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Parascolopsis akatamae, a new species of dwarf monocle bream (Perciformes: Nemipteridae) from the Indo-West Pacific, with redescription of closely related species *P. eriomma*

KEI MIYAMOTO[1, 3*], CALEB D. MCMAHAN[2] & ATSUSHI KANEKO[3,4]
[1]*Okinawa Churashima Foundation, Ishikawa 888, Motobu, Okinawa 905-0206, Japan*
[2]*Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605, USA*
cmcmahan@fieldmuseum.org; http://orcid.org/0000-0003-2113-8554
[3]*Okinawa Churaumi Aquarium, Ishikawa 424, Motobu, Okinawa 905-0206, Japan*
[4] *a-kaneko@okichura.jp; https://orcid.org/0000-0001-9558-2661*
[*]*Corresponding author. k-miyamoto@okichura.jp; https://orcid.org/0000-0002-7813-1882*

Abstract

A new species of dwarf monocle bream, *Parascolopsis akatamae* **n. sp.**, is described from the Indo-West Pacific. The new species is distinguished from all other species of *Parascolopsis* in having 16–19 gill rakers on the first arch, length of forked part of caudal fin 5.8–6.5 times in standard length, eye diameter 1.3–1.8 times in length of the longest dorsal-fin spine, and a pale yellow stripe present from lower edge of the eye to posterior edge of the preopercle. *Parascolopsis eriomma* (Jordan & Richardson, 1909) is morphologically very similar to the new species and the two have been confused with each other for a long time. Therefore, we redescribe *P. eriomma* based on the holotype and newly collected specimens. In addition, we found that patterns of biofluorescence emission for both species are clearly different. This suggests that their biofluorescence patterns may function in distinguishing each other.

Key words: Pisces, Actinopterygii, Taxonomy, biofluorescence

Introduction

Dwarf monocle breams of the genus *Parascolopsis* Boulenger, 1901 (family: Nemipteridae) are bottom-dwelling fishes usually occurring in moderately deep water (to 500 m) in outer shelf and continental slope waters throughout the Indo-West Pacific (Russell 1990; Russell & Chin 1996). They generally have a moderately deep, laterally compressed body and usually possess a reddish body color. Members of this genus are distinguishable from all other nemipterid genera in having the following characters: suborbital spine weak or absent; scales on top of head reaching forward to or in front of middle of eyes; large canine teeth in lower jaws absent (Russell 1990). Formally, the genus currently contains 12 valid species (Russell 1990; Russell & Chin 1996): *P. aspinosa* (Rao & Rao, 1981) from the Western Indian Ocean, *P. baranesi* Russell & Golani, 1993 from the Red sea, *P. boesemani* (Rao & Rao, 1981) from Pakistan and India, *P. capitinis* Russell, 1996 from Sri Lanka and the southwest coast of India, *P. eriomma* (Jordan & Richardson, 1909) from the Indo-West Pacific (West Pacific, corrected in this study), *P. inermis* (Temminck & Schlegel, 1843) from the Western North Pacific, *P. melanophrys* Russell & Chin, 1996 from the Eastern Indian Ocean and Western Pacific, *P. qantasi* Russell & Gloerfelt-Tarp, 1984 from the Eastern Indian Ocean, *P. rufomaculatus* Russell, 1986 from Australia, *P. tanyactis* Russell, 1986 from the Western Pacific and southeastern Indian Ocean, *P. tosensis* (Kamohara, 1938) from the Western Pacific, and *P. townsendi* Boulenger, 1901 from the Northwestern Indian Ocean.

In this paper we describe a new species of *Parascolopsis* from the Indo-West Pacific. This new species is closely related to and has been long confused with *P. eriomma*. Therefore, we also redescribe *P. eriomma* and clarify the morphological and genetic differences between the two species. In addition, we assess and describe species-specific biofluorescence emission patterns between the two species.

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Materials and methods

Counts and measurements generally followed Russell (1990) and Russell & Golani (1993). Length of forked part of caudal fin was measured from end of caudal skeleton to narrowest portion of caudal fin. Standard length and head length were abbreviated as SL and HL. The vertebrae were counted in radiographs. The sex of specimens was determined from observation of gonadal sections (after hematoxylin and eosin staining). Institutional codes follow Sabaj (2019), with the following addition: Okinawa Churashima Foundation (OCF), Okinawa, Japan.

Biofluorescence emission images were taken under ca. 450–490 nm blue light [produced by LED white light with a band-pass filter (468.00 nm center wavelength, 44.00 nm full width at half maximum) (PB0470-040, Asahi Spectra)] using a mirrorless interchangeable-lens camera (OM-D EM1 & M.ZUIKO DIGITAL ED 12-40mm F2.8 PRO, Olympus) with an attached 500 nm long-pass filter (SC-50, FUJIFILM) in front of the objective lens.

For genetic analysis, a small quantity of muscle was excised from fresh specimens. These samples were digested in 18 µl of 50 mM NaOH, incubated at 95 °C for 10 min, and neutralized by 2 µl of 1 M Tris-HCl (pH 8.0). Total DNA was recovered from the supernatant liquid after centrifugation (12,000 rpm, 5 min) was complete. A partial sequence of mitochondrial cytochrome oxidase subunit I (COI, ca. 700 base pair) was amplified by polymerase chain reaction (PCR) using KOD FX Neo (Toyobo Inc.), and the primers (5'-CAGCCATCTTACCTGTGGCA-3') and (5'-CTTCTGGGTGGCCGAAGAAT-3'). PCR amplifications were carried out in a Thermal Cycler Gene Atlas 322 (Astec Inc.) at 94 °C for 2 min, followed by 15 cycles of denaturation at 98 °C for 10 s, annealing at 55 °C for 15 s, and elongation at 68 °C for 20 s; 20 cycles of denaturation at 98 °C for 10 s, annealing at 52 °C for 15 s, and 68 °C for 20 s; and extension at 68 °C for 2 min. Sequence reactions were analyzed on an ABI 3730XL sequencer (Applied Biosystems) using BigDye terminator v3.1 Cycle Sequencing Kits (Applied Biosystems). All sequence data obtained were submitted to the DDBJ/EMBL/GenBank databases under the accession numbers LC545518–LC545526. The partial COI sequences of species of nemipterids from Hung *et al*. (2017) were downloaded from GenBank. All sequences were aligned using the Clustal W algorithm (Thompson *et al*. 1994). A maximum likelihood phylogeny was generated using MEGA7 (Kumar *et al*. 2016) based on the Tamura-Nei model (Tamura & Nei 1993).

Parascolopsis akatamae n. sp.

