin spine base and lateral line; 4 prominent dark blotches on body (vs. 2 faded dark blotches on body), no blotches on spinous portion of dorsal fin (vs. a blotch on spinous portion of dorsal fin), shorter postorbital length [20.6–22.3% (21.3%) of SL vs. 21.4–28.6% (24.0%) of SL], deeper body depth [37.6–40.5% (39.2%) of SL vs. 32.7–41.0% (36.8%) of SL].

***Snyderina* sp.**

(Figs. 55, 56; Table 23)

Material examined. 6 specimens, 29.6–53.5 mm SL. **PHILIPPINES:** MNHN 2005-0744, 12°06'00"N; 121°34'12"E, RV *Coriolis*, 5 June 1985.

Diagnosis. A species of *Snyderina* with the following combination of characters: XII, 9–10 (usually XII, 10) dorsal-fin rays; 15–16 (16) pectoral-fin rays; sharp spines on lateral surface of lacrimal and suborbital ridge; a prominent dark blotch on sixth to eighth dorsal-fin spines; body with two dark blotches at posterior margin of opercle and basis of last dorsal-fin spine to first dorsal-fin soft ray; 10–12 scale rows above lateral line.

Distribution. Currently known only from Philippines [based on collected specimens (Fig. 56)].

Remarks. Undescribed species of *Snyderina* can be distinguished from all other congeners in having XII dorsal-fin spines (vs. XIII, in all other species), spines on lateral surface of lacrimal and suborbital ridge (vs. no spines on lateral surface of lacrimal and

suborbital ridge), wider interorbital width (7.5–8.3% of SL vs. 5.8–7.7% of SL), longer pelvic-fin spine (21.4–24.0% of SL vs. 15.5–21.1% of SL); differed from *S. guentheri* in having 15–16 (16) pectoral-fin rays [vs. 13–14 (13), in the latter], 10–12 (vs. 0) scale rows above lateral line, 8–13 (vs. 0–3) scale rows between sixth dorsal-fin spine base and lateral line; differed from *S. yamanokami* in having 15–16 (16) pectoral-fin rays [vs. 13–15 (14), in the latter].

Genus *Tetraroge* Günther 1860

Tetraroge Günther 1860: 132 (type species: *Apistus barbatus* Cuvier 1829, by subsequent designation).

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: XIII–XIV dorsal-fin spines; its origin distinctly anterior to posterior margin of orbit; dorsal fin continuous without deeply incised membrane between third and fourth dorsal-fin spines; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not extending onto upper base of caudal fin; I, 5 pelvic-fin rays; III, 4–5 (4) anal-fin rays; 12 pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, straight; orbit diameter 9.3–12.7% of SL; nape flattened; cleithral spine absent; body not covered with scales; small papillae present on eyes, head and body; mouth large, its length 36.5–45.9% of HL; palatine teeth present; lateral line complete, well separated from dorsal-fin base; tip of opercle not reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head and body without scales, skin thick with epithelial prickles, cirri on head, papillae on eye. Lateral line complete,

continuous, extending from above upper end of gill opening to caudal-fin base, one lateral-line pore on caudal fin near base; end of tube associated with each lateral-line pore directed downward; lateral line well separated from dorsal-fin base.

Snout profile oblique, slightly straight. Two pairs of nasal openings, subequal in diameter, simple round pores with low raised rim. Mouth large, its length 2.2–2.8 in head length, terminal, oblique; posterior margin of maxilla reaching to (or short of) posterior margin of orbit, lower jaw slightly protruding anteriorly. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick, symphyseal knob absent, Eye small, orbit diameter 3.2–4.5 in head length. Snout slightly short, its length subequal to orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla weakly developed. Interorbital ridges weakly developed, median interorbital ridge absent. Head spines weakly developed; parietal, nuchal, pterotic, posttemporal, and supracleithral forming smooth shallow ridge. Lacrimal with 2 spines; anterior lacrimal spine short, blunt, directed downward; posterior spine pungent, long, directed backward, its posterior tip reaching to (or beyond) posterior margin of orbit. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip short of opercular margin; 4 lower spines tuberculated, hidden under skin. Cleithral spine absent. Opercle without spines. Upper end of gill opening reaching to horizontal line through dorsal margin of eye. Slit behind last gill arch close; gill rakers short, tuberculated.

Dorsal fin continuous, without notch between spinous and soft dorsal; origin of dorsal fin anterior to vertical through posterior margin of orbit; membrane of spinous portion of dorsal fin weakly notched; first dorsal-fin spine shortest, second spines longest, slightly longer than third spine; fifth to eighth subequal in length; ninth to last spine progressively longer; last spine slightly shorter than first dorsal-fin soft ray; distance between bases of third and fourth spines greatest. Dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin, posterior margin of fin rounded.

Anal-fin base short, its length 3.5–5.9 in dorsal-fin base length. Origin of anal fin anterior to first dorsal-fin soft ray; first anal-fin spine shortest, third anal-fin spine longest; membranes of spinous portion of anal fin weakly notch; membrane of last anal-fin soft ray posteriorly adnate to caudal peduncle but not extending to caudal-fin base; posterior margin of fin rounded. Pectoral fin without free rays; fin origin posterior to fourth dorsal-fin spine; moderately in size, its length 2.0–2.7 in dorsal-fin base length; posterior tip of fin not reaching to anus. Pelvic fin moderate, second soft ray longest, posterior tip of depressed fin not reaching to anus; its origin level with vertical through lower end of pectoral-fin base; almost entirely last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 0.9–1.2 in pectoral-fin length; posterior margin of fin rounded.

Color of preserved specimens: Vary from whole body entirely creamy to mottled brown, or mottled dark brown with black spots scattered; caudal fin translucent with mottled dark brown and a broad dark brown band on posterior margins.

Remark. *Tetraroge barbatus* was originally described by Cuvier (1829) as the species of *Apistes* on the basis of having dorsal fin continuous, teeth on palatine, lacrimal spines mobile, spines on preopercle, and body without scales. Subsequently, Günther (1860) proposed a new genus, *Tetraroge*, for *A. barbatus* on the basis of having body naked; preorbital and preoperculum with spines; XII–XVII dorsal-fin spines; spinous portion without division; pectoral fin without appendages; teeth on palatine; air bladder present; pyloric appendages in small number; no cleft behind fourth gill arch.

Key to the species of *Tetraroge*.

1a. A pair of barbels present on tip of lower jaw, supracleithral spines present, head length 37.3–39.6% of SL, interorbital width 5.8–6.3% of SL, upper-jaw length 14.9–15.1% of SL,

pre-dorsal-fin length 16.1–17.1% of SL, second dorsal-fin spine length 24.5–25.0% of SL,
 pelvic-fin spine length 13.3–14.0% of SL *T. barbata*
 1b. Barbels absent on tip of lower jaw, supracleithral spines absent, head length 39.7–46.1%
 of SL, interorbital width 7.5–9.0% of SL, upper-jaw length 15.9–20.7% of SL, pre-dorsal-fin
 length 19.9–26.9% of SL, second dorsal-fin spine length 17.7–24.0% of SL, pelvic-fin spine
 length 13.7–23.6% of SL *T. nigra*

***Tetraroge barbata* (Cuvier 1829)**

(English name: Bearded Rougefish) (Figs. 57, 59; Table 22)

Apistus barbatus Cuvier in Cuvier and Valenciennes 1829: 413 (type locality: Bouana River, Java, Indonesia); Blanc and Hureau 1968: 60 (Bouana River, Java, Indonesia; listed).

Apistus melas Bleeker 1850: 26 (type locality: Padang, western Sumatra, Indonesia); Kottelat 2013: 315 (Padang, Sumatra, Indonesia; listed).

Tetraroge barbata: Jordan and Richardson 1910: 52 (Aparri, Philippines; listed); de Beaufort and Briggs 1962: 65 (Sumatra, Java, Celebes, Ambon Island, New Guinea, Indonesia; Philippines); Shimizu in Masuda et al. 1984: 317, pl. 283-E (Japan); Kottelat et al. 1993: 102 (Indonesia; listed); Myers 1999: 102 (New Caledonia); Poss 1999: 2350, unnumbered fig. (Japan southward to Taiwan, Philippines, Indonesia, Malaysia, to Solomon Island); Nakabo 2000: 599 (Iriomote, Japan; key), Poss in Randall and Lim 2000: 606 (South China Sea; listed); Sakai et al. 2001: 92 (Iriomote, Japan; listed); Nakabo 2002: 599 (Iriomote, Japan; key); Fricke et al. 2011: 380 (New Caledonia; listed); Kottelat 2013: 315 (Java and Sumatra, Indonesia; listed); Fricke et al. 2014: 55 (Madang, Papua New Guinea; listed); Miesen et al. 2016: 88 (Sulawesi, Indonesia; listed).

Material examined. 2 specimens, 68.5–70.7 mm SL. **MALAYSIA:** AMS B. 8266, 68.5 mm SL, F. Day. **PAPUA NEW GUINEA:** AMS I. 17535-003, 70.7 mm SL, Meiro River, 05°12'00"S, 145°49'12"E.

Diagnosis. A species of *Tetraroge* with the following combination of characters: a pair of barbels present on tip of lower jaw; supracleithral spine present; head length 37.3–39.6% of SL; interorbital width narrow, 5.8–6.3% of SL; upper-jaw length 14.9–15.1% of SL; pre-dorsal-fin length 16.1–17.1% of SL; second dorsal-fin spine length 24.5–25.0% of SL; pelvic-fin spine length 13.3–14.0% of SL.

Distribution. Indo-West Pacific from Malaysia east to Papua New Guinea [based on collected specimens (Fig. 59)].

Remarks. *Tetraroge barbata* was originally described base on the single specimen collected from Bouana River, Java, Indonesia. The holotype registered as RMNH 707 (Frick et al. 2020). As well as *A. melas*, the junior synonym of *T. barbata*, was originally described by Bleeker (1850) on the basis of single specimen collected from Padang, Sumatra, Indonesia, which the holotype registered as RMNH 5880 (Frick et al. 2020). Both are deposited at Naturalis Biodiversity Center, Leiden, the Netherlands. Because the Naturalis fish collection has long been inaccessible due to building renovations, the holotype was unavailable for the present study. However, examination of the original description of *A. barbatus* and *A. melas* agrees closely with specimens considered here as *T. barbata* in having XIII, 8 dorsal-fin rays; III, 5 anal-fin rays; 12 pectoral-fin rays; I, 5 pelvic-fin rays; a pair of barbels on tip of lower jaw; 2 lacrimal spines; a pungent preopercular spine; supracleithral spine present; 2 small tubercles anterior to first dorsal-fin spine; body without scales (Cuvier in Cuvier and Valenciennes 1829; Bleeker 1850).

A pair of barbel on tip of lower jaw is a unique character of *T. barbata* in family Tetrarogidae.

***Tetraroge nigra* (Cuvier 1829)**

(English name: Blacksea Wasp) (Figs. 58, 59, Table 22)

Apistus niger Cuvier in Cuvier and Valenciennes 1829: 415 (type locality: Arian Coupang River mouth, Puducherry, India); Blanc and Hureau 1968: 6–7 (Arian Coupang River mouth, Puducherry, India; listed).

Apistus amblycephalus Bleeker 1850: 27 (type locality: Padang, Sumatra, Indonesia); Kottelat 2013: 315 (Padang, Sumatra, Indonesia; listed).

Apistus amblycephaloides Bleeker 1853: 250 (type locality: Priaman, Sumatra, Indonesia); Kottelat 2013: 315 (Priaman, Sumatra, Indonesia; listed).

Tetraroge albomarginata Perugia 1896: 51 (type locality: Mentawi Island, Indonesia); Tortonese 1963: 346 (Mentawi Island, Indonesia); Kottelat 2013: 315 (Mentawi Island, Indonesia; listed).

Tetraroge albifrons Duncker and Mohr 1929: 70 (type locality: Langemak Bay, east coast of New Guinea); Ladiges et al. 1958: 167 (Langemak Bay, New Guinea; listed); Kottelat 2013: 315 (Langemak Bay, New Guinea; listed).

Prosopodasys nigra: Sauvage 1878: 131 (Puducherry, India).

Tetraroge niger: de Beaufort and Briggs 1962: 70, fig. 16 (Sumatra, Nias, Bali, Celebes, Buru, Ceram, Tenimber Islands, New Guinea, Indonesia; Ceylon, Andamans, Philippines); Shimizu in Masuda et al. 1984: 317, pl. 283-F (Iriomote, Japan); Kawanabe and Mizuno 1989: 652 (Iriomote, Japan); Kottelat et al. 1993: 102 (Sumatra, Indonesia; listed); Poss 1999: 2350, unnumbered fig. (India east to Indonesia, Fiji, Philippines; north to Taiwan, China, Japan); Nakabo 2000: 599 (Iriomote, Japan; key); Poss in Randall and Lim 2000: 606 (South China Sea); Sakai et al. 2001: 92 (Iriomote, Japan); Nakabo 2002: 599 (Iriomote,

Japan; key); Fricke et al. 2014: 55 (Madang, Papua New Guinea; listed); Huang et al. 2015: 71, fig. 1 (Taiwan); Suresh et al. 2018: 174, unnumbered fig. (Chilika Lake, India).

Tetraroge nigra: Kottelat 2013: 315 (India and Indonesia; listed); Miesen et al. 2016: 88 (Sulawesi, Indonesia; listed); Sato et al. 2020: 1, fig. 1 (Iriomote, Japan).

Syntypes. MNHN 0000-6638, 2 specimens, syntypes of *Apistus niger*, 53.6–53.8 mm SL, Arian Coupang River mouth, Puducherry, India.

Lectotype. ZMH H145, lectotype of *Tetraroge albifrons*, 46.4 mm SL, Langemak Bay, east coast of New Guinea, Sep. 1908.

Other material examined. 17 specimens, 19.8–100.5 mm SL. **FIJI:** URM-P 31819, 12 specimens, 19.8–29.4 mm SL, Reua River, 16 Mar. 1984. **JAPAN:** NSMT-P 80854, 100.5 mm SL, Iriomote-jima Island, Okinawa, 10 Aug. 1985; NSMT-P 80855, 96.5 mm SL, Iriomote-jima Island, Okinawa, 14 Dec. 1982. **PAPUA NEW GUINEA:** AMS I. 15346-001, 41.3 mm SL, Bumbu River, 06°43'S, 147°01'E; QM I.40707, 87.8 mm SL, Bougainville Island. **PHILIPPINES:** KAUM-I. 52299, 96.9 mm SL, fish market at Aparii, Cagayan, Luzon.

Diagnosis. A species of *Tetraroge* with the following combination of characters: barbels absent on tip of lower jaw; supracleithral spines absent; head length 39.7–46.1% of SL; interorbital width wide, 7.5–9.0% of SL; upper-jaw length 15.9–20.7% of SL; pre-dorsal-fin length 19.9–26.9% of SL; second dorsal-fin spine length 17.7–24.0% of SL; pelvic-fin spine length 13.7–23.6% of SL.

Distribution. Indo-West Pacific from India east to Philippines, Papua New Guinea, Fiji, north to Japan [based on collected specimens (Fig. 59)].

Taxonomic status of *Tetraroge albifrons*

Tetraroge albifrons was originally described by Duncker and Mohr (1929) based on two specimens collected from New Guinea, registered as ZMH 11834 (designated by Ladiges et al. (1958) as lectotype of *T. albifrons*, recataloged number as H145 and ZMH 11835 (currently paralectotype of *T. albifrons*, whereabouts known). Subsequently, *T. albifrons* has been regarded as a junior synonym of *T. barbata* (see Frick et al. 2020). However, examination of the lectotype of *T. albifrons* (ZMH H145, 46.4 mm SL; Fig. 58c) during this study showed that it is identical to *T. nigra* in having XIII, 7 dorsal-fin rays; dentary without barbels; head length 43.3% of SL; head width 24.8% of SL; interorbital width 8.4% of SL; upper-jaw length 20.7% of SL, postorbital length 23.9% of SL, pre-dorsal-fin length 24.4% of SL; pelvic-fin spine length 19.6% of SL; and longest pelvic-fin soft ray length 29.3% of SL. These characters agreed well with the syntypes of *A. niger* (MNHN 0000-6638, 2 specimens, 53.6–53.8 mm SL; Figs. 58a, b) and non-type specimens of *T. nigra* examined in this study. Accordingly, *T. albifrons* is regarded here as a junior synonym of *T. nigra*.

In addition, the original description indicated that ZMH 11835 differed from ZMH 11834 in having a pair of barbels on tip of lower jaw (vs. barbels absent, in the latter). Therefore, paralectotype of *T. albifrons* is a species of *T. barbata*.

Remarks. *Tetraroge albomarginata* Perugia (1896) was originally described on the basis of three specimens collected from Mentawi Island, Indonesia. Although lacking of opportunities to examine those syntypes, Perugia's (1896) and Tortonese's (1963) descriptions indicated that *T. albomarginata* agreed with the syntypes of *A. niger* examined here in having XIII, 8 dorsal-fin rays; III, 5 anal-fin rays; 12 pectoral-fin rays; I, 5 pelvic-fin rays; body lack of scales, minute papillae present; lacrimal and preopercular spines present; posterior margin of upper jaw level with posterior margin of orbit; no barbels on anterior tip of dentary, second and third dorsal-fin spines longest.

Apistus amblycephalus was originally described by Bleeker (1850) on the basis of single specimens collected from Padang, Sumatra, Indonesia, the holotype registered as RMNH 5887 (1 of 8, 66 mm SL) (Kottelat 2013; Frick et al. 2020). Bleeker (1853) also described *A. amblycephaloides* on the basis on single specimen collected from Priaman, Sumatra, Indonesia, the holotype registered as RMNH 5887 (1 of 8, 66 mm TL) (Kottelat 2013; Frick et al. 2020). Both type specimens are deposited at Naturalis fish collection, Naturalis Biodiversity Center, Leiden, the Netherlands. Because of building renovations, the holotypes were unavailable for the present study. However, Bleeker's (1850) and Bleeker's (1853) descriptions indicated that *A. amblycephalus* and *A. amblycephaloides* agrees closely with specimens considered here as *T. niger* in having XIII, 8 dorsal-fin rays; III, 5 anal-fin rays; I, 5 pelvic-fin rays; body lack of scales; lacrimal with 2 spines, anterior one minute, posterior one long; preopercular spines present, uppermost long, lower obtuse; teeth on palatine; no barbels on anterior tip of dentary, second and third dorsal-fin spines longest and subequal in length.

Genus *Trichosomus* Swainson 1839

Trichosomus Swainson 1839: 180, 265 (type species: *Apistus trachinoides* Cuvier 1829, by subsequent designation).

Trichosoma [sic]: Swainson 1839: 65, 71, fig. 16

Diagnosis. A genus of the family Tetrarogidae with the following combination of characters: III + XII–XIII, 3–5 (usually III + XIII, 4) dorsal-fin rays; its origin vertical through preopercular margin; three anteriormost dorsal-fin spines forming separate fin; membrane of last dorsal-fin soft ray posteriorly connected to dorsal caudal peduncle but not

extending onto upper base of caudal fin; I, 4 pelvic-fin rays; III, 3–4 (4) anal-fin rays; 11–13 (13) pectoral-fin rays, four lowermost rays not detached; head and snout profile oblique, slightly straight; orbit diameter 6.7–11.9% of SL; nape flattened; cleithral spine absent; body covered with small embedded cycloid scales; papillae and tentacles present on head and body; mouth large, its length 42.4–52.4% of HL, small conical teeth on palatines; lateral line complete, adjacent to dorsal-fin base; tip of opercle curved dorsally, almost reaching to dorsal-fin base.

Description. Body somewhat elongated, laterally compressed, progressively more compressed posteriorly; body depth slightly less than head length. Head covered with papillae and tentacles, without scales, no skin flaps including at nasal openings. Dorsal body above lateral line lack of scales, sparsely covered with papillae; ventral body from below lateral line covered with small, non-imbricated, embedded cycloid scale with few papillae; lack of scale on the basis of pectoral fin, pelvic fin, and anal fin. Lateral line complete, continuous, extending from above dorsal margin of gill opening straight to dorsal end of caudal-fin base, adjacent to dorsal-fin base, one lateral-line pore near the middle of caudal fin base; end of tube associated with each lateral-line pore directed downward.

Snout profile oblique, pointed. Two pairs of nasal openings, subequal in diameter, simple tubular with low raised rim. Mouth large, its length 1.9–2.4 in head length, terminal, oblique; posterior margin of maxilla reaching to (or short of) posterior margin of orbit, lower jaw protruding anteriorly. Bands of villiform teeth on jaws, vomer, and palatines. Lips thick; symphyseal knob present. Eye small, orbit diameter 3.5–5.2 in head length. Snout slightly short, its length subequal to orbit diameter. Bony rim of orbit without spines. Ascending process of premaxilla well developed. Interorbital region concave and wide, its width 0.9–1.3 in orbit diameter. Interorbital ridges scarcely developed, median interorbital ridge absent. Head without spines, except spines on lacrimal and preopercle present. Lacrimal with 2 sharp

spines; anterior lacrimal spine short, directed posteroventrally; posterior spine longer, its posterior tip reaching to (or short of) vertical through middle of orbit. Preopercle with 5 simple spines; uppermost sharp and protruding, posterior tip short of opercular margin; 4 lower spines, blunt, hidden under skin. Opercle without spines. Cleithral spine absent. Gill opening curve upward, its tip almost reaching to dorsal-fin base. Slit behind last gill arch close; gill rakers short, tuberculated.

Dorsal-fin 2, the first of three spinous rays, triangular, widely separated from the second; the second continuous, without notch between spinous and soft dorsal; origin of first dorsal fin vertical through preopercular margin; dorsal-fin spines not different in lengths, first dorsal-fin spine shortest, its length 1.1–1.6 in second spine length; second spine subequal to third spine; fourth to the last spines progressively longer; last spine subequal to first dorsal-fin soft ray. Membranes of spinous portion of dorsal fin deeply incised; membrane between fourth to sixth spine almost reaching to base of the next spine; membrane from sixth to last spine incised about two-third of the length; dorsal-fin ray posteriorly connected to dorsal edge of caudal peduncle, but not extending onto basal margin of caudal fin, posterior margin of fin truncated. Anal-fin base short, its length 3.0–4.4 in dorsal-fin base length. Origin of anal fin level with vertical through eleventh dorsal-fin spine; first anal-fin spine shortest, 1.3–2.1 in second spine length; third anal-fin spine longest, 0.6–0.9 in second spine; membranes of spinous portion of anal fin deeply incised; membrane of last anal-fin soft ray posteriorly adnate to caudal peduncle but not extending to caudal-fin base; posterior margin of fin truncated. Pectoral fin wing-like shape, without free rays; fin origin level with vertical through posterior margin of opercle; moderate in size, its length slightly shorter than head length; posterior tip of fin beyond vertical through anal-fin origin. Pelvic fin moderate, second soft ray longest, 1.2–1.6 in pectoral-fin length, posterior tip of depressed fin not reaching to anus; its origin level with vertical through lower end of pectoral-fin base; half of

last soft ray adnate to abdomen via membrane. Caudal fin moderate, its length 0.9–1.2 in pectoral-fin length; posterior margin of fin rounded.

Color when fresh: Head and body mottled with creamy and dark brown; caudal fin translucent with indistinct vertical dark bands, dorsal and anal fins mottled dark brown with dark brown bands on posterior margins.

Color of preserved specimens: similar to *Color when fresh* but paler.

Remark. *Trichosomus trachinoides* was originally described by Cuvier in Cuvier and Valenciennes (1829), based on specimens collected from Java, Indonesia, as a new species of *Apistus* because the specimens similar to *Scorpaena scrofa* Linnaeus 1758 but differed in having three anterior dorsal-fin spines forming separated fin (vs. spinous portion of dorsal fin continuous) and embedded scales (scales projected from skin). Subsequently, Swainson (1839) recognized that *A. trachinoides* differed from *Apistus* in having spinous portion of dorsal fin forming separate fin (vs. spinous portion of dorsal fin continuous, in the latter); pectoral fin without detached ray (vs. pectoral fin with detached ray), and placed the species in his new subgenus *Trichosomus*. Kottelat (2013) treated *Trichosomus* as valid genus of the family Tetrarogidae.

Jordan and Richardson (1910) proposed a new genus, *Vespacula*, for *Prosopodasys gogorzae*. However, *Vespacula* is regarded here as an objective junior synonym of *Trichosomus*, the type species of *Vespacula* being the junior synonym of type species of *Trichosomus*.

***Trichosomus trachinoides* (Cuvier 1829)**

(English name: Goblinfish) (Figs. 60, 61, Table 23)

Apistus trachinoides Cuvier in Cuvier and Valenciennes 1829: 401, pl. 92 (type locality: Java, Indonesia); Blanc and Hureau 1968: 7 (Java, Indonesia; listed).

Prosopodasys bottae Sauvage 1878: 132, pl. 1, fig. 11 (type locality: Red Sea); Blanc and Hureau 1968: 8 (Red Sea; listed).

Prosopodasys gogorzae Jordan and Seale 1905: 792, fig. 11 (type locality: Negros, Philippines).

Prosopodasys trachinoides: Sauvage 1878: 131 (India; Batavia, Indonesia; Sea of China).

Vespicula bottae: Dor 1984: 89 (Red Sea; listed); Goren and Dor 1994: 22 (Red Sea; listed).

Vespicula gogorzae: Jordan and Richardson 1910: 52 (Negros, Philippines; listed).

Vespicula trachinoides: de Beaufort and Briggs 1962: 73 (Singapore; Sumatra, Bintang, Java, Borneo, Indonesia; Thailand; Malaysia); Poss 1999: 2352, unnumbered fig. (Myanmar eastward to Philippines and Sulawesi; Hainan; China); Poss in Randall and Lim 2000: 606 (South China Sea; listed); Prokofiev 2008: 306 (Nha Trang, Vietnam); Golani and Bogorodsky 2010: 65 (Red Sea; listed); Motomura in Kimura et al. 2015: 29, unnumbered fig. (Johor, Malaysia); Motomura in Kimura et al. 2018: 80, unnumbered fig. (Ha Long Bay, Vietnam).

Trichosomus trachinoides: Kottelat 2013: 316 (Southeast Asia; listed); Yoshida et al. 2013:81 Gulf of Thailand, Thailand).

Holotypes. MNHN 0000-6753, holotype of *Prosopodasys bottae*, 58.4 mm SL, Red Sea, 20°00'N, 39°00'E; USNM 52054, holotype of *Prosopodasys gogorzae*, 21.2 mm SL, Negros, Philippines.

Syntypes. MNHN 0000-4610, 47.2 mm SL, MNHN 0000-4611, 2 specimens, syntypes of *Apistus trachinoides*, 40.5–52.9 mm SL, Java, Indonesia, 10°00'S, 107°30'E, M.M. Kuhl and J.C. van Hasselt; MNHN 0000-6643, 2, syntypes of *A. trachinoides*, 40.6–45.0 mm SL, Jakarta, Indonesia, 06°00'S, 106°45'E, M.M. Kuhl and J.C. van Hasselt.

Other materials. 28 specimens, 21.2–75.8 mm SL. **BRUNEI:** USNM 356819, 3, 15.7–21.4 mm SL, Brunei-Muara, 04°53'12"N, long 114°58'12"E, L. Parenti et al., 15 Aug. 1997. **CHINA:** USNM 87100, 44.7 mm SL, Hainan, C. Ping, 1924. **INDONESIA:** USNM 228900, 58.8 mm SL, Celebes, 7 June 1968. **MALAYSIA:** KAUM–I. 52303, 41.9 mm SL, KAUM–I. 52321, 45.4 mm SL, Johor, 01°19'N, 103°36'E, 4–5 m depth, bottom trawl, H. Motomura et al., 8 Dec. 2012; USNM 136327, 2, 33.3–36.1 mm SL, Sandakan Bay, Sabah, 1–2 m, RV *Albatross*, 2 Mar. 1908; USNM 169192, 2, 37.0–45.4 mm SL, Sandakan Market, Borneo, RV *Albatross*, 2 Mar. 1956. **PHILIPPINES:** USNM 136326, 21.3 mm SL, Malampaya Sound, Palawan Island, 1–2 m, RV *Albatross*, 26 Dec. 1908; USNM 136398, 22.5 mm SL, USNM 161427, 40.4 mm SL, Malampaya Sound, Palawan Island, 10°50'00" N, Long: 119°22'03" E, 13 m, RV *Albatross*, 26 Dec. 1908; USNM 403404, 42.8 mm SL, Bais market, Dumaguete, J. Williams and K. Carpenter, 1 July 2011; USNM 408965, 75.8 mm SL, Casiguran Public Market, Luzon, J. Williams et al., 27 May 2012. **THAILAND:** KAUM–I. 24070, 42.6 mm SL, KAUM–I. 24071, 56.9 mm SL, KAUM–I. 24072, 58.8 mm SL, KAUM–I. 44178, 46.1 mm SL, KAUM–I. 44179, 47.4 mm SL, KAUM–I. 57817, 49.7 mm SL, purchased at fish market, Mahachai, Samut Prakarn, trawl, M. Matsunuma, 5 Oct. 2009; URM-P 12442, 3, 45.6–51.8 mm SL, Pattani fish market, Pattani, V. Chavalit, 24 Oct. 1983. **VIETNAM:** KAUM–I. 77687, 52.9 mm SL, KAUM–I. 77688, 41.2 mm SL, purchased at fish market, Ha Long, 10 m, trawl, Y. Tomohiro, 14 Aug. 2015.

Diagnosis. A species of *Trichosomus trachinoides* with the following combination of characters: III + XII–XIII, 3–5 (usually III + XII, 4) dorsal-fin rays; III, 3–4 (4) anal-fin soft

rays; 11–13 (13) pectoral-fin rays; I, 4 pelvic-fin rays; dorsal body above lateral line sparsely covered with papillae, ventral body from below lateral line covered with small, non-imbricated, embedded cycloid scale with few papillae; lateral line adjacent to dorsal-fin base; head profile relatively convex; teeth on palatines; three anteriormost dorsal-fin spines forming separate fin, origin of first dorsal fin vertical through preopercular margin; no slit behind fourth gill arch; gill opening curves dorsally, its tip almost reaching to dorsal-fin base.

Distribution. Western Pacific: from Thailand and Malaysia east to Indonesia and Philippines, north to Vietnam and China [based on collected specimens (Fig. 61)].

Remark. *Prosopodasys bottae* was originally described by Sauvage (1878) based on a single specimen collected from Red Sea as a species of *Prosopodasys*. *Prosopodasys gogorzae* was originally described by Jordan and Seale (1905) based on a single specimen collected from Negros, Philippines as a species of *Prosopodasys*. The examination of type specimens of *P. bottae* and *P. gogorzae* agreed well with syntypes of *A. trachinoides*, both are regarding here as junior synonym of *T. trachinoides*. Since currently distribution areas of *T. trachinoides* are in South East Asia and southern China, the single record from Red Sea by Sauvage (1878) probably in error (Fig. 61).

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References

- Adrim M, Chen I-S, Chen Z-P, Lim KKP, Tan HH, Yusof Y, Jaafar Z (2004) Marine fishes recorded from the Anambas and Natuna Islands, South China Sea. *Raffles Bull Zool Suppl* 11:117–130
- Ahlstrom EH, Butler JL, Sumida BY (1976) Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic. *Bull Mar Sci* 26:285–402
- Allen GR (1997) Marine fishes of tropical Australia and south-east Asia. Western Australian Museum, Perth
- Allen GR, Adrim M (2003) Coral reef fishes of Indonesia. *Zool Stud* 42(1):1–72
- Allen GR, Erdmann MV (2012) Reef fishes of the East Indies. Vol I–III. Tropical Reef Research, Perth
- Allen GR, Hoese DF, Cross NJ, Bray DJ (2006) Tetrarogidae. In: Hoese DF, Bray DJ, Paxton JR, Allen GR (eds) *Zoological catalogue of Australia*. Vol 35. Pt 2. Fishes. CSIRO Publishing, Collingwood, pp 896–902
- Allen GR, Midgley SH, Allen M (2002) Field guide to the freshwater fishes of Australia. Western Australian Museum, Perth
- Allen GR, Swainston R (1988) The marine fishes of north-western Australia. A field guide for anglers and divers. Western Australian Museum, Perth
- Alleyne HG, Macleay W (1877) The ichthyology of the Chevert expedition. *Proc Linn Soc NSW* 1(3–4):261–281, pls 3–9
- Anderson RC, Randall JE, Kuitert RH (1998) Additions to the fish fauna of the Maldivian Islands. Part 2: New records of fishes from the Maldivian Islands, with notes on other species. *Ichthyol Bull JLB Smith Instit Ichthyol* 67: 20–32, pls 1–4

- Barnard KH (1927) Diagnoses of new genera and species of South African marine fishes.
Ann Mag Nat Hist (Ser 9) 20(115):66–79
- Blanc M, Hureau JC (1968) Catalogue critique des types de poissons du Muséum national
d'Histoire naturelle (poissons a joues cuirassées). Publ Div Mus Natl Hist Nat 23:1–71
- Bleeker P (1848) A contribution to the knowledge of the ichthyological fauna of Sumbawa. J
Indian Archipel East Asia (Singap) 2:632–639
- Bleeker P (1850) Over eenige nieuwe soorten van Scleroparei van den Indischen Archipel.
Natuurk Tijdschr Ned Indië 1:17–27
- Bleeker P (1852) Bijdrage tot de kennis der ichthijologische fauna van de Moluksche
Eilanden. Visschen van Amboina en Ceram. Nat Tijdschr Ned Indië 3:229–309
- Bleeker P (1853) Diagnostische beschrijvingen van nieuwe of weinig bekende vischsoorten
van Sumatra. Tiental V–X. Nat Tijdschr Ned Indië 4:243–302
- Bleeker P (1856) Beschrijvingen van nieuwe en weinig bekende vischsoorten van Amboina,
verzameld op eene reis door den Molukschen Archipel, gedaan in het gevolg van den
Gouverneur Generaal Duymaer van Twist, in September en Oktober 1855. Acta Soc
Regiae Sci Indo-Neerl 1:1–76
- Bleeker P (1869) Description d'une espèce inédite de *Chaetopterus* de l'île d'Amboine.
Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen. Afd
Natuurk (Ser 2) 3:80–85
- Bleeker P (1876a) Genera familiae Scorpaenoideorum conspectus analyticus. Versl Akad
Amst (Ser 2) 9:294–300
- Bleeker P (1876b) Mémoire sur les espèces insulindiennes de la famille des Scorpénoïdes.
Versl Akad Amst 16(2):1–100, pls 1–5
- Bleeker P (1877) Atlas Ichthyologique des Indes Orientales Néerlandaises. Vol 9. Frederic
Mullerand Company, Amsterdam

- Boeseman M (1947) Revision of the fishes collected by Burger and Von Siebold in Japan. Zool Med Leiden 28:i–vii + 1–242, pls 1–5
- Bogorodsky SV, Randall JE (2018) Endemic fishes of the Red Sea. In: Rasul NMA, Stewart ICF (eds) Oceanographic and biological aspects of the Red Sea. Springer Oceanography, Basel, pp 239–265
- Boulenger GA (1889) Second account of the fishes obtained by Surgeon–Major ASG Jayakar at Muscat, east coast of Arabia. Proc Zool Soc Lond 1889:236–246, pls 25–28
- Carpenter KE, Krupp F, Jones DA, Zajonz U (1997) FAO species identification guide for fishery purposes. The living marine resources of Kuwait, eastern Saudi Arabia, Bahrain, Qatar, and the United Arab Emirates. FAO, Rome
- Castelnau FL (1872) Contribution to the ichthyology of Australia. No. II. Note on some South Australian fishes. Proc Zool Acclim Soc Vic, Mel 1:243–247
- Castelnau FL (1873) Contribution to the ichthyology of Australia. Nos. III thru IX. Proc Zool Acclim Soc Vic, Mel 2:37–158
- Chan WL (1966) *Neocentropogon trimaculatus*, a new scorpaenid fish from the South China Sea. Ann Mag Nat Hist (Ser 13) 8(95):635–639
- Chaudoir M (1838) Tableau d’une nouvelle subdivision du genre *Feronia* Dejean suivid’une caractéristique de trois nouveaux genres de carabiques. Bull Soc Imp Nat Moscou 11:3–32
- Chen L–C (1981) Scorpaenid fishes of Taiwan. Quart J Taiwan Mus 34:1–60
- Chungthanawong S, Motomura H (2018) Two new species of the waspfish genus *Ablabys* (Scorpaeniformes: Tetrarogidae) from the western Pacific Ocean. Ichthyol Res <https://doi.org/10.1007/s10228-018-0665-0> (also appeared in Ichthyol Res 66:114–128)

- Cuvier G (1829) *Le règne animal, distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée*. Edition 2. Vol 2. Chez Déterville, Paris
- Cuvier G, Valenciennes A (1829) *Histoire naturelle des poissons*. Vol 4. Chez FG Levrault, Paris
- Cuvier G, Valenciennes A (1830) *Histoire naturelle des poissons*. Vol 6. Chez FG Levrault, Paris
- Cuvier G, Valenciennes A (1839) *Histoire naturelle des poissons*. Vol 13. Chez Pitois–Levrault, Paris
- De Beaufort LF (1949) Two new genera of scorpaenoid fishes. *Copeia* 1949:68
- de Beaufort LF, Briggs JC (1962) Scleroparei. In: Weber M, de Beaufort LF. *The fishes of the Indo–Australian Archipelago*. Vol 11. EJ Brill, Leiden
- De Vis CW (1884a) Fishes from South Sea Islands. *Proc Linn Soc NSW* 8:445–457
- De Vis CW (1884b) New Australian fishes in the Queensland Museum. *Proc Linn Soc NSW* 9:453–462
- Dor M (1984) Checklist of the Fishes of the Red Sea. CLOFRES. The Israel Academy of Sciences and Humanities, Jerusalem
- Duffy CAJ, Ahyong ST (2015) Annotated checklist of the marine flora and fauna of the Kermadec Islands Marine Reserve and northern Kermadec Ridge, New Zealand. In: Trnski T, Schlumpf HA (eds) *Kermadec Biodiversity Expedition 2011*. *Bull Auckland Mus* 60:19–124
- Duncker G, Mohr E (1929) Die Fische der Südsee–Expedition der Hamburgischen Wissenschaftlichen Stiftung 1908–1909. Teil 3. Acanthopteri sens. ampl., Physoclisti malacopterygii, Physostomi, Plagiostomi. *Mitt Zool Mus Hamburg* 44:57–84

- Eagderi S, Fricke R, Esmaceli HR, Jalili P (2019) Annotated checklist of the fishes of the Persian Gulf: diversity and conservation status. *Iran J Ichthyol* 6 (Suppl 1):1–171
- Fowler HW (1934) Zoological results of the third De Schauensee Siamese Expedition, Part I. Fishes. *Proc Acad Nat Sci Philadelphia* 86:67–163, pl 12
- Fowler HW (1938) Descriptions of new fishes obtained by the United States Bureau of Fisheries steamer "*Albatross*", chiefly in Philippine seas and adjacent waters. *Proc US Natl Mus* 85(3032):31–135
- Fowler HW (1943) Contributions to the biology of the Philippine Archipelago and adjacent regions. Descriptions and figures of new fishes obtained in Philippine seas and adjacent waters by the United States Bureau of Fisheries steamer "*Albatross*". *Bull US Natl Mus* 100(14):i–iii + 53–91
- Francis MP (1993) Checklist of the coastal fishes of Lord Howe, Norfolk, and Kermadec Island, southwest Pacific Ocean. *Pac Sci* 47(2):136–170
- Fricke R (2017) *Ocosia sphex*, a new species of waspfish from New Hanover, Papua New Guinea (Teleostei: Tetrarogidae). *J Ocean Sci Found* 28:1–9
- Fricke R, Allen GR, Amon D, Andréfouët S, Chen W–J, Kinch J, Mana R, Russell BC, Tully D, White WT (2019) Checklist of the marine and estuarine fishes of New Ireland Province, Papua New Guinea, western Pacific Ocean, with 810 new records. *Zootaxa* 4588(1):1–360
- Fricke R, Allen GR, Andréfouët S, Chen W–J, Hamel MA, Laboute P, Mana R, Tan HH, Uyeno D (2014) Checklist of the marine and estuarine fishes of Madang District, Papua New Guinea, western Pacific Ocean, with 820 new records. *Zootaxa* 3832(1):1–247
- Fricke R, Eschmeyer WN, van der Lann R (eds) (2020) Eschmeyer Catalog of fishes: genera, species, references. Online version, updated 3 Jan 2020.

<http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>.

