Yellow-lined Cardinalfish *Ostorhinchus chrysotaenia* (Perciformes: Apogonidae) from Yaku Island, Osumi Islands; First Specimen-based Japanese Records, with an Assessment of the Holotype of the Species

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Two specimens (68.8–72.3 mm standard length) of *Ostorhinchus chrysotaenia* (Bleeker, 1851), previously recorded from Indonesia, northwestern Australia, Papua New Guinea, Solomon Islands, northern Borneo, Philippines, and Taiwan, and recently collected off Yaku Island, Osumi Islands, Kagoshima Prefecture, Japan, represent the first records of the species from Japan supported by voucher specimens, and the northernmost distributional record of the species. The holotype and an additional non-type specimen of *O. chrysotaenia* were determined from two Bleeker specimens registered under the same catalog number.

Key Words: Teleostei, new records, morphology, taxonomy, fish fauna, High-fin Cardinalfish.

Introduction

The Yellow-lined Cardinalfish *Ostorhinchus chrysotaenia* (Bleeker, 1851) (Perciformes: Apogonidae), originally described as *Apogon chrysotaenia* from a single specimen from Java, Indonesia, has been recorded from northwestern Australia and the western Pacific Ocean from Japan to Papua New Guinea (Yoshida et al. 2010; Allen and Erdmann 2012). The single Japanese record, based on an underwater photograph taken at Yaku Island, Osumi Islands, southern Japan (Yoshida et al. 2010), was probably the basis of Allen and Erdmann’s (2012) inclusion of the Ryukyu Islands in the distributional range of the species.

During an ichthyofaunal survey at Yaku Island, two specimens of *O. chrysotaenia* were collected at a depth of 18.8 m. They are described herein as the first record of *O. chrysotaenia* from Japan supported by voucher specimens, and northernmost record of the species.

Materials and Methods

Counts and measurements followed Yoshida and Motomura (2016). Measurements were made to the nearest 0.1 mm with needle-point digital calipers under a dissecting microscope. Standard and total lengths are abbreviated as SL and TL, respectively. Curatorial procedures for the newly collected specimen followed Motomura and Ishikawa (2013). Institutional codes followed Sabaj (2019).

*Ostorhinchus chrysotaenia* (Bleeker, 1851)

[New standard Japanese name: Yakushima-date-ishimochi]

(Figs 1–3; Table 1)

Material examined. KAUM–I. 127634, 72.3 mm SL, KAUM–I. 127635, 68.8 mm SL, Isso, Yaku Island, Osumi Islands, Kagoshima, 30°27′35″N, 130°29′17″E, 18.8 m, hand net, 3 February 2019, T. Yoshida.

Description. Meristics and morphometrics of the specimens are shown in Table 1. Body oval, moderately deep and compressed, deepest at first dorsal-fin origin. Dorsal profile of head and body convex from snout tip to caudal-fin base. Ventral profile of head and body convex from lower jaw to end of caudal-fin base. Caudal peduncle moderately deep. Head large, rounded. Mouth moderate in size, oblique, forming angle of ca. 30° to horizontal axis of body. Posterior tip of maxilla slightly concave, extending beyond vertical through anterior margin of body. Upper-jaw length greater than half head length. No enlarged caniniform teeth on jaws. A tooth band on both upper and lower jaws. Villiform teeth in 4 or 5 rows on vomer, 2 or 3 rows on palatine. Anterior nostril with a short oval tube, uppermost margin of opening above ventral margin of pupil. Posterior nostril oval, opening vertically, uppermost margin below level of dorsal margin of pupil. Posterior margin

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of preopercle serrated. Gill rakers slender, moderately long. Gill filaments shorter than gill rakers. Scales ctenoid. Lateral line well developed, extending from upper end of gill opening to caudal-fin base.

First dorsal-fin origin anterior to vertical through uppermost part of pectoral-fin base; third spine longest. Posterior end of membrane associated posteriorly with last dorsal-fin spine anterior to vertical through anterior tip of depressed pelvic fin. Second dorsal-fin origin anterior to vertical through anal-fin origin; first soft ray of second dorsal fin longest; all dorsal-fin soft rays branched. Posterior end of second dorsal-fin base anterior to vertical through base of fifth or sixth soft ray of anal fin. Anal-fin origin below base of third soft ray of second dorsal fin; first spine of anal fin much shorter than second. Pectoral fin extending beyond vertical through fourth soft-ray base of second dorsal fin. Pelvic-fin origin anterior to vertical through uppermost part of pectoral-fin base. Posterior tip of depressed pelvic fin extending beyond vertical through second soft-ray base of second dorsal fin. Caudal fin forked, lobes pointed. Anus anterior to anal-fin origin.