[English name: Rosy dwarf monocle bream; Standard Japanese name: Aka-tamagashira]
(Figs. 1A, 2A–D, 3, 4A–C, 5, 6; Table 1)
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Scolopsis eriomma (not of Jordan & Richardson 1909); Akazaki 1984: 169, Pl. 164-D (southern Japan).
Parascolopsis eriomma: Russell 1990: 69, Pl. IV-c (Okinawa, Japan); Russell 2001: 3081, Pl. XXII, 166 (Okinawa, Japan); Nalk *et al*. 2002: 73, fig. 1 (Goa, India); Shibukawa *et al*. 2003: 102, unnumbered color photograph (Sulawesi, Indonesia); Motomura & Matsuura 2010: 124, fig. 228 (Yaku-shima Island, Japan); White *et al*. 2013: 226, fig 75.15 (south eastern Indonesia); Kannan *et al.* 2013: fig. 1 (Tuticorin, India); Jawad & Al-Badri 2014: 186, fig. 2 (Iraqi); Hung *et al*. 2017: 11, fig. S3H (Taiwan); Fujiwara 2017: 148, color photograph of UPVMI 182 (Panay Island, Philippines).

Holotype. OCF-P4098, 160 mm SL, off Motobu, Okinawa-jima Island, southern Japan (26º38′27″N, 127º45′39″E), 200 m depth, 31 May 2019, fishing, coll. A. Kaneko, Y. Oshiro and K. Miyamoto.

Paratypes (10 specimens, 150.1–270.8 mm SL). KAUM–I. 55567–55569, 3 specimens, 260.0–270.8 mm SL, off Tokara Islands, southern Japan (29º34′N, 129º38′E), >100 m depth, 19 July 2013, line-fishing, coll. M. Matsunuma; FMNH 120979, 189.0 mm SL, Hengchun fish market, Pingtung, southern Taiwan, coll. H. C. Ho, W. L. Smith, C. C. Jones and H. J. Walker; FRLM 26347, 153.1 mm SL, Bitung fish market, North Sulawesi, Indonesia, 22 Oct. 2000, coll. S. Kimura and T. Peristiwady; FRLM 26423, 150.1 mm SL, Bitung fish market, North Sulawesi, Indonesia, 22 Oct. 2000, coll. S. Kimura and T. Peristiwady; MUFS 12090, 223.0 mm SL, Meitsu, Miyazaki, Japan, 24 Apr. 1996; OCF-P3726, 166.0 mm SL, off Motobu, Okinawa-jima Island, southern Japan (26º38′32″N, 127º45′40″E), 200 m depth, 28 Sep. 2017, fishing, coll. A. Kaneko, Y. Oshiro and K. Miyamoto; OCF-P3875, 218.5 mm SL, off Ishigaki-jima Island, southern Japan, 16 Jan. 2018, coll. T. Shimose; OCF-P4211, 152.4 mm SL, off Motobu, Okinawa-jima Island, southern Japan, 26 Sep. 2019, coll. A. Kaneko and H. Hirose.

Non-type specimens (33 specimens, 98.3–278.8 mm SL). KAUM–I. 55852, 245.0 mm SL, off Amami-oshima Island, Japan; KAUM–I. 99341, 252.1 mm SL, southern Ryukyu Islands from the Amami to Yaeyama islands,

Japan; KAUM–I. 108195, 225.9 mm SL, off Amami-oshima Island, Japan; FRLM 53348, 260.0 mm SL, off Kuchinoerabu-jima Island, Japan; MUFS 4406, 231.6 mm SL, Naha, Okinawa, Japan; MUFS 11800–11802, 3 specimens, 181.2–186.2 mm SL, Yakushima Island, Japan; MUFS 20220 and 20221, 2 specimens, 262.6 and 278.8 mm SL, Kagoshima, Japan; OCF-P20140418-8, 212.2 mm SL, female, off Okinawa-jima Island, Japan; OCF-P2982, 121.0 mm SL, male, off Motobu, Okinawa-jima Island, Japan; OCF-P3723–3725, 3 specimens, 2 males and 1 female, 113.8–172.6 mm SL, off Motobu, Okinawa-jima Island, Japan; OCF-P4071 and 4072, 2 specimens, 140.1 and 159.0 mm SL, off Okinawa-jima Island, Japan; OCF-P4088 and 4089, 2 specimens, 227.0 and 252.7 mm SL, near Ishigaki-jima Island, Japan; OCF-P4119–4127, 9 specimens, 98.3–202.2 mm SL, off Motobu, Okinawa-jima Island, Japan; URM-P 29321, 146.7 mm SL, Phuket fish market, Thailand; URM-P 35549, 219.6 mm SL, Okinawa-jima Island, Japan; URM-P 42478, 240.5 mm SL, Yoron-jima Island, Japan; URM-P 43747, Kagoshima, Japan; URM-P 44587, Nakagusuku Bay, Okinawa-jima Island, Japan.

Diagnosis. Distinguished from congeners by the following combination of characters: gill rakers on first arch 16–19; caudal fin lightly forked, length of forked part of caudal fin 5.8–6.5 times in SL (Figs. 1A, 2A–D, 3A); eye diameter 1.3–1.8 times in length of longest dorsal-fin spine (Fig. 3B); pale yellow stripe present from lower edge of the eye to posterior edge of the preopercle (Figs. 1A, 2A–D); strong biofluorescence emission observed on isthmus and branchiostegal membrane (Fig. 4A–C) (see paragraph of biofluorescence emission patterns).

Description. Counts and proportional measurements are presented in Table 1. Body moderately deep, deepest at pelvic-fin base, depth 2.5–3.2 times in SL; head moderate, 3.0–3.5 times in SL; snout short, length less than diameter of eye, 3.6–5.2 times in HL; nostrils small, anterior and posterior nostrils closely aligned, located in front of eye; anterior nostril with small nasal flap; eyes large, round, located in upper portion of anteroposterior axis, diameter 2.5–3.5 times in HL; interorbital width 0.9–1.6 times in eye diameter; suborbital shallow, depth 2.7–6.3 times in eye diameter; mouth moderate, terminal, and slightly oblique; upper jaw nearly reaching to about level of anterior margin of pupil, 2.8–3.6 times in HL; 3–5 pairs of enlarged canines on front of both jaws, single row of small conical teeth follows with canines, villiform teeth present inside of canines and small conical teeth; posterior edge of suborbital finely denticulate, with a small spine at upper corner; posterior margin of preopercle finely denticulate; posterior corner of opercle with a small spine.

Origin of dorsal fin above pectoral-fin base, predorsal-fin length 0.9–1.0 times in HL; dorsal fin without notch; longest dorsal-fin spine falls within 4th to 6th dorsal-fin spine, longest dorsal-fin spine 1.9–2.3 times in HL; origin of anal fin about level with 1st soft dorsal-fin ray, preanal-fin length 1.4–1.6 in SL; 3rd anal-fin spine longest or almost equal to 2nd anal-fin spine, 3rd anal-fin spine 2.2–2.7 times in HL; posterior tips of dorsal and anal-fin rays falling well short of caudal-fin base; pectoral fins moderately long, tip of fins just reaching level of anus or slightly short, their length 1.0–1.2 times in HL; origin of pelvic fins about level with 3rd dorsal-fin spine, tip of fins just reaching anus or slightly short; length of 1st pelvic-fin ray 1.1–1.6 times in HL; caudal fin lightly forked, upper lobe slightly longer than lower lobe; length of upper lobe and forked part of caudal fin 3.2–3.8 and 5.8–6.5 times in SL, respectively.