Accessed 20 November 2020

- Fricke R, Golani D, Appelbaum–Golani B, Zajonz U (2017) First record of the Meseda waspfish, *Neocentropogon mesedai* from the Gulf of Aqaba, northern Red Sea (Teleostei: Tetraogidae). *Mar Biodivers* <https://doi.org/10.1007/s12526-017-0686-3> (also appeared in *Mar Biodivers* 48:1863–1866)
- Fricke R, Kulbicki M, Wantiez L (2011) Checklist of the fishes of New Caledonia, and their distribution in the Southwest Pacific Ocean (Pisces). *Stuttg Beitr Naturkd (Ser A)* 4:341–463
- Fricke R, Mahafina J, Behivoke F, Jaonalison H, Léopold M, Ponton D (2018) Annotated checklist of the fishes of Madagascar, southwestern Indian Ocean, with 158 new records. *FishTaxa* 3(1):1–432
- Fricke R, Mulochau T, Durville P, Chabanet P, Tessier E, Letourneur Y (2009) Annotated checklist of the fish species (Pisces) of La Réunion, including a Red List of threatened and declining species. *Stutt Beitr Naturkd. Neue Serie A.* 2:1–168
- Fricke R, Teitelbaum A, Wantiez L (2015) Twenty–one new records of fish species (Teleostei) from the New Caledonian EEZ (south–western Pacific Ocean). *Mar Biodivers Rec* 8:1–12
- Gilchrist JDF (1906) Descriptions of fifteen new South African fishes, with notes on other species. *Mar Invest S Afr* 4:143–171, pls 37–51
- Gistel J (1848) *Naturgeschichte des Thierreichs, für höhere Schulen*. Hoffmannsche Verlags–Buchhandlung, Stuttgart
- Gmelin JF (1789) *Caroli a Linné Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species; cum characteribus, differentiis, synonymis, locis*. Editio decimo tertia, aucta, reformata 1(pt 3):1033–1516

- Golani D, Bogorodsky SV (2010) The fishes of the Red Sea—reappraisal and updated checklist. *Zootaxa* 2463:1–135
- Golani D, Fricke R (2018) Checklist of the Red Sea fishes with delineation of the Gulf of Suez, Gulf of Aqaba, endemism and Lessepsian migrants. *Zootaxa* 4509:1–215
- Gomon MF, Glover CJM, Kuitert RH (eds) (1994) The fishes of Australia's south coast. Flora and Fauna of South Australia Handbooks Committee. State Printer, Adelaide
- Goren M, Dor M (1994) An updated checklist of the fishes of the Red Sea. CLOFRES II. The Israel Academy of Sciences and Humanities, Jerusalem
- Gray JE (1838) Notes on the fish. *Ann Mag nat Hist, Mag Zool, Bot, Geol* (2):109–111
- Günther A (1860) Catalogue of the acanthopterygian fishes in the collection of the British Museum (Natural History). Vol 2. Squamipinnes, Cirrhitidae, Triglidae, Trachinidae, Sciaenidae, Polynemidae, Sphyraenidae, Trichiuridae, Scombridae, Carangidae, Xiphiidae. British Museum, London
- Günther A (1862) Descriptions of new species of reptiles and fishes in the collection of the British Museum. *Proc Zool Soc Lond* 1862:188–194, pls 25–27
- Günther A (1880) Report on the shore fishes procured during the voyage of H. M. S. Challenger in the years 1873–1876. In: Report on the scientific results of the voyage of H. M. S. Challenger during the years 1873–76. *Zoology*. 1(6):1–82, pls 1–32
- Ho H–C, Shao K–T (2011) Annotated checklist and type catalog of fish genera and species described from Taiwan. *Zootaxa* 2957: 1–74
- Ho H–C, Shao K–T, Chang C–W (2009) Three new records of the scorpaeniform fishes in Taiwan. *Platax* 6:27–34
- Hoschke A, Whisson G, Moore GI (2019) Complete list of fishes from Rottneest Island. In: Whisson G, Hoschke A (eds) The Rottneest Island fish book. Aqua Research and Monitoring Services, Perth, pp 150–161

- Huang S-P, Shao K-T, Jang-Liaw N-H, Haung H-M, Chen I-S (2015) *Tetraroge* Gunther, 1860 (Teleostei: Tetrarogidae), a new record genus of wasp fish from Taiwan. *J Natl Taiwan Mus* 68(3):71–78
- Hutchins JB (2001) Checklist of the fishes of Western Australia. *Rec West Aust Mus Suppl* 63:9–50
- Hutchins JB, Smith KN (1991) A catalogue of type specimens of fishes in the Western Australian Museum. *Rec West Aust Mus Suppl* 38:1–56
- Iwamoto T, McCosker JE (2014) Deep-water fishes of the 2011 Hearst Philippine biodiversity expedition by the California Academy of Sciences. In: Williams GC, Gosliner TM (eds) *The Coral Triangle. The 2011 Hearst Philippine Biodiversity Expedition*. California Academy of Sciences, San Francisco, pp 263–332
- Johnson JW (1999) Annotated checklist of the fishes of Moreton Bay, Queensland, Australia. *Mem Queensl Mus* 43(2):709–762
- Johnson JW, Motomura H (2008) Family Tetrarogidae Waspfishes, Sailback Scorpionfishes. In: Gomon MF, Bray DJ, Kuitert RH (eds) *Fishes of Australia's Southern Coast*. New Holland Publishers, Sydney
- Jordan DS (1919) The genera of fishes, part II, from Agassiz to Bleeker, 1833–1858, twenty-six years, with the accepted type of each. A contribution to the stability of scientific nomenclature. *Leland Stanf Jr Uni Pub* 36:163–284
- Jordan DS, Richardson RE (1910) Check-list of the species of fishes known from the Philippine Archipelago. *Dept Interior, Bur Sci, Manila Publ* 1:1–78
- Jordan DS, Seale A (1905) List of fishes collected by Dr Bashford Dean on the island of Negros, Philippines. *Proc US Natl Mus* 28(1407):769–803
- Jordan DS, Starks EC (1901) Description of three new species of fishes from Japan. *Proc Calif Acad Sci (Ser 3)* 2(7–8):381–386, pls 20–21

- Jordan DS, Starks EC (1904) A review of the scorpaenoid fishes of Japan. Proc US Nat Mus 27(1351):91–175, pls 1–2
- Kaup JJ (1873) Ueber die familie Triglidae nebst einigen worten über die classification. Arch Arturg 39:71–94
- Kawanabe H, Mizuno N (1989) Freshwater fishes of Japan. Yama–Kei Publishers, Tokyo
- Kim MJ, Hwang UW, Song CB (2010) First record of *Snyderina yamanokami* (Pisces: Scorpaeniformes) from Korea. Fish Aqua Sci 13(3):257–259
- Kimura S, Arshad A, Imamura H, Ghaffar MA (eds) (2015) Fishes of the northwestern Johor Strait, peninsular Malaysia. Universiti Putra Malaysia Press, Serdang, Selangor
- Kimura S, Imamura H, Nguyen VQ, Pham TD (2018) Fishes of Ha Long Bay, the World Natural Heritage Site in northern Vietnam. Fisheries Research Laboratory, Mie University, Mie
- Kimura S, Matsuura K (2003) Fishes of Bitung, northern tip of Sulawesi, Indonesia. Ocean Research Institute, Tokyo
- Kimura S, Peristiwady T (2000) Fishes Ikan. In: Matsuura K, Kurnaen Sumadhiharga O and Tsukamoto K (eds) Field Guide to Lombok Island: Identification guide to marine organisms in seagrass beds of Lombok Island, Indonesia. pp. 99–334
- Klausewitz W (1985) Tiefenwasser–und Tiefseefische aus dem Roten Meer. XI. *Neocentropogon mesedai* n. sp. aus dem Mesobenthos (Pisces: Teleostei: Scorpaenidae: Tetraroginae). Senck Marit 17(1/3):15–23
- Koeda, K, Hibino Y, Yoshida T, Kimura Y, Miki R, Kunishima T, Sasaki D, Furukawa T, Sakurai M, Eguchi K, Suzuki H, Inaba T, Uejo T, Tanaka S, Fujisawa M, Wada H, Uchiyama T (2016) Annotated checklist of fishes of Yonaguni–jima island, the westernmost island in Japan. The Kagoshima University Museum, Kagoshima

- Kottelat M (2013) The fishes of the inland waters of southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries. *Raffles Bull Zool Suppl* 27:1–663
- Kottelat M, Whitten AJ, Kartikasari SN, Wirjoatmodjo S (1993) Freshwater fishes of Western Indonesia and Sulawesi. Periplus Editions, Hong Kong
- Kuiter RH (1993) Coastal fishes of south–eastern Australia. University of Hawaii Press, Honolulu
- Kwun H–J, Park J, Kim H–S, Kim J–H, Park H–S (2017) Checklist of the tidal pool fishes of Jeju Island, Korea. *Zookeys* 709:135–154
- Lacepède BGE (1802) Histoire naturelle des poissons. Vol 4. Plassan, Paris
- Ladiges W, von Wahlert G, Mohr E (1958) Die Typen und Typoide der Fischesammlung des Hamburgischen Zoologischen Staatsinstituts und Zoologischen Museums. *Mitt Hamb Zool Mus Inst* 56:155–167
- Larson HK, Williams RS, Hammer MP (2013) An annotated checklist of the fishes of the Northern Territory, Australia. *Zootaxa* 3696:1–293
- Linck JH (1783) Index Musaei Linckiani: oder kurzes systematisches Verzeichniß der vornehmsten Stücke der Linckischen Naturaliensammlung zu Leipzig. Vol 1. Leipzig, Beygangsche Buchh
- Linnaeus C (1758) Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata. Laurentii Salvii, Holmiae
- Lloyd RE (1909a) A description of the deep–sea fish caught by the R. I. M. S. ship '*Investigator*' since the year 1900, with supposed evidence of mutation in *Malthopsis*. *Mem Indian Mus* 2(3):139–180

- Lloyd RE (1909b) Illustrations of the zoology of the Royal Indian marine survey ship
Investigator. Fishes: part 10. Indian Museum, Calcutta, pls 44–50
- Macleay W (1881) Descriptive catalogue of the fishes of Australia. Part I. Proc Linn Soc
NSW 5(pt 3):302–444
- Mandrytsa SA (2001) Lateral line system and classification of scorpaenoid fishes
(Scorpaeniformes: Scorpaenoidei). Perm State Univ Press, Perm
- Mandrytsa SA, Usachev SI (1990) A new species of the genus *Ocosia* Jordan and Starks
(Scorpaeniformes, Tetrarogidae) from the western part of the Indian Ocean. J Ichthyol
30(3):130–134
- Manilo LG, Bogorodsky SV (2003) Taxonomic composition, diversity and distribution of
coastal fishes of the Arabian Sea. J Ichthyol 43 (suppl 1):S75–S149 Matsubara K (1943)
Studies on the scorpaenoid fishes of Japan. Anatomy, phylogeny and taxonomy (II).
Transactions Sigenkagaku Kenkyusyo 2:171–486
- Masuda H, Amaoka K, Araga C, Uyeno T, Yoshino T (1984) The fishes of the Japanese
Archipelago. Tokai University Press, Tokyo
- Matsubara K (1943) Studies on the scorpaenoid fishes of Japan. Anatomy, phylogeny and
taxonomy (II). Transactions Sigenkagaku Kenkyusyo 2:171–486
- McCulloch AR (1929) A check-list of the fishes recorded from Australia. Mem Aust Mus
5:1–534
- McDowall RM (1996) Freshwater fishes of south–eastern Australia. Second, revised edition.
Reed Books, Chatswood, NSW, Australia
- Mees GF (1962) Additions to the fish fauna of Western Australia 3. Fish Bull West Aust
9:23–30, pl 1
- Mees GF (1964) A note on the genus *Liocranium* Ogilby (Pisces, Scorpaenidae). Zool Meded
40:5–7

- Menon AGK, Rama–Rao KV (1971) Further notes on the fish types in the R.I.M.S. "Investigator" collections (1884–1926). *Copeia* 1971:343–344
- Menon AGK, Yazdani GM (1968) Catalogue of type specimens in the Zoological Survey of India. Part 2. Fishes. *Rec Zool Surv India* 61(1–2): 91–190
- Miesen FW, Droppelmann F, Hüllen S, Hadiaty RK, Herder F (2016) An annotated checklist of the inland fishes of Sulawesi. *Bonn Zool Bull* 64(2):77–106
- Mohsin AKM, Ambak MA (1996) Marine fishes and fisheries of Malaysia and neighbouring countries. Universiti Pertanian Malaysia Press, Selangor
- Moore GI, Hutchins JB, Smith KN, Morrison SM (2008) Catalogue of type specimens of fishes in the Western Australian Museum. *Rec West Aust Mus Suppl* 74:1–69
- Motomura H (2004a) New species of scorpionfish, *Scorpaena cocosensis* (Scorpaeniformes: Scorpaenidae) from the Cocos Islands, Costa Rica, eastern Pacific Ocean. *Copeia* 2004:818–824
- Motomura H (2004b) Revision of the scorpionfish genus *Neosebastes* (Scorpaeniformes: Neosebastidae), with descriptions of five new species. *Indo–Pac Fish* 37:1–76
- Motomura, H. 2009 Tetrarogidae. In: Kimura S, Satapoomin U, Matsuura K. Fishes of Andaman Sea, west coast of southern Thailand. National Museum of Nature and Science, Tokyo, p 70
- Motomura H (2018) Tetrarogidae. In: Kimura S, Imamura H, Nguyen VQ, Pham TD. Fishes of Ha Long Bay, the World Natural Heritage Site in northern Vietnam. Fisheries Research Laboratory, Mie University, Mie
- Motomura H, Alama UB, Muto N, Babaran RP, Ishikawa S (eds) (2017) Commercial and bycatch market fishes of Panay Island, Republic of the Philippines. The Kagoshima University Museum, Kagoshima, University of the Philippines Visayas, Iloilo, and Research Institute for Humanity and Nature, Kyoto

- Motomura H, Iwatsuki Y (1997) A preliminary report of scorpaenid, synanceiid, tetraogid and aploactinid fishes in Miyazaki waters, southern Japan. Bull Fac Agric Miyazaki Univ 44(1–2):127–138
- Motomura H, Last PR, Johnson, JW (2008) Review of the waspfish genus *Liocranium* (Scorpaeniformes: Tetraogidae), with restoration of *L. pleurostigma* (Weber). Zootaxa 1820:27–40
- Motomura H, Kuriwa K, Katayama E, Senou H, Ogihara G, Meguro M, Matsunuma M, Takata Y, Yoshida T, Yamashita M, Kimura S, Endo H, Murase A, Iwatsuki Y, Sakurai Y, Harazaki S, Hidaka K, Izumi H, Matsuura K (2010) Annotated checklist of marine and estuarine fishes of Yaku-shima Island, Kagoshima, southern Japan. In: Motomura H, Matsuura K (eds) Fishes of Yaku-shima Island. National Museum of Nature and Science, Tokyo, pp 65–247
- Myers RF (1999) Micronesian reef fishes. A comprehensive guide to the coral reef fishes of Micronesia. 3rd revised ed. Coral Graphics, Guam
- Nakabo T (1984) Congiopodidae. In: Masuda H, Amaoka K, Araga C, Uyeno T, Yoshino T (eds) The fishes of the Japanese Archipelago. Tokai University Press, Tokyo, p 319
- Nakabo T (2000) Tetraogidae. In: Nakabo T (ed) Fishes of Japan with pictorial keys to the species. Second edition. Tokai University Press, Hadano, pp 599–600
- Nakabo T (2002) Tetraogidae. In: Nakabo T (ed) Fishes of Japan with pictorial keys to the species. English edition. Tokai University Press, Hadano, pp 599–600
- Naranji MK, Kandula S. (2017) A new record of Gunther’s Waspfish *Snyderina guentheri* (Boulenger, 1889) (Scorpaeniformes: Tetraogidae) from Visakhapatnam, India. J threat taxa 9(4):10130–10132

- Nijssen H, van Tuijl L, Isbrücker IJH (1982) A catalogue of the type specimens of Recent fishes in the Institute of Taxonomic Zoology (Zoölogisch Museum), University of Amsterdam, The Netherlands. Verslagen en Technische Gegevens, Inst Taxon Zoöo Univ Amst 33:1–173
- Nijssen H, van Tuijl L, Isbrücker IJH (1993) Revised catalog of the type specimens of recent fishes in the Institute of Taxonomic Zoology (Zoölogisch Museum), University of Amsterdam, The Netherlands. Bull Zoöl Mus Univ Amst 13(18):211–260
- Ogihara G, Motomura H (2012) First record of *Neocentropogon aeglefinus japonicus* from Kagoshima Prefecture, southern Japan, with a synopsis of waspfishes (Scorpaeniformes: Tetrarogidae) in Kagoshima Prefecture. Nat Kagoshima 38:139–144
- Ogilby JD (1903) Studies in the ichthyology of Queensland. Proc R Soc Qld 18:7–27
- Ogilby JD (1910) On some new fishes from the Queensland coast. Proc R Soc Qld 23:85
- Paepke H–J (2001) Comments on the old Japanese fish collections in the Museum of Natural History of the Humboldt University of Berlin. Ichthyol Res 48(3):329–334
- Paepke H–J, Fricke R (1992) Kritischer Katalog der Typen der Fischeammlung des Zoologischen Museums Berlin. Teil 4: Scorpaeniformes. Mitt Zool Mus Berlin 68(2):267–293
- Paulin CD (1982) Scorpionfishes of New Zealand (Pisces: Scorpaenidae). New Zeal J Zool 9:437–450
- Paxton JR, Hoese DF, Allen GR, Hanley JE (1989) Zoological catalogue of Australia. Vol 7. Pisces. Petromyzontidae to Carangidae. Australian Government Publishing Service, Canberra
- Perugia A (1896) Elenco dei pesci raccolti dal Dott. Elio Modigliani nelle isole Mentawai. Ann Mus Civ Stor Nat Genova (Ser 2) 16:47–54

- Peters W (1855a) Uebersicht der in Mossambique beobachteten Fische. Arch Nat 21:234–282, pls 2–3
- Peters W (1855b) Übersicht der in Mossambique beobachteten Seefische. Ber Akad Wiss Berlin 1855:428–466
- Pollard DA, Parker P (1996) Family Scorpaenidae: scorpionfishes. In: McDowall RM (ed) Freshwater fishes of south-eastern Australia. Reed, Sydney, pp 144–145
- Poss SG (1986) Tetrarogidae. In: Smith MM, Heemstra PC (eds) Smiths' Sea Fishes. Macmillan South Africa, Johannesburg, p 479, pl 29
- Poss SG (1999) Scorpaenidae. Scorpionfishes (also, lionfishes, rockfishes, stingfishes, stonefishes, and waspfishes). In: Carpenter KE, Niem VH (eds) FAO species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Vol 4. Bony fishes part 2 (Mugilidae to Carangidae). FAO, Rome, pp 2291–2352
- Poss SG (2000) Scorpaenidae. In: Randall JE, Lim KKP (eds) A checklist of the fishes of the South China Sea. Raffles Bull Zool Suppl 8:569–667
- Poss SG, Eschmeyer WN (1975) The Indo–West Pacific scorpionfish genus *Ocosia* Jordan and Starks (Scorpaenidae, Tetraroginae), with description of three new species. Matsya 1:1–18
- Poss SG, Rama–Rao KV (1984) Scorpaenidae (scorpionfishes, rockfishes, rosefishes, stingfishes, stonefishes, turkeyfishes and waspfishes). In: Fischer W, Bianchi G (eds) FAO species identification sheets for fishery purposes. Fishing area 51. Western Indian Ocean. Vol 4. FAO, Rome, pp 1–13
- Prokofiev AM (2008) Scorpionfishes of families Apistidae, Tetrarogidae, and Aploactinidae of Nha Trang Bay (South China Sea, Central Vietnam). J Ichthyol 48(4):301–312

- Psomadakis, P, Thein H, Russell BC, Tun MT (2020) Field identification guide to the living marine resources of Myanmar. FAO species identification guide for fishery purposes. FAO and MOALI, Rome
- Psomadakis PN, Osmany HB, Moazzam M (2015) Field identification guide to the living marine resources of Pakistan. FAO species identification guide for fishery purposes. Food and Agriculture Organization of the United Nations, Rome
- Pusey BJ, Burrows DW, Kennard MJ, Perna CN, Unmack PJ, Allsop Q, Hammer MP (2017) Freshwater fishes of northern Australia. *Zootaxa* 4253(1):1–104
- Quéro JC, Spitz J, Vayne JJ (2011) Une éruption volcanique débusque *Neocentropogon profundus* (Tetrarogidae, Scorpaenoidei) à l'île de la Réunion (océan Indien). *Cybium* 35:99–103
- Quoy JRC, Gaimard JP (1824) Description des Poissons. In: Freycinet L de (ed) Voyage autour du Monde exécuté sur les corvettes de S. M. L'Uranie et La Physicienne, pendant les années 1817, 1818, 1819 et 1820 par M. L. de Freycinet. Zoologie tome 3. Pillet Aîné, Paris, pp 192–401
- Randall JE (1995) Coastal fishes of Oman. Crawford House Publishing Pty Ltd, Bathurst
- Randall JE (2005) Reef and shore fishes of the South Pacific. New Caledonia to Tahiti and the Pitcairn Islands. University of Hawai'i Press, Honolulu
- Randall JE, Allen GR, Steene RC (1990) Fishes of the Great Barrier Reef and Coral Sea. Crawford House Press, Bathurst NSW
- Randall JE, Allen GR, Steene RC (1997) Fishes of the Great Barrier Reef and Coral Sea. 2nd, revised ed., Crawford House Press, Bathurst NSW
- Randall JE, Eschmeyer WN (2002, dated as 2001) Revision of the Indo–Pacific scorpionfish genus *Scorpaenopsis*, with descriptions of eight new species. *Indo–Pac Fish* 34:1–79

- Randall JE, Lim KKP (2000) A checklist of the fishes of the South China Sea. *Raffles Bull Zool Suppl* 8:569–667
- Regan CT (1919) Fishes from Durban, Natal, collected by Messrs. H. W. Bell Marley and Romer Robinson. *Ann Durban Mus* 2:197–204
- Richardson J (1848) Fishes. In: Adams A (ed) *The zoology of the voyage of HMS Samarang; under the command of Captain Sir Edward Belcher, during the years 1843–1846*. Reeve and Benham, London, pp 1–28, pls 1–10
- Richardson J (1850) Notices of Australian fish. *Proc Zoo Soc Lond* 1850 (18):58–77, pls 1–3
- Sabaj MH (2019) Standard symbolic codes for institutional resources in herpetology and ichthyology: an online reference, ver 7.1 (21 March 2019). American Society of Ichthyologists and Herpetologists, Washington, DC. <http://www.asih.org/>. Accessed 20 November 2020
- Sainsbury K, Kailola PJ, Leyland GG (1985) Continental shelf fishes of northern and north-western Australia. An illustrated guide. Clouston and Hall and Peter Pownall Fisheries Information Service, Canberra
- Sakai H, Sato M, Nakamura M (2001) Annotated checklist of fishes collected from the rivers in the Ryukyu Archipelago. *Bull Natl Sci Mus (Tokyo) Ser A*, 27(2):81–139
- Sato M, Kobayashi H, Iida M, Shirai K, Sasaki K (2020) A record of *Tetraroge nigra* (Tetrarogidae) from Iriomote Island, southern Japan, with notes on its ecological aspects. *Ichthyol Res* <https://doi.org/10.1007/s10228-020-00763-5>
- Sauvage H–E (1878) Description de poissons nouveaux ou imparfaitement connus de la collection du Muséum d'Histoire Naturelle. Famille des Scorpénidées, des Platycéphalidées et des Triglidées. *Nouv Arch Mus Hist Nat Paris (Sér 2)* 1:109–158, pls 1–2

- Shao, K–T, Ho H–C, Lin P–L, Lee P–F, Lee M–Y, Tsai C–Y, Liao Y–C, Lin Y–C (2008) A checklist of the fishes of southern Taiwan, Northern South China Sea. *Raffles Bull Zool Suppl. No.* 19:233–271
- Shimizu T (2001) An annotated list of the coastal fishes from Iyo City, Ehime Prefecture [sic], Japan. *Bull Tokushima Prefect Mus* 11:17–99
- Shinohara G, Endo H, Matsuura K, Machida Y, Honda H (2001) Annotated checklist of the deepwater fishes from Tosa Bay, Japan. In: Fujita T, Saito H, Takeda M (eds) Deep–sea fauna and pollutants in Tosa Bay. *Natl Sci Mus Monogr* 20:283–343
- Shinohara G, Sato T, Aonuma Y, Horikawa H, Matsuura K, Nakabo T, Sato K (2005) Annotated checklist of deep–sea fishes from the waters around the Ryukyu Islands, Japan. Deep–sea fauna and pollutants in the Nansei Islands. *Natl Sci Mus Monogr* 29:385–452
- Shinohara G, Sato Y, Matsuura K (2000) Coastal fishes of Ishima Island, Tokushima, Japan. *Monogr Nat Sci Mus Tokyo* 33:175–186
- Shinohara G, Williams JT (2006) Historical Japanese fish specimens from the Sagami Sea in the National Museum of Natural History, Smithsonian Institution. *Memoirs of the National Science Museum Tokyo* 41:343–568
- Smith JLB (1958) Fishes of the families Tetrarogidae, Caracanthidae and Synanciidae, from the western Indian Ocean with further notes on scorpaenid fishes. *Ichthyol Bull JLB Smith Inst Ichthyol* 12:67–181, pls 7–8
- Soniyama T, Ogimoto K, Hori S, Uchida Y, Kawano M (2020) An annotated checklist of marine fishes of the Sea of Japan off Yamaguchi Prefecture, Japan, with 74 new records. *Bull Kagoshima Univ Mus* 11:1–152
- Steindachner F (1866) Zur Fischfauna von Port Jackson in Australien. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Math Naturwiss Kl* 53:424–481, pls 1–7

- Struthers CD (2015) Family Tetraogidae. In: Roberts CD, Stewart AL, Struthers CD (eds) The Fishes of New Zealand. Vol 3. Te Papa Press, Wellington, pp 1101–1102
- Suresh VR, Mohanty SK, Manna RK, Bhatta KS, Mukherjee M, Karna SK, Sharma AP, Das BK, Pattnaik AK, Nanda S, Lenka S (2018) Fish and shellfish diversity and its sustainable management in Chilika Lake. ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata and Chilika Development Authority, Bhubaneswar
- Swainson W (1839) On the natural history and classification of fishes, amphibians, and reptiles, or monocardian animals. Spottiswoode and Co, London
- Temminck CJ, Schlegel H (1843) Pisces. Parts 2–3. In: von Siebold PF (ed) Fauna Japonica, sive descriptio animalium quae in itinere per Japoniam suscepto annis 1823–30 collegit, notis, observationibus et adumbrationibus illustravit. J Müller and Co, Amsterdam, pp 21–72
- Tortonese E (1963) Catalogo dei tipi di pesci del Museo Civico di Storia Naturale di Genova. (Parte III). Ann Mus Civ Stor Nat Giacomo Doria 73:333–350
- Varghese M (2013) First record of *Ablabys binotatus* (Scorpaeniformes: Tetraogidae) from Indian waters. Mar Biodivers Rec 6(120):1–3
- Weber M (1913) Die Fische der Siboga-Expedition. EJ Brill, Leiden
- Weber C (1998) Catalogue révisé des types primaires de la collection ichtyologique du Muséum d'histoire naturelle de la Ville de Genève (MHNG). Rev suisse zool 105(1):3–14
- White J (1790) Journal of a voyage to New South Wales with sixty-five plates of non-descript animals, birds, lizards, serpents, curious cones of trees and other natural productions. JD Piccadilly, London
- Whitehead PJP, Talwar PK (1976) Francis Day (1829–1889) and his collections of Indian fishes. Bull Br Mus nat Hist 5(1):1–189, pls 1–4

- Whitley GP (1927) Studies in ichthyology. No. 1. Records of the Australian Museum
15(5):289–304, pls 24–25
- Whitley GP (1931) Studies in ichthyology. No 4. Rec Aust Mus 18(3):96–133, pls 9–16
- Whitley GP (1933) Studies in ichthyology. No 7. Rec Aust Mus 19(1):60–112, pls 11–15
- Whitley GP (1958) Descriptions and records of fishes. Proc R Zool Soc NSW 77:28–51
- Yamakawa T (1976) The record of scorpaenoid fish, *Snyderina yamanokami*, collected from
Amami–Oshima, Kagoshima Prefecture, Japan. JPN J Ichthyol 23:60–61
- Yoshida T, Motomura H, Musikasinthorn P, Matsuura K (2013) Fishes of northern Gulf of
Thailand. National Museum of Nature and Science, Tsukuba Research Institute for
Humanity and Nature, Kyoto, and Kagoshima University Museum, Kagoshima

Table 1 Frequency distribution of selected meristics in species of *Neocentropogon*

	Dorsal-fin spines				Dorsal-fin soft rays			Pectoral-fin rays (one side/other side)					Anal-fin soft rays					
	13	14	15	16	6	7	8	13/14	14/14	14/15	15/15	15/16	5	6	7	8		
<i>N. aeglefinus</i>	3	63	1		1	57	9	1	7	3	53	3	1	66				
<i>N. affinis</i>		7 ^S				6 ^S	1 ^S				7 ^S			7 ^S				
<i>N. japonicus</i>		1	65 ^H	6	9	63 ^H			3	2	67 ^S			19	53 ^H			
<i>N. mesedai</i>	1 ^H						1 ^H		1 ^H				1 ^H					
<i>N. profundus</i>		5 ^S				5 ^S				1 ^H	4		5 ^H					
<i>N. trimaculatus</i>																		
Northern Hemisphere		9 ^H	3		2	6	4 ^H		1	3	7 ^H	1			11 ^H	1		
Southern Hemisphere	1	24	1			5	21		2	6	18			2	23	1		
	Lateral-line pores									Total gill rakers								
	18	19	20	21	22	23	24	25	26	12	13	14	15	16	17	18	19	20
<i>N. aeglefinus</i>			1	7	20	34	5			1	1	17	21	14	5	5	1	
<i>N. affinis</i>					2 ^S	4 ^S	1 ^S					1 ^S	1 ^S	3 ^{2S}	2			
<i>N. japonicus</i>		2	5	11	31 ^H	20	3					1	2 ^H	13	23	26	7	
<i>N. mesedai</i>	1 ^H													1 ^H				
<i>N. profundus</i>					1 ^H	3	1			1 ^H	1	3						
<i>N. trimaculatus</i>																		
Northern Hemisphere					1		8 ^H	3						2	7 ^H	1	2	
Southern Hemisphere				2	2	1	12	8	1						7	11	6	2

^H and ^S indicate holotype and syntype, respectively

Table 2 Counts and measurements in *Neocentropogon aeglefinus*, *N. affinis*, *N. japonicus*, and *N. mesedai*

	<i>N. aeglefinus</i>		<i>N. affinis</i>			<i>N. japonicus</i>		<i>N. mesedai</i>	
	Non-types <i>n</i> = 77	Modes	Syntypes <i>n</i> = 4	Non-types <i>n</i> = 3	Modes	Holotype FAKU 1761	Non-types <i>n</i> = 73	Modes	Holotype SMF 20198
Standard length (SL; mm)	29.6–116.4		56.2–67.2	60.6–73.9		97.9	27.5–108.5		62.1
Counts		Modes			Modes			Modes	
Dorsal-fin rays	XIII–XV, 6–8	XIV, 7	XIV, 7–8	XIV, 7	XIV, 7	XV, 7	XIV–XVI, 6–7	XV, 7	XIII, 8
Anal-fin rays	III, 5–6	III, 6	III, 6	III, 6	III, 6	III, 7	III, 6–7	III, 7	III, 5
Pectoral-fin rays (one side/other side)	14–16/13–15	15/15	15/15	15/15	15/15	15/15	14–15/15	15/15	14/14
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	94–137	104	79–96	86–94	80	114	97–139	117	85
Scale rows above lateral line	8–17	14	0–7	7–8	7	15	10–21	14	2
Scale rows below lateral line	28–42	35	28–34	28–36	28	38	29–44	32	30
Scale rows between last dorsal-fin spine base and lateral line	8–14	10	8–10	8–10	10	12	8–16	10	7
Scale rows between sixth dorsal-fin spine base and lateral line	9–19	16	8–13	10–13	10	21	12–23	16	5
Lateral-line pores	21–24	23	22–24	22–23	23	22	19–24	22	18
Gill rakers (upper + lower = total)	2–5 + 9–14 = 12–19	4 + 12 = 15	2–4 + 12 = 14–16	4 + 12–13 = 16–17	4 + 12 = 16	4 + 11 = 15	3–5 + 11–14 = 14–19	4 + 13 = 18	4 + 12 = 16
Measurements (% of SL)		Means			Means			Means	
Head length (HL)	37.1–44.0	40.6	40.3–40.8	41.6–42.0	41.1	39.3	36.7–42.8	39.6	42.5
Head width	19.5–27.4	23.2	20.8–24.4	19.3–24.1	22.5	21.2	18.1–25.3	21.5	20.1
Snout length	8.1–11.8	9.7	8.8–10.1	9.0–10.3	9.5	9.4	7.6–11.7	10.0	11.1
Body depth	27.5–37.1	30.7	31.6–33.9	29.4–31.8	32.0	29.7	27.7–38.6	31.5	32.2
Body width	16.7–28.7	21.1	17.6–21.5	16.7–21.0	19.3	16.7	13.6–24.2	18.8	17.4
Orbit diameter	11.8–15.3	13.5	13.0–14.8	13.2–13.5	13.7	12.5	11.4–14.1	12.7	13.7
Suborbital width	2.5–5.2	3.8	3.1–4.0	3.6–3.8	3.6	3.6	1.7–5.2	3.8	6.4
Interorbital width	3.6–7.3	5.2	5.4–5.9	5.3–5.9	5.6	5.4	4.4–6.5	5.5	—
Upper-jaw length	16.3–20.1	18.3	19.1–19.4	18.1–19.6	19.1	18.3	16.6–19.6	18.2	18.4
Postorbital length	17.2–20.2	18.9	17.6–19.8	19.4–20.6	19.4	18.1	15.7–20.2	18.4	19.8
Pre-dorsal-fin length	18.9–24.6	21.8	20.5–23.8	21.9–23.1	22.7	21.7	18.4–26.0	21.4	23.5
Pre-anal-fin length	56.7–70.0	64.8	62.4–68.7	64.1–64.7	65.2	65.6	58.9–70.5	65.0	68.1
Pre-pelvic-fin length	31.7–44.5	35.9	35.4–42.3	34.8–36.4	36.6	32.7	31.6–45.3	35.5	38.0
Caudal-peduncle depth	7.4–10.0	8.8	8.8–9.6	8.0–9.1	8.9	11.2	8.0–14.3	8.8	8.1
Caudal-peduncle length	10.8–19.6	15.8	14.9–18.2	15.3–17.7	16.2	16.3	12.3–18.1	15.7	13.8
Dorsal-fin base length	63.7–77.0	71.0	65.5–78.4	73.5–74.6	72.8	72.5	68.3–82.0	74.3	71.3
Anal-fin base length	20.0–27.2	23.6	20.2–23.3	21.8–24.0	22.3	23.5	18.4–27.6	23.0	—
Caudal-fin length	26.2–38.3	32.9	26.6	27.6–31.9	29.1	30.3	28.5–37.4	32.5	—
Pectoral-fin length	31.5–43.4	36.2	33.0–36.9	32.9–35.2	34.4	31.0	29.0–43.5	33.8	40.0

Posterior lacrimal spine length	6.4–13.4	10.0	8.9–9.8	9.2–10.1	9.5	8.8	5.4–11.5	9.0	8.7
First dorsal-fin spine length	6.7–18.3	11.6	8.0–10.3	9.6–12.5	10.2	9.3	7.9–14.9	9.8	13.2
Second dorsal-fin spine length	13.6–30.0	18.8	16.1–18.5	15.5–20.4	17.9	14.4	11.1–22.0	15.0	—
Third dorsal-fin spine length	15.2–33.6	19.5	15.2–15.5	16.1–19.9	16.7	15.8	12.6–22.0	16.4	24.3
Fourth dorsal-fin spine length	12.5–22.5	16.1	11.6–13.6	12.0–15.7	13.5	14.4	12.3–19.0	14.5	23.5
Fifth dorsal-fin spine length	10.1–20.0	15.3	11.9–14.5	10.7–14.3	13.0	14.1	11.3–18.7	14.0	22.4
Sixth dorsal-fin spine length	11.1–18.2	15.2	11.0–14.5	11.5–14.6	12.8	13.9	11.1–19.2	13.9	—
Penultimate dorsal-fin spine length	13.0–20.4	16.7	—	15.2–15.4	15.3	15.0	13.1–19.5	16.1	—
Last dorsal-fin spine length	14.2–20.6	17.4	14.2–17.4	15.5–15.6	15.6	15.6	13.9–19.5	16.4	18.4
Longest dorsal-fin soft ray length	17.2–23.9	20.9	—	20.0–20.8	20.4	18.5	15.6–23.7	19.4	22.1
First anal-fin spine length	4.3–11.3	7.6	5.2–6.2	6.5–7.9	6.7	7.3	5.5–11.5	7.8	10.8
Second anal-fin spine length	8.7–15.7	11.3	9.9–14.8	10.4–12.6	11.8	10.0	9.1–16.9	11.2	15.6
Third anal-fin spine length	11.7–18.8	14.4	13.4–14.7	12.4–15.0	14.0	11.8	11.3–18.5	14.1	20.1
Longest anal-fin soft ray length	11.9–25.5	19.3	14.1	18.3–20.9	18.3	18.8	13.6–22.4	19.2	22.7
Pelvic-fin spine length	14.2–25.1	17.4	16.7–18.5	16.2–19.4	17.9	13.7	13.1–23.9	16.1	21.3
Longest pelvic-fin soft ray length	18.6–29.7	24.0	25.5	21.6–25.4	24.5	20.9	17.7–27.3	22.1	27.7
Measurements (% of HL)									
Upper-jaw length	40.1–49.2	45.0	47.1–47.7	43.3–46.8	46.5	46.7	42.9–49.9	46.1	43.2

Table 3 Counts and measurements in *Neocentropogon profundus* and *N. trimaculatus*

	<i>N. profundus</i>			<i>N. trimaculatus</i>			
	Holotype SAIAB 300	Non-types <i>n</i> = 4	Modes	Holotype BMNH 1965.11.6.3	Northern Hemisphere <i>n</i> = 11	Southern Hemisphere <i>n</i> = 26	Modes
Standard length (SL; mm)	56.4	66.9–85.10		80.8	24.5–145.6	48.8–139.3	
Counts							
Dorsal-fin rays	XIV, 7	XIV, 7	XIV, 7	XIV, 8	XIV–XV, 6–8	XIII–XV, 7–8	XIV, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 7	III, 7–8	III, 6–8	III, 7
Pectoral-fin rays (one side/other side)	14/15	15/15	15/15	15/15	14–16/14–15	14–15/14–15	15/15
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	71	71–76	71	110	118–143	92–104	138
Scale rows above lateral line	5	5–8	5	12	7–16	1–19	2
Scale rows below lateral line	25	24–28	27	39	40–50	25–55	46
Scale rows between last dorsal-fin spine base and lateral line	5	5–8	5	13	9–16	6–19	16
Scale rows between sixth dorsal-fin spine base and lateral line	10	8–10	10	11	11–27	1–26	9
Lateral-line pores	22	23–24	23	24	22–25	21–26	24
Gill rakers (upper + lower = total)	3 + 9 = 12	3 + 10–11 = 13–14	3 + 11 = 14	4 + 13 = 17	4–5 + 12–14 = 16–19	3–5 + 12–15 = 17–20	4 + 13 = 17
Measurements (% of SL)			Means				Means
Head length (HL)	40.6	40.4–42.1	41.1	39.3	35.4–38.8	37.0–42.5	38.7
Head width	26.3	23.6–24.4	24.3	26.4	19.9–24.0	19.2–25.0	18.2
Snout length	11.7	10.9–12.4	11.7	11.5	7.4–12.5	9.2–13.0	10.5
Body depth	36.2	32.0–34.9	33.7	32.2	30.3–37.8	28.2–34.9	31.6
Body width	21.8	17.3–22.7	20.2	19.3	18.4–22.1	15.7–21.3	19.4
Orbit diameter	16.0	15.4–17.0	15.9	12.9	10.5–12.2	11.6–14.7	12.7
Suborbital width	3.8	3.2–3.9	3.7	3.3	1.4–8.4	3.1–7.1	4.2
Interorbital width	7.5	6.6–7.4	7.1	6.8	5.4–6.9	4.8–7.4	6.1
Upper-jaw length	18.8	17.1–18.3	18.0	16.8	13.4–17.3	16.4–18.5	17.0
Postorbital length	16.6	16.8–15.4	16.2	16.8	14.4–17.4	14.6–18.1	16.5
Pre-dorsal-fin length	19.1	22.9–24.4	22.6	22.9	16.2–24.4	20.6–25.6	22.2
Pre-anal-fin length	69.3	68.1–73.1	70.0	62.6	58.6–66.2	60.5–68.5	64.2
Pre-pelvic-fin length	39.0	38.9–43.1	40.0	36.8	31.6–35.9	33.5–41.5	35.9
Caudal-peduncle depth	9.6	8.2–9.3	8.9	9.5	8.1–10.5	7.4–9.6	8.6
Caudal-peduncle length	13.4	13.0–15.4	13.8	17.0	12.0–17.4	13.0–19.5	15.5
Dorsal-fin base length	75.7	68.9–74.9	72.6	71.0	67.5–77.4	67.5–75.8	71.7
Anal-fin base length	—	19.8–21.2	20.3	26.2	21.6–28.8	22.1–25.9	24.4
Caudal-fin length	29.9	26.9–30.5	29.3	36.5	30.9–35.9	31.0–39.2	34.1
Pectoral-fin length	35.5	32.0–34.8	33.8	35.8	29.2–66.7	30.0–37.5	34.8
Posterior lacrimal spine length	9.8	8.7–11.4	9.9	8.1	4.6–9.4	6.9–10.6	8.4

First dorsal-fin spine length	—	10.0–10.7	10.3	10.6	8.7–25.6	7.2–13.6	11.5
Second dorsal-fin spine length	—	15.9–17.5	16.8	—	13.7–38.0	13.6–20.0	18.2
Third dorsal-fin spine length	—	19.1–20.9	19.9	—	16.6–43.1	15.7–23.1	20.4
Fourth dorsal-fin spine length	—	18.8–20.9	19.7	17.4	14.7–37.5	12.4–20.6	18.3
Fifth dorsal-fin spine length	—	16.6–18.9	18.0	17.8	14.9–33.1	13.6–19.8	17.3
Sixth dorsal-fin spine length	—	17.4–17.9	17.6	16.6	14.5–31.4	13.0–17.5	16.4
Penultimate dorsal-fin spine length	—	16.5–18.8	17.8	22.5	17.1–32.0	14.3–20.9	19.3
Last dorsal-fin spine length	20.0	18.4–19.0	18.9	—	17.6–30.8	15.1–21.1	19.2
Longest dorsal-fin soft ray length	21.6	20.0–21.4	21.0	23.1	19.7–28.8	18.5–23.7	21.7
First anal-fin spine length	—	6.7–7.8	7.4	7.0	6.2–15.4	6.6–9.8	8.3
Second anal-fin spine length	—	11.2–13.0	12.3	11.5	8.8–23.2	9.6–14.0	12.0
Third anal-fin spine length	—	14.4–18.1	16.0	14.1	11.5–29.7	11.6–16.8	14.9
Longest anal-fin soft ray length	—	18.5–19.2	18.9	22.6	16.3–25.5	15.8–22.3	19.4
Pelvic-fin spine length	—	14.7–16.0	15.2	15.0	12.0–35.2	12.2–18.1	15.3
Longest pelvic-fin soft ray length	—	23.5–24.5	24.1	27.1	19.4–38.0	21.2–25.7	24.4
Measurements (% of HL)							
Upper-jaw length	46.3	42.4–46.3	42.8	42.7	37.4–46.3	41.7–47.6	43.9

Table 4 Comparative features for genera in the family Tetrarogidae

	Dorsal-fin spines	Pelvic-fin soft rays	Pectoral- fin rays	Upper jaw length (% of HL)	Orbit diameter (% of SL)	Cirri, papillae, or tentacles on		
						head	body	eyes
<i>Ablabys</i>	15–18	5	11–13	26.1–40.4	8.2–12.7	absent	absent	absent
<i>Centropogon</i>	15–17	5	13–14	30.3–43.8	11.1–16.0	absent	absent	absent
<i>Coccotropsis</i>	14–16	3	11–12	41.7–47.3	7.7–10.3	present	absent	present
<i>Cottapistus</i>	14–15	4	14	51.9–53.0	9.1–10.7	absent	absent	absent
<i>Glyptauchen</i>	17	5	13–14	22.7–29.2	11.9–13.4	absent	absent	absent
<i>Gymnapistes</i>	13	5	11–12	40.8–42.4	10.9–14.0	absent	absent	absent
<i>Liocranium</i>	13–14	4	13–15	41.6–45.9	12.3–15.7	absent	absent	absent
<i>Neocentropogon</i>	13–16	5	13–16	37.4–49.9	10.5–17.0	absent	absent	absent
<i>Neovespicula</i>	13	5	10–12	37.9–44.0	8.5–13.4	absent	absent	absent
<i>Notesthes</i>	15	5	11–12	39.5–44.9	7.7–11.6	absent	absent	absent
<i>Ocosia</i>	14–17	5	12–13	31.2–41.8	9.1–13.0	absent	absent	absent
<i>Paracentropogon</i>	14–15	4	10–11	30.4–38.9	10.9–13.7	present	absent	absent
<i>Pseudovespicula</i>	11–14	5	11–14	38.3–51.9	11.1–14.5	absent	absent	present***
<i>Richardsonichthys</i>	12–13	5	14–17	46.1–56.5	11.6–17.7	absent	absent	present
<i>Snyderina</i>	12–13	5	13–16	34.6–51.1	9.9–15.7	present/absent	absent	absent
<i>Tetraroge</i>	13–14	5	12	36.5–45.9	9.3–12.7	present	present	present (papillae)
<i>Trichosomus</i>	15–16	4	11–13	42.8–52.4	6.7–11.9	present	present	present