**Table 1.** Meristics and morphometrics of specimens of *Ostorhinchus chrysotaenia.*

| Standard length (SL; mm) | Non-type specimens Japan n=2 | Holotype of *A. chrysotaenia* Indonesia RMNH.PISC 5598 | Non-type Bleeker specimen Indonesia RMNH.PISC 5598 | Non-type specimens Western Pacific n=7 | Modes |
|--------------------------|-------------------------------|---------------------------------|---------------------------------|---------------------------------|-------|
| Dorsal-fin rays          | VII-I, 9                      | VII-I, 9                        | VII-I, 9                        | VII-I, 9                        |       |
| Anal-fin rays            | II, 8                         | II, 8                           | II, 8                           | II, 8                           |       |
| Pectoral-fin rays (left/right) | 14/14                        | 14/14                           | 14/14                           | 14/14                           |       |
| Pelvic-fin rays          | 1, 5                          | 1, 5                            | 1, 5                            | 1, 5                            |       |
| Pored lateral-line scales| 24                            | 24                              | 24                              | 24                              |       |
| Transverse scale rows above lateral line | 2                            | 2                               | 2                               | 2                               |       |
| Transverse scale rows below lateral line | 6                            | 6                               | 6                               | 6                               |       |
| Median predorsal-fin scale rows | 3                           | 3                               | 3                               | 3                               |       |
| Circumpeduncular scales | 12                            | 12                              | 12                              | 12                              |       |
| Developed gill rakers    | $2 + 10 = 12$                 | $3 + 11 = 14$                   | $3 + 11 = 14$                   | $1 - 3 + 9 - 11 = 11 - 14$      | 12    |
| Gill rakers including rudiments | $4 - 5 + 13 = 17 - 18$        | $5 + 14 = 19$                   | $5 + 14 = 19$                   | $4 - 5 + 12 - 14 = 16 - 19$     | 17    |
| Principal caudal-fin rays| $9 + 8$                       | $9 + 8$                         | $9 + 8$                         | $9 + 8$                         |       |
| % of SL                  |                               |                                 |                                 |                                 |       |
| Body depth               | 34.0–34.3                     | 37.3                            | 34.5                            | 32.4–35.8                       | 34.8  |
| Body width               | 17.8–18.3                     | 17.3                            | 16.8                            | 15.3–20.8                       | 18.5  |
| Head length              | 38.3–38.8                     | 35.7                            | 35.7                            | 37.8–39.9                       | 38.3  |
| Snout length             | 10.2–10.5                     | 7.8                             | 8.9                             | 8.0–10.3                        | 9.5   |
| Eye diameter             | 12.2                          | 12.0                            | 11.8                            | 12.4–14.6                       | 13.0  |
| Interorbital width       | 7.3–8.2                       | 7.2                             | 7.6                             | 6.9–9.0                         | 7.8   |
| Upper-jaw length         | 18.5–18.9                     | —                               | —                               | 17.2–19.4                       | 18.3  |
| Caudal-peduncle depth    | 17.4–17.8                     | 17.3                            | 15.7                            | 16.7–18.7                       | 17.4  |
| Caudal-peduncle length   | 24.6–24.9                     | 23.8                            | 27.2                            | 24.0–28.5                       | 26.0  |
| Pre-dorsal-fin length    | 40.8–41.6                     | 41.6                            | 40.6                            | 39.7–43.4                       | 41.9  |
| Dorsal-fin base length   | 36.2–36.3                     | 38.0                            | 36.2                            | 34.4–37.6                       | 36.3  |
| 1st dorsal-fin spine length | 2.6–2.8                      | 3.8                             | 4.1                             | 1.9–3.1                         | 2.9   |
| 2nd dorsal-fin spine length | 8.0–9.0                      | 10.0                            | 9.3                             | 8.0–9.9                         | 8.9   |
| 3rd dorsal-fin spine length | 19.9–20.3                    | 20.6                            | 21.8                            | 19.6–21.5                       | 20.6  |
| 4th dorsal-fin spine length | 18.0–18.5                    | 18.9                            | 19.1                            | 18.1–19.7                       | 18.7  |
| 1st spine length of 2nd dorsal fin | 17.0–17.7                   | 15.6                            | 16.6                            | 16.2–18.0                       | 16.9  |
| Longest dorsal-fin soft ray length | 31.1–35.8                 | —                               | —                               | 29.4–34.3                       | 32.9  |
| Pre-anal-fin length      | 62.5–63.4                     | 63.2                            | 61.5                            | 58.4–63.4                       | 61.8  |
| Anal-fin base length     | 16.0                          | 14.1                            | 14.0                            | 13.8–16.0                       | 15.0  |
| 1st anal-fin spine length | 2.2–2.5                      | 2.6                             | 2.7                             | 1.9–3.3                         | 2.4   |
| 2nd anal-fin spine length | 12.7–13.8                    | 12.4                            | —                               | 11.8–14.0                       | 12.8  |
| Longest anal-fin soft ray length | 22.8–23.7                 | —                               | —                               | 21.6–23.4                       | 22.3  |
| Pectoral-fin base length | 6.0–6.2                       | 4.9                             | 5.5                             | 5.3–6.3                         | 5.8   |
| Pectoral-fin length      | 23.2–23.3                     | 24.1                            | 22.0–23.9                       | 23.1                            |
| Pre-pelvic-fin length    | 38.3–39.4                     | 36.7                            | 36.9                            | 36.2–38.9                       | 37.3  |
| Pelvic-fin spine length  | 14.1–15.1                     | 15.2                            | 14.4                            | 12.7–15.3                       | 14.3  |
| Longest pelvic-fin soft ray length | 21.4–22.5               | —                               | 21.5                            | 20.9–22.7                       | 21.8  |