Scales cycloid; scales on top of head extending forward between eyes to about level of posterior margin of pupil; snout, suborbital, lips, maxilla and isthmus naked; preopercle with 3–5 transverse scale rows, its lower limb naked; opercle with 3–6 transverse scale rows; dorsal fin and anal fin scaleless; axilla of pectoral fin naked; pelvic fin with axillary scales; anterior half of caudal fin covered with small scales.

Color of fresh specimens (Figs. 1A, 2A–D). Generally reddish body, darker dorsally and paler ventrally; iris red or orange; three pale yellow stripes on head, 1) tip of jaws to lower part of cheek, 2) lower edge of eye to posterior edge of preopercle, 3) posterior edge of eye to pectoral-fin base; pale yellow stripe on mid-lateral line of trunk and tail; dark red saddle larger than eye present on dorsal-fin origin (unclear or absent in large specimen); small black spot on upper portion of pectoral-fin base; dorsal fin mainly yellow (small specimen) or red (large specimen), red vermiculate patterns present on membrane in small specimens; pectoral, pelvic and anal fins pale yellow; caudal fin mainly yellow, unclear red vermiculate patterns present on forked part.

Color of preserved specimens. Generally brownish, darker dorsally and paler ventrally; eyes blackish; yellow and red marks present in the fresh condition completely lost with preservation; all fins translucent white.

Biofluorescence emission patterns (Fig. 4A–C)**.** Yellow lateral stripe across pupil on iris; weak green stripe on mid-lateral line of trunk and tail; green vermiculated patterns present on dorsal fin; base of pectoral fin green, pelvic and anal fins green; caudal fin mainly green, dark vermiculated patterns present on caudal fin; isthmus and branchiostegal membrane strongly green.

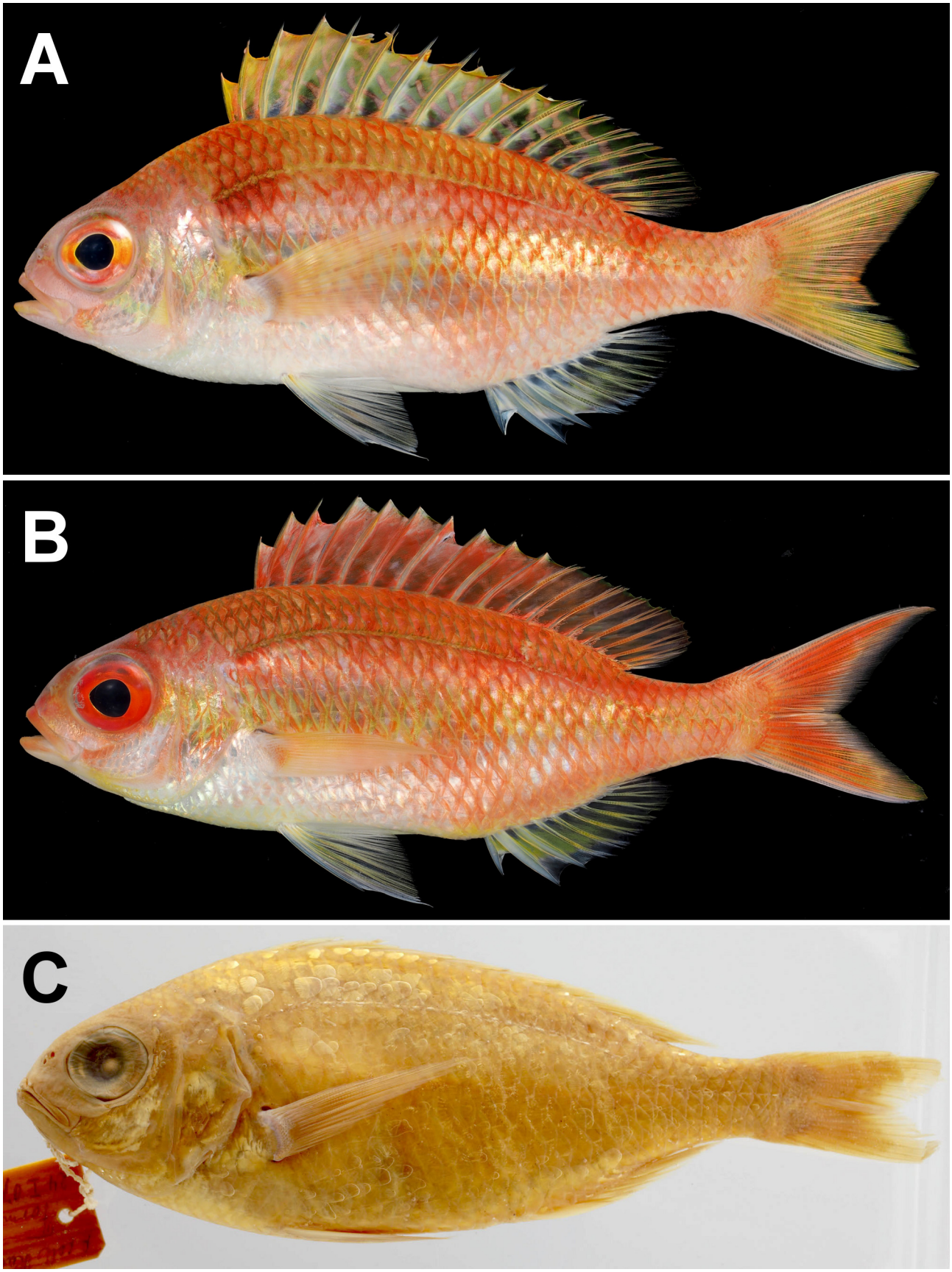

FIGURE 1. *Parascolopsis akatamae* **n. sp**. (A) and *P. eriomma* (B–C). A) fresh specimen, OCF-P4098, **holotype**, 160.5 mm SL, Okinawa-jima Island, Japan; B) fresh specimen, OCF-P4097, 154.4 mm SL, Okinawa-jima Island, Japan; C) preserved specimen, FMNH 52247, **holotype,** 190.9 mm SL, Kaohsiung, Taiwan.