* in *A. pauciporus*** in *O. sphex**** in *V. cypho*

Table 4 (continued)

	Head profile	Nape profile	Position of opercular tip relative to dorsal-fin base	Teeth on palatines	Scales on body	Position of lateral line relative to dorsal-fin base
<i>Ablabys</i>	almost vertical, slightly concave	flattened	well separated	present	present	well separated
<i>Centropogon</i>	oblique, convex	flattened	well separated	present	present	well separated
<i>Cocotropsis</i>	oblique, slightly convex	flattened	well separated	absent	absent	well separated
<i>Cottapistus</i>	oblique, slightly convex	flattened	well separated	present	present	well separated
<i>Glyptauchen</i>	vertical, squarish	concave	well separated	present	present	well separated
<i>Gymnapistes</i>	oblique, slightly convex	flattened	well separated	present	absent	well separated
<i>Liocranium</i>	oblique, straight	flattened	well separated	absent	present	well separated
<i>Neocentropogon</i>	oblique, straight	flattened	well separated	present	present	well separated
<i>Neovespicula</i>	oblique, straight	flattened	well separated	present	present	well separated
<i>Notesthes</i>	oblique, straight	flattened	well separated	present	present	well separated
<i>Ocosia</i>	oblique, straight	flattened	well separated	present	absent	well separated
<i>Paracentropogon</i>	oblique, straight	flattened	well separated	present	present	well separated
<i>Pseudovespicula</i>	oblique, straight	flattened	well separated	present	present	well separated
<i>Richardsonichthys</i>	oblique, convex	flattened	adjacent	present	absent	close
<i>Snyderina</i>	oblique, straight	flattened	well separated	absent	present	well separated
<i>Tetraroge</i>	oblique, straight	flattened	well separated	present	absent	well separated
<i>Trichosomus</i>	oblique, straight	flattened	adjacent	present	present	close

Table 4 (continued)

	Cleithral spines	Position of dorsal-fin origin relative to posterior margin of orbit	Anterior dorsal-fin spines forming separate fin	Membrane of last dorsal-fin soft ray posteriorly connected to upper basal caudal fin	Lowermost four pectoral-fin rays detached
<i>Ablabys</i>	absent	anterior	no	yes	no
<i>Centropogon</i>	present	posterior	no	no	no
<i>Cocotropsis</i>	present	anterior	no	no	no
<i>Cottapistus</i>	absent	anterior	no	no	no
<i>Glyptauchen</i>	present	posterior	no	no	no
<i>Gymnapistes</i>	absent	posterior	no	no	no
<i>Liocranium</i>	absent	anterior	no	no	no
<i>Neocentropogon</i>	absent	anterior	no	no	yes
<i>Neovespicula</i>	absent	posterior	no	no	no
<i>Notesthes</i>	present	posterior	no	no	no
<i>Ocosia</i>	absent	anterior	no	no	no
<i>Paracentropogon</i>	absent	anterior	no	no	no
<i>Pseudovespicula</i>	absent	posterior	no	no	no
<i>Richardsonichthys</i>	absent	anterior	no	no	no
<i>Snyderina</i>	present/absent	anterior	no	no	no
<i>Tetraroge</i>	absent	anterior	no	no	no
<i>Trichosomus</i>	absent	posterior	yes	no	no

Table 5 Counts and measurements in *Ablabys binotatus* and *A. gymnothorax*

	<i>A. binotatus</i>			<i>A. gymnothorax</i>			
	<i>Apistus binotatus</i>	<i>Tetraroge marleyi</i>	<i>A. binotatus</i>	Holotype		Paratypes	
	Holotype ZMB814	Holotype BMNH1919.4.1.32	Non-types <i>n</i> = 1	KAUM-I. 77808	<i>n</i> = 3		
Standard length (SL; mm)	95.2	94.3	90.6		47.9	59.9–82.8	
Counts				Modes			Modes
Dorsal-fin rays	XV, 8	XV, 8	XV, 9	XV, 8	XVI, 9	XVI, 9	XVI, 9
Anal-fin rays	III, 5	III, 5	III, 5	III, 5	III, 8	III, 9	III, 9
Pectoral-fin rays (one side/other side)	12/12	12/12	12/12	12/12	13/13	12/12	12/12
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	84	—	96	—	89	88–90	89
Scale rows above lateral line	1	—	5	—	11	12–13	13
Scale rows below lateral line	30	—	30	30	34	30–31	30
Scale rows between last dorsal-fin spine base and lateral line	9	—	11	—	11	11	11
Scale rows between sixth dorsal-fin spine base and lateral line	9	—	7	—	10	10–13	10
Lateral-line pores	21	24	22		20	20	20
Gill rakers (upper + lower = total)	0 + 5 = 5	0 + 5 = 5	1 + 4 = 5	0 + 5 = 5	1 + 5 = 6	1 + 5 = 6	1 + 5 = 6
Measurements (% of SL)				Means			Means
Head length	35.5	32.8	33.3	33.2	29.4	27.7–29.5	29.0
Head width	20.2	18.4	19.5	19.3	13.2	12.2–15.3	13.8
Head depth	—	—	25.1	25.1	20.5	17.8–22.9	20.2
Snout length	8.2	7.1	7.3	7.5	5.9	5.6–6.8	6.1
Body depth	32.7	37.0	33.8	34.5	29.8	29.6–35.3	31.1
Body width	19.2	19.7	20.0	19.7	12.6	11.9–16.0	13.9
Orbit diameter	11.6	10.0	12.3	11.3	8.7	8.1–9.9	8.9
Suborbital width	5.0	4.6	4.1	4.6	3.0	3.2–3.5	3.3
Interorbital width	5.6	5.0	5.5	5.4	4.1	4.1–4.4	4.2
Upper-jaw length	9.4	8.5	9.3	9.3	8.6	7.6–8.4	8.1
Postorbital length	17.1	17.4	16.8	17.1	15.1	14.9–15.6	15.2
Pre-dorsal-fin length	14.6	12.8	15.5	14.3	9.8	8.1–12.2	10.3
Pre-anal-fin length	64.5	63.2	62.8	63.5	53.2	55.9–60.1	57.9
Pre-pelvic-fin length	33.9	32.7	33.0	33.2	32.5	27.4–32.2	30.5
Caudal-peduncle depth	10.7	10.6	11.6	11.0	9.7	9.3–9.7	9.6
Caudal-peduncle length	14.9	16.2	16.8	16.0	15.0	11.6–15.7	13.6
Dorsal-fin base length	90.2	89.2	90.4	89.9	91.6	85.8–1.0	89.2
Anal-fin base length	—	—	24.4	24.4	32.1	32.1–35.0	32.9
Caudal-fin length	29.2	37.6	36.1	34.3	45.0	39.1–43.3	42.6
Pectoral-fin length	38.1	37.8	36.6	37.5	38.4	36.1–38.2	37.7
Posterior lacrimal spine length	12.2	8.5	10.4	10.3	3.8	2.4–3.3	3.1

First dorsal-fin spine length	11.7	10.3	10.5	10.8	8.4	7.6–8.9	8.2
Second dorsal-fin spine length	33.1	—	35.5	34.3	42.8	39.0–48.5	44.3
Third dorsal-fin spine length	34.1	—	34.2	34.2	37.5	35.8–40.8	38.3
Fourth dorsal-fin spine length	22.9	—	27.5	25.2	27.6	25.4–30.6	28.1
Fifth dorsal-fin spine length	17.5	21.1	18.9	19.2	21.3	19.1–24.7	22.2
Sixth dorsal-fin spine length	16.3	17.3	16.6	16.7	18.3	17.4–19.6	18.6
Penultimate dorsal-fin spine length	20.3	20.7	20.8	20.6	19.4	17.2–19.8	18.9
Last dorsal-fin spine length	20.3	22.4	22.0	21.6	20.6	17.8–19.8	19.5
Longest dorsal-fin soft ray length	26.4	31.1	27.0	28.1	29.5	24.2–29.9	28.2
First anal-fin spine length	9.2	8.6	9.4	9.1	7.3	5.6–6.9	6.5
Second anal-fin spine length	19.3	17.0	17.5	17.9	11.0	10.0–11.6	10.7
Third anal-fin spine length	22.1	20.6	20.6	21.1	11.3	10.9–12.2	11.4
Longest anal-fin soft ray length	24.8	31.2	26.7	27.5	25.4	21.9–28.5	25.2
Pelvic-fin spine length	19.8	20.8	20.1	20.2	14.9	12.7–14.9	14.0
Longest pelvic-fin soft ray length	28.6	30.0	28.6	29.1	21.6	20.7–21.7	21.5

Table 6 Counts and measurements in *Ablabys macracanthus* and *A. pauciporus*

	<i>A. macracanthus</i>		<i>A. pauciporus</i>		
	Non-types <i>n</i> = 5		Holotype QM I. 36106	Paratypes <i>n</i> = 2	
Standard length (SL; mm)	57.2–70.2		43.6	46.6–52.4	
Counts		Modes			Modes
Dorsal-fin rays	XV–XVI, 8–9	XV, 8	XVII, 5	XVI–XVII, 6	
Anal-fin rays	III, 7	III, 7	III, 5	III, 4–5	
Pectoral-fin rays (one side/other side)	12/12–13/13	13/13	11/11	11/11	
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	
Scale rows in longitudinal series	73–78	73	55	47–48	
Scale rows above lateral line	5–7	5–6	1	0–1	
Scale rows below lateral line	23–28		18	17–18	
Scale rows between last dorsal-fin spine base and lateral line	8–11	8–9	5	4–5	
Scale rows between sixth dorsal-fin spine base and lateral line	6–8	7–8	4	1–2	
Lateral-line pores	18–20	20	12	12–13	
Gill rakers (upper + lower = total)	1–2 + 3–4 = 4–5	1 + 4 = 5	2 + 6 = 8	1–2 + 5 = 6–7	
Measurements (% of SL)		Means			Means
Head length	30.2–34.0	32.1	38.7	37.7–38.1	
Head width	14.6–16.7	15.3	20.9	19.0–19.5	
Head depth	20.1–21.3	20.5	29.0	28.1–30.3	
Snout length	6.2–6.6	6.5	9.0	8.3–8.5	
Body depth	31.7–34.2	32.8	36.3	34.7–35.0	
Body width	12.5–15.1	13.9	19.0	17.8–18.9	
Orbit diameter	8.9–9.4	9.1	12.6	12.4–12.7	
Suborbital width	3.7–3.9	3.8	3.5	4.8–5.6	
Interorbital width	5.0–6.4	5.6	5.7	6.6–6.8	
Upper-jaw length	9.0–10.2	9.7	13.5	12.4–13.2	
Postorbital length	16.4–19.0	18.0	19.2	18.6–17.8	
Pre-dorsal-fin length	10.0–11.6	10.6	17.6	15.6–16.3	
Pre-anal-fin length	56.1–63.2	59.9	67.2	64.6–69.1	
Pre-pelvic-fin length	30.3–33.0	31.6	34.8	35.4–39.1	
Caudal-peduncle depth	10.5–11.4	10.8	10.4	9.4–9.7	
Caudal-peduncle length	12.2–16.3	14.8	15.3	15.3–15.7	
Dorsal-fin base length	90.0–94.5	92.1	85.6	81.9–87.5	
Anal-fin base length	28.2–33.3	30.8	19.8	21.1–22.8	
Caudal-fin length	34.2–42.0	38.0	36.7	33.0–34.3	
Pectoral-fin length	34.6–38.6	36.4	41.8	37.5–40.5	
Posterior lacrimal spine length	3.6–4.4	3.9	5.6	6.9–7.0	
First dorsal-fin spine length	7.6–10.3	8.8	10.9	13.0–15.5	
Second dorsal-fin spine length	33.6–41.1	37.2	29.7	31.8–33.6	
Third dorsal-fin spine length	21.5–27.2	24.8	30.7	34.1	

Fourth dorsal-fin spine length	16.6–20.4	18.0	21.7	22.3–25.1	23.0
Fifth dorsal-fin spine length	14.6–15.1	14.8	—	19.8–20.3	20.0
Sixth dorsal-fin spine length	12.9–15.6	14.1	13.9	15.9–17.4	15.7
Penultimate dorsal-fin spine length	15.8–18.2	17.4	15.2	18.1–20.1	17.8
Last dorsal-fin spine length	16.6–19.4	17.8	16.6	21.1–21.5	19.7
Longest dorsal-fin soft ray length	24.1–26.7	25.6	25.1	25.4	25.3
First anal-fin spine length	5.6–7.2	6.2	—	8.8–9.2	8.7
Second anal-fin spine length	10.1–12.0	10.9	13.0	14.6–16.8	14.8
Third anal-fin spine length	11.2–14.5	13.1	17.6	19.3–20.2	19.0
Longest anal-fin soft ray length	20.9–25.8	24.1	23.2	22.6–23.0	23.0
Pelvic-fin spine length	15.6–17.9	17.0	19.1	18.0–19.2	18.8
Longest pelvic-fin soft ray length	20.3–24.3	23.2	31.0	30.5–31.2	30.9

Table 7 Counts and measurements in *Ablabys taenianotus*

	<i>A. taenianotus</i>			Modes
	<i>Amblyapistus slacksmithi</i>	<i>Tetraroge cristagalli</i>	<i>A. taenianotus</i>	
	Holotype AMS IB. 3898	Holotype BMNH 1843.9.30.21	Non-types <i>n</i> = 34	
Standard length (SL; mm)	26.9	84.5	16.4–100.9	
Counts				
Dorsal-fin rays	XVII, 7	XVII, 7	XVII–XVIII, 6–7	XVII, 7
Anal-fin rays	III, 5	III, 5	III, 4–5	III, 5
Pectoral-fin rays (one side/other side)	12/12	11/11	11/11–12/12	11/11
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	—	105	74–99	89
Scale rows above lateral line	—	—	6–15	10
Scale rows below lateral line	—	36	24–33	30
Scale rows between last dorsal-fin spine base and lateral line	—	—	6–13	10
Scale rows between sixth dorsal-fin spine base and lateral line	—	—	7–13	12
Lateral-line pores	22	—	20–25	23
Gill rakers (upper + lower = total)	0 + 7 = 7	1 + 4 = 5	0–2 + 3–6 = 5–7	1 + 5 = 6
Measurements (% of SL)				Means
Head length	38.8	33.6	33.7–37.5	33.8
Head width	20.9	17.8	12.7–22.9	18.2
Head depth	—	—	22.1–26.4	23.7
Snout length	9.4	7.2	6.4–9.9	7.7
Body depth	33.1	36.6	31.4–39.5	35.2
Body width	16.0	17.2	11.7–21.8	17.4
Orbit diameter	10.8	9.9	8.8–11.4	9.8
Suborbital width	3.8	4.5	2.3–4.8	3.9
Interorbital width	6.1	5.1	4.8–6.5	5.5
Upper-jaw length	13.1	9.9	9.1–15.1	10.9
Postorbital length	19.6	18.2	16.1–20.4	17.8
Pre-dorsal-fin length	15.9	13.0	11.4–16.9	13.4
Pre-anal-fin length	67.6	68.6	59.5–70.2	66.0
Pre-pelvic-fin length	38.8	35.4	31.0–38.6	35.0
Caudal-peduncle depth	10.3	9.7	9.0–11.6	10.3
Caudal-peduncle length	12.3	10.2	12.8–18.3	15.2
Dorsal-fin base length	83.0	88.0	78.9–90.3	87.2
Anal-fin base length	—	—	20.2–24.7	22.4
Caudal-fin length	37.1	31.1	29.5–39.9	35.2
Pectoral-fin length	39.1	37.0	29.8–39.5	35.4
Posterior lacrimal spine length	4.1	4.8	4.0–5.4	4.7
First dorsal-fin spine length	9.3	10.3	7.1–13.3	10.4
Second dorsal-fin spine length	29.6	28.9	27.3–39.0	33.4

Third dorsal-fin spine length	26.7	25.7	24.4–34.7	29.8
Fourth dorsal-fin spine length	21.9	18.7	16.7–25.9	22.2
Fifth dorsal-fin spine length	18.8	14.4	13.7–20.1	16.8
Sixth dorsal-fin spine length	16.0	13.6	12.5–18.1	14.8
Penultimate dorsal-fin spine length	20.2	16.4	14.2–21.8	18.4
Last dorsal-fin spine length	17.6	18.1	15.1–23.1	19.8
Longest dorsal-fin soft ray length	26.1	23.8	18.1–30.0	26.1
First anal-fin spine length	8.1	8.9	5.9–10.4	8.3
Second anal-fin spine length	18.2	15.7	11.5–19.5	16.2
Third anal-fin spine length	—	19.2	15.8–25.8	21.9
Longest anal-fin soft ray length	23.3	21.8	18.0–28.1	24.3
Pelvic-fin spine length	19.3	15.5	15.1–19.6	17.5
Longest pelvic-fin soft ray length	24.8	24.7	19.3–28.5	24.9

Table 8 Counts and measurements in *Centropogon australis*

	<i>C. australis</i>			
	<i>Scorpaena jacksoniana</i>	<i>Tetraroge hamiltoni</i>	<i>C. australis</i>	
	Holotype MNHN 0000-6640	Syntypes QM I.116	Non-types <i>n</i> = 15	
Standard length (SL; mm)	69.3	70.5	20.0–64.3	
Counts				Modes
Dorsal-fin rays	XVI, 8	XVI, 8	XVI, 7–9	XVI, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	14/14	14/14	13–14/14	14/14
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	90	76	60–85	78
Scale rows above lateral line	0	0	0–2	0
Scale rows below lateral line	24	23	19–27	24
Scale rows between last dorsal-fin spine base and lateral line	8	7	6–10	8
Scale rows between sixth dorsal-fin spine base and lateral line	5	5	4–6	5
Lateral-line pores	27	28	26–28	27
Gill rakers (upper + lower = total)	4 + 11 = 15	4 + 12 = 16	2–4 + 8–12 = 12 – 16	4 + 11 = 15
Measurements (% of SL)				Means
Head length	37.5	39.1	35.3–42.4	39.0
Head width	20.5	24.5	18.2–24.7	22.1
Snout length	10.1	11.4	10.2–12.7	11.0
Body depth	34.5	34.3	29.7–36.9	32.9
Body width	18.8	20.7	10.7–21.1	17.1
Orbit diameter	11.4	12.3	11.4–16.0	13.2
Suborbital width	5.3	4.4	3.4–5.2	4.4
Interorbital width	5.3	4.9	4.7–7.1	5.8
Upper-jaw length	13.1	13.6	12.0–15.4	13.7
Postorbital length	17.6	18.0	16.8–19.2	17.8
Pre-dorsal-fin length	26.6	27.1	24.7–35.0	29.6
Pre-anal-fin length	71.4	70.1	67.4–74.6	71.1
Pre-pelvic-fin length	42.1	42.0	36.8–46.5	41.0
Caudal-peduncle depth	9.5	9.8	8.9–10.1	9.6
Caudal-peduncle length	14.6	17.1	15.5–20.9	17.6
Dorsal-fin base length	70.1	70.6	59.2–86.8	68.2
Anal-fin base length	—	—	12.8–17.3	15.7
Caudal-fin length	28.0	29.9	26.9–35.4	30.5
Pectoral-fin length	34.2	32.9	32.4–37.6	34.6
Posterior lacrimal spine length	13.9	14.0	10.6–14.0	12.5
First dorsal-fin spine length	broken	8.9	8.2–11.4	9.8
Second dorsal-fin spine length	21.1	21.5	18.9–25.0	21.5
Third dorsal-fin spine length	23.7	25.7	22.3–29.4	24.7

Fourth dorsal-fin spine length	20.6	22.7	21.0–25.4	23.2
Fifth dorsal-fin spine length	20.6	22.3	18.6–24.3	21.6
Sixth dorsal-fin spine length	20.6	21.4	18.2–22.7	21.0
Penultimate dorsal-fin spine length	11.3	12.6	10.6–13.8	12.1
Last dorsal-fin spine length	12.4	12.8	11.9–15.9	13.3
Longest dorsal-fin soft ray length	22.7	21.5	19.6–24.3	22.5
First anal-fin spine length	10.4	12.0	9.2–12.6	11.3
Second anal-fin spine length	19.6	21.4	18.5–22.4	20.4
Third anal-fin spine length	18.6	18.5	15.5–20.1	18.4
Longest anal-fin soft ray length	25.7	23.7	19.8–25.8	23.8
Pelvic-fin spine length	17.3	17.3	15.6–18.3	17.1
Longest pelvic-fin soft ray length	28.7	28.9	24.9–30.8	28.0
Measurements (% of SL)				

Table 9 Counts and measurements in *Centropogon latifrons*

	<i>C. latifrons</i>			Modes
	<i>Centropogon australis latifrons</i>		<i>C. latifrons</i>	
	Holotype WAM P 5140	Paratype <i>n</i> = 2	Non-types <i>n</i> = 14	
Standard length (SL; mm)	76.7	53.8–72.7	34.9–84.6	
Counts				
Dorsal-fin rays	XVI, 8	XVI, 8	XVI, 8–9	XVI, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	13/13	13/13	13/13	13/13
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	69	59–66	56–70	59
Scale rows above lateral line	0	0	0–1	0
Scale rows below lateral line	25	14–23	11–22	14
Scale rows between last dorsal-fin spine base and lateral line	4	4–6	4–7	5
Scale rows between sixth dorsal-fin spine base and lateral line	3	3	3–6	4
Lateral-line pores	26	25–26	27–28	27
Gill rakers (upper + lower = total)	2 + 7 = 9	2 + 5 = 7	2–4 + 4–6 = 6–9	3 + 5 = 9
Measurements (% of SL)				Means
Head length	38.2	39.1–40	37.4–42.3	39.8
Head width	24.0	25.3–26.2	21.8–28.9	24.4
Snout length	7.7	9.1–10.1	8.8–12.7	9.8
Body depth	30.1	31.2–33.9	30.9–34.6	32.6
Body width	23.2	19.9–23.1	17.3–22.5	19.9
Orbit diameter	13.0	12.5–12.6	11.1–13.3	12.6
Suborbital width	2.5	2.9–4.3	3.1–4.2	3.6
Interorbital width	10.1	9.5–10.1	8.9–11.4	9.7
Upper-jaw length	12.9	12.2–14.1	11.7–14.1	13.2
Postorbital length	19.3	19.6–20.2	18.7–20.4	19.7
Pre-dorsal-fin length	27.1	28.1–31.8	27.5–32.4	29.8
Pre-anal-fin length	71.8	71.0–73.5	68.5–73.3	70.8
Pre-pelvic-fin length	43.2	40.4–41.3	36.3–43.4	40.2
Caudal-peduncle depth	9.9	9.4–9.6	8.9–11.2	10.0
Caudal-peduncle length	17.9	17.1–20.0	16.0–19.7	17.9
Dorsal-fin base length	67.4	66.1–69.6	62.9–71.6	68.8
Anal-fin base length	—	—	16.6–17.7	17.1
Caudal-fin length	29.2	27.6–28.1	28.2–35.3	29.8
Pectoral-fin length	35.1	33.3–33.8	29.9–38.6	33.5
Posterior lacrimal spine length	14.9	15.4	11.2–15.4	13.4
First dorsal-fin spine length	—	7.8–7.9	7.5–11.2	8.9
Second dorsal-fin spine length	13.9	13.6	10.8–17.6	15.0
Third dorsal-fin spine length	16.3	16.9–18.3	16.8–22.0	19.4

Fourth dorsal-fin spine length	18.5	16.3–20.3	18.2–24.0	20.9
Fifth dorsal-fin spine length	22.2	19.2	18.8–24.6	21.4
Sixth dorsal-fin spine length	22.6	20.1	18.6–22.6	21.2
Penultimate dorsal-fin spine length	11.9	10.1–12.3	9.5–14.4	12.0
Last dorsal-fin spine length	11.8	11.1–11.4	11.3–20.4	14.4
Longest dorsal-fin soft ray length	18.8	16.8–20.3	17.3–22.2	19.3
First anal-fin spine length	12.0	9.8–11.6	9.6–12.8	11.3
Second anal-fin spine length	18.9	20.4	16.2–21.4	19.4
Third anal-fin spine length	16.7	14.3	14.9–19.6	17.2
Longest anal-fin soft ray length	21.9	16.5–21.8	19.3–23.3	21.0
Pelvic-fin spine length	16.3	16.9	13.7–19.1	16.9
Longest pelvic-fin soft ray length	28.4	26.3–29.4	24.3–29.1	27.1

Table 10 Counts and measurements in *Centropogon marmoratus*

	<i>C. marmoratus</i>			
	<i>C. marmoratus</i> Holotype BMNH 1862.1.6.44	<i>Tetraroge vestitus</i> Holotype QM I.1597	<i>C. marmoratus</i> Non-types <i>n</i> = 16	
Standard length (SL; mm)	55.6	57.2	13.6–67.2	
Counts				Modes
Dorsal-fin rays	XVI, 8	XVI, 8	XVI–XVII, 7–8	XVI, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	13/13	14/14	13–14/13–14	13/14
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	64	58	55–67	64
Scale rows above lateral line	6	7	4–6	6
Scale rows below lateral line	21	23	18–22	18
Scale rows between last dorsal-fin spine base and lateral line	7	8	6–7	7
Scale rows between sixth dorsal-fin spine base and lateral line	6	7	5–8	6
Lateral-line pores	27	25	24–27	27
Gill rakers (upper + lower = total)	3 + 8 = 11	3 + 10 = 13	2–4 + 5–10 = 8–13	3–8 = 11
Measurements (% of SL)				Means
Head length	42.8	42.5	39.0–45.1	42.3
Head width	25.9	23.6	18.4–25.5	22.9
Snout length	11.0	9.7	9.0–11.8	10.6
Body depth	36.3	38.0	30.6–37.1	34.8
Body width	21.4	18.3	13.8–21.3	18.5
Orbit diameter	13.1	14.4	11.9–14.6	13.6
Suborbital width	4.1	4.7	2.2–5.6	3.9
Interorbital width	6.8	8.2	5.4–8.2	6.9
Upper-jaw length	16.7	16.3	15.2–18.7	16.7
Postorbital length	20.0	19.1	17.3–20.6	19.0
Pre-dorsal-fin length	30.8	32.3	27.0–37.1	31.8
Pre-anal-fin length	74.1	66.3	66.8–75.5	71.2
Pre-pelvic-fin length	42.4	40.6	35.1–46.5	40.9
Caudal-peduncle depth	10.1	10.1	8.7–10.5	9.8
Caudal-peduncle length	14.2	18.5	15.5–20.6	18.0
Dorsal-fin base length	68.7	70.2	56.5–72.2	65.4
Anal-fin base length	—	—	14.0–17.9	16.3
Caudal-fin length	30.9	—	27.2–41.0	32.1
Pectoral-fin length	34.5	—	29.7–42.4	34.5
Posterior lacrimal spine length	11.9	13.5	8.7–14.6	11.5
First dorsal-fin spine length	9.0	8.0	7.6–11.2	9.0
Second dorsal-fin spine length	16.7	15.9	14.8–21.0	18.0
Third dorsal-fin spine length	20.5	—	18.7–24.9	21.3

Fourth dorsal-fin spine length	20.3	—	18.1–24.3	20.5
Fifth dorsal-fin spine length	19.4	18.6	17.1–23.3	19.4
Sixth dorsal-fin spine length	19.2	17.6	15.3–22.0	19.0
Penultimate dorsal-fin spine length	10.6	8.5	8.4–13.1	10.4
Last dorsal-fin spine length	11.7	10.9	9.7–13.9	12.3
Longest dorsal-fin soft ray length	—	—	20.0–23.9	21.4
First anal-fin spine length	12.0	9.9	7.2–12.6	10.2
Second anal-fin spine length	18.3	17.8	15.4–20.5	18.5
Third anal-fin spine length	15.5	16.5	15.4–19.0	16.6
Longest anal-fin soft ray length	—	—	20.7–26.4	23.1
Pelvic-fin spine length	16.7	17.5	14.9–18.7	16.2
Longest pelvic-fin soft ray length	29.1	27.5	25.4–30.0	27.3

Table 11 Counts and measurements in *Cocotropsis gymmoderma*

	<i>C. gymmoderma</i>		
	<i>Tetraroge gymmoderma</i>	<i>C. gymmoderma</i>	
	Syntypes BMNH 1930.1.14.6 <i>n</i> = 2	Non-types <i>n</i> = 18	
Standard length (SL; mm)	23.9–28.7	10.7–29.1	
Counts			Modes
Dorsal-fin rays	XV, 5	XIV–XVI, 5–6	XV, 5
Anal-fin rays	III, 4	III, 3–4	III, 4
Pectoral-fin rays (one side/other side)	11–12/11–12	11/11	11/11
Pelvic-fin rays	I, 3	I, 3	I, 3
Scale rows in longitudinal series	naked	naked	naked
Scale rows above lateral line	naked	naked	naked
Scale rows below lateral line	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked
Lateral-line pores	8	7–10	8
Gill rakers (upper + lower = total)	2–3 + 7 = 9–10	2–3 + 5–8 = 7–11	3 + 6 = 9
Measurements (% of SL)			Means
Head length	36.4–40.7	37.5–45.3	40.0
Head width	22.4–22.6	19.6–25.8	22.2
Snout length	7.1–8.9	7.7–12.5	9.4
Body depth	30.8–35.3	32.5–37.1	34.7
Body width	16.3–20.9	16.2–21.6	18.5
Orbit diameter	10.3	8.7–12.9	11.1
Suborbital width	3.0–3.1	2.4–3.8	3.2
Interorbital width	6.8–7.8	6.7–9.7	8.0
Upper-jaw length	17.2–18.7	15.6–22.1	18.7
Postorbital length	15.9–20.0	17.3–22.5	19.5
Pre-dorsal-fin length	21.4–23.4	21.3–26.8	23.9
Pre-anal-fin length	61.8–65.5	60.8–72.2	66.8
Pre-pelvic-fin length	32.6–36.4	32.2–40.2	35.9
Caudal-peduncle depth	7.3–8.5	7.3–11.5	9.5
Caudal-peduncle length	18.7–20.8	15.8–22.3	19.4
Dorsal-fin base length	73.0–74.3	63.1–72.6	68.6
Anal-fin base length	15.3–17.6	12.3–18.4	15.7
Caudal-fin length	—	25.3–36.4	31.5
Pectoral-fin length	—	29.9–42.9	36.0
Posterior lacrimal spine length	5.6–6.3	7.4–11.0	8.6
First dorsal-fin spine length	8.8	7.6–11.6	9.4
Second dorsal-fin spine length	16.9–17.8	16.5–21.3	18.6

Third dorsal-fin spine length	19.2–21.4	18.6–23.4	20.8
Fourth dorsal-fin spine length	16.7	13.7–20.4	16.5
Fifth dorsal-fin spine length	14.2	10.0–16.6	13.5
Sixth dorsal-fin spine length	—	10.5–14.2	12.2
Penultimate dorsal-fin spine length	14.7	12.5–17.1	15.1
Last dorsal-fin spine length	16.4	15.1–18.9	17.1
Longest dorsal-fin soft ray length	19.3	17.2–21.6	19.1
First anal-fin spine length	—	6.0–10.5	8.3
Second anal-fin spine length	—	11.4–16.2	13.9
Third anal-fin spine length	—	16.3–21.6	19.4
Longest anal-fin soft ray length	22.2	17.5–23.7	20.4
Pelvic-fin spine length	18.2–19.4	11.2–22.5	18.0
Longest pelvic-fin soft ray length	—	20.1–26.8	23.7

Table 12 Counts and measurements in *Cottapistus cottoides*

	<i>C. cottoides</i>		<i>C. cottoides</i>	Modes
	<i>Paracentropogon scorpio</i>			
	Holotype AMS E.2945	Paratypes <i>n</i> = 2	Non-types <i>n</i> = 1	
Standard length (SL; mm)	57.1	62.4–68.6	54.6	
Counts				
Dorsal-fin rays	XIV, 5	XIV, 5	XV, 5	XIV, 5
Anal-fin rays	III, 6	III, 5–6	III, 6	III, 6
Pectoral-fin rays (one side/other side)	14/14	14/14	14/14	14/14
Pelvic-fin rays	I, 4	I, 4	I, 4	I, 4
Scale rows in longitudinal series	—	82–102	79	
Scale rows above lateral line	0	0	0	0
Scale rows below lateral line	34	29–31	34	34
Scale rows between last dorsal-fin spine base and lateral line	6	7	6	6
Scale rows between sixth dorsal-fin spine base and lateral line	9	0–4	0	0
Lateral-line pores	24	22–23	20	
Gill rakers (upper + lower = total)	6 + 18 = 24	6 + 18 = 24	5 + 15 = 20	6 + 18 = 24
Measurements (% of SL)				Means
Head length	37.6	39.7–40.9	40.6	39.7
Head width	21.8	21.0–22.2	17.5	20.6
Snout length	9.7	11.0–12.8	10.9	11.1
Body depth	33.5	32.6–33.6	32.2	33.0
Body width	17.6	16.9–18.8	15.3	17.2
Orbit diameter	9.1	9.6–10.3	10.7	9.9
Suborbital width	3.9	4.0–4.8	3.7	4.1
Interorbital width	10.7	11.5–11.6	12.0	11.5
Upper-jaw length	19.9	20.8–21.3	21.6	20.9
Postorbital length	19.8	20.5–21.8	22.0	21.0
Pre-dorsal-fin length	15.3	13.5–16.3	12.7	14.4
Pre-anal-fin length	67.4	65.4–75.0	66.2	68.5
Pre-pelvic-fin length	38.8	37.4–51.0	39.0	41.5
Caudal-peduncle depth	10.5	10.0–10.5	9.2	10.0
Caudal-peduncle length	16.6	15.7–16.3	16.1	16.2
Dorsal-fin base length	76.3	73.6–80.6	81.3	77.9
Anal-fin base length	20.7	22.5–24.4	21.3	22.3
Caudal-fin length	28.5	26.6–27.7	26.4	27.3
Pectoral-fin length	28.5	27.8–28.2	29.4	28.4
Posterior lacrimal spine length	7.5	7.9–9.3	7.8	8.1
First dorsal-fin spine length	—	10.1–10.2	11.2	10.5
Second dorsal-fin spine length	—	15.5–15.6	18.8	16.6
Third dorsal-fin spine length	—	20.1–21.2	21.6	21.0

Fourth dorsal-fin spine length	—	12.3	15.8	14.0
Fifth dorsal-fin spine length	—	12.2–15.5	14.0	13.9
Sixth dorsal-fin spine length	—	12.6–13.9	16.0	14.2
Penultimate dorsal-fin spine length	—	18.5	20.3	19.1
Last dorsal-fin spine length	—	17.2–19.5	21.5	19.4
Longest dorsal-fin soft ray length	17.4	17.8–19.3	20.1	18.6
First anal-fin spine length	7.7	8.1–10.4	9.9	9.0
Second anal-fin spine length	9.1	12.9–14.9	14.3	12.8
Third anal-fin spine length	13.5	15.6–17.4	16.4	15.7
Longest anal-fin soft ray length	19.5	19.1–20.4	20.6	19.9
Pelvic-fin spine length	15.0	14.4–14.6	18.9	15.7
Longest pelvic-fin soft ray length	19.3	19.2–22.2	21.1	20.5

Table 13 Counts and measurements in *Glyptauchen panduratus* and *Gymnapistes marmoratus*

	<i>Gl. panduratus</i>			<i>Gy. marmoratus</i>			
	<i>Glyptauchen insidiator</i>	<i>Glyptauchen insidiator mirandus</i>	<i>Gl. panduratus</i>	<i>Apistus marmoratus</i>	<i>Gy. marmoratus</i>		
	Holotype AMS IA. 4634	Holotype AMS B. 5786	Non-types <i>n</i> = 6	Syntypes <i>n</i> = 2	Non-types <i>n</i> = 3		
Standard length (SL; mm)	100.9	150.9	48.1–153.1		98.1–115.1	68.7–87.4	
Counts				Modes		Modes	
Dorsal-fin rays	XVII, 6	XVII, 6	XVII, 6–7	XVII, 7	XIII, 8–9	XIII, 8	XIII, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 5	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	14/14	14/14	13–14/13–14	14/14	11–12/11	11/11	11/11
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	52	63	54–64	59	naked	naked	naked
Scale rows above lateral line	0	0	0–2	1	naked	naked	naked
Scale rows below lateral line	16	15	16–20	16	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	4	5	4–5	4	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	2	3	2–3	3	naked	naked	naked
Lateral-line pores	25	26	24–26	25	23	23–25	23
Gill rakers (upper + lower = total)	2 + 8 = 10	2 + 7 = 9	1–2 + 4–8 = 5–10	2 + 8 = 10	3–4 + 10–12 = 13–16	3–4 + 11–12 = 14–16	14–16
Measurements (% of SL)				Means		Means	
Head length	40.9	36.2	37.9–42.9	39.9	38.9–40.8	38.3–42.6	40.5
Head width	29.8	29.2	26.8–31.5	29.6	19.9–22.1	21.6–22.9	21.8
Snout length	9.8	8.4	7.2–9.0	8.5	9.0–10.2	9.7–9.8	9.7
Body depth	31.5	33.7	32.4–34.6	33.1	33.3–36.3	32.4–35.7	34.3
Body width	25.2	28.6	23.5–28.6	26.4	16.1–18.7	17.1–21.0	18.0
Orbit diameter	12.9	9.4	11.9–13.4	12.1	10.9–12.1	12.0–14.0	12.4
Suborbital width	4.5	3.4	2.5–3.3	3.2	3.4–3.8	2.6–3.8	3.4
Interorbital width	11.6	8.0	8.0–11.5	10.1	5.9–6.5	5.6–6.9	6.3
Upper-jaw length	9.7	8.8	9.6–11.1	10.1	16.2–16.6	16.2–17.5	16.8
Postorbital length	21.9	20.2	20.4–24.1	21.8	20.3–20.9	18.6–21.0	20.3
Pre-dorsal-fin length	29.8	26.6	27.5–32.4	29.8	28.7–29.0	26.6–28.4	28.0
Pre-anal-fin length	74.9	78.3	70.1–77.2	74.6	67.2–70.4	68.6–71.4	69.3
Pre-pelvic-fin length	43.5	39.8	35.9–43.4	40.5	36.4–40.3	40.1–44.8	41.2
Caudal-peduncle depth	9.9	9.6	9.1–9.9	9.6	8.9–9.4	7.9–9.5	9.0
Caudal-peduncle length	15.3	15.1	11.6–15.6	14.1	15.7–17.6	16.9–18.2	17.2
Dorsal-fin base length	65.9	67.1	52.3–67.9	63.4	70.8–72.5	64.5–66.9	68.0
Anal-fin base length	—	—	—	—	—	16.3–17.3	16.8
Caudal-fin length	27.0	28.5	26.3–30.6	28.6	26.8–28.0	27.0–31.9	28.2

Pectoral-fin length	34.0	38.1	35.5–38.4	36.8	31.6–33.5	29.7–34.2	32.4
Posterior lacrimal spine length	8.4	6.6	5.2–9.6	7.4	13.6–17.2	9.9–13.3	13.4
First dorsal-fin spine length	7.3	7.9	5.0–7.2	6.4	10.0–10.5	6.9–10.2	9.6
Second dorsal-fin spine length	11.7	10.6	10.7–12.8	11.5	17.4–19.3	17.1–19.3	18.3
Third dorsal-fin spine length	15.2	12.7	14.1–16.7	15.3	22.3–23.3	18.8–21.1	21.3
Fourth dorsal-fin spine length	17.4	14.2	16.1–20.6	18.0	20.5–22.7	16.6–20.9	20.3
Fifth dorsal-fin spine length	19.4	17.2	16.8–21.8	19.3	20.0–21.6	14.7–20.1	19.0
Sixth dorsal-fin spine length	19.8	18.1	18.8–22.5	20.5	18.8–21.5	13.7–19.1	17.8
Penultimate dorsal-fin spine length	12.7	12.2	9.8–13.7	12.3	12.0–13.3	10.4–14.0	12.6
Last dorsal-fin spine length	10.5	11.0	10.2–11.6	10.9	12.5	11.7–14.8	13.2
Longest dorsal-fin soft ray length	19.8	18.9	19.9–24.8	21.2	19.5–20.3	17.8–24.7	21.3
First anal-fin spine length	10.5	9.1	7.9–13.0	10.7	11.7–12.4	11.0–11.7	11.7
Second anal-fin spine length	18.8	17.9	15.3–21.2	19.0	19.5–19.6	15.4–18.7	18.1
Third anal-fin spine length	18.0	18.2	15.0–20.8	18.1	17.1–18.5	12.8–19.0	16.7
Longest anal-fin soft ray length	21.5	20.2	17.9–23.0	20.9	21.0–23.1	18.9–23.2	21.6
Pelvic-fin spine length	15.2	13.9	14.9–19.3	16.3	17.5–17.7	15.3–19.2	17.2
Longest pelvic-fin soft ray length	27.1	30.2	27.8–30.4	29.1	24.8–26.1	22.3–27.9	25.4

Table 14 Counts and measurements in *Liocranium pleurostigma* and *L. praepositum*