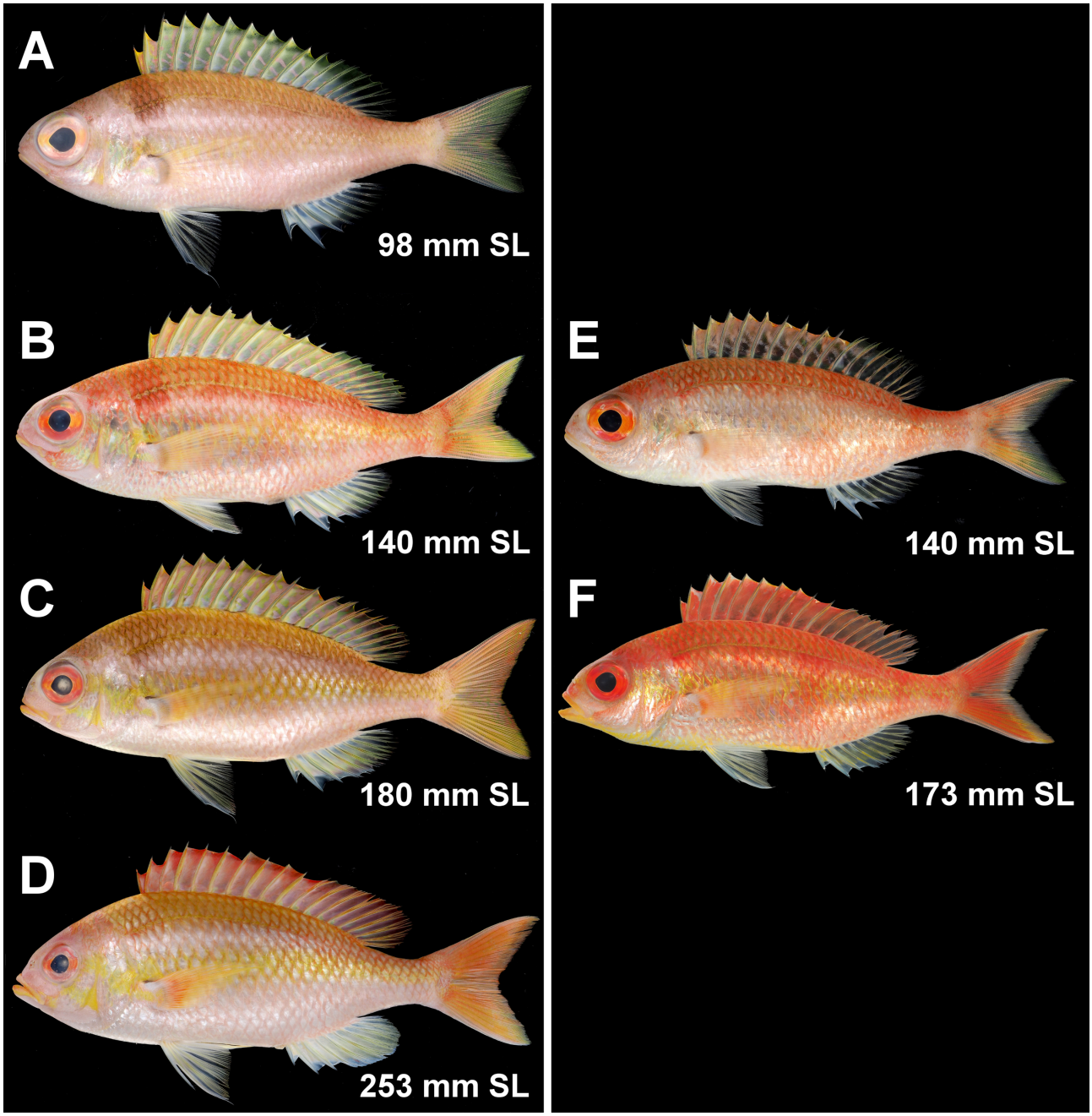

FIGURE 2. Fresh specimens of *Parascolopsis akatamae* **n. sp**. (A–D) and *P. eriomma* (E–F) at different growth stages. A) OCF-P4119, 98.3 mm SL, Okinawa-jima Island, Japan; B) OCF-P4071, 140.1 mm SL, Okinawa-jima Island, Japan; C) OCF-P4123, 179.7 mm SL, Okinawa-jima Island, Japan; D) OCF-P4089, 252.7 mm SL, Ishigaki-jima Island, Japan; E) OCF-P4212, 139.6 mm SL, Okinawa-jima Island, Japan; F) OCF-P3889, 172.8 mm SL, Okinawa-jima Island, Japan.

Distribution (Fig. 5)**.** *Parascolopsis akatamae* **n. sp**. has been recorded based on specimens or identifiable photographs from southern Japan (Akazaki 1984; Russell 1990; 2002; Motomura *et al*. 2010; this study), Taiwan (Hung *et al*. 2016; this study), Philippines (Fujiwara 2017), Indonesia (Shibukawa *et al*. 2003; White *et al*. 2013; this study), Thailand (this study), India (Nalk *et al*. 2002; Kannan *et al*. 2013) and Iraq (Jawad & Al-Badri 2014).

It is possible that *P. akatamae* is widely distributed in the Indo-West Pacific. The following records identified as "*Parascolopsis eriomma*" may actually be *P. akatamae*: South China Sea (Randall & Lim 2000), Myanmar (Psomadakis *et al*. 2020), Timor and Arafura Seas (Larson *et al*. 2013), Arabian Sea (Manilo & Bogorodsky 2003; Psomadakis *et al*. 2015), Red Sea (Khalaf 2004; Golani & Fricke 2018) and Madagascar (Fricke *et al*. 2018).

Etymology. *Parascolopsis akatamae* **n. sp.** has long been confused with *P. eriomma*. *P. akatamae* is more widely distributed than *P. eriomma* (Fig. 5), and more common at least in Japan and Taiwan (Hung *et al*. 2016;

this study). Therefore, the English name "Rosy dwarf monocle bream" and Japanese name "Aka-tamagashira" previously used for *P. eriomma* more appropriately applies to the new species to avoid unnecessary confusion. The specific epithet "*akatamae*" is derived from the local name in Japan of the type locality.

Remarks. *Parascolopsis akatamae* **n. sp.** was collected from a depth of 100–200 m on a sand-rubble bottom. No sexual dimorphism is observed in morphology, coloration, or fluorescence patterns.

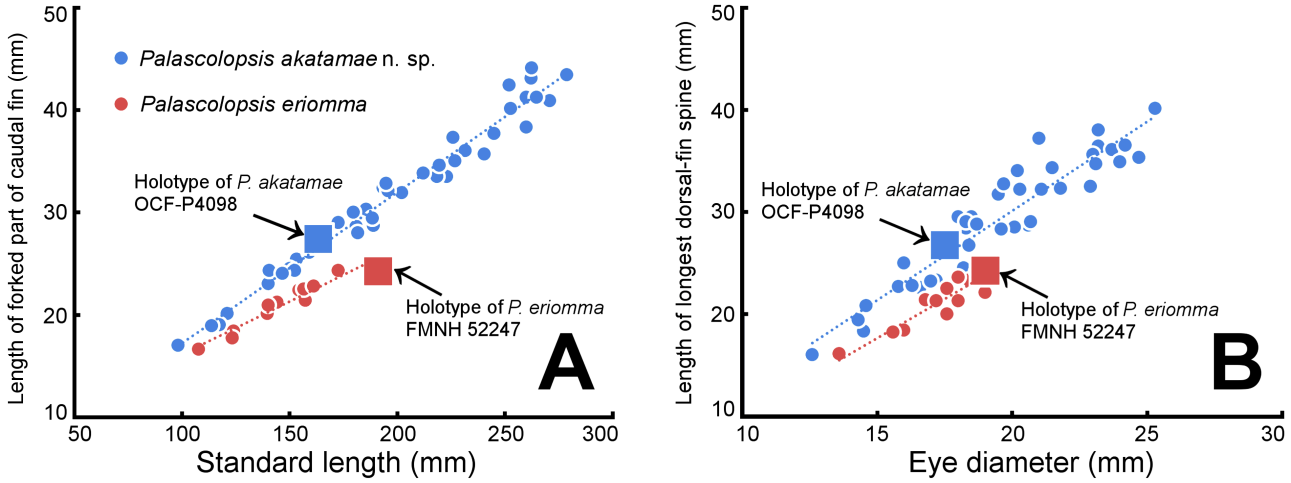

FIGURE 3. Relationships of length of forked part of caudal fin to standard length (A) and length of longest dorsal-fin spine to eye diameter (B) in *Parascolopsis akatamae* **n. sp.** (blue markers) and *P. eriomma* (red markers). Large squares indicates data from holotypes. Regression equations for (A) *P. akatamae*: $y = 0.1473x + 2.4922$, $R^2 = 0.9729$; *P. eriomma*: $y = 0.104x + 5.7483$, $R^2 = 0.9234$, and (B), *P. akatamae*: $y = 1.7484x - 4.865$, $R^2 = 0.8817$; *P. eriomma*: $y = 1.5366x + 5.3993$, $R^2 = 0.8184$.

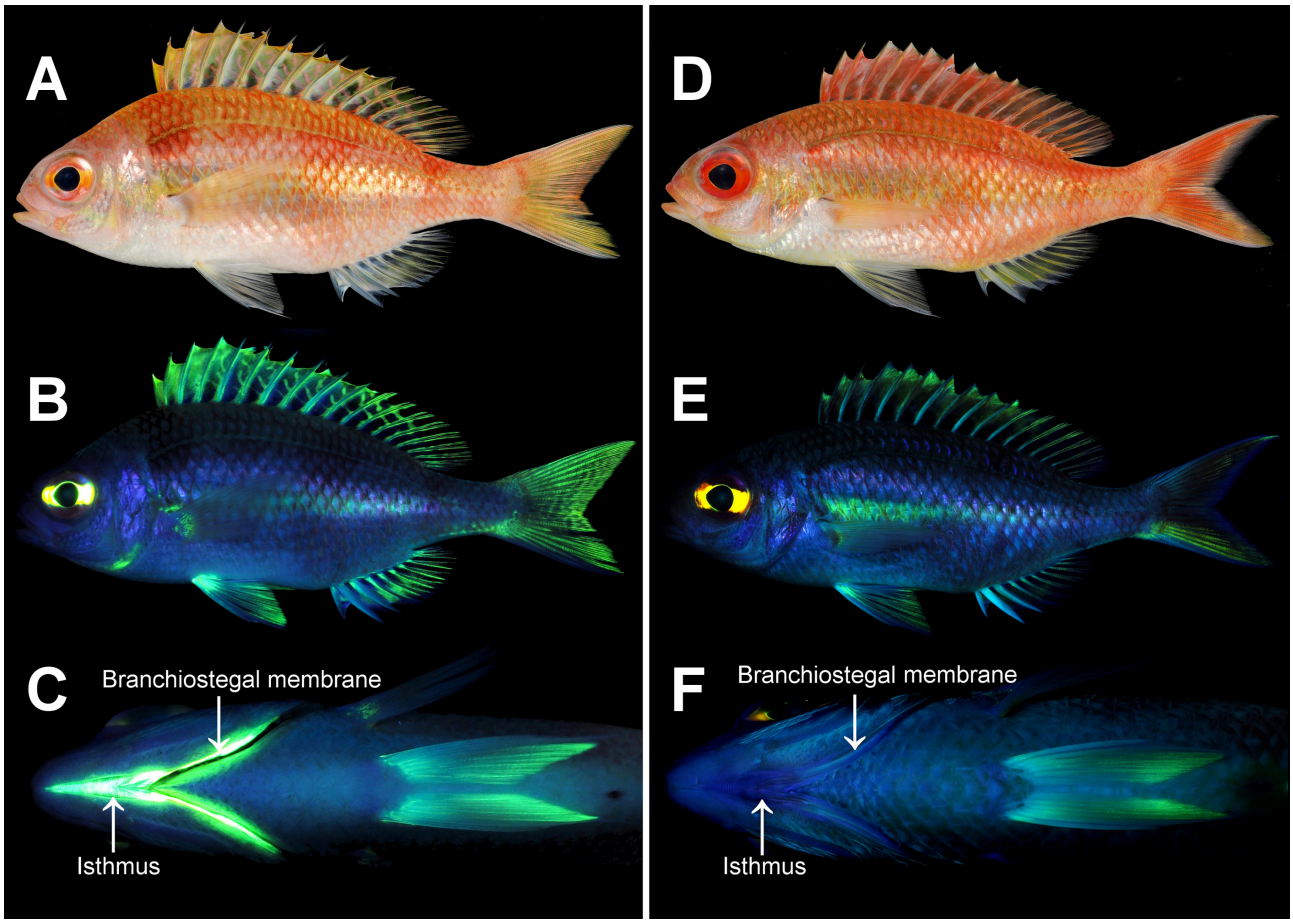

FIGURE 4. Biofluorescence emission patterns of *Parascolopsis akatamae* **n. sp.** (A–C, OCF-P4098, holotype, 160.5 mm SL) and *P. eriomma* (D–F, OCF-P4097, 154.4 mm SL). A) lateral view, under white light; B) lateral view, under blue light; C) ventral view, under blue light; D) lateral view, under white light; E) lateral view, under blue light; F) ventral view, under blue light.

***Parascolopsis eriomma* (Jordan & Richardson, 1909)**

[New English name: Swallowtail dwarf monocle bream; New standard Japanese name: Ennbi-aka-tamagashira] (Figs. 1B–C, 2E–F, 3, 4D–F, 5, 6; Table 1)

Scolopsis eriomma Jordan & Richardson, 1909: 188, Pl. LXX [type locality: Kaohsiung (Takao), Taiwan].
Parascolopsis cf. *eriomma*: Hung *et al*. 2016: 11, fig. S3G (Taiwan).
Parascolopsis eriomma: Fujiwara 2017: 148, color photograph of UPVMI 1634 (Panay Island, Philippines).

Holotype. FMNH 52247, 190.9 mm SL, Kaohsiung (Takao), Taiwan.