	<i>L. pleurostigma</i>		<i>L. praepositum</i>			
	Non-types <i>n</i> = 5	Modes	QM I.1582 Lectotype	QM I.509 Syntype	Non-types <i>n</i> = 4	Modes
Standard length (SL; mm)	28.6–90.5		77.9	107.3	36.3–112.0	
Counts		Modes				Modes
Dorsal-fin rays	XIII, 7–8	XIII, 8	XIII, 8	XIII, 8	XIII–XIV, 6–8	XIII, 8
Anal-fin rays	III, 5–6	III, 6	III, 6	III, 6	III, 5	III, 5
Pectoral-fin rays (one side/other side)	14–15/14–15	14/14	15/15	15/13	13–15/14–15	15/15
Pelvic-fin rays	I, 4	I, 4	I, 4	I, 4	I, 4	I, 4
Scale rows in longitudinal series	69–78		75	78	79–84	
Scale rows above lateral line	7–10	7	8	10	5–6	
Scale rows below lateral line	31–37	31	39	38	32–34	
Scale rows between last dorsal-fin spine base and lateral line	10–16		12	15	10–12	12
Scale rows between sixth dorsal-fin spine base and lateral line	11–13	11	16	11	10	10
Lateral-line pores	20–23	21	21	21	19–21	21
Gill rakers (upper + lower = total)	3–4 + 10–13 = 14–16	4 + 10 = 14	3 + 9 = 12	3 + 10 = 13	3–4 + 10–12 = 14–15	3 + 10 = 14
Measurements (% of SL)		Means				Means
Head length	40.9–46.5	43.5	42.2	41.8	41.4–46.2	43.0
Head width	20.4–23.9	21.8	21.8	22.8	21.1–24.5	22.3
Snout length	8.7–10.1	9.6	10.3	10.2	9.9–11.3	10.4
Body depth	40.3–44.9	42.6	38.2	40.4	41.9–44.5	41.9
Body width	16.6–21.2	18.4	17.0	18.6	16.9–19.7	18.3
Orbit diameter	12.3–15.7	14.5	13.3	12.7	12.6–15.1	13.6
Suborbital width	3.9–4.9	4.3	4.7	6.0	4.5–5.7	5.2
Interorbital width	5.9–7.2	6.7	6.5	6.0	6.3–7.4	6.6
Upper-jaw length	17.4–20.2	18.9	17.2	17.5	18.4–20.9	18.9
Postorbital length	19.9–23.2	21.8	21.8	23.1	19.5–22.6	21.8
Pre-dorsal-fin length	20.1–23.1	21.9	21.7	21.5	21.0–22.3	21.6
Pre-anal-fin length	63.1–69.7	66.6	66.0	64.8	62.3–69.5	65.2
Pre-pelvic-fin length	37.4–45.6	41.9	38.5	38.8	37.0–40.7	38.6
Caudal-peduncle depth	10.6–11.7	11.2	10.4	10.5	10.1–11.8	10.8
Caudal-peduncle length	13.8–17.6	15.6	14.9	17.4	14.4–17.1	15.9
Dorsal-fin base length	79.4–83.3	81.5	81.7	78.9	79.3–83.4	80.8
Anal-fin base length	19.2–22.7	20.7	—	—	19.6–24.0	21.6
Caudal-fin length	29.5–34.1	32.1	28.2	31.8	30.8–35.7	31.7
Pectoral-fin length	30.9–39.9	37.2	33.7	39.3	33.8–36.0	35.2
Posterior lacrimal spine length	7.1–7.8	7.4	8.5	8.2	8.3–9.7	8.8
First dorsal-fin spine length	7.3–11.8	10.3	8.9	10.4	9.7–11.6	10.4

Second dorsal-fin spine length	17.1–23.2	20.3	17.9	—	18.7–21.0	19.6
Third dorsal-fin spine length	23.0–26.4	24.5	21.6	—	20.4–23.8	22.2
Fourth dorsal-fin spine length	18.8–24.4	21.9	—	—	17.6–19.5	18.8
Fifth dorsal-fin spine length	18.1–23.2	19.8	—	16.3	16.4–20.3	17.2
Sixth dorsal-fin spine length	19.2–23.3	20.1	—	16.3	17.0–18.9	17.4
Penultimate dorsal-fin spine length	19.4–20.5	20.0	18.7	17.6	21.1–21.5	20.0
Last dorsal-fin spine length	18.6–22.6	20.1	18.0	18.3	20.3–22.9	20.2
Longest dorsal-fin soft ray length	23.4–28.4	24.9	19.9	18.7	22.0–25.3	22.5
First anal-fin spine length	10.4–13.4	11.4	11.7	10.3	10.0–13.9	11.4
Second anal-fin spine length	16.3–18.1	17.2	17.5	15.6	16.7–21.1	17.6
Third anal-fin spine length	20.2–22.9	21.7	21.3	19.9	21.8–23.9	22.2
Longest anal-fin soft ray length	22.9–28.0	25.8	25.0	23.9	24.4–26.6	25.3
Pelvic-fin spine length	20.4–21.8	21.2	19.7	20.0	20.4–26.2	21.7
Longest pelvic-fin soft ray length	26.4–28.8	27.4	24.7	24.5	20.9–25.4	24.0

Table 15 Counts and measurements in *Neovespicula depressifrons* and *Notesthes robusta*

	<i>Ne. depressifrons</i>		<i>No. robusta</i>			
	Non-types <i>n</i> = 34	Modes	<i>Centropogon nitens</i> Holotype QM I.954	<i>Tetraroge bellona</i> Holotype QM I.1598	<i>Centropogon troschelii</i> Syntypes <i>n</i> = 2	Modes
Standard length (SL; mm)	8.7–54.8		167.7	26.6	186.6–202.3	
Counts						
Dorsal-fin rays	XIII, 6–8	XIII, 7	XV, 9	XV, 8	XV, 9	XV, 9
Anal-fin rays	III, 5–6	III, 5	III, 5	III, 4	III, 5	III, 5
Pectoral-fin rays (one side/other side)	10–12/10–12	11/11	12/11	12/—	12/12	12/12
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	61–82	72	—	62	78–85	
Scale rows above lateral line	3–5	5	—	0	13–15	
Scale rows below lateral line	21–35	25	15	19	22–23	
Scale rows between last dorsal-fin spine base and lateral line	4–7	5	9	8	9–10	9
Scale rows between sixth dorsal-fin spine base and lateral line	4–8	5	13	6	14–15	
Lateral-line pores	19–22	21	—	24	28–29	
Gill rakers (upper + lower = total)	4–6 + 11–15 = 15–20	5–13 = 18	—	3 + 11 = 14	5 + 10 = 15	5 + 10 = 15
Measurements (% of SL)		Means				Means
Head length	34.2–45.5	38.5	36.8	40.1	37.1–39.4	38.4
Head width	17.3–22.9	19.5	18.6	20.2	19.8–24.2	20.7
Snout length	6.0–9.3	7.3	9.5	10.1	8.9–10.0	9.6
Body depth	25.6–37.5	32.0	31.9	35.6	29.4–35.4	33.1
Body width	13.0–22.2	17.2	19.4	17.4	21.3–22.8	20.2
Orbit diameter	8.5–13.4	10.7	7.7	11.6	8.2–8.4	9.0
Suborbital width	1.3–4.1	2.8	4.4	3.1	4.7–5.2	4.4
Interorbital width	3.7–6.5	5.4	6.9	6.5	5.8–6.6	6.4
Upper-jaw length	13.0–18.9	15.8	14.6	18.0	15.4–16.2	16.0
Postorbital length	18.5–23.9	20.9	20.1	18.7	21.2–21.5	20.4
Pre-dorsal-fin length	20.5–32.9	24.4	30.0	38.0	30.4–32.8	32.8
Pre-anal-fin length	63.3–73.8	68.1	70.5	65.9	73.1–74.6	71.0
Pre-pelvic-fin length	33.9–43.5	37.5	38.9	36.3	33.3–35.6	36.0
Caudal-peduncle depth	8.4–11.1	9.7	10.1	9.8	10.2–11.3	10.4
Caudal-peduncle length	15.2–20.3	17.7	17.8	16.5	18.2–19.0	17.9
Dorsal-fin base length	63.6–73.9	69.7	64.8	60.0	61.7–63.1	61.6
Anal-fin base length	13.1–21.0	17.6	13.0	11.4	13.113.9	12.9
Caudal-fin length	26.5–39.5	33.7	—	—	23.1–24.4	23.7
Pectoral-fin length	32.8–43.6	37.6	—	34.2	26.2–27.5	26.8

Posterior lacrimal spine length	4.5–7.0	5.6	5.6	13.8	5.4	5.5
First dorsal-fin spine length	10.9–17.3	14.1	6.0	—	6.0–7.0	6.3
Second dorsal-fin spine length	16.3–24.8	20.5	10.7	—	10.8–12.5	11.3
Third dorsal-fin spine length	18.1–25.5	21.7	15.7	—	15.1–15.4	15.4
Fourth dorsal-fin spine length	10.9–16.5	13.3	16.0	—	16.6–16.8	16.5
Fifth dorsal-fin spine length	12.3–18.9	15.5	15.9	—	15.9–16.2	16.0
Sixth dorsal-fin spine length	14.5–20.7	17.1	14.5	—	15.7–16.0	15.4
Penultimate dorsal-fin spine length	15.2–20.5	17.6	11.2	9.5	9.0–9.3	9.8
Last dorsal-fin spine length	16.6–23.6	19.9	10.3	—	9.2–9.6	9.7
Longest dorsal-fin soft ray length	19.9–26.9	23.6	—	—	14.6–15.7	15.2
First anal-fin spine length	8.4–14.5	11.4	8.7	7.5	7.6	7.8
Second anal-fin spine length	14.3–21.9	17.6	14.0	14.8	11.7–12.1	13.2
Third anal-fin spine length	17.6–26.6	22.0	14.3	17.4	11.6–13.4	14.2
Longest anal-fin soft ray length	22.1–30.3	25.6	—	18.8	16.1–16.2	17.1
Pelvic-fin spine length	20.2–29.6	24.3	14.7	14.8	13.8	14.2
Longest pelvic-fin soft ray length	27.2–34.8	31.1	—	24.8	21.1–21.4	22.4

Table 16 Counts and measurements in *Ocosia apia* and *O. fasciata*

	<i>O. apia</i>		<i>O. fasciata</i>			Modes
	Paratype <i>n</i> = 2		<i>Ocosia gracile</i> Holotype USNM 99513	Paratype USNM 99514	<i>O. fasciata</i> Non-types <i>n</i> = 19	
Standard length (SL; mm)	49.5–49.7		36.4	29.3	31.0–43.7	
Counts		Modes				Modes
Dorsal-fin rays	XVI, 8	XVI, 8	XV, 9	XV, 8	XIV–XVI, 7–9	XV, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	12/12	12/12	—/12	12/12	12–13/12–13	12/12
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	naked	naked	naked	naked	naked	naked
Scale rows above lateral line	naked	naked	naked	naked	naked	naked
Scale rows below lateral line	naked	naked	naked	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked
Lateral-line pores	17	17	15	15	13–17	15
Gill rakers (upper + lower = total)	3–5 + 10–14 = 15–17		3 + 8 = 13	5 + 10 = 15	2–4 + 5–9 = 7–12	3 + 6 = 9
Measurements (% of SL)		Means				Means
Head length	37.4	37.4	38.0	37.9	34.6–42.2	38.6
Head width	17.1–20.0	18.5	17.7	20.1	17.9–21.4	19.4
Snout length	12.0–12.9	12.4	11.7	10.6	6.6–11.3	10.2
Body depth	29.0–31.8	30.4	30.5	31.7	27.4–36.2	31.8
Body width	17.3–17.7	17.5	17.4	18.8	14.2–20.4	18.3
Orbit diameter	9.8–9.9	9.8	12.0	11.9	9.2–13.0	11.9
Suborbital width	5.7–7.0	6.4	4.1	4.8	3.5–6.3	5.0
Interorbital width	5.6	5.6	3.7	5.8	4.1–5.6	4.9
Upper-jaw length	12.5–12.9	12.7	14.5	14.0	11.5–15.0	13.9
Postorbital length	16.3–16.6	16.4	16.9	16.7	16.2–19.8	17.6
Pre-dorsal-fin length	22.7–24.1	23.4	24.4	24.6	20.6–26.7	24.5
Pre-anal-fin length	64.4–66.3	65.3	69.8	67.9	66.0–75.7	70.5
Pre-pelvic-fin length	35.0–36.2	35.6	37.7	38.2	32.4–47.2	39.4
Caudal-peduncle depth	8.9	8.9	8.6	9.2	8.2–9.8	9.0
Caudal-peduncle length	17.1–17.4	17.2	15.1	17.1	14.7–21.9	17.3
Dorsal-fin base length	77.0–86.3	81.7	70.1	72.7	65.4–79.8	70.8
Anal-fin base length	19.3	19.3	—	17.4	13.5–19.8	16.5
Caudal-fin length	26.0–26.9	26.4	—	—	22.4–28.9	26.4
Pectoral-fin length	26.6–30.8	28.7	32.8	—	21.5–32.7	29.7

Posterior lacrimal spine length	6.9–7.6	7.3	4.0	5.1	3.9–8.1	5.5
First dorsal-fin spine length	9.7–10.1	9.9	5.9	—	7.1–10.8	8.4
Second dorsal-fin spine length	32.2–35.4	33.8	20.4	—	21.5–28.1	23.3
Third dorsal-fin spine length	19.7–21.6	20.7	19.5	—	17.4–25.3	20.1
Fourth dorsal-fin spine length	17.1–18.2	17.6	—	20.8	15.9–20.9	17.8
Fifth dorsal-fin spine length	15.3–17.8	16.5	—	—	13.0–20.8	16.6
Sixth dorsal-fin spine length	14.7–16.1	15.4	—	16.4	13.7–18.6	15.7
Penultimate dorsal-fin spine length	14.3–14.6	14.4	10.4	—	10.6–18.4	14.2
Last dorsal-fin spine length	15.1–16.4	15.7	12.6	15.7	11.6–19.7	15.5
Longest dorsal-fin soft ray length	18.8–20.1	19.4	—	23.2	15.8–23.6	20.3
First anal-fin spine length	7.0	7.0	6.4	—	4.9–8.2	6.6
Second anal-fin spine length	12.6–14.5	13.5	12.4	14.3	10.7–14.9	12.7
Third anal-fin spine length	15.1–18.1	16.6	16.4	17.4	13.5–19.4	15.9
Longest anal-fin soft ray length	20.1–21.2	20.7	19.9	—	17.1–22.7	20.5
Pelvic-fin spine length	12.9–16.3	14.6	14.3	—	9.7–18.4	14.4
Longest pelvic-fin soft ray length	19.8–22.1	21.0	21.1	—	16.8–25.1	22.2

Table 17 Counts and measurements in *Ocosia possi* and *O. spinosa*

	<i>O. possi</i>		Modes	<i>O. spinosa</i>	
	Holotype ZIN 48785	Paratypes ZIN 48786 <i>n</i> = 3		Non-type <i>n</i> = 7	Modes
Standard length (SL; mm)	63.8	63.8–76.7		30.2–101.8	
Counts					
Dorsal-fin rays	XV, 7	XV, 8–9	XV, 8	XV–XVII, 6–8	XVII, 8
Anal-fin rays	III, 5	III, 5	III, 5	III, 4–6	III, 5
Pectoral-fin rays (one side/other side)	12/12	12/12	12/12	12–13/13	13/13
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	naked	naked	naked	naked	naked
Scale rows above lateral line	naked	naked	naked	naked	naked
Scale rows below lateral line	naked	naked	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked
Lateral-line pores	17	17–18	17	15–18	17
Gill rakers (upper + lower = total)	3 + 11 = 14	3–4 + 11–12 = 15	3 + 12 = 15	2–4 + 5–12 = 7–16	4 + 5 = 8
Measurements (% of SL)			Means		Means
Head length	38.7	36.1–40.4	38.8	34.9–40.1	37.3
Head width	23.1	22.2–24.8	23.2	15.6–20.7	17.8
Snout length	11.0	11.3–12.2	11.6	10.0–11.3	10.9
Body depth	30.7	32.3–33.7	32.3	31.2–34.2	32.7
Body width	17.2	17.6–19.6	18.1	14.8–20.4	17.3
Orbit diameter	11.7	10.2–11.5	11.1	9.3–11.4	9.8
Suborbital width	4.5	4.6–4.7	4.6	3.5–5.7	4.7
Interorbital width	4.9	5.0–5.5	5.2	4.4–5.2	4.8
Upper-jaw length	14.4	13.7–14.7	14.2	12.9–15.0	13.9
Postorbital length	17.7	14.6–17.1	16.4	16.4–19.3	17.7
Pre-dorsal-fin length	24.3	22.9–24.1	23.8	18.4–23.3	20.9
Pre-anal-fin length	65.0	66.4–68.3	66.6	64.1–69.3	66.8
Pre-pelvic-fin length	36.1	36.3–38.6	37.0	33.5–36.9	34.6
Caudal-peduncle depth	8.8	8.2–9.2	8.7	8.4–10.3	8.9
Caudal-peduncle length	17.7	16.0–18.5	17.2	14.0–19.3	16.0
Dorsal-fin base length	76.4	73.1–79.2	75.5	74.1–79.8	77.4
Anal-fin base length	21.7	20.1–21.5	20.9	17.6–22.7	19.0
Caudal-fin length	22.4	21.6–25.3	23.4	23.6–28.6	24.9
Pectoral-fin length	25.3	26.6–29.6	27.8	26.4–30.3	27.8
Posterior lacrimal spine length	5.9	6.1–7.0	6.4	4.9–5.9	5.4
First dorsal-fin spine length	7.2	6.9–8.3	7.5	6.8–9.3	8.1
Second dorsal-fin spine length	30.4	31.1–34.9	32.8	19.5–26.5	23.4
Third dorsal-fin spine length	17.5	18.4–21.9	19.6	18.9–22.6	20.8

Fourth dorsal-fin spine length	17.0	15.9–20.1	18.0	16.1–18.6	17.1
Fifth dorsal-fin spine length	—	16.0–19.5	17.5	14.3–17.1	15.5
Sixth dorsal-fin spine length	16.0	14.9–18.9	16.6	13.4–16.0	14.5
Penultimate dorsal-fin spine length	9.9	9.1–9.7	9.5	12.4–16.5	13.8
Last dorsal-fin spine length	7.5	6.6–7.2	7.0	13.3–17.3	14.7
Longest dorsal-fin soft ray length	14.1	14.7–18.4	15.8	16.7–20.0	17.8
First anal-fin spine length	5.9	6.5–8.1	7.1	5.2–8.3	6.4
Second anal-fin spine length	12.1	12.6–15.4	13.4	10.9–14.7	12.7
Third anal-fin spine length	13.3	14.5–16.6	14.9	13.5–17.0	15.5
Longest anal-fin soft ray length	15.4	16.7–19.2	17.1	16.8–20.4	18.2
Pelvic-fin spine length	11.9	11.9–14.1	12.6	10.5–13.6	12.3
Longest pelvic-fin soft ray length	14.3	16.3–17.4	16.3	18.6–22.8	21.0

Table 18 Counts and measurements in *Ocosia vespa* and *O. zaspilota*

	<i>O. vespa</i>			<i>O. zaspilota</i>		<i>Ocosia</i> sp.	
	Holotype USNM 50911	Non-type <i>n</i> = 30		Non-type <i>n</i> = 14	<i>n</i> = 52		
Standard length (SL; mm)	37.8	34.0–65.9		46.7–95.3		26.8–128.2	
Counts			Modes		Modes		Modes
Dorsal-fin rays	XVI, 8	XVI–XVII, 7–8	XVI, 8	XIV–XVI, 7–9	XV, 8	XV–XVI, 7–9	XVI, 8
Anal-fin rays	III, 5	III, 5–6	III, 5	III, 4–6	III, 5	III, 5–7	III, 6
Pectoral-fin rays (one side/other side)	12/11	12–13/11–13	12/12	12–13/12–13	12/12	12–14/12–14	13/13
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	naked	naked	naked	naked	naked	naked	naked
Scale rows above lateral line	naked	naked	naked	naked	naked	naked	naked
Scale rows below lateral line	naked	naked	naked	naked	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked	naked
Lateral-line pores	14	10–14	12	14–17	16	15–20	18
Gill rakers (upper + lower = total)	4 + 7 = 11	2–4 + 6–8 = 9–12	3 + 7 = 9	2–4 + 6–9 = 8–13	3 + 7 = 10	2–5 + 5–10 = 9–14	4 + 6 = 10
Measurements (% of SL)			Means		Means		Means
Head length	41.1	37.0–41.0	38.6	37.6–41.2	39.5	36.1–43.9	39.1
Head width	22.0	16.6–21.0	18.4	17.8–22.3	20.0	113.9–22.3	19.7
Snout length	12.3	9.4–12.5	10.9	10.4–12.0	11.3	11.0–16.0	12.6
Body depth	38.7	26.8–35.9	31.1	31.6–35.3	33.5	27.9–39.0	32.7
Body width	17.9	11.8–19.5	15.9	15.7–21.7	18.9	13.5–21.9	17.9
Orbit diameter	12.2	10.6–12.9	11.5	9.8–11.7	10.6	8.4–12.9	10.2
Suborbital width	5.1	4.7–7.5	5.7	4.5–6.9	5.7	4.5–8.4	6.2
Interorbital width	5.6	5.0–7.0	5.8	4.1–5.1	4.7	4.2–6.9	5.6
Upper-jaw length	14.9	12.0–14.1	13.3	14.5–15.7	15.3	13.1–15.9	14.5
Postorbital length	18.7	15.4–20.1	17.6	18.0–20.9	19.2	18.2–20.0	18.2
Pre-dorsal-fin length	24.3	20.9–26.5	23.3	21.9–25.0	23.4	19.9–26.4	23.2
Pre-anal-fin length	68.3	60.7–73.8	68.4	65.3–73.2	69.7	61.1–73.6	67.9
Pre-pelvic-fin length	37.0	32.7–46.4	38.8	33.6–41.4	38.0	32.7–43.9	37.2
Caudal-peduncle depth	9.0	7.7–9.2	8.4	8.9–10.3	9.7	7.8–10.1	9.1
Caudal-peduncle length	11.1	13.8–20.5	16.7	14.1–20.1	17.0	9.9–18.7	13.7
Dorsal-fin base length	80.7	69.4–86.1	74.0	70.3–87.2	75.2	75.8–82.0	75.8
Anal-fin base length	—	16.0–21.8	18.5	16.2–19.4	17.6	15.4–26.2	20.6
Caudal-fin length	21.6	24.0–31.3	27.2	24.5–30.3	27.3	22.8–36.6	27.1
Pectoral-fin length	27.3	16.0–32.6	29.0	26.5–33.2	30.8	24.2–33.7	29.3
Posterior lacrimal spine length	5.6	4.8–8.7	5.7	5.3–7.1	6.2	5.4–10.5	7.8
First dorsal-fin spine length	10.2	7.7–11.6	9.5	6.3–10.1	8.8	6.0–11.0	8.5
Second dorsal-fin spine length	—	20.3–27.2	23.5	26.9–38.0	31.7	27.9–42.8	34.2

Third dorsal-fin spine length	28.1	19.2–25.9	22.8	22.6–29.6	26.3	22.3–35.3	28.5
Fourth dorsal-fin spine length	23.2	16.7–23.2	20.4	17.1–23.4	20.0	18.1–33.8	25.0
Fifth dorsal-fin spine length	21.4	15.3–21.4	18.8	15.3–20.2	17.9	14.9–30.9	23.5
Sixth dorsal-fin spine length	—	13.9–19.9	17.4	13.6–19.6	16.2	14.7–28.6	22.2
Penultimate dorsal-fin spine length	—	15.2–18.9	17.1	12.0–16.7	14.3	13.9–22.4	17.4
Last dorsal-fin spine length	—	15.9–20.2	17.9	12.4–18.5	15.5	14.4–20.7	17.8
Longest dorsal-fin soft ray length	—	16.0–23.5	20.4	18.6–22.4	20.0	17.4–25.5	21.3
First anal-fin spine length	—	6.7–11.3	8.8	5.1–8.2	7.1	5.9–9.5	7.6
Second anal-fin spine length	—	12.7–16.4	14.5	9.7–16.2	13.6	11.5–19.3	14.7
Third anal-fin spine length	—	14.4–19.9	17.6	13.3–17.7	16.3	14.0–21.0	17.8
Longest anal-fin soft ray length	—	17.9–22.8	21.1	17.6–22.2	19.9	17.3–24.5	20.6
Pelvic-fin spine length	20.9	14.0–18.4	16.3	11.6–16.1	13.9	10.6–18.8	13.9
Longest pelvic-fin soft ray length	25.1	22.2–27.6	25.2	19.6–24.8	22.2	17.8–26.8	22.0

Table 19 Counts and measurements in *Paracentropogon longispinis* and *P. rubipinnis*

	<i>P. longispinis</i>			<i>P. rubipinnis</i>	
	<i>Apistus longispinis</i> Syntype ZMB 810	<i>P. longispinis</i> Non-type <i>n</i> = 9		Non-type <i>n</i> = 12	
Standard length (SL; mm)	52.8	24.6–70.5		33.6–72.7	
Counts			Modes		Modes
Dorsal-fin rays	XIV, 7	XIV–XV, 6–7	XIV, 7	XIV–XV, 6–7	XIV, 7
Anal-fin rays	III, 4	III, 4–5	III, 4	III, 4	III, 4
Pectoral-fin rays (one side/other side)	10/10	10/10	10/10	10–11/11	11/11
Pelvic-fin rays	I, 4	I, 4	I, 4	I, 4	I, 4
Scale rows in longitudinal series	125	57–70	64	7–22	18
Scale rows above lateral line	0	0–5	0	0	0
Scale rows below lateral line	33	23–28	26	10–13	10
Scale rows between last dorsal-fin spine base and lateral line	13	6–12	8	0–2	1
Scale rows between sixth dorsal-fin spine base and lateral line	10	5–7	5	0–1	0
Lateral-line pores	22	19–21	20	15–21	17
Gill rakers (upper + lower = total)	3 + 6 = 9	2–4 + 6–8 = 8–11	2 + 6 = 9	2–4 + 6–11 = 9–12	3 + 7 = 10
Measurements (% of SL)			Means		Means
Head length	37.7	37.3–41.9	39.0	37.1–41.4	39.7
Head width	18.4	18.8–23.9	21.1	20.8–24.4	22.2
Snout length	9.3	8.2–10.1	9.2	7.9–9.6	9.0
Body depth	32.0	33.4–37.4	35.3	31.7–39.1	36.3
Body width	16.7	15.1–22.5	18.2	17.9–22.9	20.3
Orbit diameter	12.9	10.9–13.4	12.0	11.5–13.7	12.5
Suborbital width	4.9	4.2–5.9	5.0	3.0–4.7	3.8
Interorbital width	5.9	5.1–6.9	6.2	5.5–6.4	5.9
Upper-jaw length	13.3	12.0–15.8	13.6	14.2–15.8	14.9
Postorbital length	18.2	18.6–21.2	19.4	18.4–20.7	20.1
Pre-dorsal-fin length	20.6	17.2–21.4	19.6	18.0–22.1	20.0
Pre-anal-fin length	67.6	60.9–68.7	65.5	63.0–71.4	67.3
Pre-pelvic-fin length	35.8	34.7–40.7	36.2	33.2–37.2	35.2
Caudal-peduncle depth	10.2	10.2–11.8	11.1	8.8–11.0	10.0
Caudal-peduncle length	15.7	15.2–18.5	16.7	15.0–18.7	16.8
Dorsal-fin base length	77.5	73.4–82.8	78.8	75.1–81.9	78.3
Anal-fin base length	—	19.5–21.8	18.4	18.7–22.4	20.7
Caudal-fin length	27.8	28.1–34.0	30.4	27.3–32.7	30.0
Pectoral-fin length	31.3	30.3–36.5	33.6	30.8–35.5	33.5
Posterior lacrimal spine length	11.4	9.1–11.3	10.3	9.3–12.1	10.7

First dorsal-fin spine length	11.9	10.9–15.5	13.2	8.5–12.1	10.2
Second dorsal-fin spine length	—	22.7–30.9	26.2	17.3–32.7	22.9
Third dorsal-fin spine length	23.5	21.5–32.0	26.4	18.5–32.2	23.7
Fourth dorsal-fin spine length	—	15.7–27.4	21.9	14.4–29.2	19.7
Fifth dorsal-fin spine length	—	15.9–24.0	20.0	12.3–24.9	17.1
Sixth dorsal-fin spine length	15.3	14.4–22.0	18.1	13.0–21.0	15.7
Penultimate dorsal-fin spine length	16.9	17.4–22.3	19.5	14.3–21.1	17.0
Last dorsal-fin spine length	17.0	18.7–22.0	19.8	15.9–20.5	17.6
Longest dorsal-fin soft ray length	—	20.2–25.2	22.5	18.1–23.1	20.2
First anal-fin spine length	8.7	7.3–11.0	9.4	7.4–11.9	9.4
Second anal-fin spine length	14.0	15.0–19.0	16.2	12.5–17.7	14.9
Third anal-fin spine length	18.8	19.6–22.6	20.5	15.9–19.8	17.7
Longest anal-fin soft ray length	—	21.3–24.8	23.6	16.1–20.5	19.3
Pelvic-fin spine length	18.4	17.7–21.6	19.4	14.3–18.6	17.1
Longest pelvic-fin soft ray length	26.9	25.1–30.7	28.2	23.9–26.6	25.5

Table 20 Counts and measurements in *Paracentropogon vespa*

	<i>P. vespa</i>			
	<i>P. vespa</i>	<i>Paracentropogon vespa livingstonei</i>	<i>P. vespa</i>	
	Holotype AMS IA.4236	Holotype AMS E.2932	Non-type <i>n</i> = 4	
Standard length (SL; mm)	66.9	59.0	30.4–73.2	
Counts				Modes
Dorsal-fin rays	XVI, 7	XIV, 7	XIV, 7	XIV, 7
Anal-fin rays	III, 4	III, 4	III, 3–4	III, 4
Pectoral-fin rays (one side/other side)	10/10	10/10	10/10	10/10
Pelvic-fin rays	I, 4	I, 4	I, 4	I, 4
Scale rows in longitudinal series	65	65	64–72	65
Scale rows above lateral line	0	0	0	0
Scale rows below lateral line	25	27	23–27	25
Scale rows between last dorsal-fin spine base and lateral line	7	9	7–8	7
Scale rows between sixth dorsal-fin spine base and lateral line	4	1	7–8	7
Lateral-line pores	21	20	19–21	20
Gill rakers (upper + lower = total)	3 + 5 = 8	1 + 5 = 6	1–2 + 5–7 = 7–8	2 + 5 = 8
Measurements (% of SL)				Means
Head length	38.2	40.1	35.3–40.2	38.9
Head width	22.2	24.3	20.7–21.5	21.8
Snout length	10.5	12.0	8.4–9.9	9.8
Body depth	33.4	35.9	31.9–34.6	33.6
Body width	18.3	19.6	15.1–18.2	17.8
Orbit diameter	11.0	11.8	11.2–13.4	12.1
Suborbital width	4.4	5.5	4.1–6.0	5.0
Interorbital width	6.3	7.0	6.5–7.1	6.7
Upper-jaw length	12.8	12.0	11.1–13.7	12.4
Postorbital length	19.3	19.0	17.7–21.0	19.5
Pre-dorsal-fin length	19.7	21.9	16.9–20.6	19.4
Pre-anal-fin length	67.9	67.7	66.2–67.4	67.2
Pre-pelvic-fin length	38.2	39.0	35.2–39.0	37.5
Caudal-peduncle depth	10.5	11.0	10.3–11.8	10.9
Caudal-peduncle length	17.3	13.7	16.3–20.4	17.1
Dorsal-fin base length	77.8	79.6	78.5–83.8	80.0
Anal-fin base length	—	—	17.2–23.2	20.5
Caudal-fin length	28.7	27.7	29.6–35.7	31.2
Pectoral-fin length	33.0	28.7	33.6–34.8	33.1
Posterior lacrimal spine length	9.8	10.0	9.9–11.1	10.4
First dorsal-fin spine length	13.0	10.0	9.3–14.1	12.0
Second dorsal-fin spine length	19.7	16.0	19.3–25.2	20.8
Third dorsal-fin spine length	23.3	19.9	20.9–24.4	22.4

Fourth dorsal-fin spine length	19.8	15.8	16.2–20.0	18.3
Fifth dorsal-fin spine length	18.8	15.8	16.0–19.3	17.6
Sixth dorsal-fin spine length	17.4	15.1	16.3–19.7	17.4
Penultimate dorsal-fin spine length	20.1	18.8	17.7–21.8	19.9
Last dorsal-fin spine length	19.5	19.2	20.3–22.6	20.7
Longest dorsal-fin soft ray length	22.4	22.6	21.9–24.9	23.3
First anal-fin spine length	10.1	9.6	9.4–12.0	10.4
Second anal-fin spine length	18.3	14.6	16.5–19.4	17.3
Third anal-fin spine length	23.4	19.6	22.1–24.5	22.7
Longest anal-fin soft ray length	23.2	21.8	23.5–26.0	24.0
Pelvic-fin spine length	18.6	16.5	18.2–22.6	19.4
Longest pelvic-fin soft ray length	26.8	25.1	26.3–31.6	27.5

Table 21 Counts and measurements in *Pseudovespicula cypho* and *P. dracaena*

	<i>P. cypho</i>			<i>P. dracaena</i>			
	<i>Prosopodasys cypho</i>		<i>Pseudovespicula cypho</i>	<i>Apistus dracaena</i>		<i>Apistus belengerii</i>	<i>P. dracaena</i>
	Holotype USNM 98902	Non-types <i>n</i> = 4	Modes	Syntypes <i>n</i> = 6	Syntypes <i>n</i> = 2	Non-types <i>n</i> = 4	Modes
Standard length (SL; mm)	32.0	38.3–47.1			46.8–47.5	37.8–49.0	
Counts							
Dorsal-fin rays	XIII, 7	XIII–XIV, 6–7	XIV, 6	XII, 6–8	XII, 7	XII–XIII, 6–7	XII, 7
Anal-fin rays	III, 5	III, 5	III, 5	III, 5–6	III, 5	III, 5	III, 5
Pectoral-fin rays (one side/other side)	12/12	12/12–13	12/12	12–14/13–14	13/13	12–13/12–13	13/13
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	—	58–66	N/A	65–84	81–82	59–66	83
Scale rows above lateral line	—	2–5	4	3–6	6	5	6
Scale rows below lateral line	—	20–24	N/A	26–30	27–28	22–26	26
Scale rows between last dorsal-fin spine base and lateral line	—	5–6	5	4–8	8–10	6–8	6
Scale rows between sixth dorsal-fin spine base and lateral line	—	6–8	7	3–6	6	6–7	6
Lateral-line pores	17	15–18	15	19–21	21	18–21	21
Gill rakers (upper + lower = total)	4 + 9 = 13	4–5 + 9–12 = 14–16	4 + 9 = 14	4–5 + 12–15 = 16–19	5–6 + 15 = 20–21	4–5 + 12–15 = 17–19	5 + 14 = 19
Measurements (% of SL)							
Head length	38.8	34.3–36.6	36.4	40.1–43.4	38.9–40.6	40.9–42.8	41.4
Head width	22.8	21.3–22.6	22.0	21.7–24.4	20.2–22.4	22.4–25.4	23.2
Snout length	8.4	6.7–7.4	7.2	8.1–8.6	7.5–7.6	7.0–7.9	7.9
Body depth	36.3	32.1–34.7	33.6	36.3–41.9	36.0–36.3	34.4–40.3	37.8
Body width	18.4	18.6–19.8	19.0	19.7–22.2	16.8–19.4	18.0–21.7	20.2
Orbit diameter	11.8	11.3–12.3	11.7	11.6–14.5	11.2–12.0	12.3–14.0	12.7
Suborbital width	3.5	3.8–3.9	3.8	3.8–5.5	3.4–3.8	3.2–3.3	4.0
Interorbital width	5.4	4.5–5.7	5.1	6.2–7.3	5.9–6.0	5.8–6.5	6.5
Upper-jaw length	18.1	17.6–17.9	17.8	16.0–17.4	15.6–16.0	14.6–17.6	16.4
Postorbital length	18.3	17.4–19.1	18.4	20.7–23.2	20.4–22.2	20.6–22.0	21.8
Pre-dorsal-fin length	23.3	20.8–22.4	21.7	21.0–23.0	20.2–20.3	17.1–22.0	20.9
Pre-anal-fin length	66.2	65.4–67.1	66.2	65.9–72.6	69.4–70.9	67.7–69.4	69.2
Pre-pelvic-fin length	35.1	32.2–35.9	34.4	38.9–42.8	37.2–37.7	38.0–41.0	39.9
Caudal-peduncle depth	11.9	10.4–11.9	11.3	10.5–11.7	10.0–10.5	9.9–11.0	10.6
Caudal-peduncle length	14.8	16.5–17.8	16.6	14.1–18.5	12.6–16.2	13.6–16.9	15.9
Dorsal-fin base length	76.9	73.4–75.2	74.7	69.9–75.3	70.5–72.6	69.6–72.9	71.7
Anal-fin base length	23.3	20.2–22.6	21.8	18.1–22.1	19.4–23.0	18.7–20.9	20.2
Caudal-fin length	31.2	29.9–34.6	31.3	33.6–38.2	31.2–32.6	30.4–31.8	33.9
Pectoral-fin length	39.8	34.8–39.9	37.4	44.5–48.3	42.1–42.7	34.0–39.2	42.5
Posterior lacrimal spine length	6.7	5.2–7.9	6.5	8.8–11.7	10.0–10.3	6.4–8.8	9.4

First dorsal-fin spine length	13.6	10.5–14.2	12.6	17.2–21.7	16.0	17.7–18.2	18.5
Second dorsal-fin spine length	—	16.6–22.4	20.3	20.0–28.7	21.4–22.5	19.3–22.0	22.8
Third dorsal-fin spine length	—	17.3–22.9	19.6	20.3–25.3	20.3–21.1	19.7–21.3	22.0
Fourth dorsal-fin spine length	14.7	12.5–16.4	14.2	16.2–19.3	16.2–16.9	14.4–16.4	17.1
Fifth dorsal-fin spine length	17.9	13.6–16.2	15.6	16.2–20.5	18.4–19.2	14.6–17.1	18.2
Sixth dorsal-fin spine length	17.3	13.1–16.7	15.5	16.2–23.5	18.6	15.8–19.5	19.0
Penultimate dorsal-fin spine length	—	15.8–17.9	17.0	14.1–17.4	15.4–15.6	11.9–12.1	15.0
Last dorsal-fin spine length	—	17.4–19.1	18.5	15.3–20.2	14.1	12.5–10.0	16.3
Longest dorsal-fin soft ray length	—	20.1–23.0	22.0	22.2–27.1	22.7–25.0	17.5–18.4	22.8
First anal-fin spine length	—	7.5–10.7	8.9	8.5–11.7	10.3–11.2	7.7–11.8	10.1
Second anal-fin spine length	—	11.8–14.0	12.8	14.6–17.5	14.5–15.6	14.6–14.7	15.6
Third anal-fin spine length	—	14.6–18.0	16.0	17.9–21.9	17.9	13.5–18.5	17.8
Longest anal-fin soft ray length	19.9	21.0–23.2	21.7	24.1–27.1	21.3–22.0	16.8–20.7	22.8
Pelvic-fin spine length	23.5	19.4–23.9	21.9	22.4–26.2	22.6–25.3	21.8–23.8	24.2
Longest pelvic-fin soft ray length	27.1	24.7–29.5	26.2	32.6–35.9	30.3–30.5	21.8–27.1	30.4

Table 22 Counts and measurements in *Richardsonichthys leucogaster*

	<i>R. leucogaster</i>		
	<i>Tetraroge darnleyensis</i>	<i>R. leucogaster</i>	
	Holotype AMS I.16352-001	Non-types <i>n</i> = 20	
Standard length (SL; mm)	42.3	18.1–73.6	
Counts			Modes
Dorsal-fin rays	XIII, 7	XII–XIII, 6–7	XIII, 6
Anal-fin rays	III, 6	III, 5–7	III, 6
Pectoral-fin rays (one side/other side)	14/15	15–17/15–16	15/15
Pelvic-fin rays	I, 5	I, 5	I, 5
Scale rows in longitudinal series	naked	naked	naked
Scale rows above lateral line	naked	naked	naked
Scale rows below lateral line	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked
Lateral-line pores	14	9–14	13
Gill rakers (upper + lower = total)	2 + 11 = 13	2–4 + 6–10 = 9–13	2 + 8 = 10
Measurements (% of SL)			Means
Head length	39.2	37.1–47.3	41.6
Head width	25.6	18.0–31.7	25.1
Snout length	7.8	5.8–10.0	8.4
Body depth	37.1	30.1–37.9	34.3
Body width	25.4	14.2–25.0	20.6
Orbit diameter	15.1	11.6–17.5	14.4
Suborbital width	4.0	2.7–5.5	4.4
Interorbital width	6.1	5.3–8.9	7.2
Upper-jaw length	20.7	19.9–22.7	21.1
Postorbital length	16.2	18.3–22.4	20.0
Pre-dorsal-fin length	20.2	16.8–24.6	20.2
Pre-anal-fin length	63.8	60.2–69.2	64.8
Pre-pelvic-fin length	38.5	35.0–46.9	38.5
Caudal-peduncle depth	8.3	8.4–10.9	9.5
Caudal-peduncle length	11.2	7.8–14.3	12.0
Dorsal-fin base length	76.6	69.5–79.4	76.3
Anal-fin base length	—	24.5–31.0	27.4
Caudal-fin length	—	26.6–33.1	30.2
Pectoral-fin length	—	26.0–35.1	32.5
Posterior lacrimal spine length	8.8	6.6–9.5	8.2
First dorsal-fin spine length	10.4	5.4–11.3	9.2
Second dorsal-fin spine length	17.6	13.1–19.2	16.3
Third dorsal-fin spine length	21.3	16.2–22.6	19.6

Fourth dorsal-fin spine length	19.2	7.9–23.7	18.1
Fifth dorsal-fin spine length	16.0	11.6–21.4	18.1
Sixth dorsal-fin spine length	18.7	13.7–22.0	18.8
Penultimate dorsal-fin spine length	—	18.7–25.6	21.1
Last dorsal-fin spine length	—	18.7–26.2	20.5
Longest dorsal-fin soft ray length	—	17.5–23.6	20.9
First anal-fin spine length	9.3	6.5–10.7	8.0
Second anal-fin spine length	13.5	8.5–13.0	10.8
Third anal-fin spine length	14.7	10.2–16.0	13.0
Longest anal-fin soft ray length	—	12.3–22.0	17.5
Pelvic-fin spine length	17.0	13.1–18.4	16.0
Longest pelvic-fin soft ray length	—	21.0–27.8	24.0

Table 23 Counts and measurements in *Snyderina guentheri*, *S. yamanokami* and *S. sp.*