Non-type specimens (14 specimens, 107.9–172.8 mm SL). FMNH 110452, 139.4 mm SL, Dumaguete fish market, Negros Island, Philippines, 21 Sep. 1995, coll. M. W. Westneat; FMNH 137885, 107.9 mm SL, Puerto Galera fish market, Mindoro Island, Philippines, 24 May 2000, coll. K. Carpenter and M. W. Westneat; FRLM 34892, 123.9 mm SL, Bitung fish market, north Sulawesi, Indonesia, 14 Nov. 2008, coll. S. Kimura, H. Sakakibara and P. Teguh; OCF-P3727, 144.1 mm SL, male, off Motobu, Okinawa-jima Island, southern Japan (26º38′32″N, 127º45′41″E), 200 m depth, 28 Sep. 2017, fishing, coll. A. Kaneko, Y. Oshiro and K. Miyamoto; OCF-P3802, 139.2 mm SL, female, off Motobu, Okinawa-jima Island, southern Japan (26º39′56″N, 127º46′38″E), 150 m depth, 13 Nov. 2017, fishing, coll. A. Kaneko and Y. Oshiro; OCF-P3888 and 3889, 2 specimens, 123.5 and 172.8 mm SL, male and female, off Motobu, Okinawa-jima Island, southern Japan (26º38′27″N, 127º45′46″E), 200 m depth, 14 Feb. 2018, fishing, coll. A. Kaneko, Y. Oshiro and K. Miyamoto; OCF-P4096 and 4097, 2 specimens, 154.4 and 154.8 mm SL, off Motobu, Okinawa-jima Island, southern Japan (26º38′26″N, 127º45′39″E), 200 m depth, 31 May 2019, fishing, coll. A. Kaneko, Y. Oshiro and K. Miyamoto; OCF-P4209, 4210, 4212 and 4213, 4 specimens, 139.6–157.2 mm SL, off Motobu, Okinawa-jima Island, southern Japan, 26 Sep. 2019, coll. A. Kaneko and H. Takaoka; URM-P 37587, 161.2 mm SL, Okinawa-jima Island, 11 Jan. 1997, coll. H. Yoshigo.

Diagnosis. Distinguished from congeners by the following combination of characters: gill rakers on first arch 15–17; caudal fin forked, length of forked part of caudal fin 6.5–7.9 times in SL (Figs. 1B–C, 2E–F, 3A); eye diameter 1.1–1.3 times in length of longest dorsal-fin spine (Fig. 3B); yellow stripe absent on cheek (Figs. 1B–C, 2E–F); very weak or no biofluorescence emission observed on isthmus and branchiostegal membrane (Fig. 4D–F) (see paragraph on biofluorescence emission patterns).

Description. Counts and proportional measurements are presented in Table 1. Body moderately deep, deepest at pelvic-fin base, depth 2.9–3.3 times in SL; head moderate, 3.1–3.3 times in SL; snout short, length less than diameter of eye, 3.8–4.7 times in HL; nostrils small, anterior and posterior nostrils closely aligned, located in front of eye; anterior nostril with small nasal flap; eyes large, round, located in upper portion of anteroposterior axis, diameter 2.4–2.9 times in HL; interorbital width 1.2–1.6 times in eye diameter; suborbital shallow, depth 3.8–5.2 times in eye diameter; mouth moderate, terminal, and slightly oblique; upper jaw nearly reaching to about level of anterior margin of pupil, 2.9–3.3 times in HL; 3–5 pairs of enlarged canines on front of both jaws, single row of small conical teeth follows with canines, villiform teeth present inside canines and small conical teeth; posterior edge of suborbital finely denticulate, with a small spine at upper corner; posterior margin of preopercle finely denticulate; posterior corner of opercle with a small spine.

Origin of dorsal fin above pectoral-fin base, predorsal-fin length 0.9 times in HL; dorsal fin without notch; longest dorsal-fin spine falls within 4th to 6th dorsal-fin spine, longest dorsal-fin spine 2.0–2.2 times in HL; origin of anal fin about level with 1st soft dorsal-fin ray, preanal-fin length 1.5–1.6 in SL; 3rd anal-fin spine longest or almost equal to 2nd anal-fin spine, 3rd anal-fin spine 2.3–2.8 times in HL; posterior tips of dorsal and anal-fin rays falling well short of caudal-fin base; pectoral fins moderately long, tip of fins just reaching level of anus or slightly short, their length 1.1–1.2 times in HL; origin of pelvic fins about level with 3rd dorsal-fin spine, tip of fins just reaching anus or slightly short; length of 1st pelvic-fin ray 1.3–1.5 times in HL; caudal fin forked, tip of upper and lower lobes pointed; length of upper lobe and forked part of caudal fin 3.1–3.6 and 6.5–7.3 times in SL, respectively.

Scales cycloid; scales on top of head extending forward between eyes to about level of posterior margin of pupil; snout, suborbital, lips, maxilla and isthmus naked; preopercle with 3–5 transverse scale rows, its lower limb naked; opercle with 3–6 transverse scale rows; dorsal fin and anal fin scaleless; axilla of pectoral fin naked; pelvic fin with axillary scales; anterior half of caudal fin covered with small scales.

Color of fresh specimens (Figs. 1B, 2E–F). Generally reddish body, darker dorsally and paler ventrally; iris red; pale yellow stripe on posterior edge of eye to pectoral-fin base; pale yellow stripe on mid-lateral line of trunk and tail; small black spot on upper portion of pectoral-fin base; dorsal fin mainly red, translucent vermiculate pat-

terns present on membrane in small specimens; pectoral, pelvic and anal fins pale yellow; caudal fin mainly red, posterior edge and forked part paler.

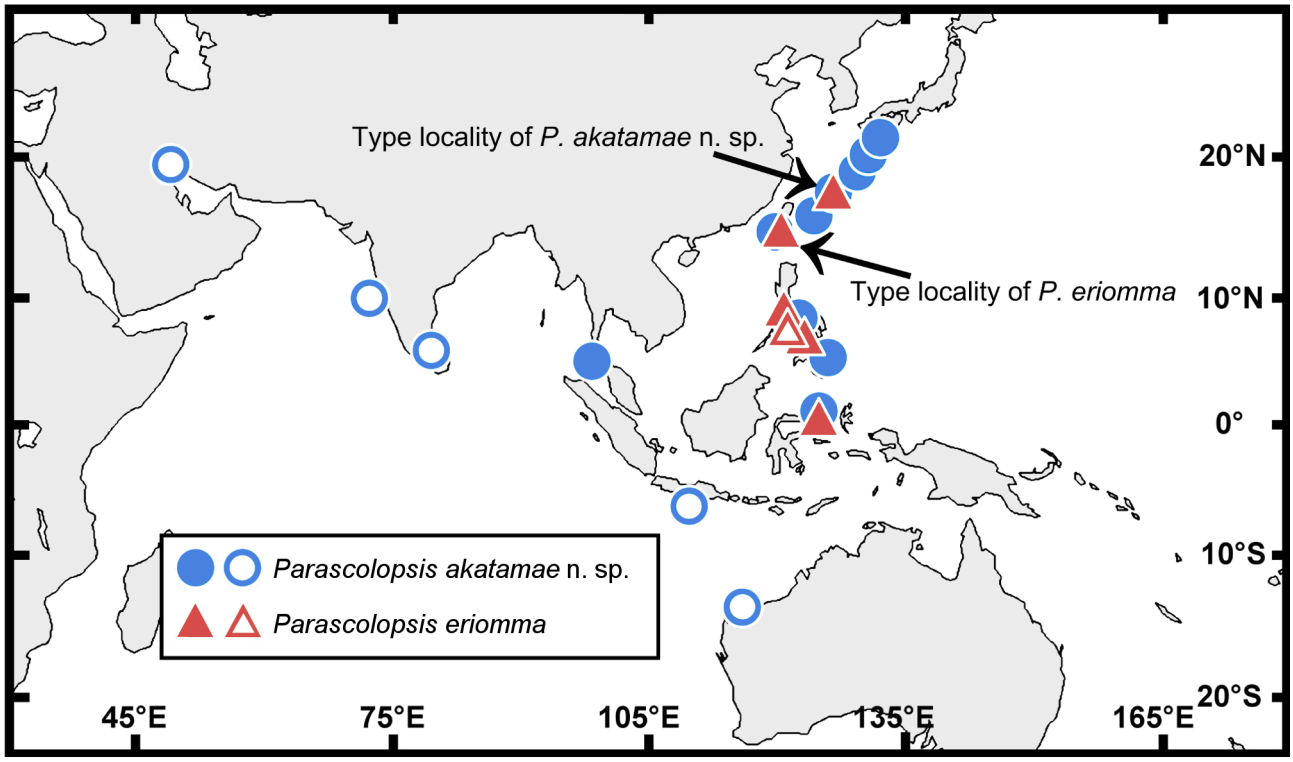

FIGURE 5. Distribution of *Parascolopsis akatamae* **n. sp.** and *P. eriomma*. Closed markers are based on specimens examined during this study; open markers are based on literature records (identified from color photographs).

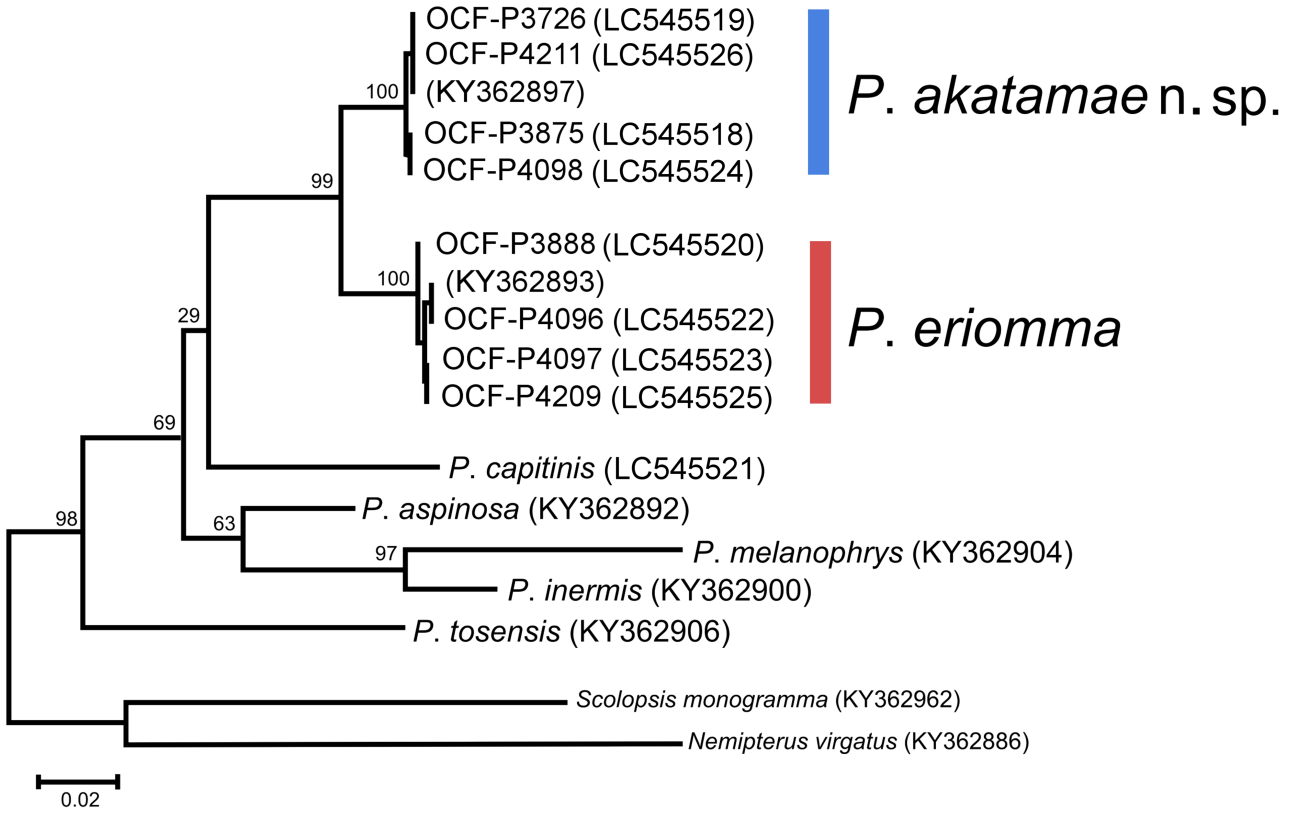

FIGURE 6. Maximum likelihood phylogeny derived from partial sequences of the mitochondrial cytochrome oxidase subunit I for the genus *Parascolopsis* and closely related species. Numbers at branches indicate bootstrap probabilities based on 1,000 replications. DDBJ/EMBL/GenBank accession numbers are shown in parentheses.

Color of preserved specimens. Generally brownish, darker dorsally and paler ventrally; eyes blackish; yellow and red marks present in the fresh condition completely lost with preservation; all fins translucent white.

Biofluorescence emission patterns (Fig. 4D–F)**.** Yellow lateral stripe across pupil on iris; weak green stripe on mid-lateral line of trunk and tail; dorsal edge of dorsal fin green; base of pectoral fin green; pelvic and anal fins weakly green; lower lobe and tip of upper lobe of caudal fin green; isthmus and branchiostegal membrane very weak green or without biofluorescence.

Distribution (Fig. 5)**.** *Parascolopsis eriomma* has been recorded based on specimens or identifiable photographs from southern Japan (this study), Taiwan (Jordan & Richardson 1909; Hung *et al*. 2016, this study), Philippines (Fujiwara 2017; this study) and northern Sulawesi, Indonesia (this study).

Etymology. Previously, the English name "Rosy dwarf monocle bream" and Japanese name "Aka-tamagashira" were used for *P*. *eriomma*. However, this study revealed that previously recognized *P. eriomma* included *P. akatamae* **n. sp.** This species is more narrowly distributed than *P*. *akatamae* (Fig. 5) and very rare at least in Japan and Taiwan (Hung *et al*. 2016; this study). Therefore, the English name "Rosy dwarf monocle bream" and Japanese name "Aka-tamagashira," which were previously used for *P. eriomma*, were applied to *P. akatamae*, and a new English name, "Swallowtail dwarf monocle bream" and new standard Japanese name, "Ennbi-aka-tamagashira" have been applied to this *P*. *eriomma*. The Japanese "Ennbi" means tail of swallow and is derived from shape of the caudal fin of the species.