	<i>Snyderina guentheri</i>			<i>Snyderina yamanokami</i>			<i>S. sp.</i>	
	Holotype BMNH 1888.12.29.145	Non-types <i>n</i> = 15	Modes	Holotype CAS-SU 6433	Non-types <i>n</i> = 8	Modes	<i>n</i> = 6	Modes
Standard length (SL; mm)	164.2	46.9–152.9		162.5	92.6–159.2		29.6–53.5	
Counts								
Dorsal-fin rays	XIII, 10	XIII, 10–11	XIII, 10	XIII, 10	XIII, 9–10	XIII, 10	XII, 9–10	XII, 10
Anal-fin rays	III, 5	III, 5–6	III, 6	III, 5	III, 5–6	III, 6	III, 6	III, 6
Pectoral-fin rays (one side/other side)	13/13	13–14/13–14	13/13	13/14	14/14–15	14/14	15–16/15–16	16/16
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	63	52–89	63	99	76–99	99	70–75	70
Scale rows above lateral line	0	0	0	9	0–9	9	10–12	10
Scale rows below lateral line	31	23–34	31	28	30–40	35	27–29	28
Scale rows between last dorsal-fin spine base and lateral line	12	4–9	7	6	8–16	12	8–10	9
Scale rows between sixth dorsal-fin spine base and lateral line	0	0–3	0	12	0–13	8	8–13	10
Lateral-line pores	23	21–26	23	21	20–23	21	21–23	22
Gill rakers (upper + lower = total)	4 + 12 = 16	3–4 + 10–14 = 14–18	4 + 11 = 14	3 + 11 = 14	3–4 + 10–12 = 13–16	3 + 11 = 14	2–4 + 8–9 = 10–12	3 + 8 = 12
Measurements (% of SL)			Means			Means		Means
Head length	44.0	40.8–46.7	43.5	41.5	40.1–42.8	41.1	40.6–45.1	43.3
Head width	22.9	18.0–24.4	21.8	19.1	19.1–22.9	20.7	19.5–23.1	20.8
Snout length	11.6	9.2–11.0	10.2	10.1	9.4–10.7	10.1	10.5–11.4	10.8
Body depth	37.9	32.7–41.0	36.8	38.0	37.6–40.5	39.2	37.8–44.5	40.4
Body width	21.3	14.8–21.8	18.8	15.6	15.8–20.8	18.1	13.6–18.7	16.3
Orbit diameter	10.2	9.9–15.7	12.3	11.3	10.7–12.2	11.2	12.2–15.5	14.1
Suborbital width	6.4	4.2–5.5	5.0	7.1	4.2–5.2	5.0	5.2–5.7	5.5
Interorbital width	7.0	5.8–7.7	6.8	6.3	6.2–6.8	6.4	7.5–8.3	8.0
Upper-jaw length	17.2	14.7–18.0	16.6	17.3	15.3–17.0	16.3	15.9–18.1	17.5
Postorbital length	24.5	21.4–28.6	24.0	22.3	20.6–21.8	21.3	19.3–21.7	20.8
Pre-dorsal-fin length	20.7	17.3–22.8	19.4	17.2	18.3–21.6	19.1	19.3–23.2	21.3
Pre-anal-fin length	66.9	63.3–70.0	66.0	70.1	65.0–70.2	68.3	64.4–71.9	67.9
Pre-pelvic-fin length	41.2	35.2–43.2	38.3	37.4	36.9–40.6	39.0	37.8–44.9	41.8
Caudal-peduncle depth	8.6	7.1–9.4	8.2	8.6	7.3–9.0	8.1	9.1–11.2	10.1
Caudal-peduncle length	16.9	14.8–18.9	16.9	18.0	15.7–17.1	16.6	14.3–16.7	15.3
Dorsal-fin base length	81.1	76.8–86.1	81.6	80.4	78.1–83.8	80.5	76.4–81.2	79.5
Anal-fin base length	19.1	18.5–21.6	19.9	—	18.7–20.7	19.5	18.6–21.5	19.8
Caudal-fin length	37.9	31.2–39.5	35.3	33.7	33.3–36.1	34.6	32.3–34.6	33.5
Pectoral-fin length	37.2	30.0–44.0	37.6	37.8	33.5–39.0	36.2	33.8–41.4	37.7
Posterior lacrimal spine length	6.4	6.0–9.1	7.5	6.8	5.9–7.2	6.6	6.8–9.5	8.4
First dorsal-fin spine length	6.2	6.0–10.7	7.9	7.4	6.4–9.5	8.3	8.9–12.9	10.7

Second dorsal-fin spine length	22.3	18.9–25.7	22.3	—	17.6–21.3	19.5	18.0–22.6	21.1
Third dorsal-fin spine length	23.9	22.4–28.2	24.9	—	21.3–23.0	22.3	20.9–25.7	23.7
Fourth dorsal-fin spine length	—	20.1–25.2	22.9	—	20.6–22.1	21.3	17.9–22.3	20.1
Fifth dorsal-fin spine length	19.4	18.3–22.7	20.9	—	19.2–20.8	20.3	15.2–21.0	18.0
Sixth dorsal-fin spine length	17.0	16.6–21.1	19.0	—	17.9–20.4	18.7	13.9–19.8	16.8
Penultimate dorsal-fin spine length	17.0	16.5–20.2	18.2	—	16.9–19.9	17.7	15.3–18.9	17.3
Last dorsal-fin spine length	16.4	16.0–20.5	18.1	19.1	17.2–21.0	18.7	16.9–18.9	18.1
Longest dorsal-fin soft ray length	27.1	22.1–29.7	25.5	23.2	22.1–27.0	24.5	24.5–28.2	25.9
First anal-fin spine length	10.0	7.4–11.0	9.0	10.4	8.3–9.8	9.2	8.2–10.8	9.2
Second anal-fin spine length	15.7	13.7–16.9	15.2	15.1	12.4–16.3	14.3	14.3–16.3	15.4
Third anal-fin spine length	18.2	17.0–21.9	19.6	19.1	17.3–20.0	18.3	19.3–21.1	20.5
Longest anal-fin soft ray length	25.6	21.7–28.2	25.1	26.2	22.3–25.2	24.1	23.9–26.1	25.1
Pelvic-fin spine length	18.5	15.9–21.1	18.4	18.3	15.5–18.2	17.0	21.4–24.0	23.0
Longest pelvic-fin soft ray length	26.1	22.4–28.3	26.1	28.2	23.3–28.6	26.3	27.6–29.1	28.3

Table 24 Counts and measurements in *Tetraroge barbata* and *T. nigra*

	<i>T. barbata</i>		<i>T. nigra</i>			
	Non-types <i>n</i> = 17	Modes	<i>Apistus niger</i> Syntypes <i>n</i> = 2	<i>Tetraroge albifrons</i> Lectotype ZMH 145	<i>T. nigra</i> Non-types <i>n</i> = 17	
Standard length (SL; mm)	68.5–70.7		53.6–53.8	46.4	19.8–100.5	
Counts						Modes
Dorsal-fin rays	XIII, 7	XIII, 7	XIII, 7	XIII, 7	XIII–XIV, 5–7	XIII, 6
Anal-fin rays	III, 4–5	III, 4	III, 4	III, 4	III, 4–5	III, 4
Pectoral-fin rays (one side/other side)	12/12	12/12	12/12	12/12	12/12	12/12
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5	I, 5	I, 5
Scale rows in longitudinal series	naked	naked	naked	naked	naked	naked
Scale rows above lateral line	naked	naked	naked	naked	naked	naked
Scale rows below lateral line	naked	naked	naked	naked	naked	naked
Scale rows between last dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked
Scale rows between sixth dorsal-fin spine base and lateral line	naked	naked	naked	naked	naked	naked
Lateral-line pores	14	14	16–18	18	14–17	16
Gill rakers (upper + lower = total)	3 + 7–9 = 10–12		3–4 + 8 = 11–12	3 + 10 = 13	3–5 + 7–14 = 10–17	3 + 8 = 12
Measurements (% of SL)						Means
Head length	37.3–39.6	38.5	39.7–40.5	43.3	40.1–46.1	42.3
Head width	18.6–20.7	19.7	19.7–20.7	24.8	20.4–26.8	22.7
Snout length	8.4–9.4	8.9	9.1–9.7	10.1	8.3–10.9	9.7
Body depth	34.9–37.8	36.3	36.4–36.9	34.9	32.7–44.1	37.5
Body width	17.3–17.7	17.5	16.7–17.0	20.0	16.1–26.8	19.1
Orbit diameter	9.3–9.8	9.6	9.9–10.4	10.1	9.4–12.7	11.2
Suborbital width	4.4–4.8	4.6	4.6–5.0	5.2	3.1–5.4	4.3
Interorbital width	5.8–6.3	6.0	7.6–8.2	8.4	7.5–9.0	8.1
Upper-jaw length	14.9–15.1	15.0	16.4–17.7	20.7	15.9–20.0	17.6
Postorbital length	20.9–21.7	21.3	21.8–22.9	23.9	21.0–27.6	22.8
Pre-dorsal-fin length	16.1–17.1	16.6	22.3–22.8	24.4	19.9–26.9	23.3
Pre-anal-fin length	69.6–71.4	70.5	71.8–72.1	77.4	67.0–76.3	72.4
Pre-pelvic-fin length	32.6–33.6	33.1	35.8–36.2	35.8	33.4–45.3	38.3
Caudal-peduncle depth	9.2–9.9	9.5	9.7–10.3	10.3	7.7–12.1	10.6
Caudal-peduncle length	14.2–15.8	15.0	13.4–14.0	14.9	8.5–20.3	15.9
Dorsal-fin base length	80.2–80.5	80.3	76.1–78.1	77.8	66.9–85.6	75.2
Anal-fin base length	17.1–18.3	17.7	—	—	13.0–20.2	17.4
Caudal-fin length	27.8–29.1	28.5	29.7–31.6	29.1	27.2–36.4	31.8
Pectoral-fin length	28.8–30.7	29.8	35.4–36.4	30.2	29.2–36.7	33.4
Posterior lacrimal spine length	8.4–9.9	9.2	10.4–11.8	6.9	7.4–12.0	10.0
First dorsal-fin spine length	6.2–6.4	6.3	8.2	6.9	4.4–8.3	6.6
Second dorsal-fin spine length	24.5–25.0	24.8	20.7–21.7	19.8	17.7–24.0	20.4

Third dorsal-fin spine length	20.5–21.8	21.1	19.5–21.1	21.1	15.4–22.5	19.4
Fourth dorsal-fin spine length	14.1–15.6	14.8	15.1–15.4	15.7	11.3–18.7	14.1
Fifth dorsal-fin spine length	12.2–13.3	12.8	14.4–15.2	14.2	11.5–16.5	13.4
Sixth dorsal-fin spine length	12.9–13.1	13.0	15.3–16.0	13.4	12.1–15.3	13.6
Penultimate dorsal-fin spine length	14.1–16.0	15.0	16.0–17.0	14.7	14.1–16.6	15.2
Last dorsal-fin spine length	15.5–15.6	15.6	16.9–17.4	15.9	15.2–17.0	16.3
Longest dorsal-fin soft ray length	22.0–24.1	23.0	23.6–24.3	25.9	16.3–23.7	22.2
First anal-fin spine length	6.1–7.9	7.0	10.1–10.8	7.5	7.2–9.4	8.3
Second anal-fin spine length	10.7–13.2	11.9	14.2–15.8	13.6	10.6–15.1	13.1
Third anal-fin spine length	15.9–17.0	16.5	18.7–18.8	17.5	13.1–19.0	16.7
Longest anal-fin soft ray length	22.7–23.6	23.1	24.4–24.9	24.1	19.2–25.4	22.7
Pelvic-fin spine length	13.3–14.0	13.6	17.0–17.3	19.6	13.7–23.6	18.3
Longest pelvic-fin soft ray length	24.6–25.6	25.1	26.7–27.7	29.3	23.4–29.3	27.6

Table 25 Counts and measurements in *Trichosomus trachinoides*

	<i>T. trachinoides</i>				Modes
	<i>Apistus trachinoides</i>	<i>Prosopodasys bottae</i>	<i>Prosopodasys gogorzae</i>	<i>T. trachinoides</i>	
	Syntypes <i>n</i> = 5	Holotype MNHN 0000-6753	Holotype USNM 52054	Non-types <i>n</i> = 28	
Standard length (SL; mm)	40.5–52.9	58.4	21.2	21.2–75.8	
Counts					
Dorsal-fin rays	III+XII, 3–4	III+XII, 4	III+XII, 4	III+XII–XIII, 3–5	III+XII, 4
Anal-fin rays	III, 4	III, 4	III, 4	III, 3–4	III, 4
Pectoral-fin rays (one side/other side)	12–13/12–13	13/13	12/12	11–13/12–13	13/13
Pelvic-fin rays	I, 4	I, 4	I, 4	I, 4	I, 4
Scale rows in longitudinal series	0	0	0	0	0
Scale rows above lateral line	0	0	0	0	0
Scale rows below lateral line	22–27	—	26	19–30	24
Scale rows between last dorsal-fin spine base and lateral line	0	0	0	0	0
Scale rows between sixth dorsal-fin spine base and lateral line	0	0	0	0	0
Lateral-line pores	15–17	15	11	13–17	15
Gill rakers (upper + lower = total)	3–5 + 11–14 = 15–19	4 + 11 = 15	3 + 9 = 12	3–5 + 10–14 = 13–19	4 + 12 = 16
Measurements (% of SL)					Means
Head length	33.6–36.3	34.5	37.1	30.4–42.1	35.9
Head width	20.0–23.1	18.8	23.9	19.2–24.8	22.0
Snout length	22.4–25.8	20.5	22.5	6.7–9.1	7.8
Body depth	28.1–34.0	25.2	30.6	26.8–34.4	29.8
Body width	19.5–22.1	28.8	22.0	15.3–22.6	20.3
Orbit diameter	7.4–9.4	8.5	8.7	6.7–11.9	8.6
Suborbital width	3.8–4.4	3.6	2.2	2.2–4.4	3.4
Interorbital width	7.4–7.9	7.5	9.7	6.3–9.7	7.7
Upper-jaw length	16.7–19.0	14.6	16.6	14.9–20.6	17.3
Postorbital length	19.3–21.2	19.2	21.1	17.8–24.0	20.5
Pre-dorsal-fin length	21.2–22.2	18.4	21.2	18.0–29.4	21.0
Pre-anal-fin length	65.0–68.6	64.5	64.6	61.1–68.3	65.7
Pre-pelvic-fin length	34.7–38.2	35.3	35.0	31.4–40.4	35.1
Caudal-peduncle depth	10.0–11.5	11.1	10.8	9.2–11.5	10.5
Caudal-peduncle length	15.1–20.9	14.7	16.7	14.9–22.3	17.2
Dorsal-fin base length	63.1–73.7	68.7	72.4	65.6–72.8	70.1
Anal-fin base length	—	—	18.0	16.7–22.5	15.6
Caudal-fin length	27.5–32.1	—	29.5	26.0–36.0	30.1
Pectoral-fin length	32.0–36.8	31.1	34.1	30.4–36.8	33.3
Posterior lacrimal spine length	4.9–6.2	—	5.3	4.0–8.5	5.3
First dorsal-fin spine length	10.0–13.6	—	10.0	8.0–13.4	10.9
Second dorsal-fin spine length	14.6–19.3	—	13.1	11.7–17.7	14.8

Third dorsal-fin spine length	12.8–15.0	—	13.8	11.3–15.6	13.7
Fourth dorsal-fin spine length	10.6–14.5	—	11.4	8.1–12.6	11.0
Fifth dorsal-fin spine length	13.3–17.0	—	15.7	11.8–17.2	14.2
Sixth dorsal-fin spine length	14.6–18.0	—	16.0	11.9–18.1	15.1
Penultimate dorsal-fin spine length	17.4–20.7	—	23.2	14.9–23.1	18.2
Last dorsal-fin spine length	19.8–25.2	—	21.2	16.4–22.4	19.6
Longest dorsal-fin soft ray length	18.4–21.7	—	19.8	15.3–21.7	18.7
First anal-fin spine length	7.8–10.2	6.8	8.8	5.0–11.2	9.0
Second anal-fin spine length	13.8–18.3	12.8	14.3	10.6–16.6	14.3
Third anal-fin spine length	18.4–21.7	—	23.2	15.1–23.2	18.7
Longest anal-fin soft ray length	18.4–22.5	18.4	22.6	16.4–22.6	19.7
Pelvic-fin spine length	19.3–22.7	—	18.9	15.1–23.0	19.2
Longest pelvic-fin soft ray length	22.5–24.9	—	24.7	20.4–25.9	23.8

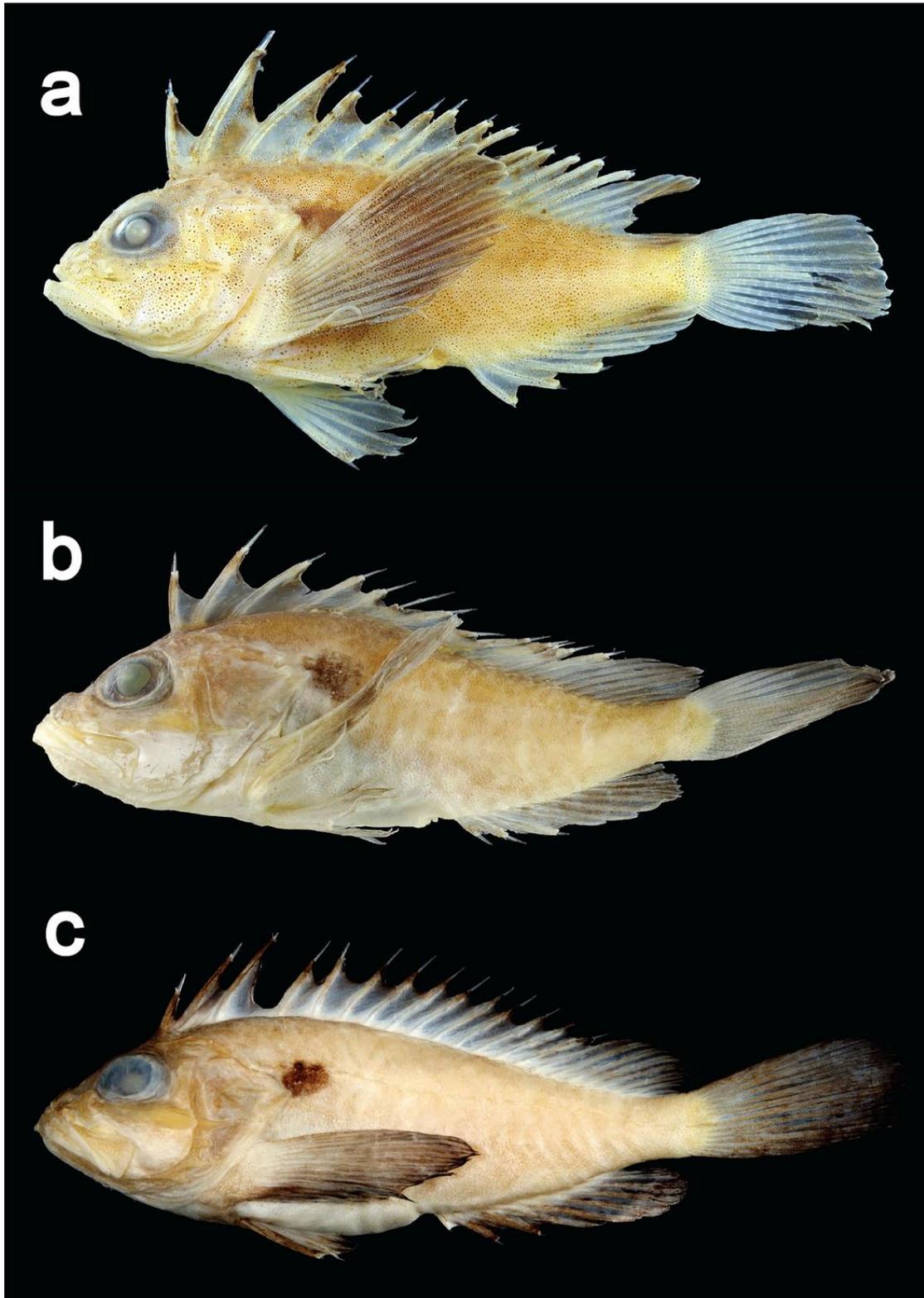


Fig. 1 Preserved specimens of *Neocentropogon aeglefinus* at different growth stages. **a** AMS I. 37476-003, 30.59 mm SL, Australia; **b** CAS 235562, 71.35 mm SL, Philippines; **c** CSIRO H. 7277-01, 113.27 mm SL, Australia

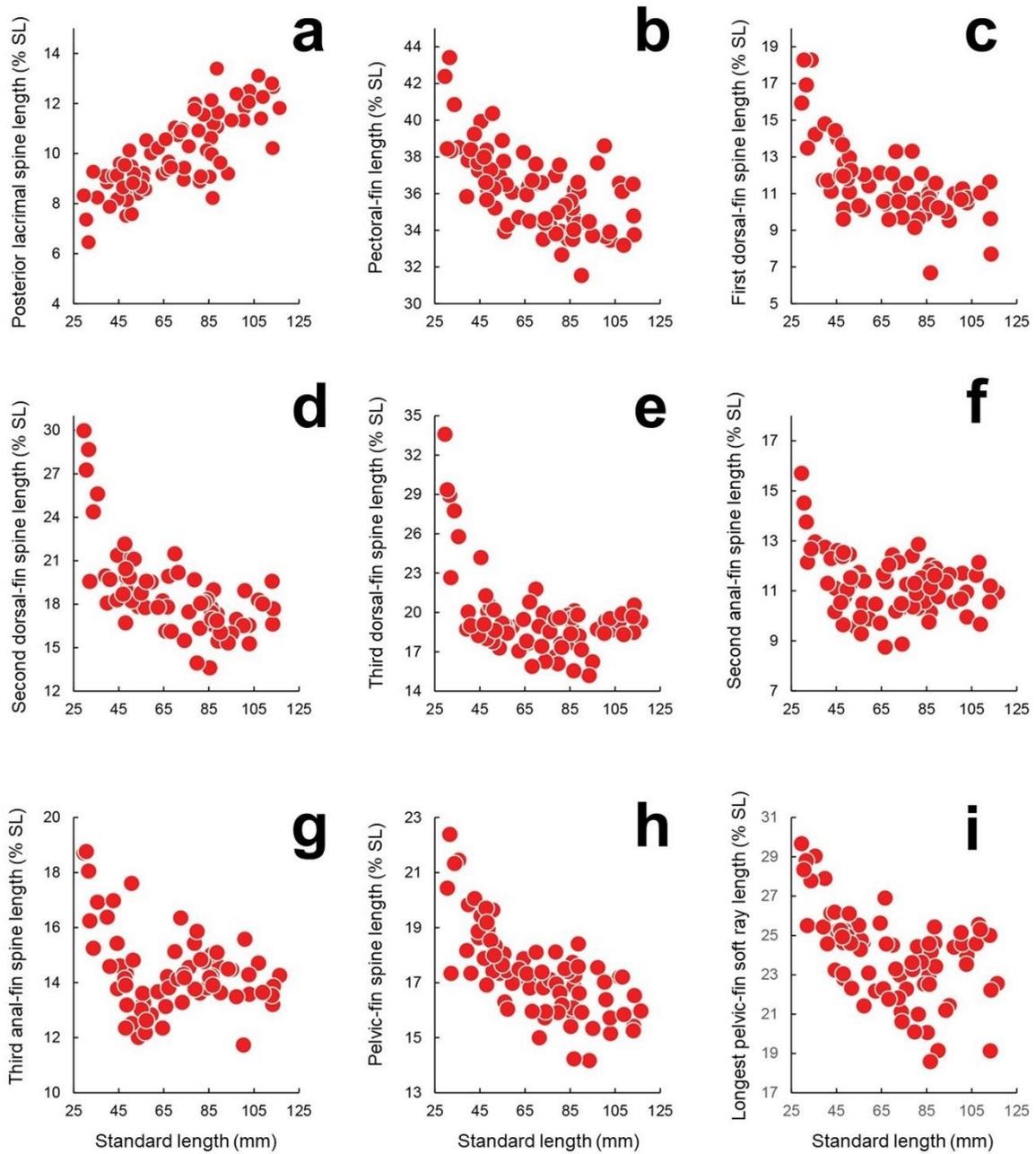


Fig. 2 Relationships of **a** Posterior lacrimal spine length; **b** Pectoral-fin length; **c** First dorsal-fin spine length; **d** Second dorsal-fin spine length; **e** Third dorsal-fin spine length; **f** Second anal-fin spine length; **g** Third anal-fin spine length; **h** Pelvic-fin spine length; **i** Longest pelvic-fin soft ray length (all percentages of standard length) to standard length (mm) in *Neocentropogon aeglefinus*

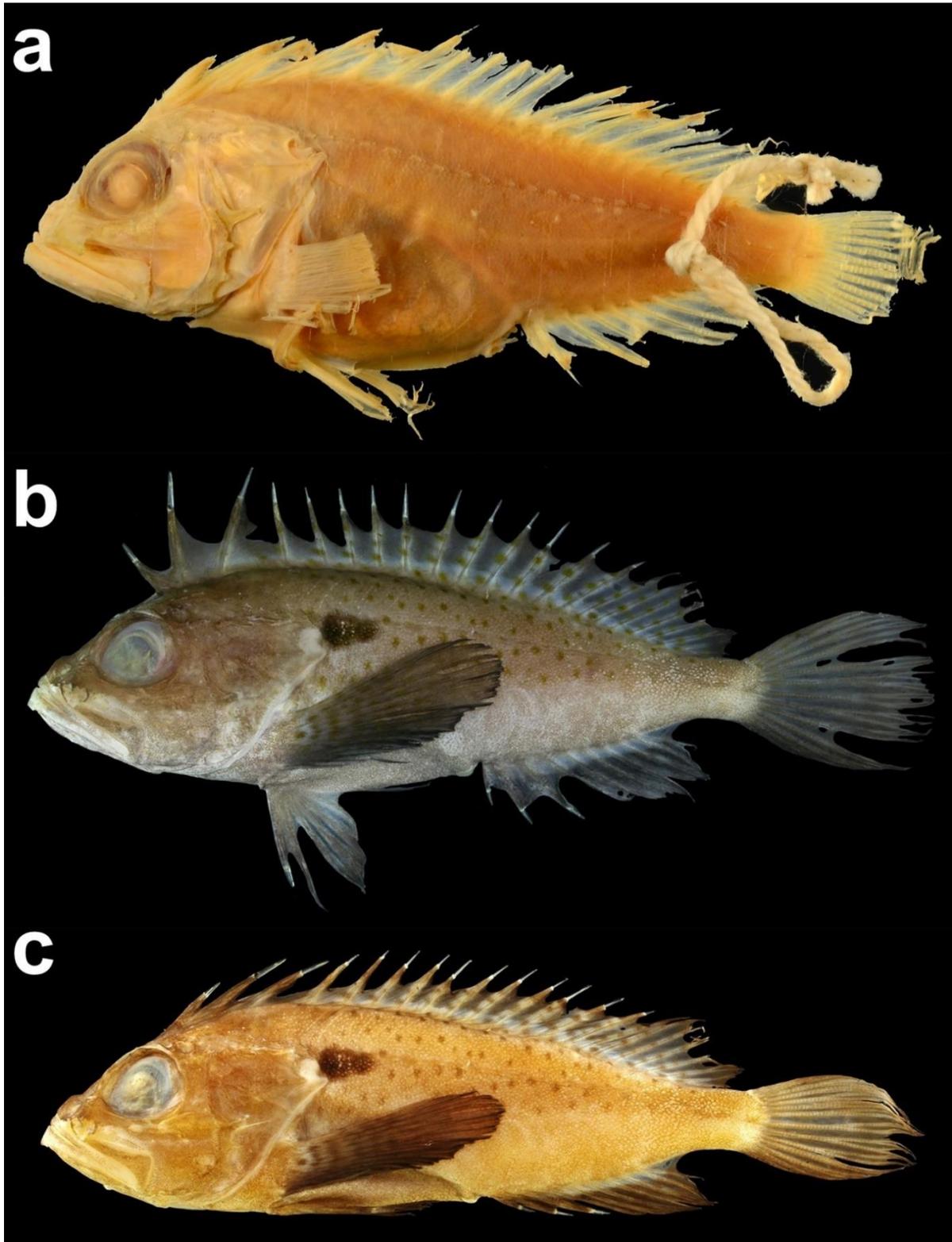


Fig. 3 Specimens of *Neocentropogon affinis*. **a** preserved specimen of ZSI 1172/2–1178/2, syntype, 1 of 4 specimens, 59.8 mm SL, India; **b** fresh specimen of KAUM–I. 33280, 73.9 mm SL, Thailand; **c** preserved specimen of KAUM–I. 33280, 73.9 mm SL, Thailand



Fig. 4 Specimens of *Neocentropogon japonicus*. **a** preserved specimen of FAKU 1761, holotype, 97.9 mm SL, Japan; **b** fresh specimen of KAUM-I. 30815, 85.8 mm SL, Japan



Fig. 5 Preserved specimens of *Neocentropogon mesedai*, SMF 20198, holotype, 62.1 mm SL, Red Sea

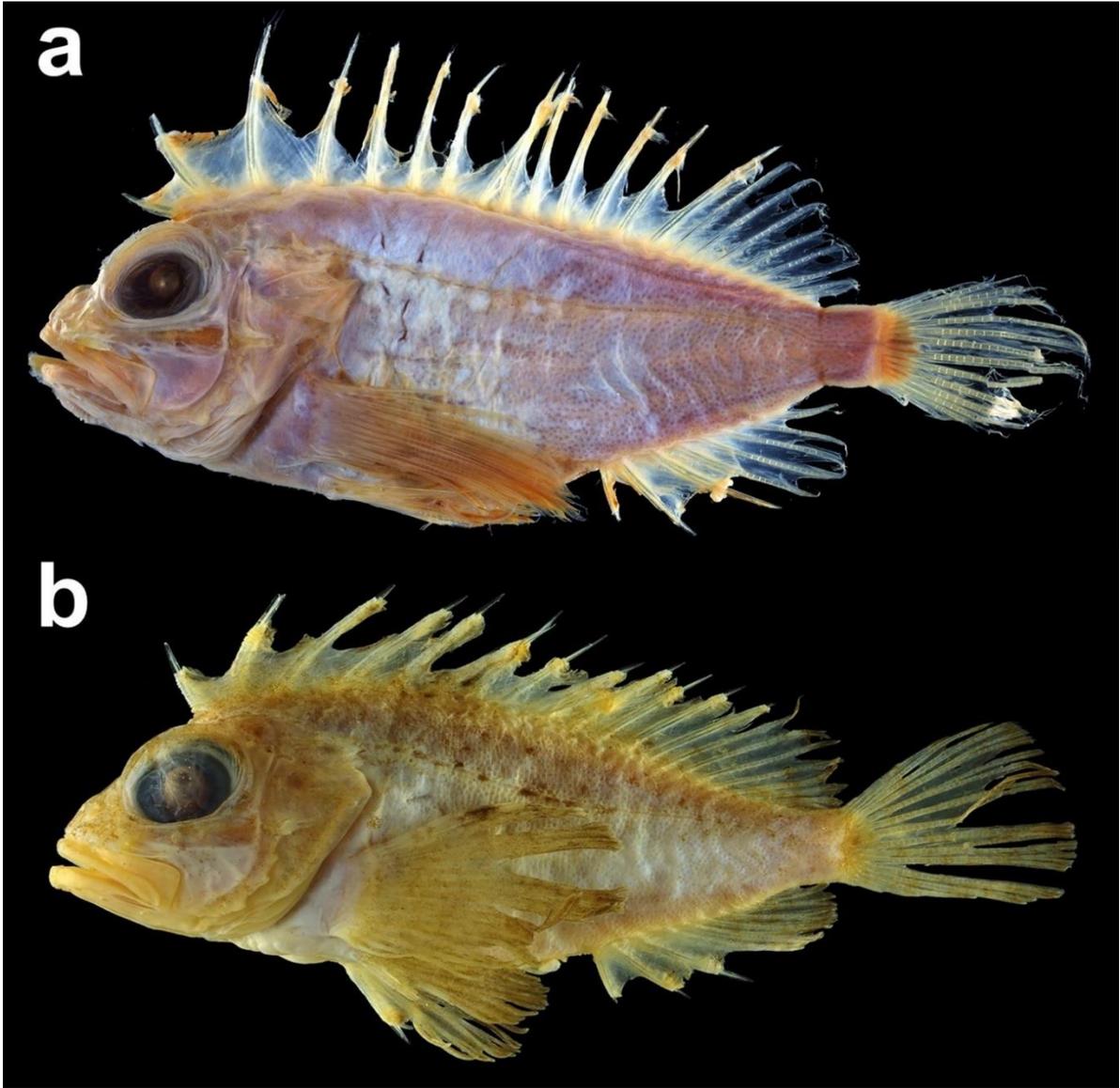


Fig. 6 Preserved specimens of *Neocentropogon profundus* **a** SAIAB 300, holotype, 56.4 mm SL, off Mozambique; **b** MNHN 2006-0008, 1 of 4 specimens, 66.9 mm SL, Réunion Island

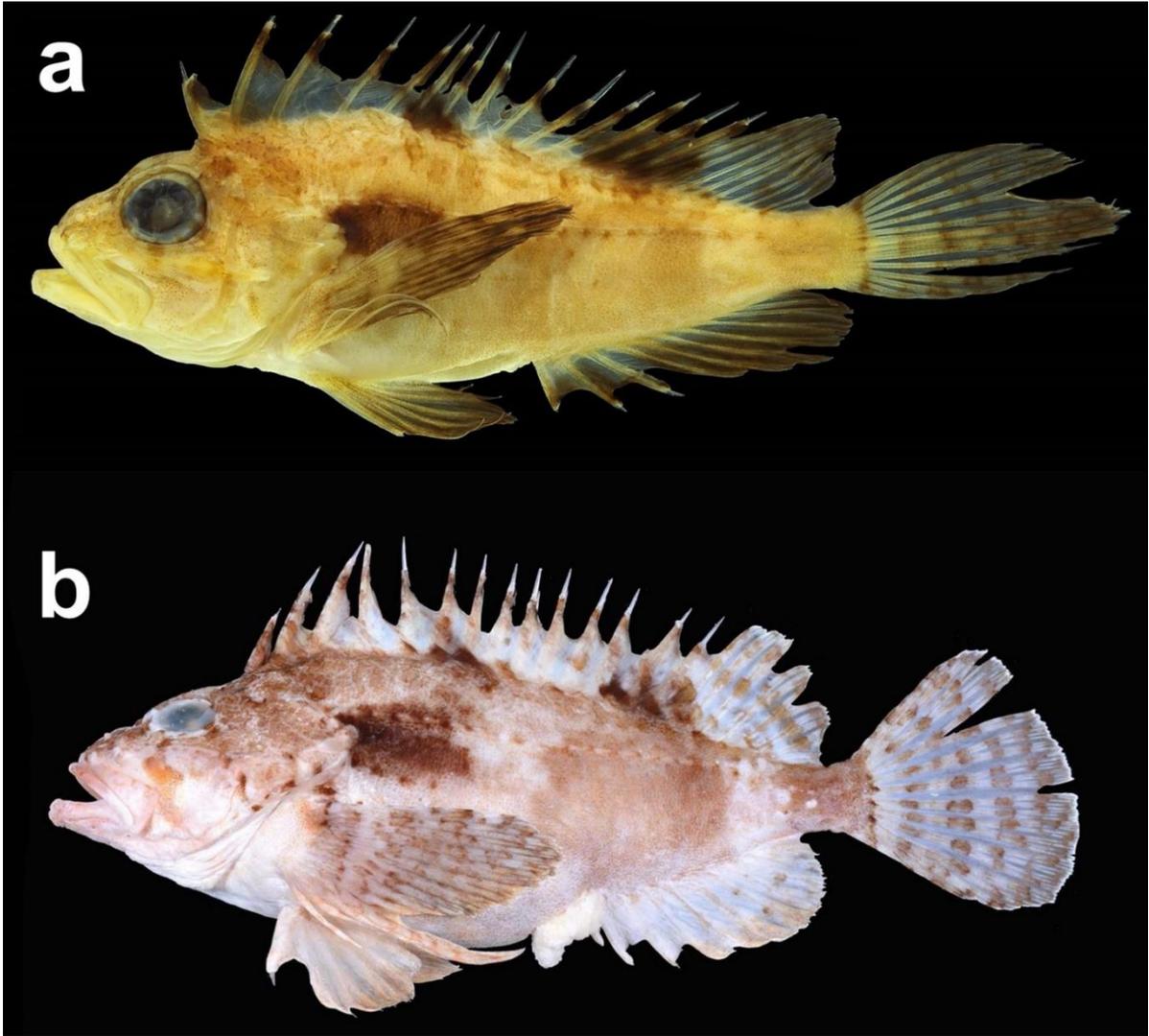


Fig. 7 Specimens of *Neocentropogon trimaculatus*. **a** preserved specimens of BMNH 1965.11.6.3, holotype, 80.8 mm SL, off Hong Kong; **b** fresh specimens of KAUM-I. 17716, 130.7 mm SL, Japan

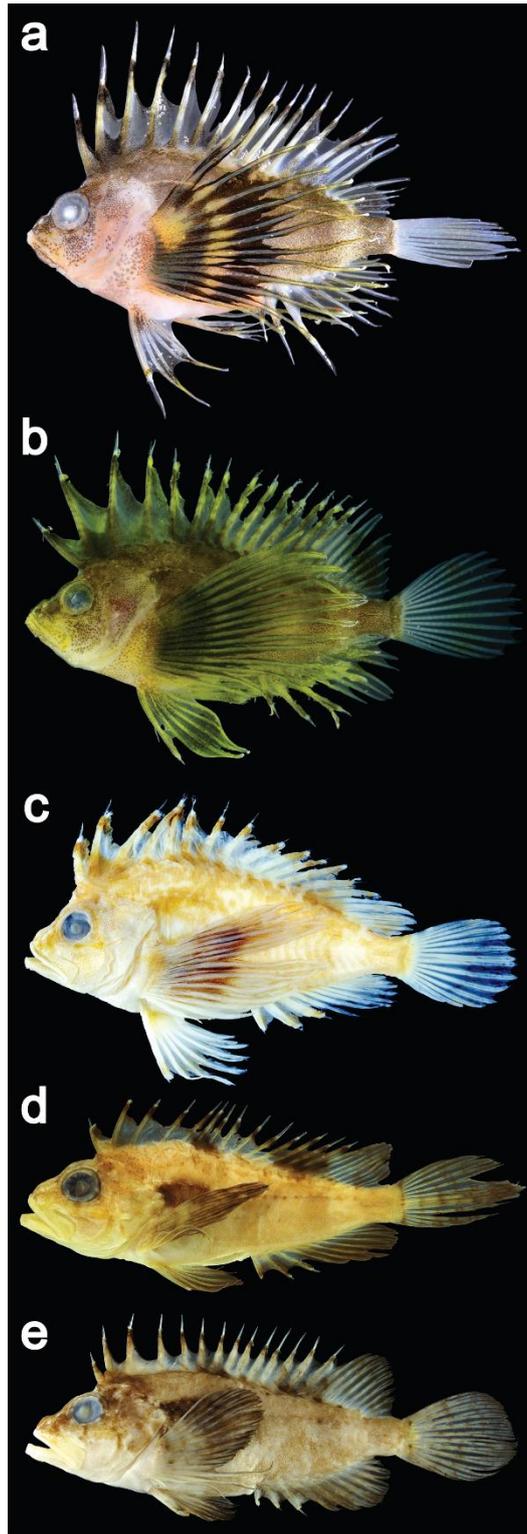


Fig. 8 Preserved specimens of *Neocentropogon trimaculatus* at different growth stages. **a** KAUM-I. 77119, 24.5 mm SL, East China Sea; **b** KAUM-I. 09519, 29.6 mm SL, Japan; **c** KAUM-I. 22469, 39.8 mm SL, Japan; **d** BMNH 1965.11.6.3, holotype, 80.8 mm SL, South China Sea; **e** KAUM-I. 77117, 116.0 mm SL, East China Sea

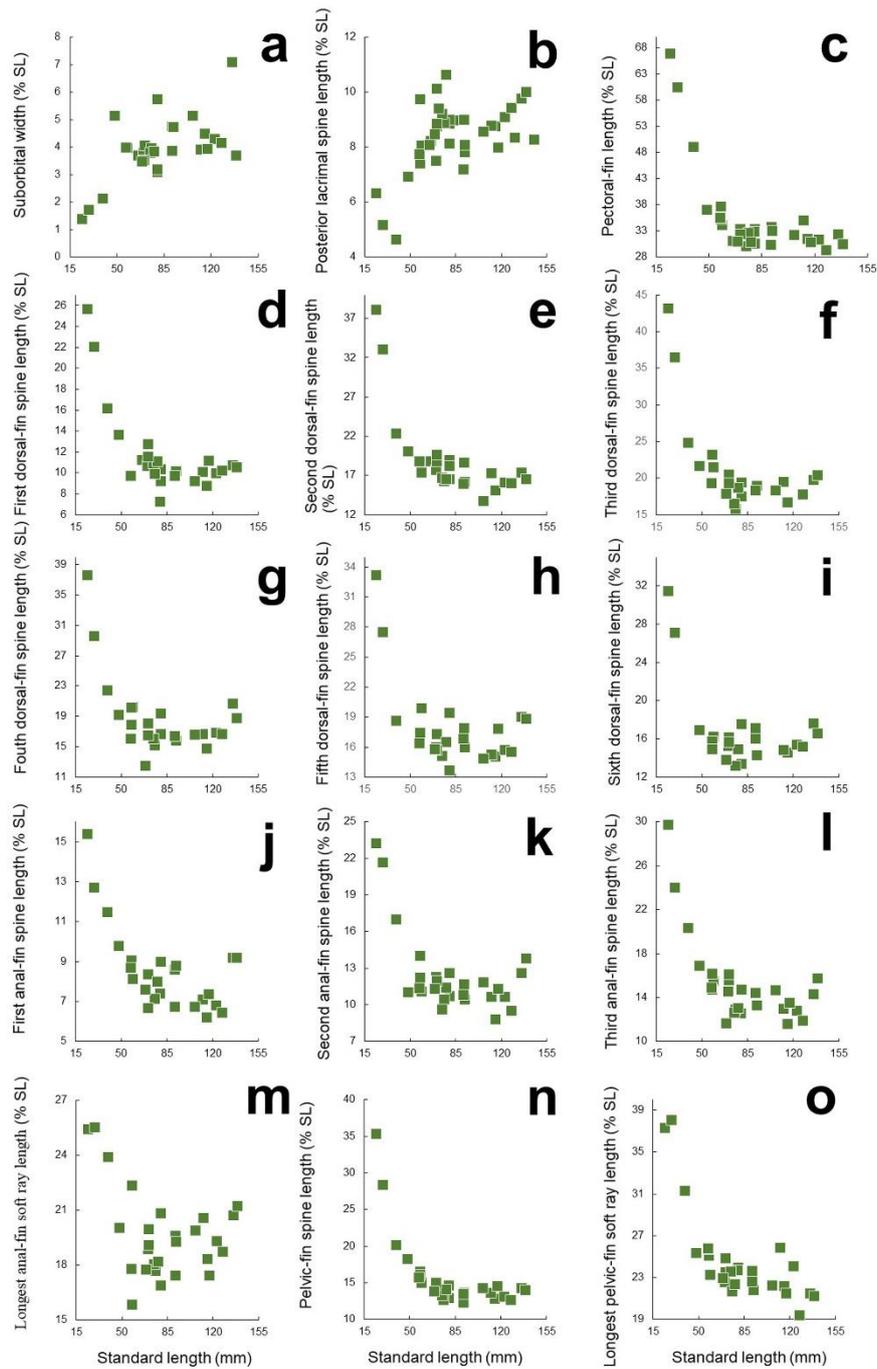


Fig. 9 Relationships of **a** suborbital width; **b** posterior lacrimal spine length; **c** pectoral-fin length; **d** first dorsal-fin spine length; **e** second dorsal-fin spine length; **f** third dorsal-fin spine length; **g** fourth dorsal-fin spine length; **h** fifth dorsal-fin spine length; **i** sixth dorsal-fin spine length; **j** first anal-fin spine length; **k** second anal-fin spine length; **l** third anal-fin spine length; **m** longest anal-fin soft ray length; **n** pelvic-fin spine length; **o** longest pelvic-fin soft ray length (all percentages of standard length) to standard length (mm) in *Neocentropogon trimaculatus*