Remarks. *Scolopsis eriomma* Jordan & Richardson, 1909 was originally described on the basis of 3 specimens [FMNH 52247 and CAS-SU 9243 (2 specimens)] collected from Kaohsiung, Taiwan. The original specimen labeled "type" and figured as such (FMNH 52247; Jordan & Richardson 1909) has been considered the holotype (Henn 1928; Ibarra & Stewart 1987; Ho & Shao 2011). Counts and measurements of examined non-type specimens mostly agree with those of the holotype (Table 1, Fig. 3). Body depth of the holotype is noticeably higher than non-type specimens, however this is regarded as proportional change with growth because the holotype is the largest among examined specimens. On the other hand, measurements of *P. akatamae* differ with those of the holotype for diagnostic characters (Fig. 3).

This species was collected from a depth of 150–200 m on a sand-rubble bottom. No sexual dimorphism is observed in morphology, coloration or fluorescence patterns.

Discussion

Comparisons. *Parascolopsis akatamae* **n. sp.** and *P. eriomma* can be easily differentiated from the other 11 congeners in having 15–19 gill rakers on the first gill arch (vs. 8–14 in others) (Russell 1990; Russell & Chin 1996; this study). Furthermore, *P. akatamae* differs from *P. eriomma* in having following characters: length of forked part of caudal fin 5.8–6.5 times in SL (vs. 6.5–7.9) (Figs. 1, 2, 3A); eye diameter 1.3–1.8 times in length of longest dorsal-fin spine (vs. 1.1–1.3) (Fig. 3B); a pale yellow stripe present on lower edge of the eye to posterior edge of preopercle (vs. no stripes on that part of the body) (Figs. 1, 2).

In the genetic analysis, the partial sequences of COI for seven species of *Parascolopsis* were aligned for a total of 599 sites. The maximum likelihood phylogeny derived from the aligned sequences showed *P. akatamae* and *P. eriomma* as sister species supported by high bootstrap probability (Fig. 6). Hung *et al*. (2016) conducted a genetic analysis of Nemipteridae and suggest that the former *P. eriomma* may contain two species, namely *P. eriomma* (KY362897, from Taiwan) and *P*. cf. *eriomma* (KY362893, from Taiwan). Our study reveals that the former is *P. akatamae* **n. sp.** and latter is *P. eriomma* (Jordan & Richardson, 1909).

In Okinawa, *P. akatamae* and *P. eriomma* co-occur and can be fished from the same point, same depth and same bait, however *P. eriomma* is rarer (K. Miyamoto and A. Kaneko, personal observation). The habitat of both species overlaps, at least in Japan and Taiwan (Hung *et al*. 2016; this study), and may also overlap in the Philippines and Indonesia. On the other hand, all examined specimens or literature records from the Indian Ocean were *P. akatamae*, thus *P. eriomma* may be endemic to the West Pacific. In addition, *P. eriomma* may be a smaller species than *P. akatamae*, as we have never observed large specimens beyond the holotype (190.9 mm SL) (vs. *P. akatamae* reaching 270.8 mm SL).

In recent years the phenomenon of biofluorescence in fishes has grown and some hypotheses have been proposed regarding ecological functions. For example, intraspecific communication, appealing to the opposite sex, and

TABLE 1. Counts and measurements of *Parascolopsis akatamae* **n. sp.** and *Parascolopsis eriomma.*

	Parascolopsis akatamae **n. sp.**		*Parascolopsis eriomma*	
	Holotype Okinawa Island, Japan OCF-P4098	Paratypes and non-types southern Japan, Taiwan, Indonesia and Thailand *n* = 43	Holotype Kaohsiung, Taiwan FMNH 52247	Non-types southern Japan, Philippines and Indonesia *n* = 14
Standard length (mm)	115.5	98.3–278.8	190.9	107.9–172.8
Counts:				
Dorsal-fin rays	X, 9	X, 8–9 (almost 9)	X, 9	X, 9
Anal-fin rays	III, 7	III, 7	III, 7	III, 7
Pectoral-fin rays	17	16–17	17	16–17
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Pored lateral-line scales	36	35–37	37	34–37
Scales between lateral-line and 5th dorsal-fin spine	2 ½	2 ½	2 ½	2 ½
Scales below lateral-line	13	12–14	12	11–13
Scale rows on preopercle	4	3–5	4	3–5
Scale rows on opercle	4	3–6	5	4–5
Gill rakers	18	16–19	17	15–17
Vertebras	10 + 14	10 + 14	-	10 + 14
Measurements (% SL):				
Body depth	37.1	31.5–40.4	37.1	30.2–34.8
Head length	31.2	28.9–32.9	30.2	30.6–31.9
Snout length	7.4	6.1–8.8	7.9	6.8–8.3
Eye diameter	10.9	8.6–12.8	10.0	10.9–12.9
Interorbital width	8.7	7.9–10.2	10.4	8.2–9.3
Suborbital depth	3.0	2.0–3.2	2.7	2.4–2.9
Upper jaw length	10.2	8.8–11.2	10.4	9.4–10.6
Depth of caudal-peduncle	10.5	9.6–11.4	9.9	9.1–10.4
Length of caudal-peduncle	21.9	20.5–24.5	19.8	21.3–24.1
Predorsal-fin length	34.7	32.5–36.3	33.9	33.5–36.8

.....continued on the next page

TABLE 1. (Continued)

	Parascolopsis akatamae **n. sp.**		*Parascolopsis eriomma*	
	Holotype Okinawa Island, Japan	Paratypes and non-types southern Japan, Taiwan, Indonesia and Thailand	Holotype Kaohsiung, Taiwan	Non-types southern Japan, Philippines and Indonesia
	OCF-P4098	*n* = 43	FMNH 52247	*n* = 14
Dorsal-fin base length	53.6	51.4–55.8	51.8	50.2–54.2
Longest dorsal-fin spine length	16.7	13.1–17.2	12.7	13.7–15.6
Pectoral-fin length	30.1	25.3–32.0	28.6	26.2–29.8
pelvic-fin spine length	15.7	15.3–17.9	15.6	14.6–18.0
1st soft pelvic-fin ray length	26.1	19.8–27.4	21.3	21.1–25.3
Preanal-fin length	65.1	63.8–72.0	66.2	64.2–67.0
Anal-fin base length	17.4	16.4–19.0	18.6	15.9–17.8
1st anal-fin spine length	7.7	5.9–8.5	6.1	6.0–7.9
2nd anal-fin spine length	13.1	9.0–14.3	10.4	10.8–13.4
3rd anal-fin spine length	13.8	11.2–14.7	11.7	11.5–13.3
Upper lob of caudal-fin length	30.3	26.5–31.0	broken	28.2–32.5
Fork part of caudal-fin length	16.5	14.7–17.3	12.7	13.6–15.4
Lower lob of caudal-fin length	27.8	24.3–29.3	broken	25.8–29.4

assistance with camouflage have been suggested (Sparks *et al*. 2014; Gruber *et al*. 2015, 2016). *P. akatamae* and *P. eriomma* are very similar and their habitat overlaps; however, differences in their species-specific fluorescence patterns may be functional for species identification and intraspecific communication in the deep sea limited to weak blue light.

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