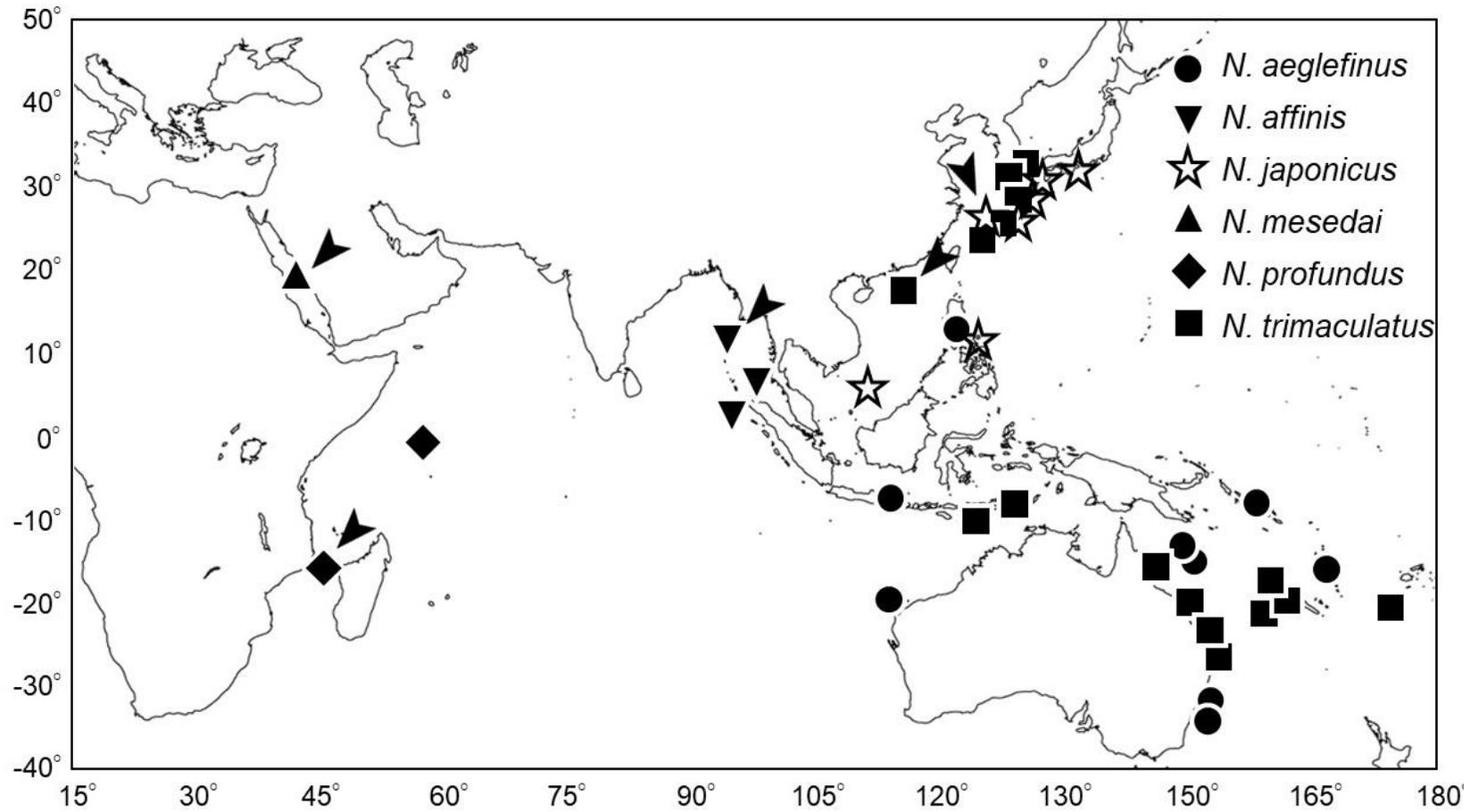


Fig. 10 Distributional map of *Neocentropogon aeglefinus* (circles), *N. affinis* (triangles), *N. japonicus* (open stars), *N. mesedai* (inverted triangle), *N. profundus* (diamonds), and *N. trimaculatus* (squares) based on specimens examined in this study. Arrowhead indicates type-specimens

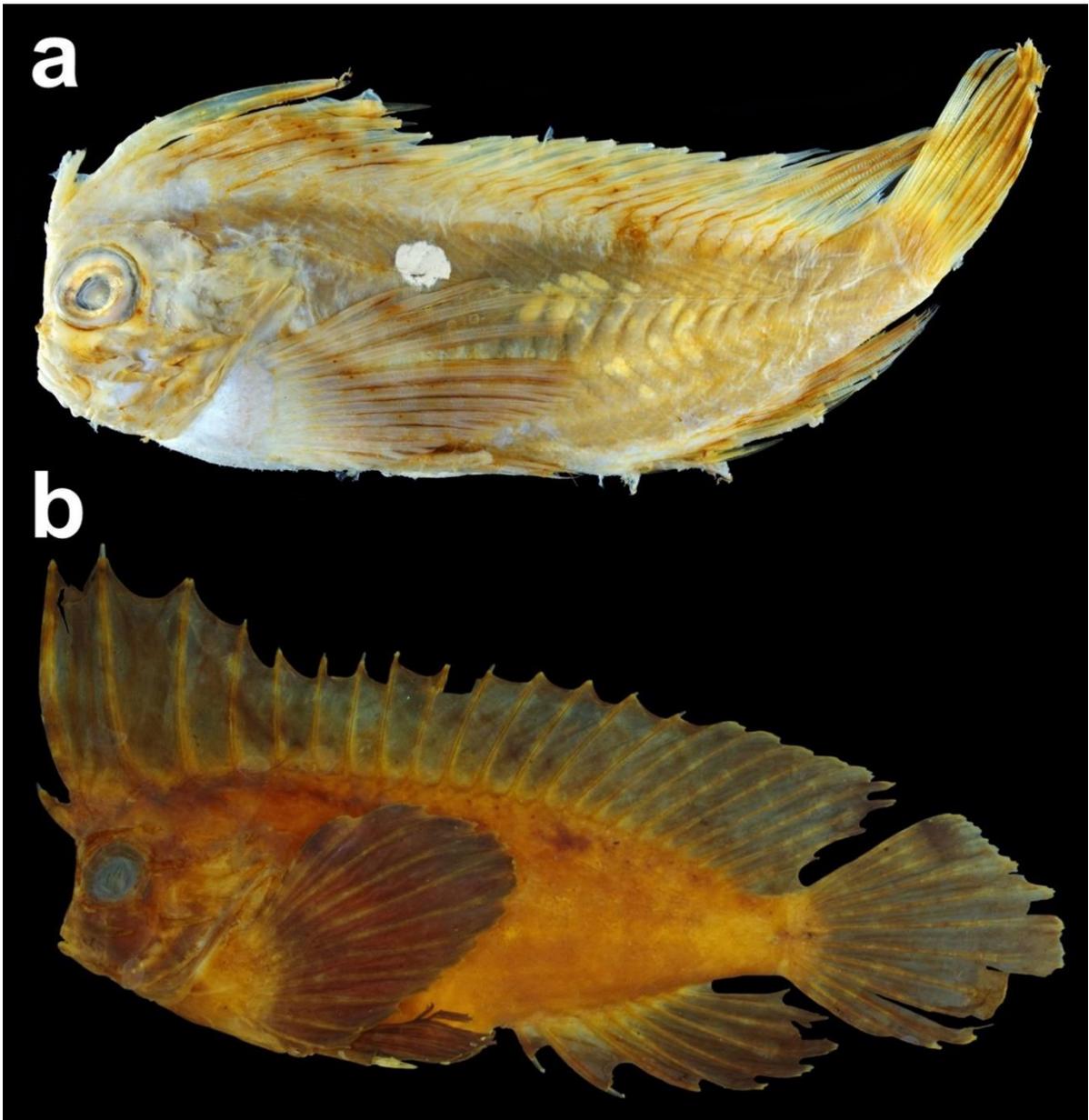


Fig. 11 Preserved specimens of *Ablabys binotatus*. **a** ZMB 814, holotype of *Apistus binotatus*, 95.2 mm SL, Mozambique; **b** BMNH 1919.4.1.32, holotype of *Amblyapistus marleyi*, 94.3 mm SL, South Africa

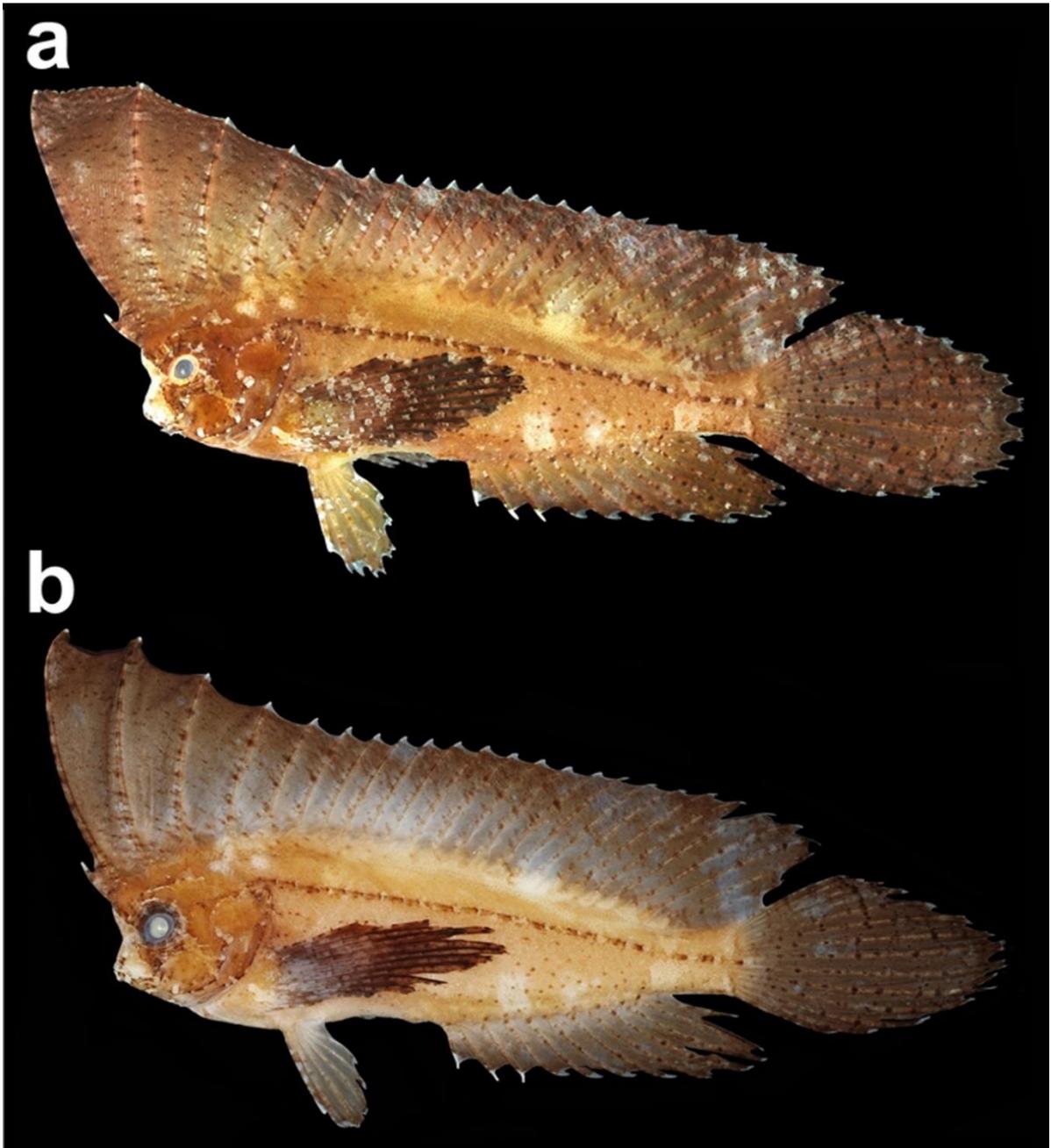


Fig. 12 Specimens of KAUM-I. 77808, holotype of *Ablabys gymnothorax*, 47.9 mm SL, Japan. **a** fresh specimen; **b** preserved specimen



Fig. 13 Preserved specimens of *Ablabys macracanthus*, KAUM-I. 33282, 70.2 mm SL, Thailand



Fig. 14 Preserved specimens of QM I. 36106, holotype of *Ablabys pauciporus*, 43.6 mm SL, Australia

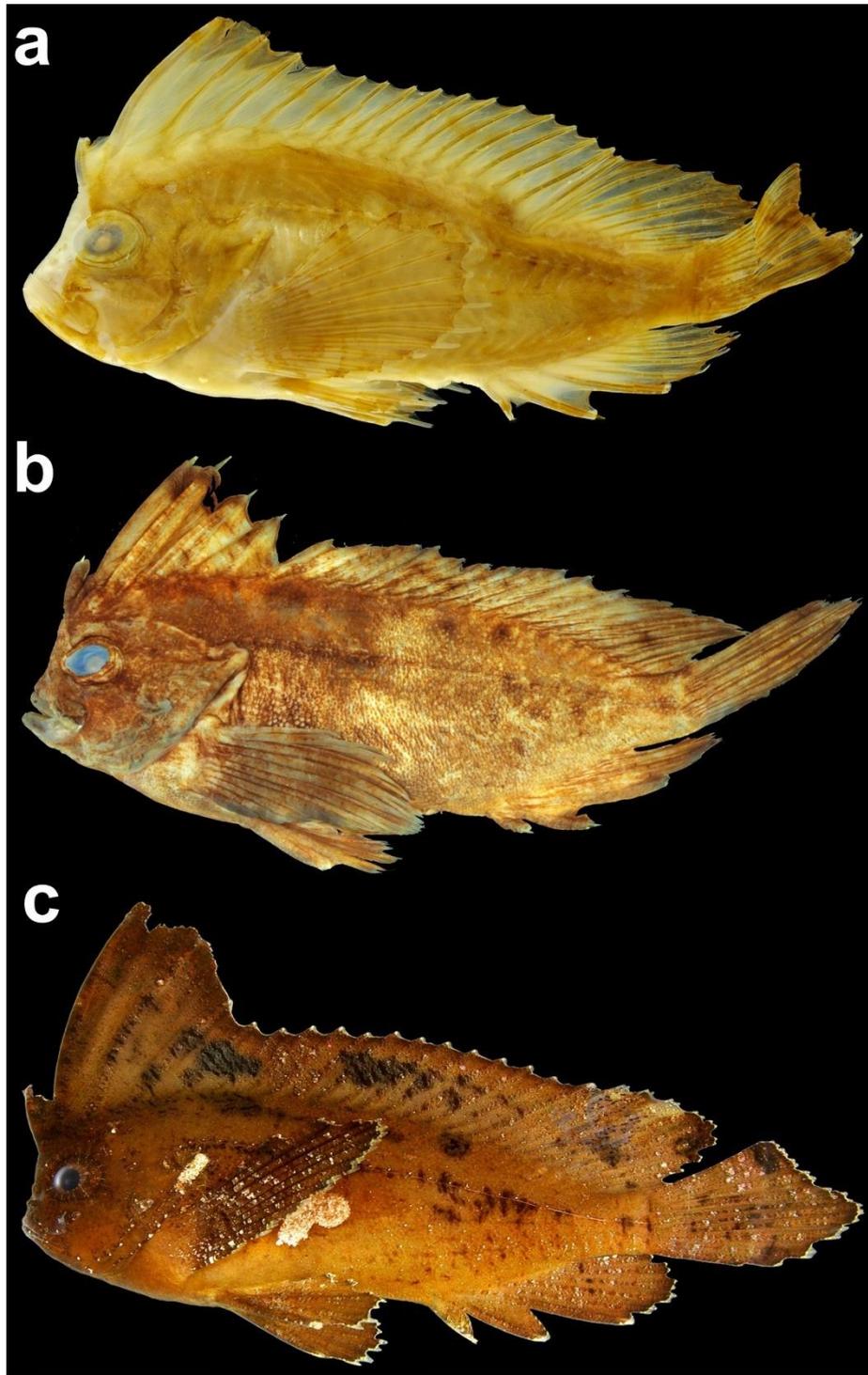


Fig. 15 Specimens of *Ablabys taenianotus*. **a** preserved specimen of AMS IB. 3898, holotype of *Amblyapistus slacksmithi*, 26.9 mm SL, Australia; **b** preserved specimen of BMNH 1843.9.30.21, holotype of *Tetraroge cristagalli*, 84.5 mm SL, Philippines; **c** fresh specimen of KAUM-I. 20310, 68.2 mm SL, Japan

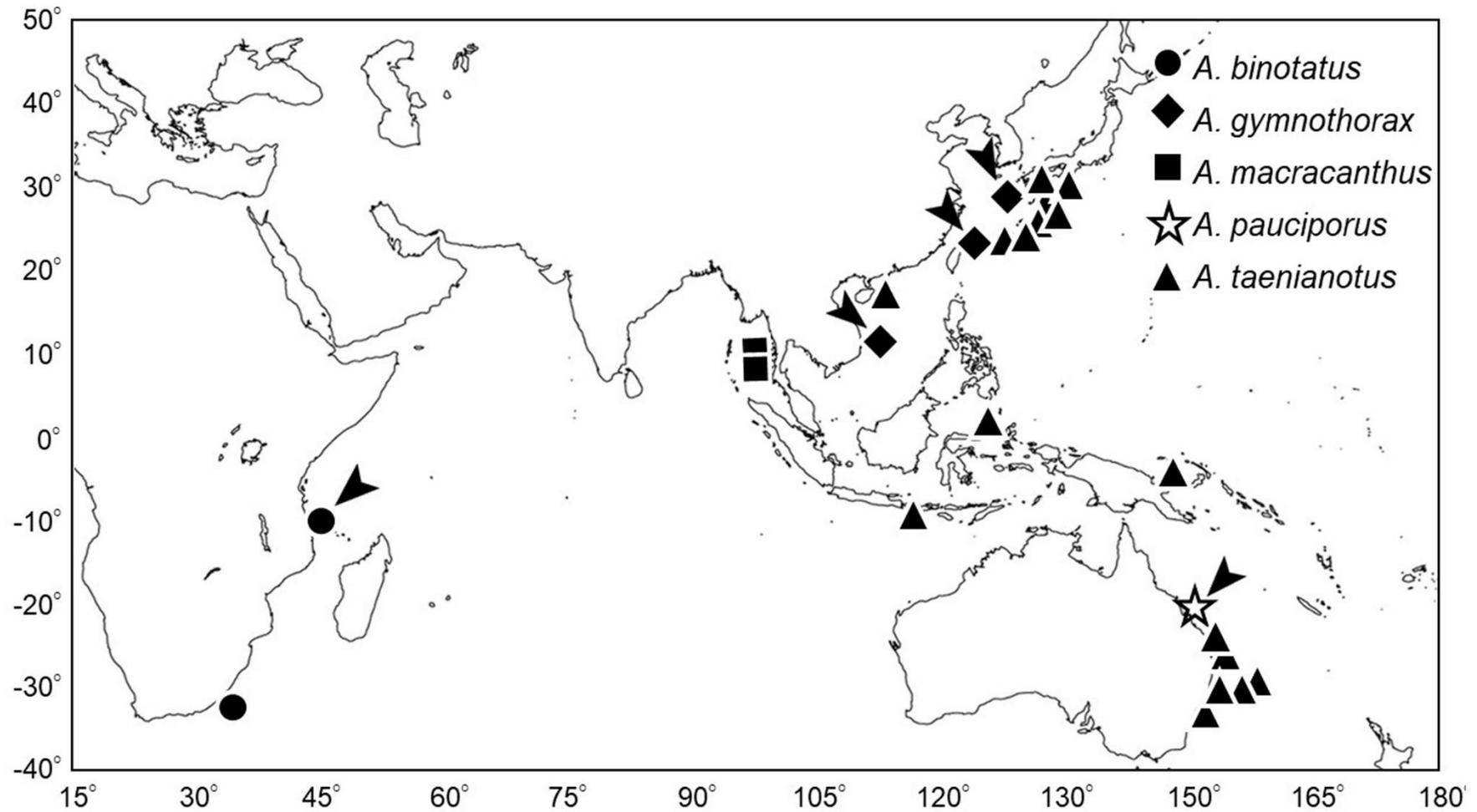


Fig. 16 Distributional map of *Ablabys binotatus* (circles), *A. gymnothorax* (diamonds), *A. macracanthus* (squares), *A. pauciporus* (open stars), and *A. taenianotus* (triangles) based on specimens examined in this study. Arrowhead indicates type-specimens



Fig. 17 Preserved specimens of *Centropogon australis*. **a** MNHN 0000-6640, holotype of *Scorpaena jacksoniana*, 69.3 mm SL, Australia; **b** QM I. 116, syntype of *Tetraroge hamiltoni*, 70.5 mm SL, Australia

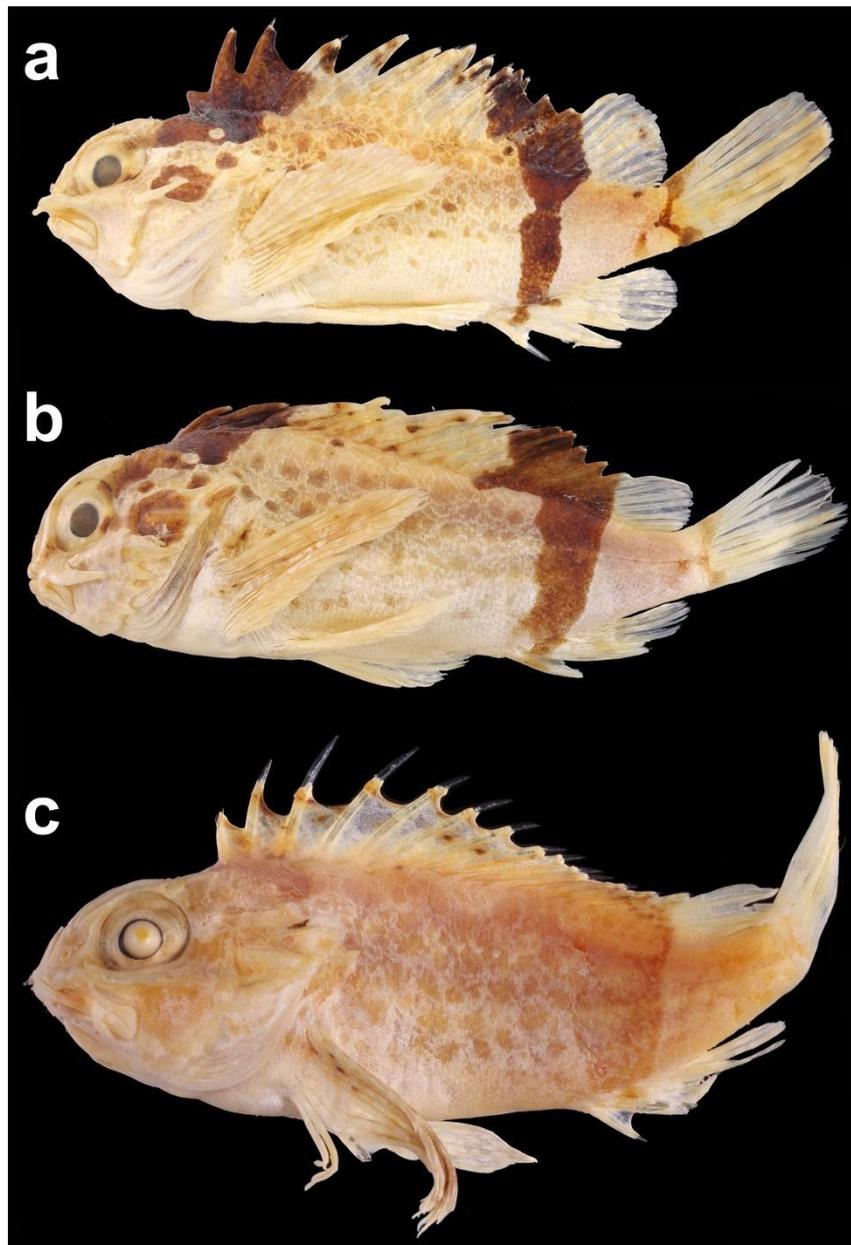


Fig. 18 Preserved specimens of *Centropogon latifrons*. **a** WAM P. 5140, holotype of *Centropogon australis latifrons*, 46.7 mm SL, Australia; **b** WAM P. 4871-001, paratype of *C. a. latifrons*, 72.7 mm SL, Australia; **c** WAM P. 4872, paratype of *C. a. latifrons*, 53.8 mm SL, Australia

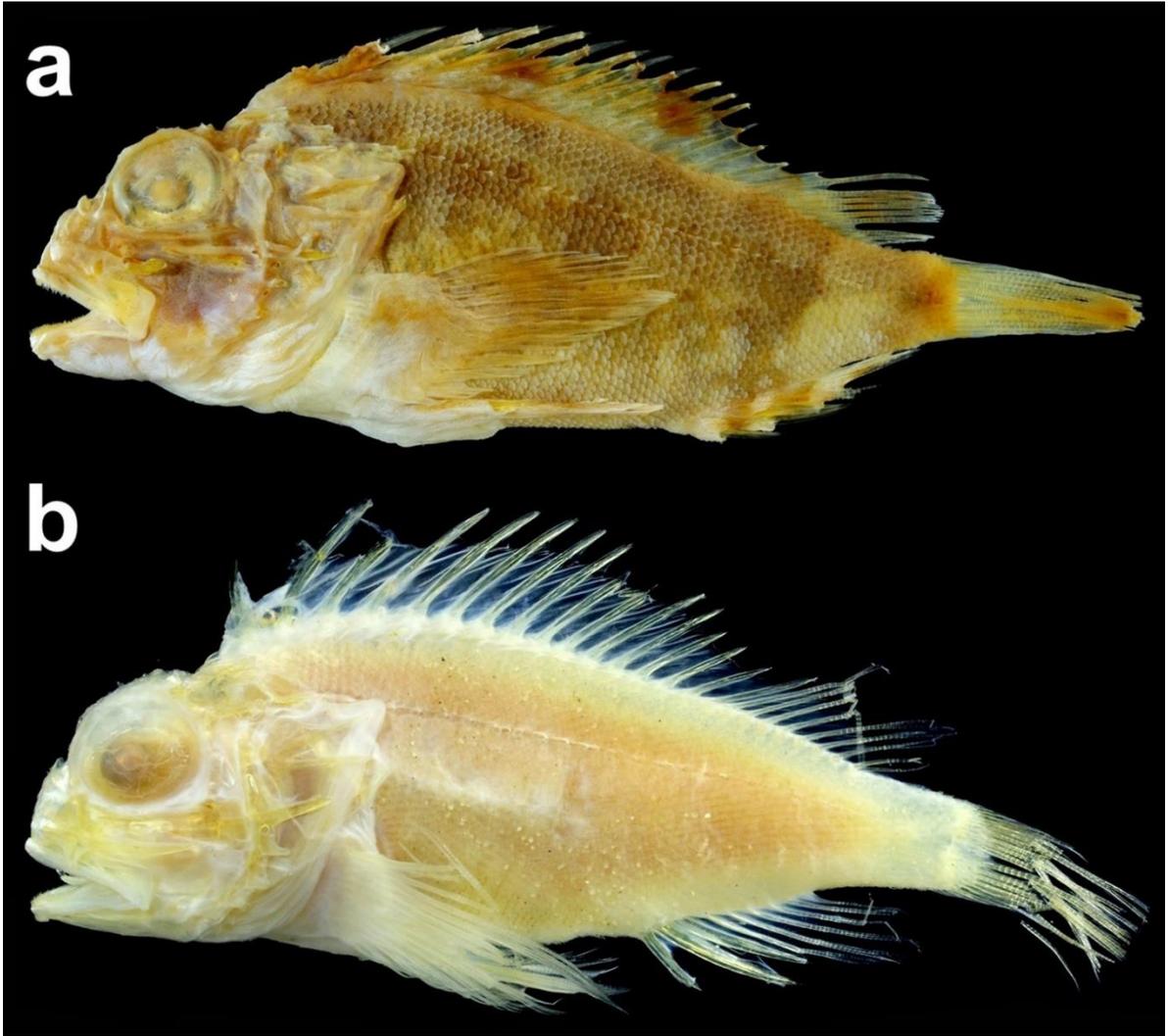


Fig. 19 Preserved specimens of *Centropogon marmoratus*. **a** BMNH 1862.1.6.44, holotype of *C. marmoratus*, 55.6 mm SL, Australia; **b** QM I. 1597, holotype of *Tetraroge vestitus*, 57.2 mm SL, South Sea

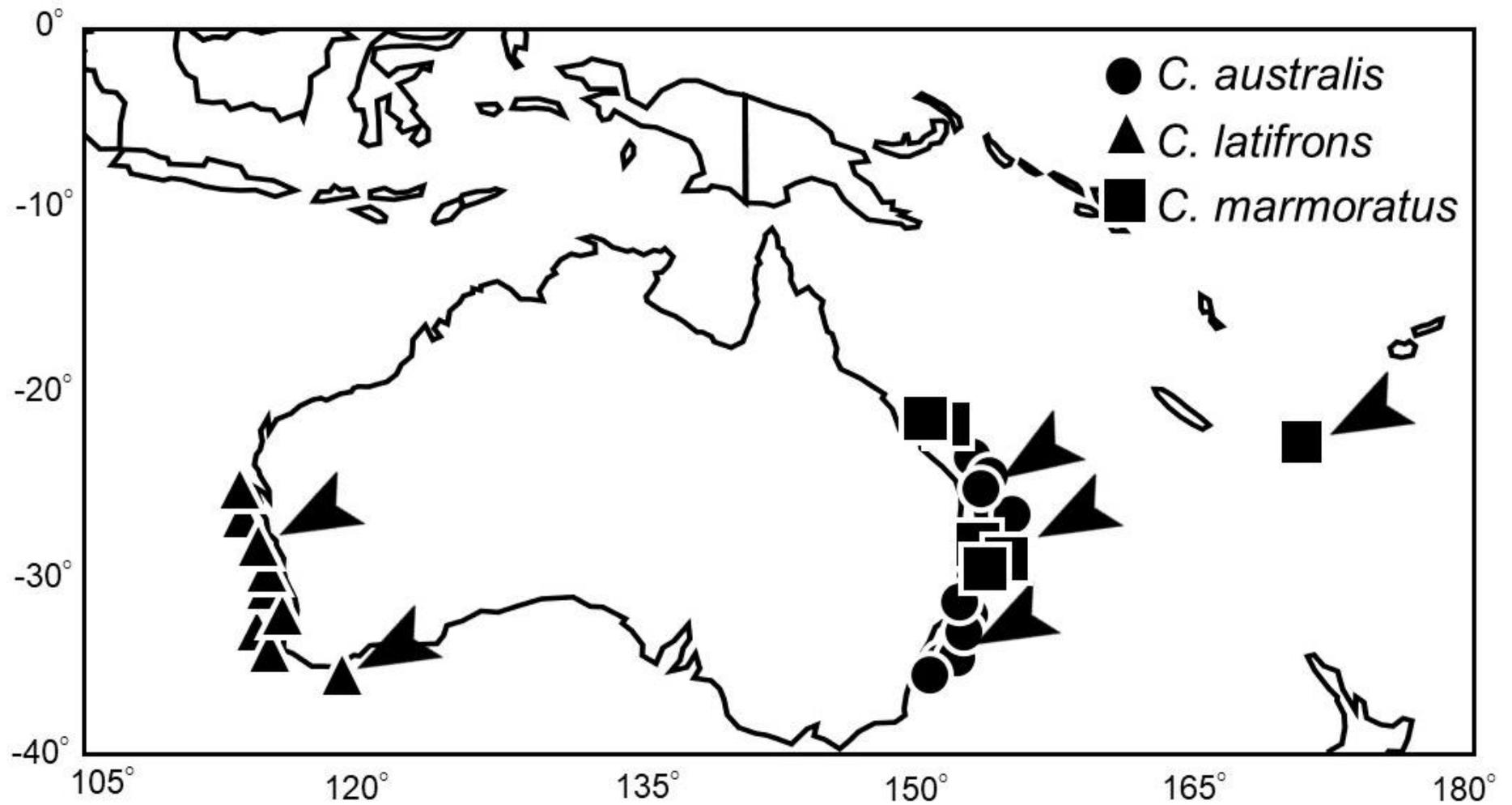


Fig. 20 Distributional map of *Centropogon australis* (circles), *C. gymnothorax* (diamonds), *C. latifrons* (triangles), and *A. marmoratus* (squares) based on specimens examined in this study. Arrowhead indicates type-specimens

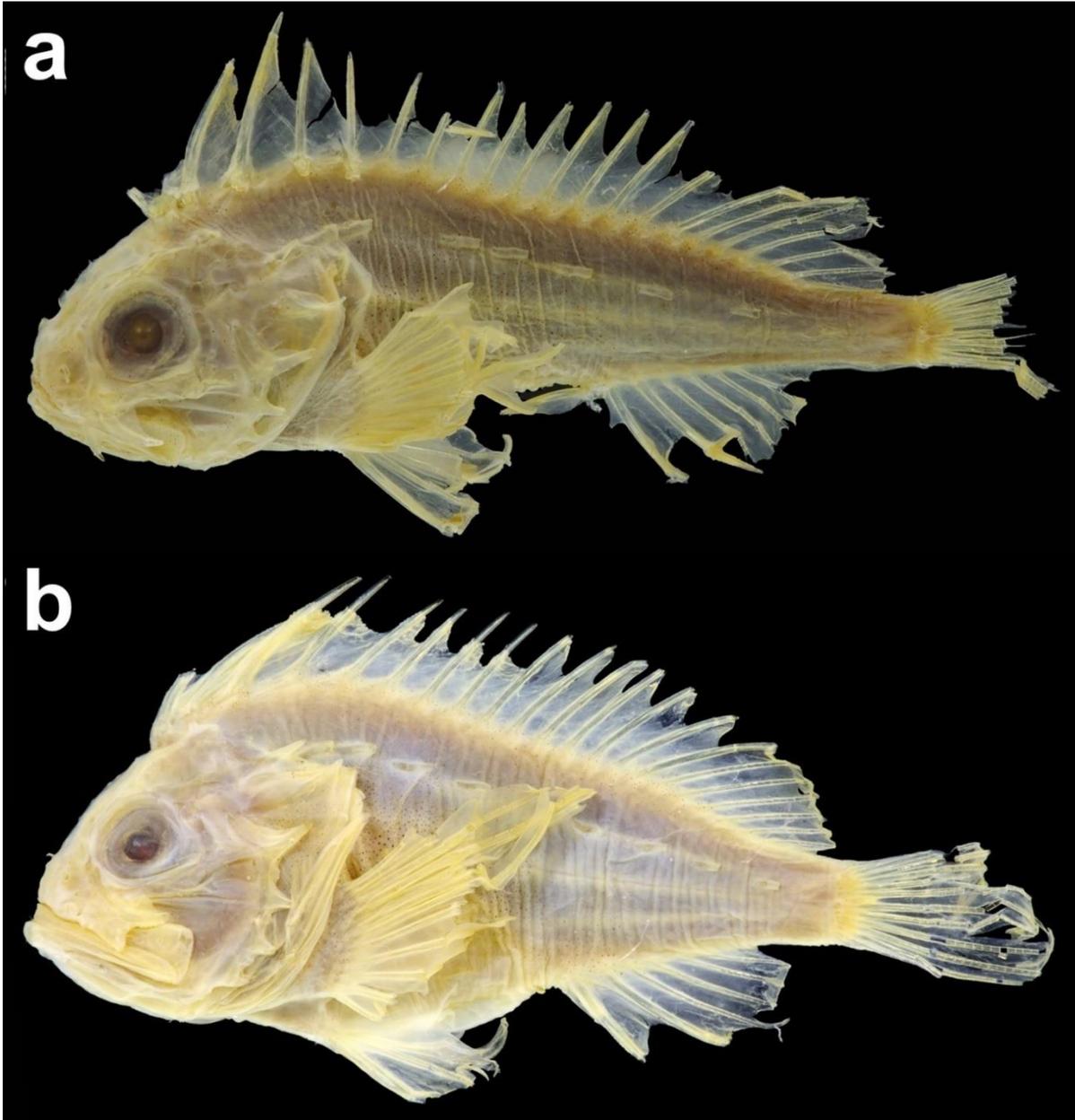


Fig. 21 Preserved specimens of *Coccotropsis gymnoderma* **a** BMNH 1930.1.14.6, syntypes of *Tetraroge gymnoderma*, 28.7 mm SL, **b** BMNH 1930.1.14.6, syntypes of *Tetraroge gymnoderma*, 23.9 mm SL, South Africa

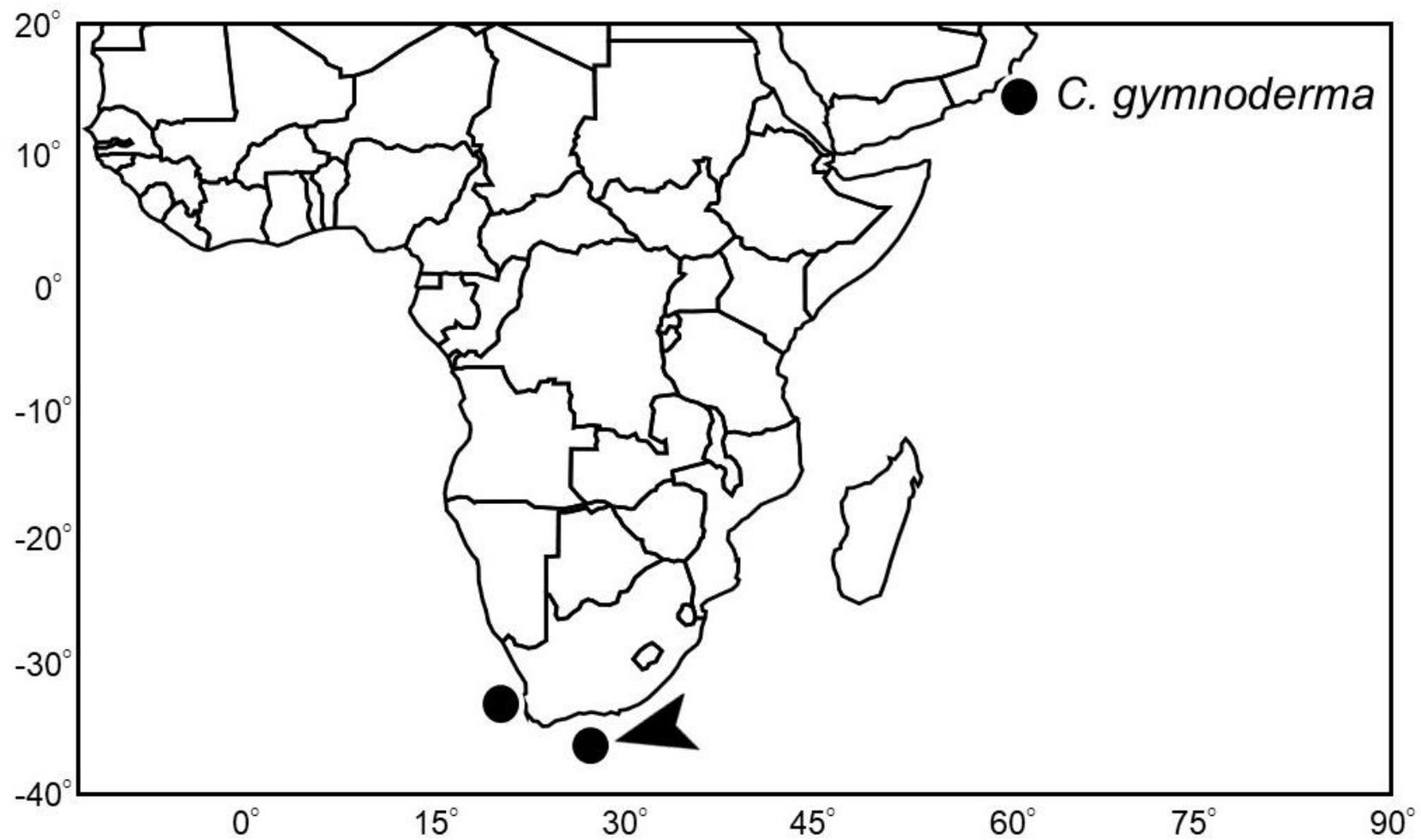


Fig. 22 Distributinal map of *Coccothopsis gymnoderma* (circles) based on specimens examined in this study. *Arrowhead* indicates syntype

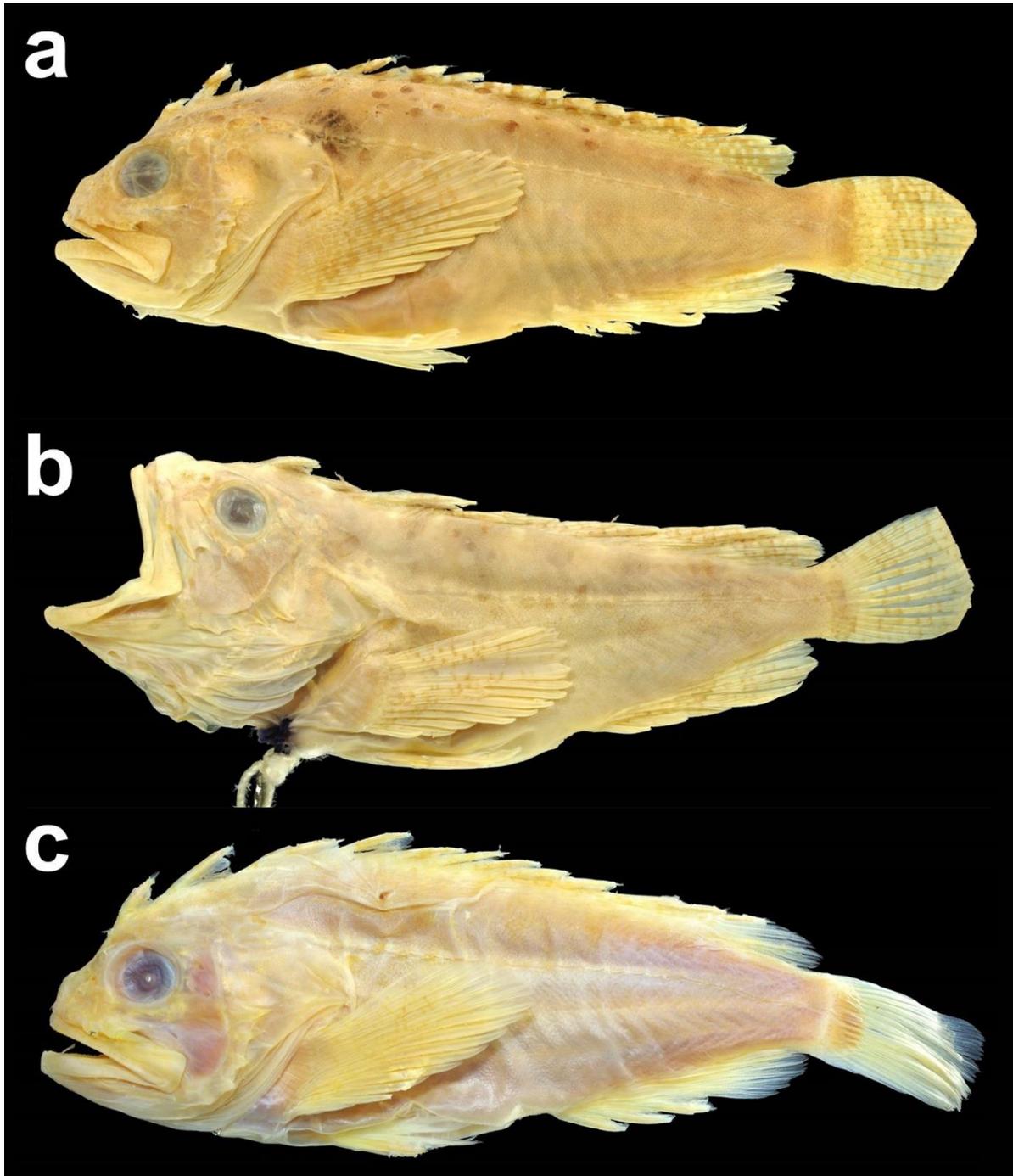


Fig. 23 Preserved specimens of *Cottapistus cottoides* **a** AMS E. 2945, holotype of *Paracentropogon scorpio* Ogilby 1910, 57.1 mm SL, Australia; **b** AMS E. 2681, paratype of *P. scorpio*, 62.4 mm SL, Australia; **c** QM I. 1578, paratype of *P. scorpio*, 68.6 mm SL, Australia

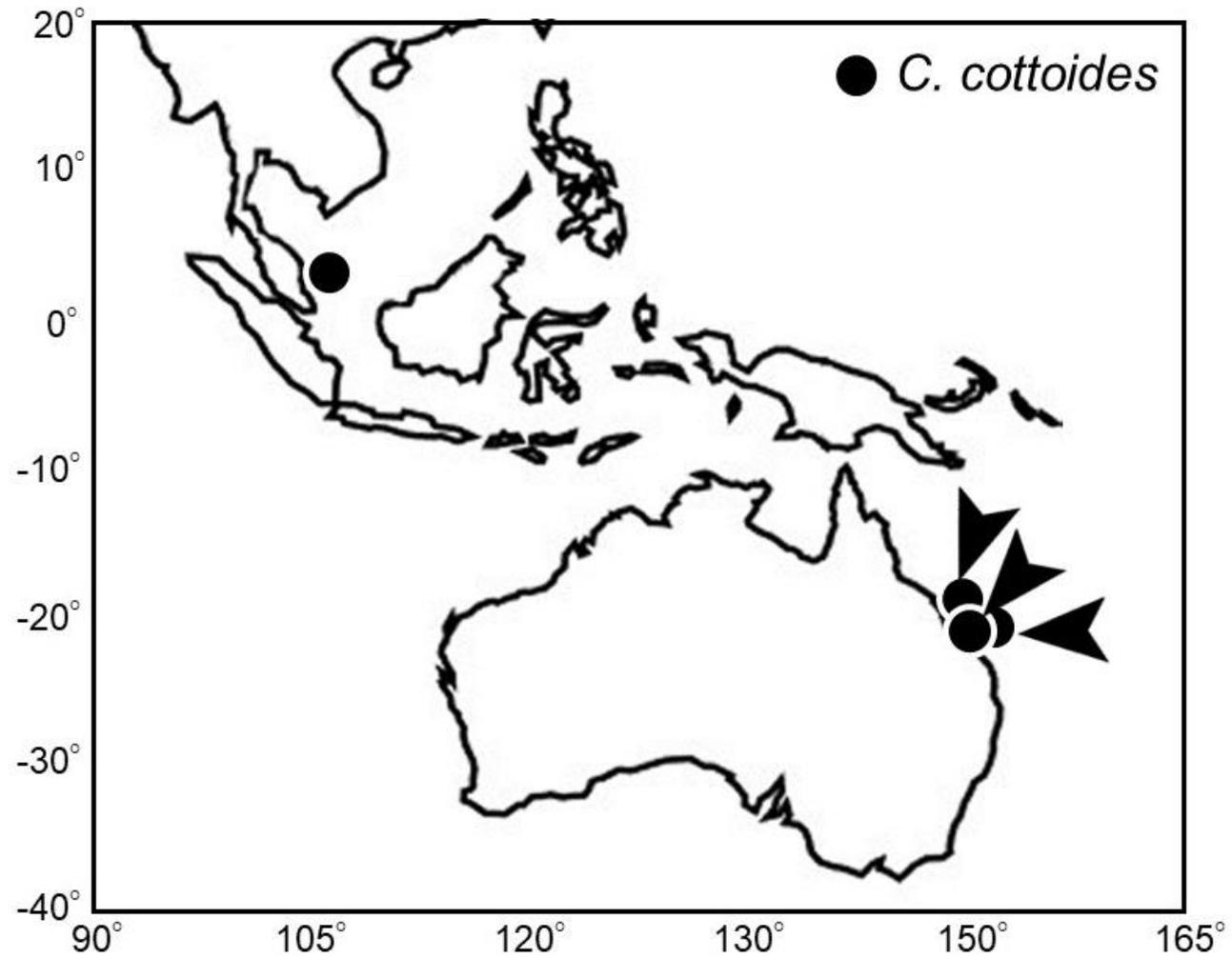


Fig. 24 Distributinal map of *Cottapistus cottoides* (circles) based on specimens examined in this study. *Arrowhead* indicates type-specimens

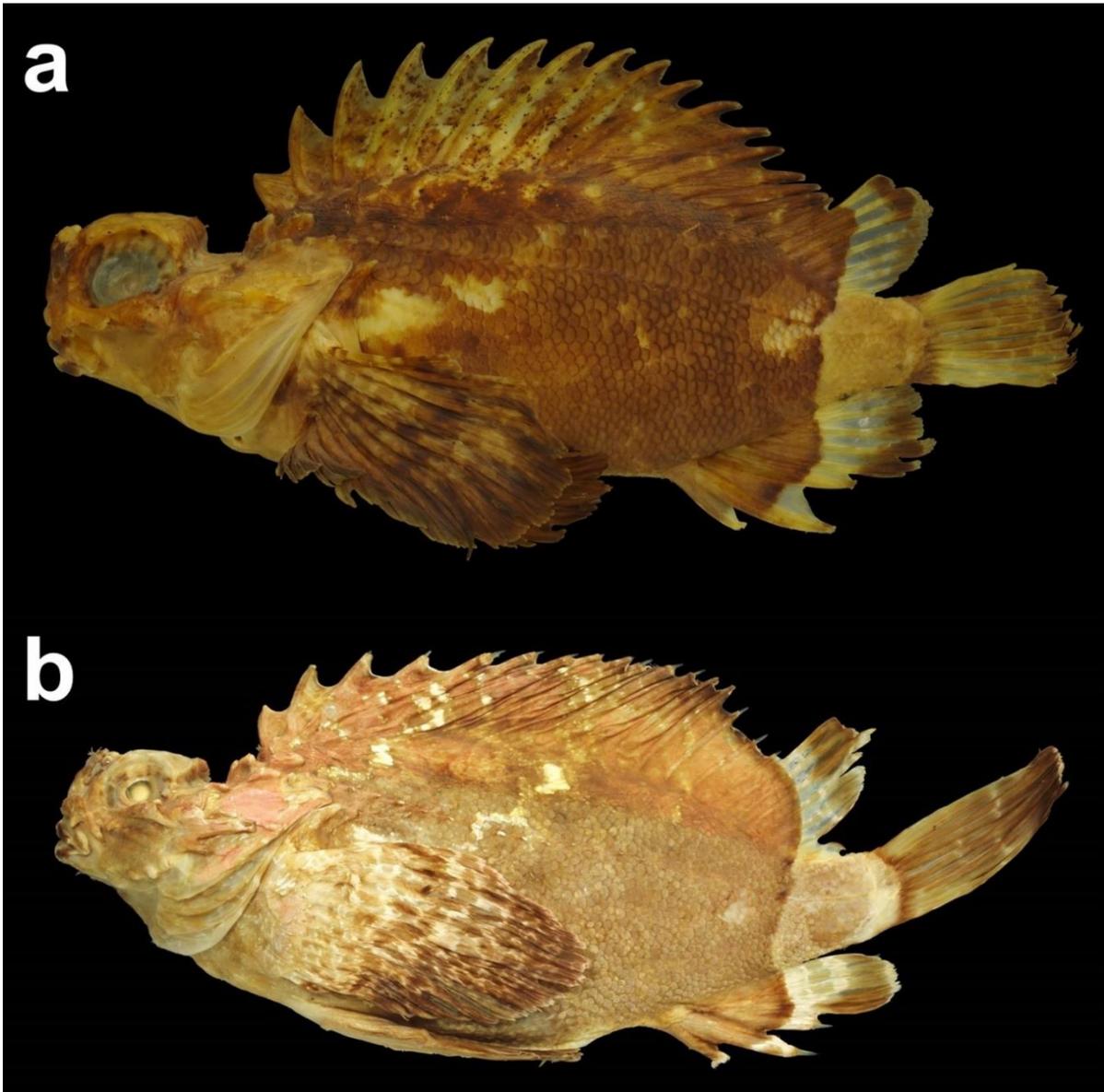


Fig. 25 Preserved specimens of *Glyptauchen panduratus* **a** AMS IA. 4634, holotype of *Glyptauchen insidiator*, 100.9 mm SL, Australia; **b** AMS B. 5786, holotype of *Glyptauchen insidiator mirandus*, 150.9 mm SL, Australia.

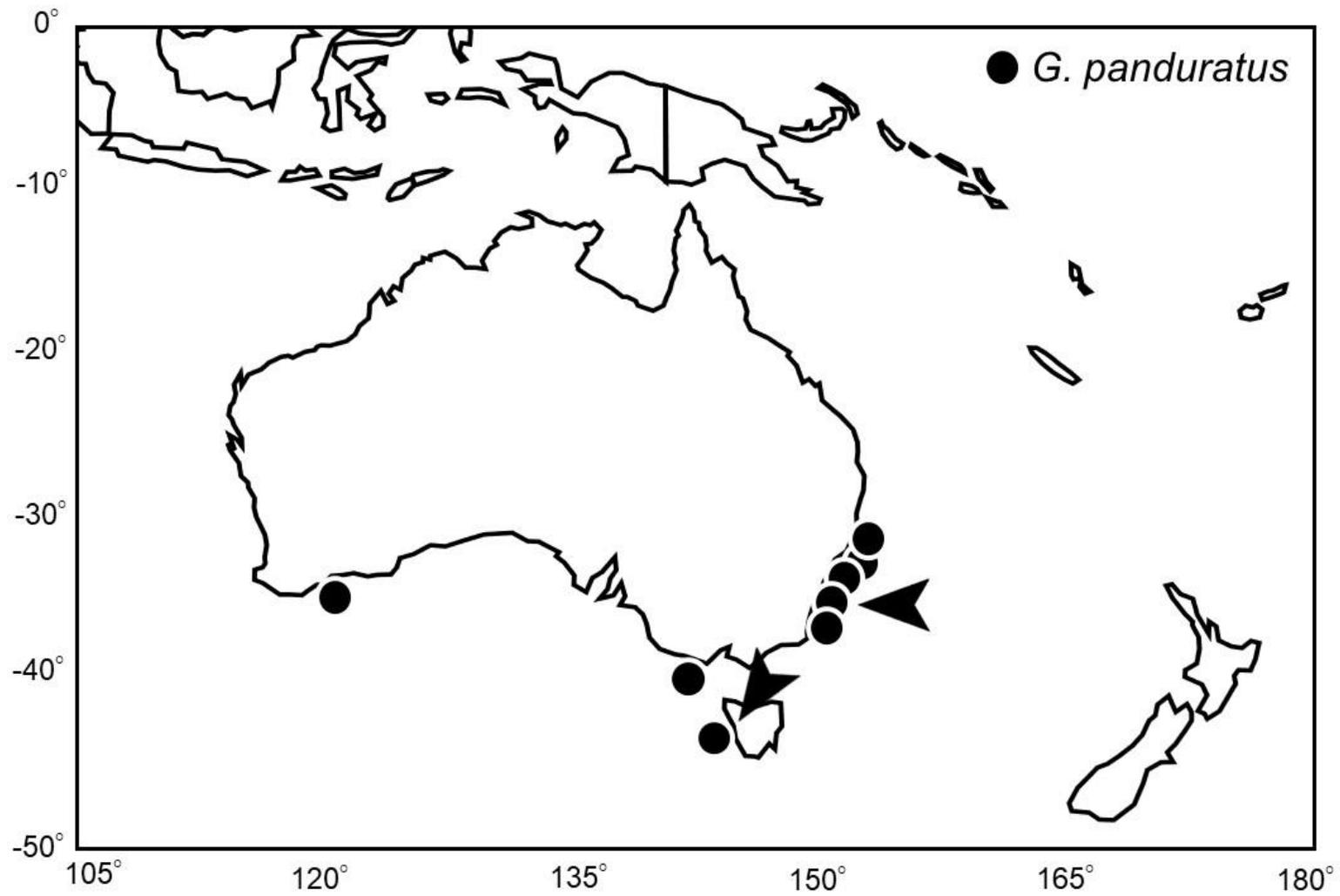


Fig. 26 Distributional map of *Glyptauchen panduratus* (circles) based on specimens examined in this study. Arrowhead indicates holotypes



Fig. 27 Preserved specimens of *Gymnapistes marmoratus*, MNHN 0000-6523, syntype of *Apistus marmoratus*, Malay Archipelago **a** 98.1 mm SL; **b** 15.1 mm SL

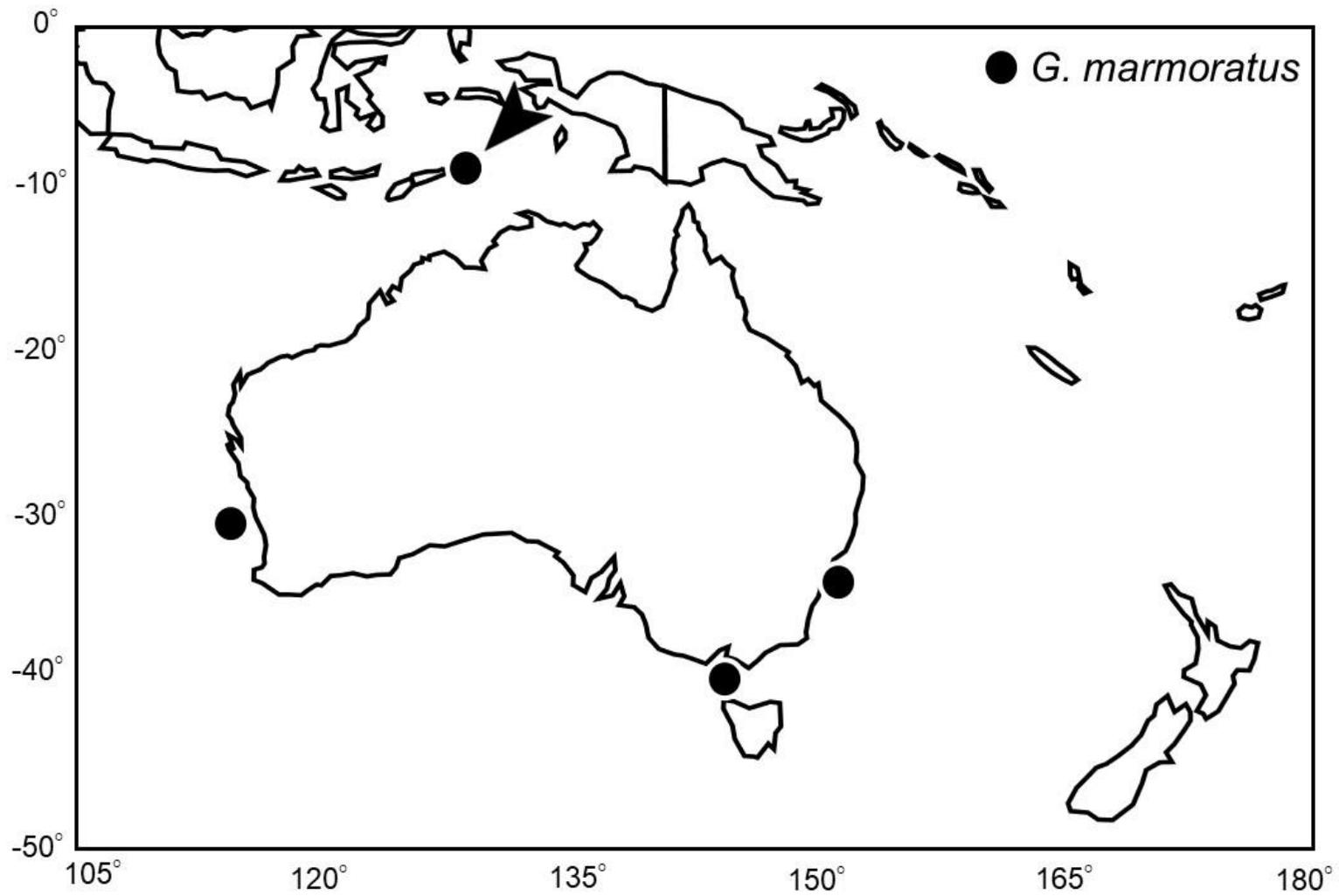


Fig. 28 Distributinal map of *Gymnapistes marmoratus* (circles) based on specimens examined in this study. Arrowhead indicates syntype



Fig. 29 Preserved specimens of *Liocranium pleurostigma*, QM I. 38512, 29.8 mm SL, Australia



Fig. 30 Preserved specimens of *Liocranium praepositum* **a** QM I. 1582, lectotype of *L. praepositum*, 61.9 mm SL, Australia **b** QM I. 509, paralectotype of *L. praepositum*, 81.7 mm SL, Australia

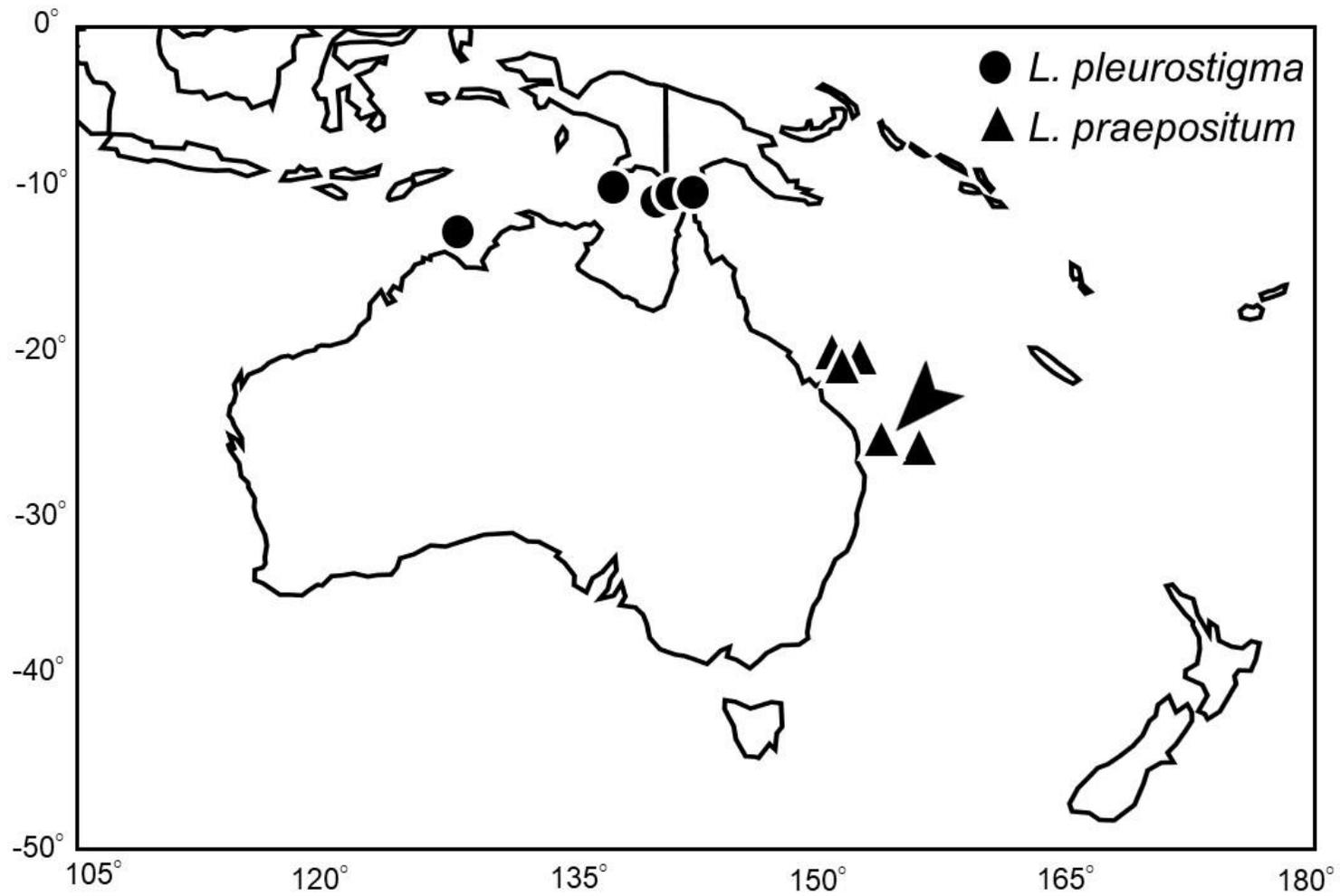


Fig. 31 Distributional map of *Liocranium pleurostigma* (circles), *L. praepositum* (triangles) based on specimens examined in this study.

Arrowhead indicates lectotype



Fig. 32 Preserved specimens of *Neovespicula depressifrons*, QM I. 29345, 29.3 mm SL, Indonesia

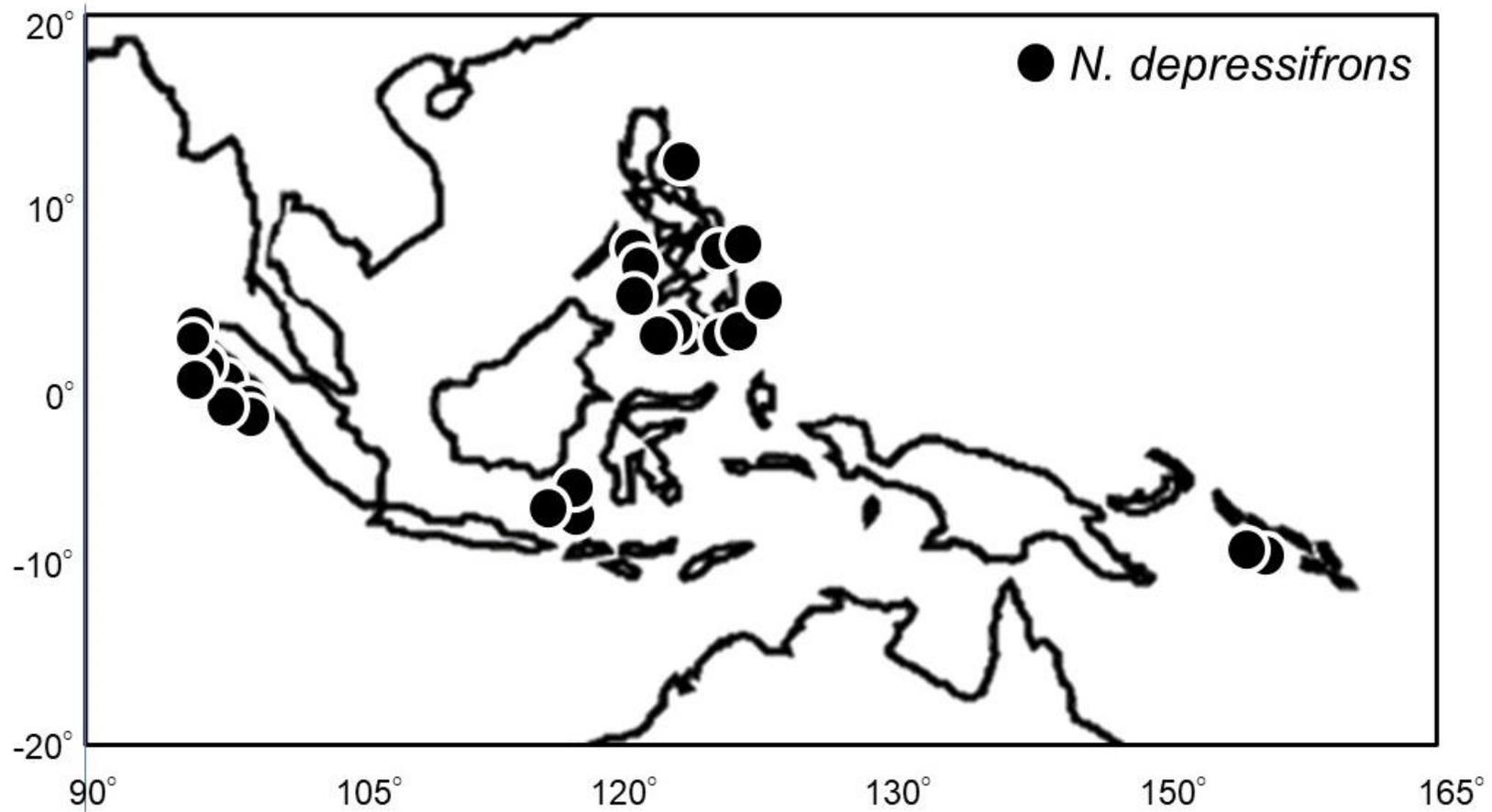


Fig. 33 Distributional map of *Neovespicula depressifrons* (circles) based on specimens examined in this study.

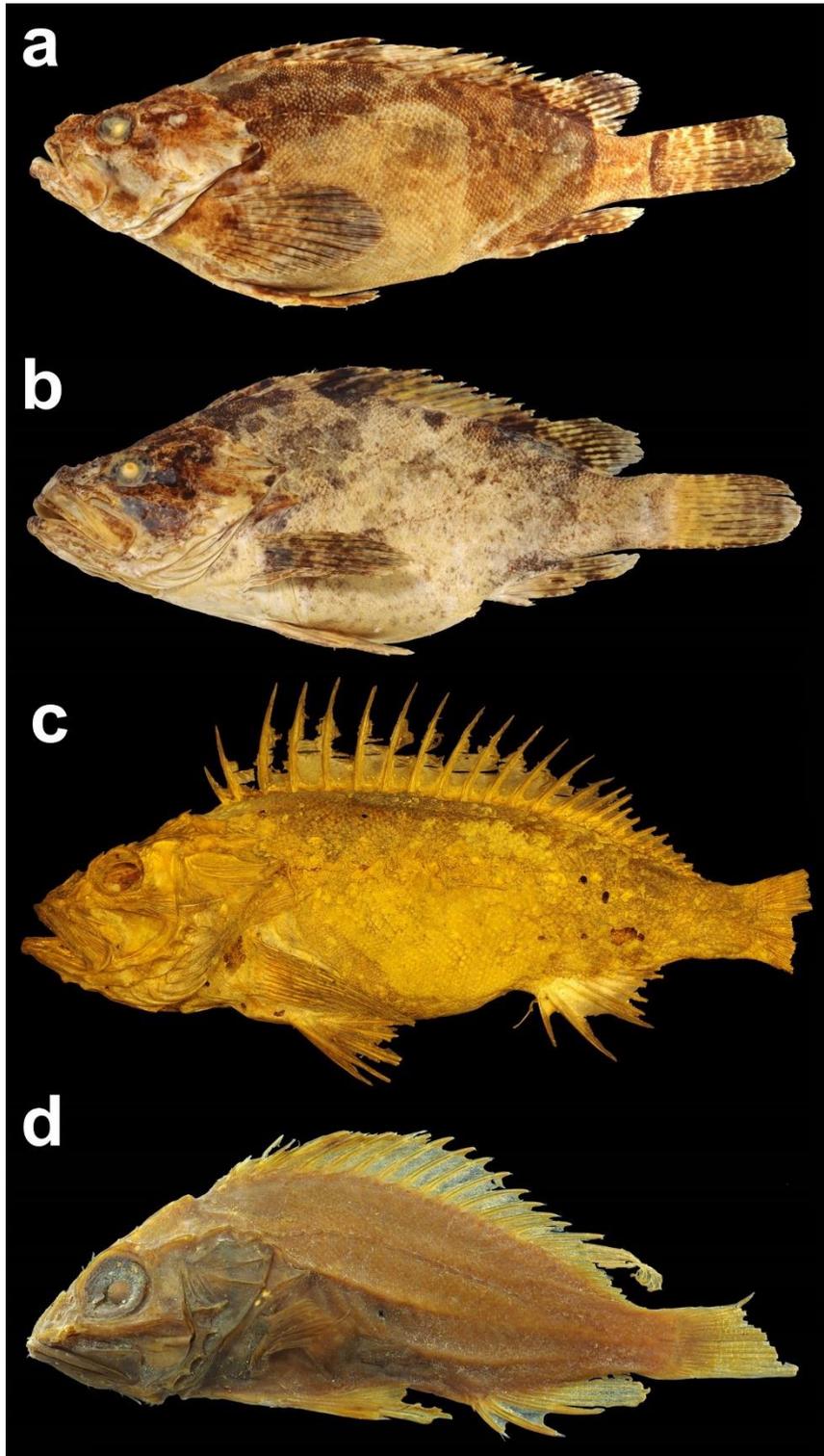


Fig. 34 Preserved specimens of *Notesthes robusta* **a** NMW 12094, syntype of *Centropogon troschellii*, 202.3 mm SL, Australia; **b** NMW 78424, syntype of *C. troschellii*, 186.6 mm SL, Australia; **c** QM I. 954, holotype of *Centropogon nitens*, 167.7 mm SL, Australia; **d** QM I.1598, holotype of *Tetraroge bellona*, 26.6 mm SL, Australia

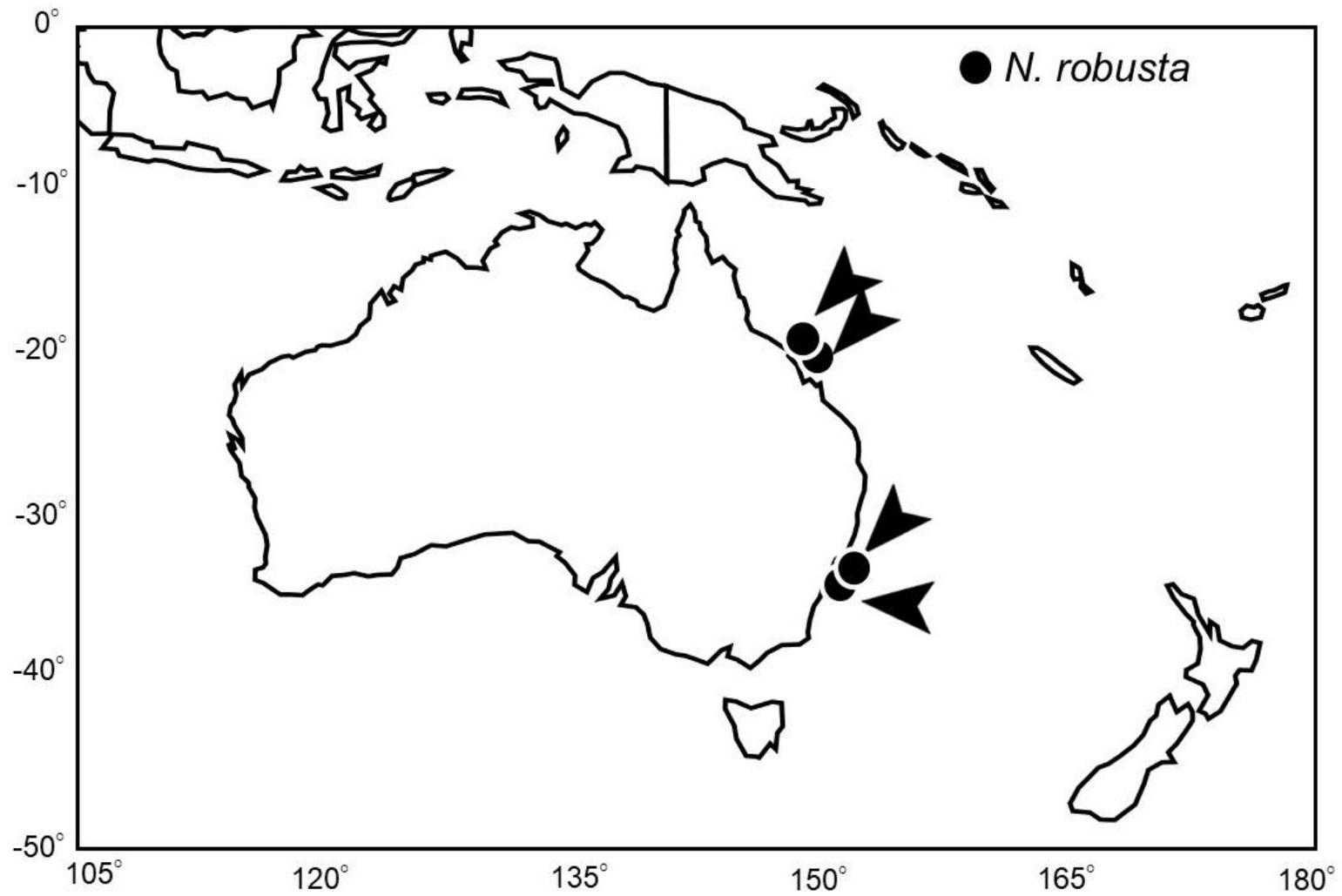


Fig. 35 Distributional map of *Notesthes robusta* (circles) based on specimens examined in this study. Arrowhead indicates type-specimens



Fig. 36 Preserved specimens of paratypes of *Ocosia apia* **a** AMS I. 18496-001, 49.5 mm SL; **b** USNM 214814, 49.7 mm SL, New Zealand



Fig. 37 Preserved specimens of *Ocosia fasciata* **a** USNM 99513, holotype of *Ocosia gracile*, 36.4 mm SL, Japan **b** USNM 99513, paratype of *Ocosia gracile*, 29.3 mm SL, Japan



Fig. 38 Preserved specimens of ZIN 48785, holotype of *Ocosia possi*, 67.4 mm SL, Seychelles



Fig. 39 Preserved specimens of *Ocosia spinosa*, BSKU 51541, 72.0 mm SL, Japan



Fig. 40 Preserved specimens of USNM 50911, holotype of *Ocosia vespa*, 37.8 mm SL, Japan



Fig. 41 Preserved specimens of CAS 33069, holotype of *Ocosia zaspilota*, 69.5 mm SL, Philippines



Fig. 42 Preserved specimens of *Ocosia* sp., QM I. 34221, 48.9 mm SL, Australia

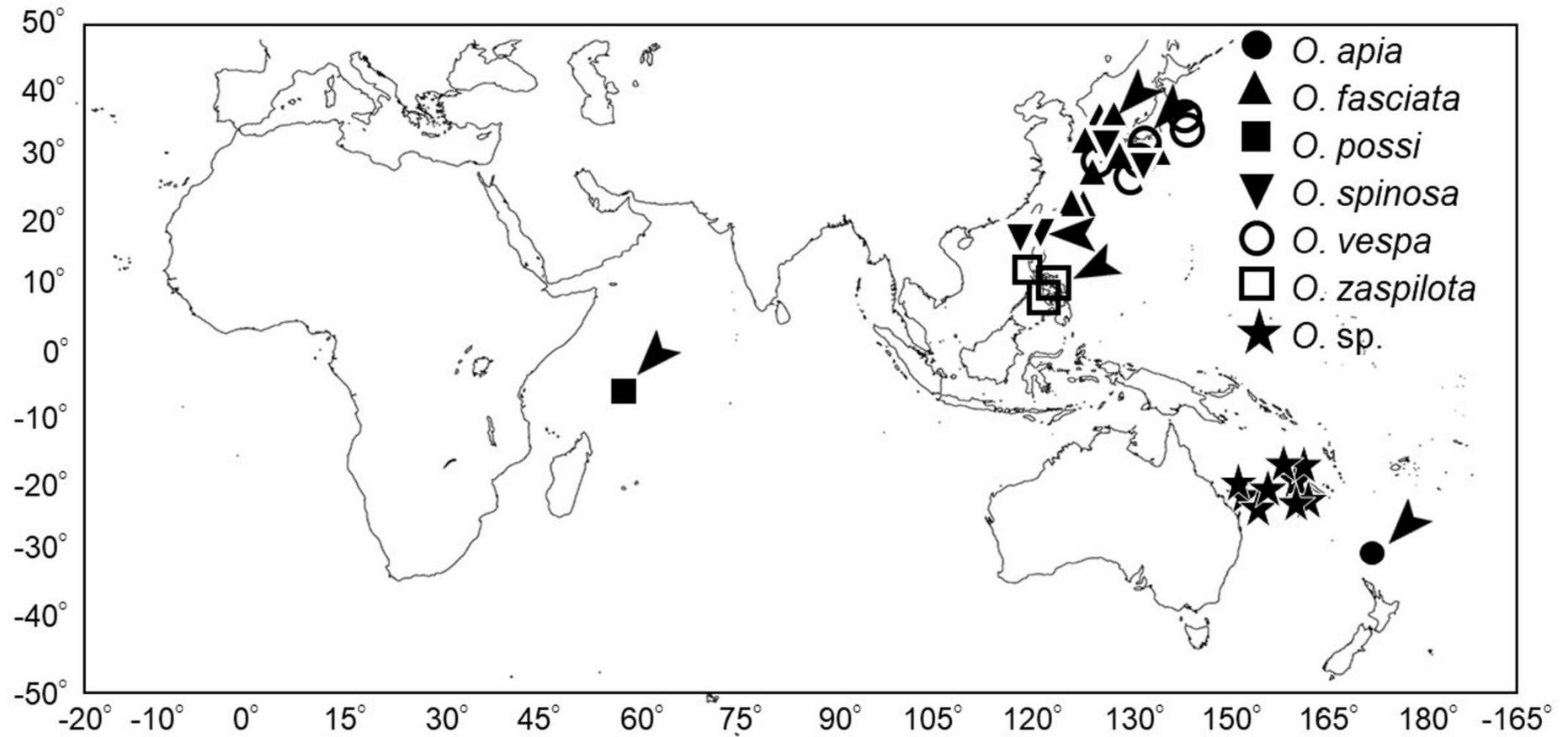


Fig. 43 Distributional map of *Ocosia apia* (circles), *O. fasciata* (triangles), *O. possi* (squares), *O. spinosa* (inverted triangles), *O. vespa* (open circles), *O. zaspilota* (open squares), and *O. sp.* (stars) based on specimens examined in this study. Arrowhead indicates type-specimens

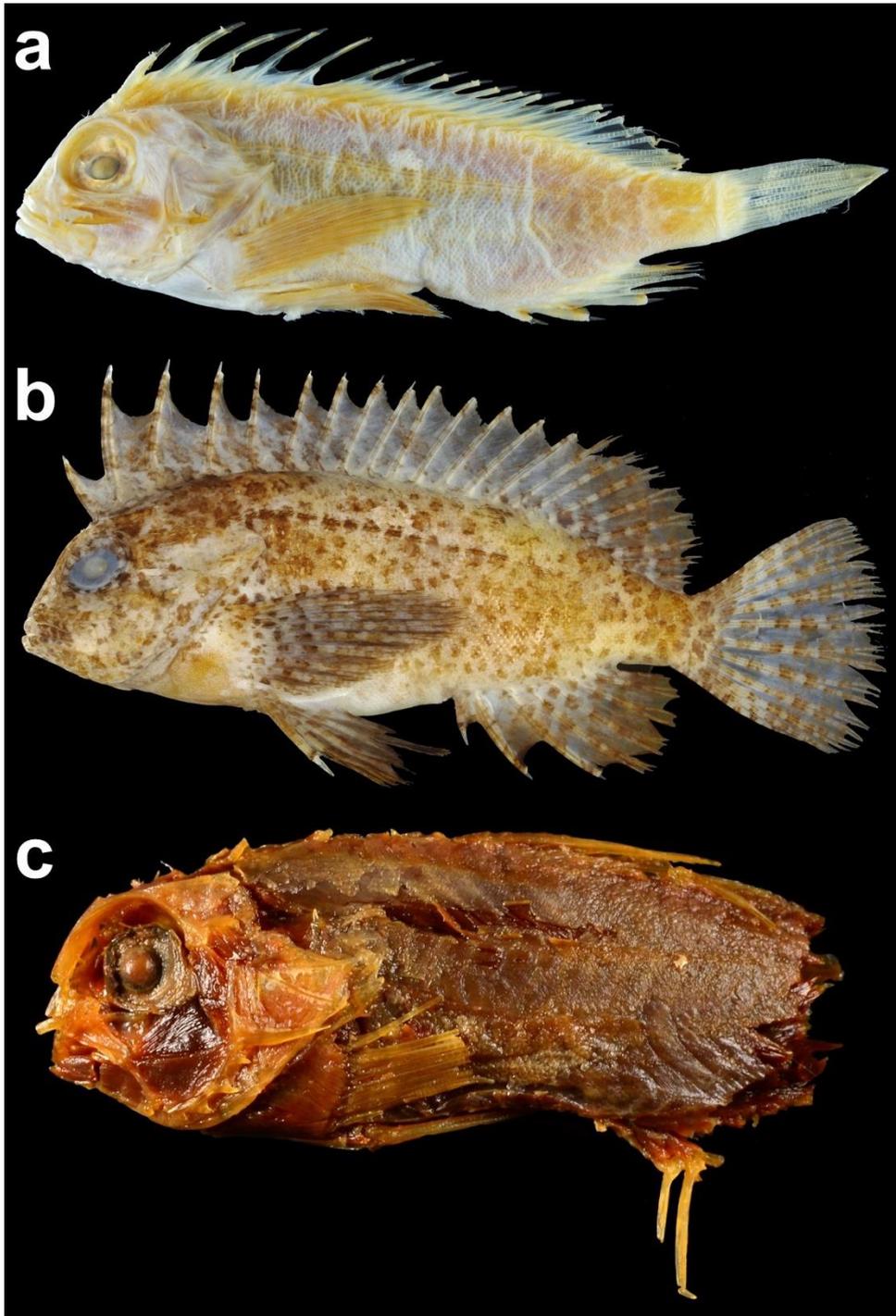


Fig. 44 Preserved specimens of *Paracentropogon longispinis* **a** ZMB 810, syntype of *Apistus longispinis*, 52.8 mm SL, Indonesia; **b** KAUM-I. 80615, 52.6 mm SL, Philippines **c** ZSI F1734, holotype of *Centropogon indicus*, India



Fig. 45 Specimens of *Paracentropogon rubripinnis* **a** ZMB 815, paralectotype of *Apistus rubripinnis*, 42.3 mm SL, Japan **b** fresh specimen of KAUM-I. 1361, 49.07 mm SL, Japan



Fig. 46 Preserved specimens of *Paracentropogon vespa* **a** AMS IA. 4236, holotype of *Paracentropogon vespa livingstonei*, 59.0 mm SL, Australia; **b** AMS E. 2932, holotype of *Paracentropogon vespa*, 66.9 mm SL, Australia

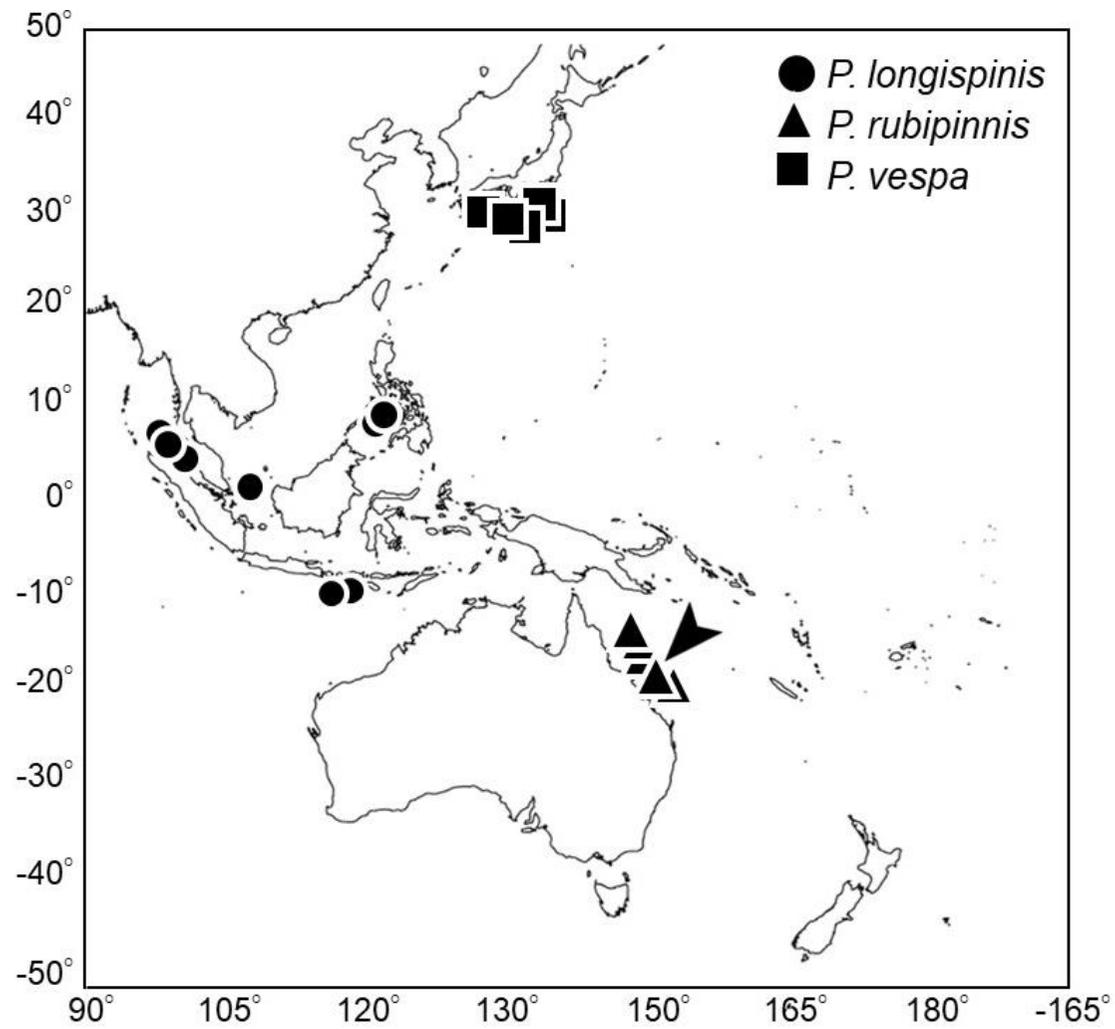


Fig. 47 Distributional map of *Paracentropogon longispinis* (circles), *P. rubipinnis* (squares), and *P. vespa* (triangles) based on specimens examined in this study. Arrowhead indicates type-specimens แผนที่ชนิด



Fig. 48 Preserved specimens of USNM 98902, holotype of *Prosopodasys cypho*, 32.0 mm SL, Philippines

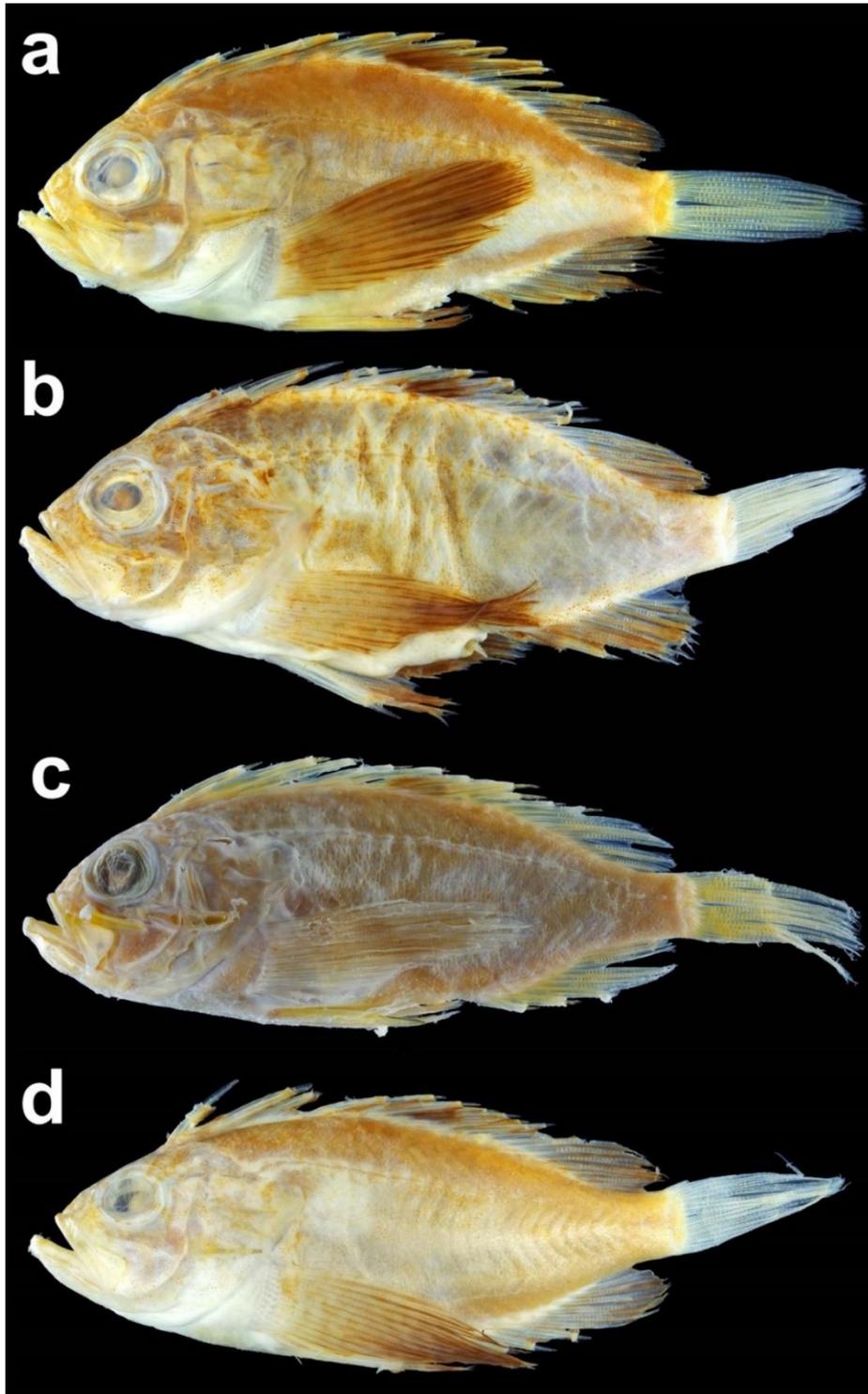


Fig. 49 Preserved specimens of *Pseudovespicula dracaena* **a** MNHN 0000-7306, syntype of *Apistus dracaena*, 1 of 2, 35.1 mm SL; **b** MNHN 0000-6522, 1 of 2, syntype of *Apistus belengerii*, 46.8 mm SL, India; **c** SMF 389, syntype of *Apistus dracaena*, 45.4 mm SL, India; **d** MNHN 0000-5743, 1 of 2, syntype of *A. dracaena*, 39.6 mm SL, India

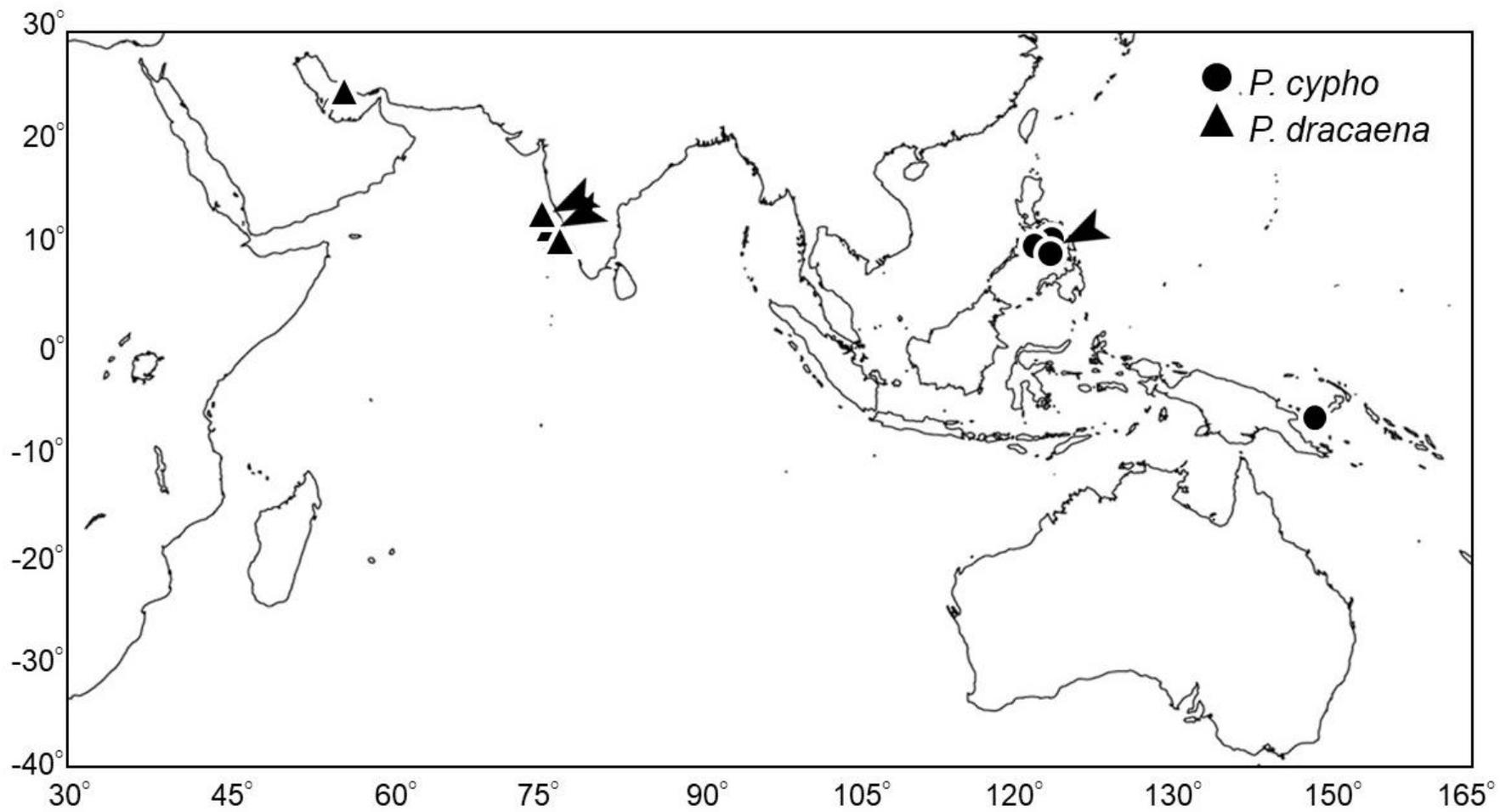


Fig. 50 Distributional map of *Pseudovespicula cypho* (circles) and *P. dracaena* (triangles) based on specimens examined in this study.

Arrowhead indicates type-specimens

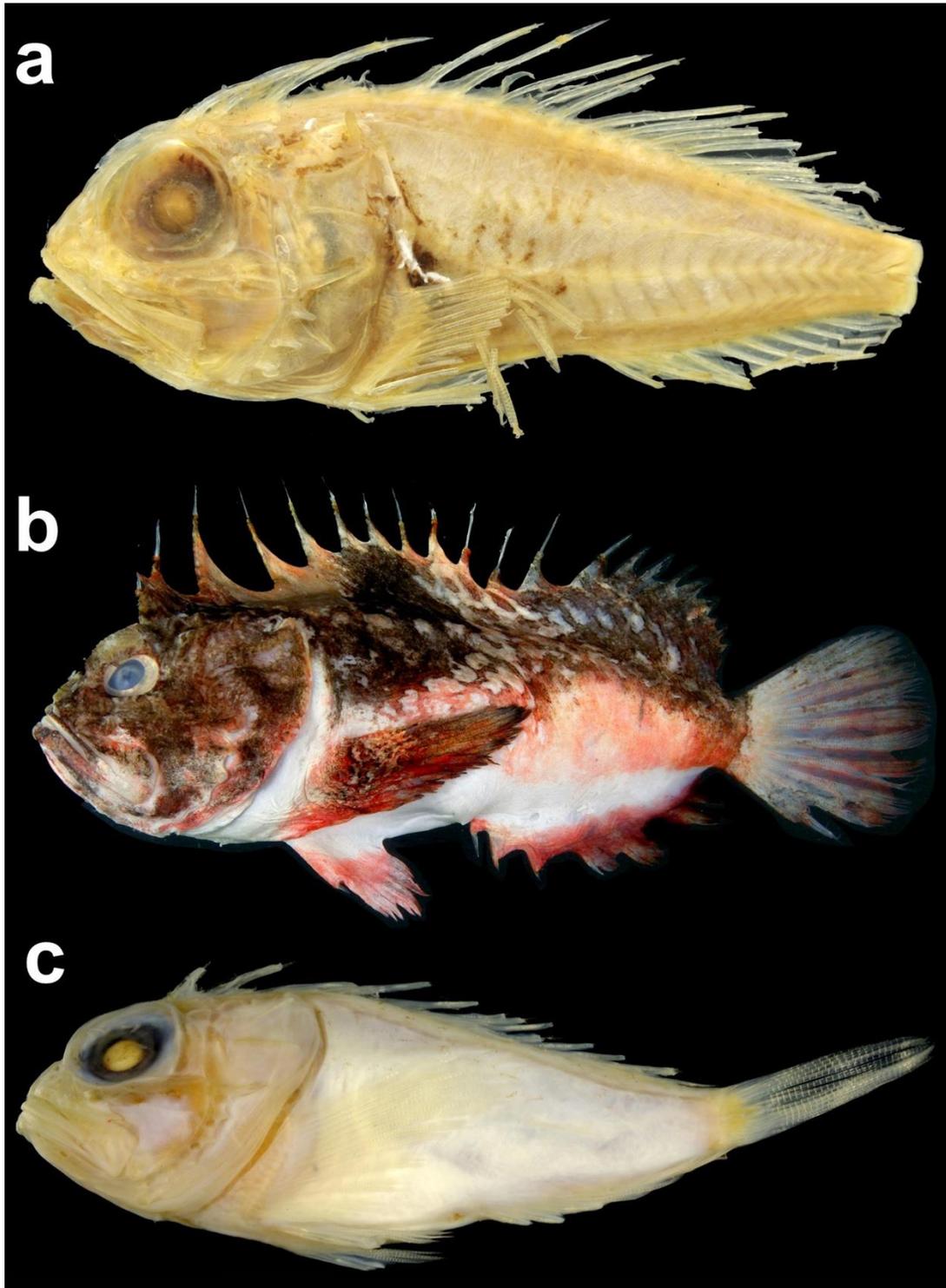


Fig. 51 Specimens of *Richardsonichthys leucogaster* **a** preserved specimen of AMS I. 16352-001, holotype of *Tetraroge darnleyensis*, 42.3 mm SL, Australia; **b** fresh specimen of KAUM-I. 33274, 73.6 mm SL, Thailand; **c** preserved specimen of BPBM 33835, 1 of 2, 37.2 mm SL, New Caledonia

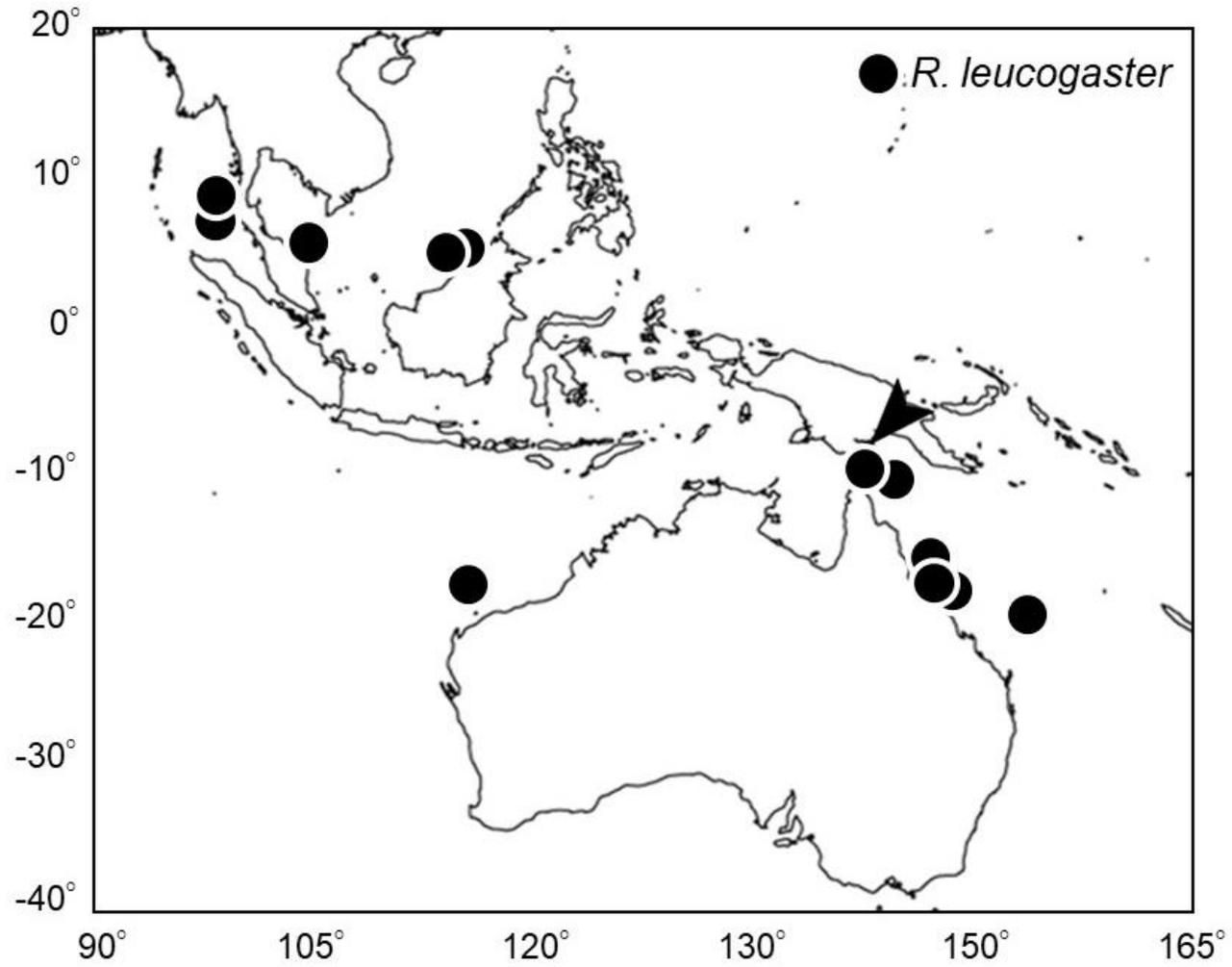


Fig. 52 Distributional map of *Richardsonichthys leucogaster* (circles) based on specimens examined in this study. *Arrowhead* indicates holotype



Fig. 53 Preserved specimens of BMNH 1888.12.29.145, holotype of *Tetraroge guentheri*, 164.2 mm SL, Oman

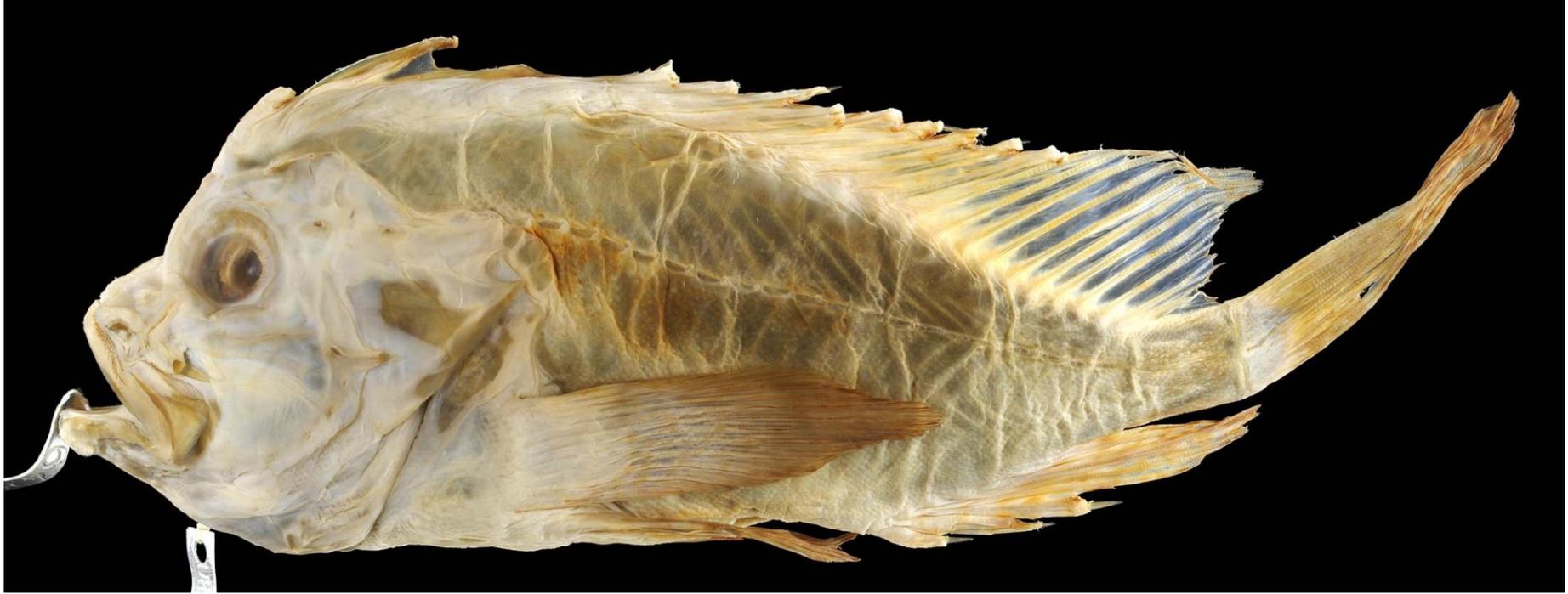


Fig. 54 Preserved specimens of CAS-SU 106433, holotype of *Snyderina yamanokami*, 162.5 mm SL, Japan



Fig. 55 Preserved specimens of *Snyderina* sp. MNHN 2005-0744, 53.5 mm SL, Philippines

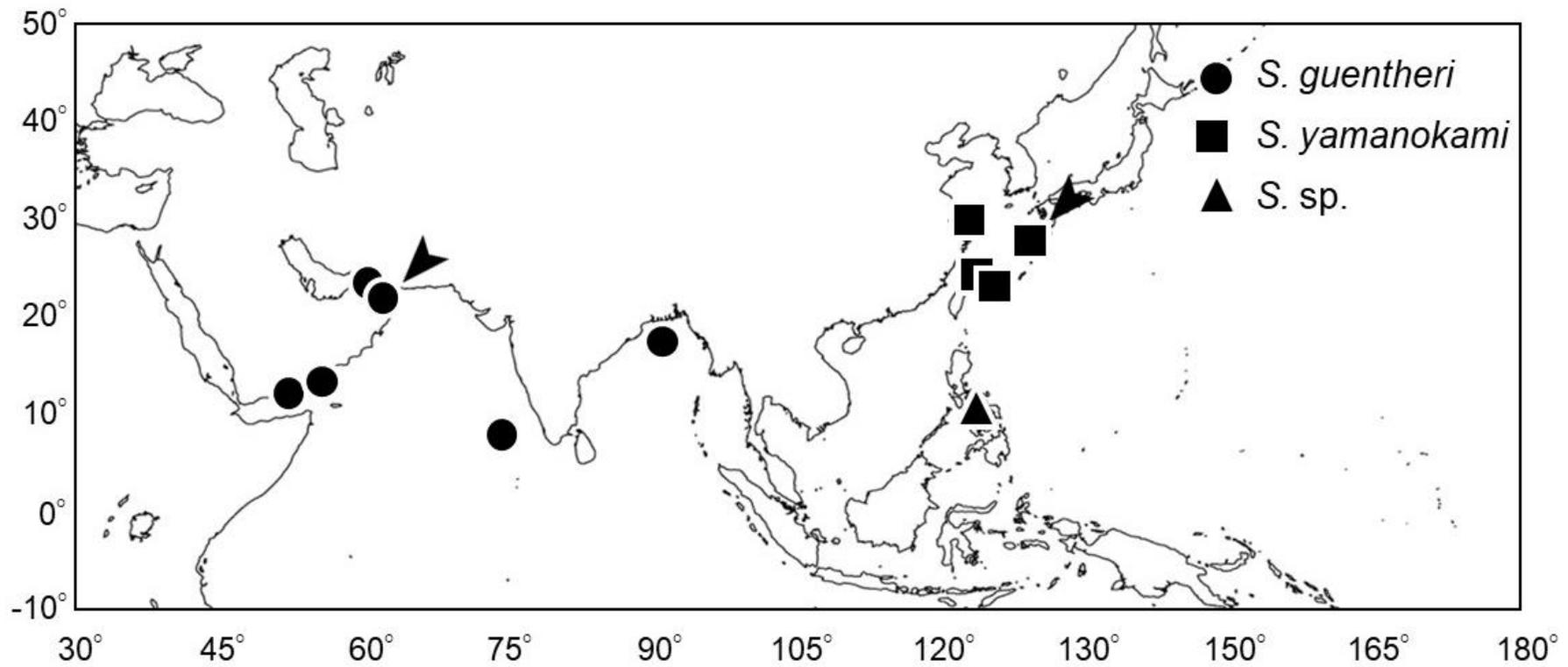


Fig. 56 Distributional map of *Snyderina guentheri* (circles), *S. yamanokami* (squares), and *S. sp.* (triangles) based on specimens examined in this study. *Arrowhead* indicates holotype



Fig. 57 Preserved specimens of *Tetraroge barbata* **a** AMS B. 8266, 68.5 mm SL, Malaysia; **b**: AMS I. 17535-003, 70.7 mm SL, Papua New Guinea

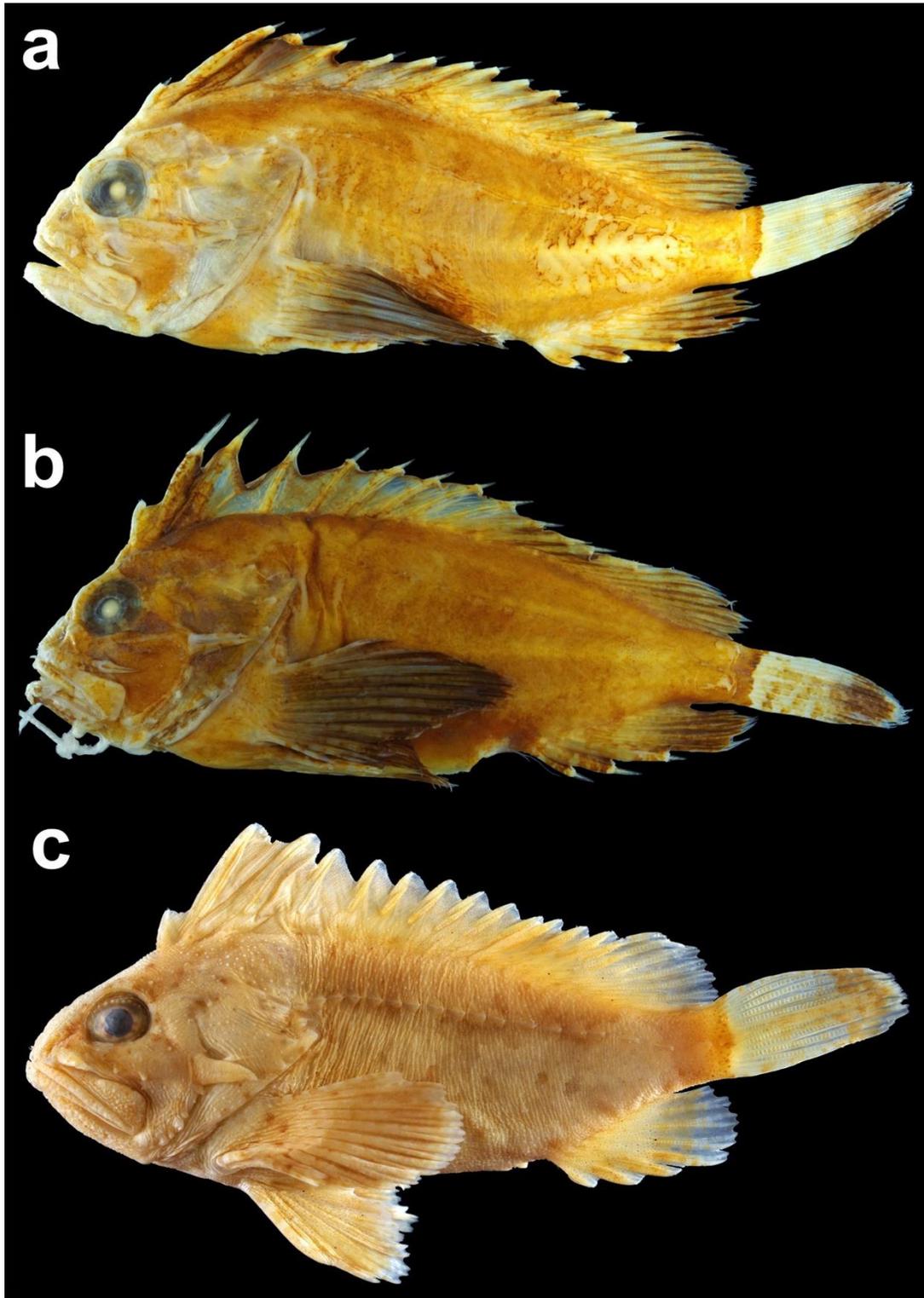


Fig. 58 Preserved specimens of *Tetraroge nigra* **a** MNHN 0000-6638, syntype of *Apistus niger*, 53.6 mm SL, India; **b** MNHN 0000-6638, syntype of *A. niger*, 53.8 mm SL, India; **c** ZMH H145, lectotype of *Tetraroge albifrons*, 46.4 mm SL, New Guinea

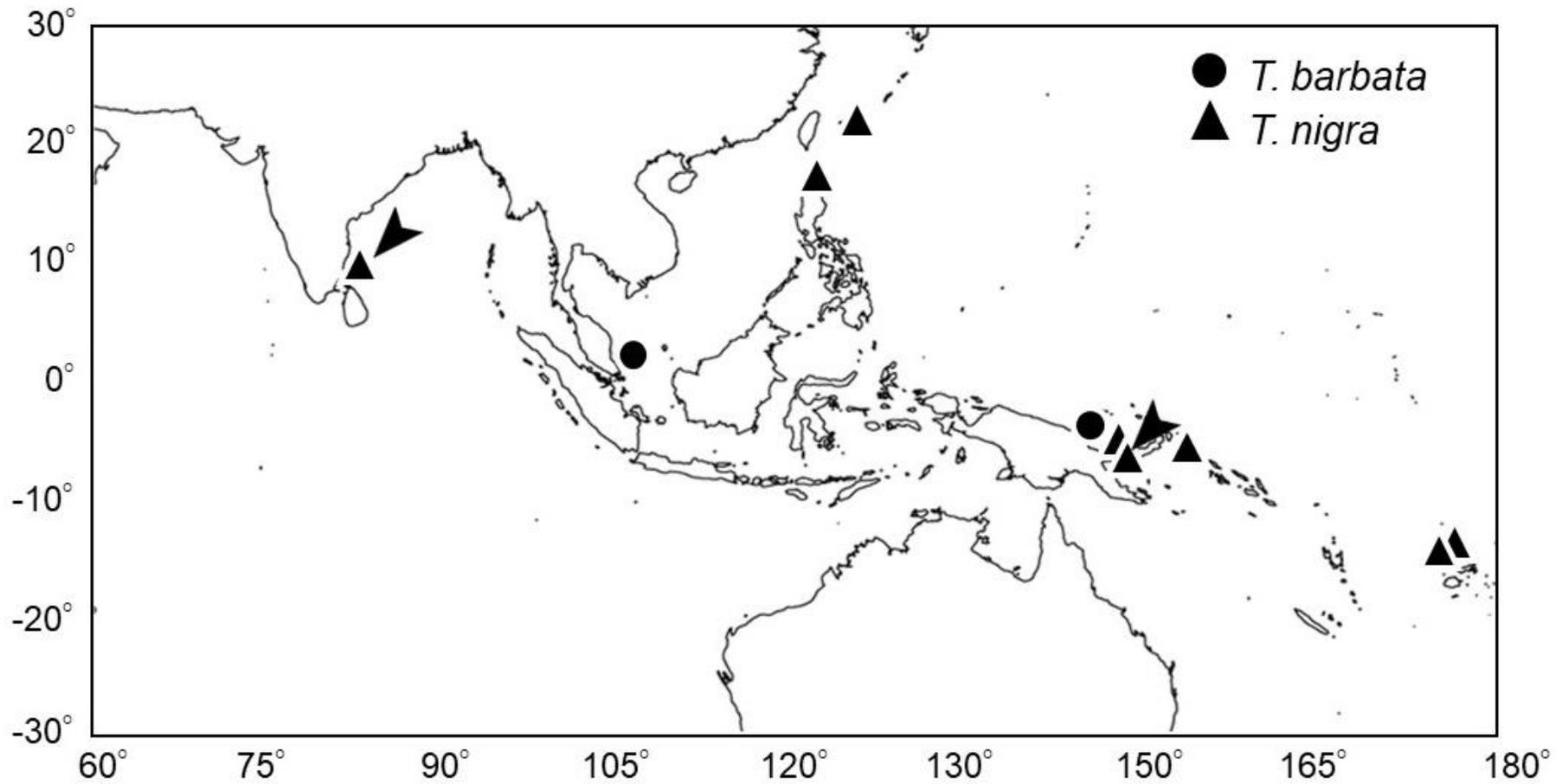


Fig. 59 Distributional map of *Tetraroge barbata* (circles) and *T. nigra* (triangles) based on specimens examined in this study. Arrowhead indicates type-specimens

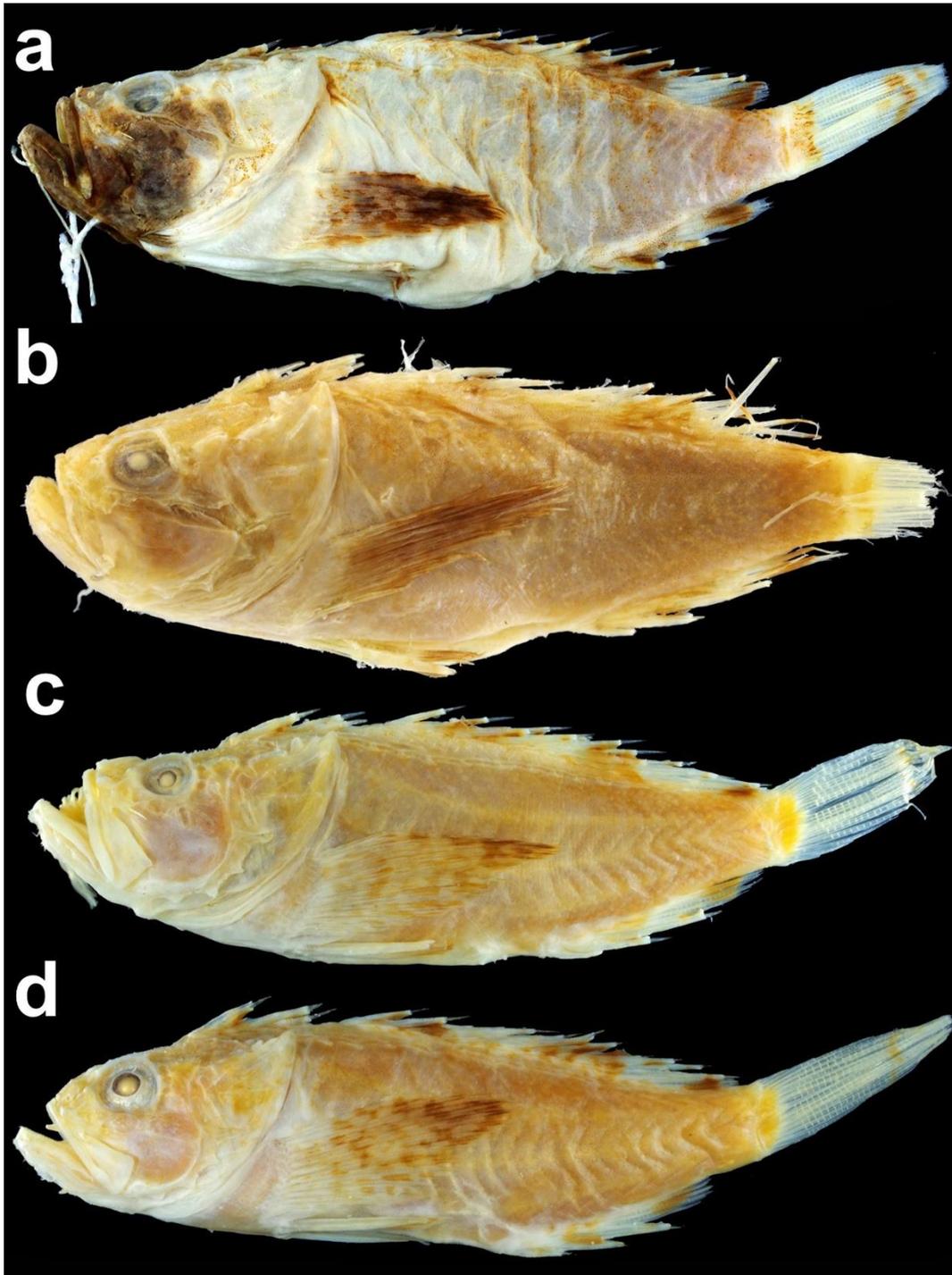


Fig. 60 Preserved specimens of *Trichosomus trachinoides* **a** MNHN 0000-6753, holotype of *Prosopodasys bottae*, 58.4 mm SL, Red Sea; **b** USNM 52504, holotype of *Prosopodasys gogorzae*, 21.2 mm SL, Philippines; **c** MNHN 0000-4611, 1 of 2, syntypes of *Apistus trachinoides*, 40.5 mm SL, Indonesia; **d** MNHN 0000-6643, 1 of 2, syntypes of *A. trachinoides*, 40.6 mm SL, Indonesia

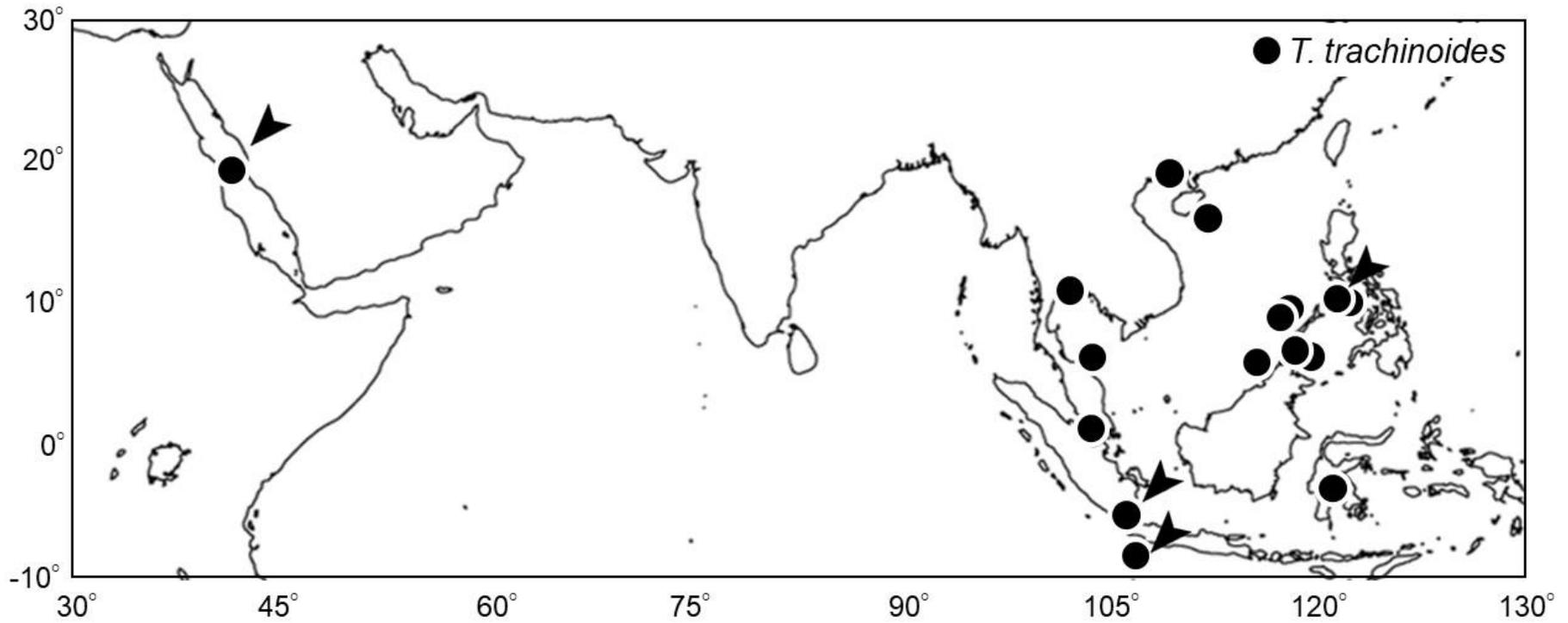


Fig. 61 Distributional map of *Trichosomus trachinoides* (circles) based on specimens examined in this study. Arrowhead indicates type-specimens