*Fresh coloration* [Based on color photographs of
First Japanese records of *Ostorhinchus chrysotaenia*

KAUM–I. 127634 (Fig. 1). Head reddish-orange, with 6 fluorescent blue stripes radiating backwards from snout. Body yellowish-orange with faint brown stripes from nape to caudal peduncle. A poorly defined black blotch on caudal-fin base. First dorsal fin reddish-yellow, inter-spinous membrane from third spine to posterior end of membrane associated posteriorly with last dorsal-fin spine greenish-yellow. Second dorsal fin reddish-yellow, base blackish-golden. Anal fin yellowish-orange with a thin blackish-yellow stripe along base, posteriorly pinkish distally. Pectoral fin translucent red. Pelvic fins semi-transparent yellow with orange anterior margin. Caudal fin yellowish-orange.

**Distribution and habitat.** *Ostorhinchus chrysotaenia* has been recorded from the following Indo-West Pacific localities: Indonesia (northeastern Kalimantan and Bali eastward), northwestern Australia, Papua New Guinea, Solomon Islands, Brunei, Malaysia (Sabah), Philippines, Taiwan and southern Japan (Yaku Island, Osumi Islands) (Shao and Chen 1986; Yoshida et al. 2010; Allen and Erdmann 2012; this study). The species has been reported as occurring at depths of 1–20 m (Yoshida et al. 2010; Allen and Erdmann 2012), the present Japanese specimens having been collected under large rocks at a depth of 18.8 m.

**Remarks.** The present specimens were identified as *Ostorhinchus chrysotaenia* on the basis of the following combination of characters: dorsal-fin rays VII-I, 9; pectoral-fin rays 14; median predorsal-fin scale rows 3; developed gill rakers 12–14; total gill rakers 17 or 18; body depth 34.0–34.3% SL; longest dorsal-fin soft-ray length 31.1–35.8% SL; tip of second dorsal fin elongate; a yellowish-orange body; six fluorescent blue stripes radiating from the snout; yellowish dorsal, anal, and caudal fins; and a small poorly-defined black blotch, its size less than pupil diameter, on the caudal-fin base (Yoshida et al., 2010; Allen and Erdmann, 2012). In addition, meristic and morphometric values for the specimens agreed well with those of the holotype and other non-type specimens of *O. chrysotaenia* (Table 1).

*Ostorhinchus chrysotaenia* is similar to *O. fleurieu* Lacepède, 1802 in sharing a yellowish-orange body with fluorescent blue stripes radiating from the snout. However, the
former differs in having yellowish dorsal, anal, and caudal fins (vs. reddish in the latter), a small black blotch, its size less than pupil diameter, on the caudal-fin base (vs. large black blotch, its size greater than pupil diameter), 3 median predorsal-fin scale rows (vs. 5), developed gill rakers 11–14 (mode 12) [vs. 16–18 (18)], gill rakers including rudiments 16–19 (17) [vs. 19–21 (21)], body depth 32.4–37.3% SL (mean 34.8% SL) [vs. 34.1–46.3% (39.4%)], and longest dorsal-fin soft ray length 29.4–35.8% SL (32.9%) [vs. 23.6–30.8% (26.1%)] (Yoshida and Motomura 2015; this study).

Although *O. chrysotaenia* is similar to *O. griffini* (Seale, 1910) in having an elongated second dorsal fin, it is easily distinguished from *O. griffini* by having a yellowish-orange body (vs. purplish body with brown margined scales and whitish caudal peduncle in the latter), and yellowish pelvic and anal fins (vs. reddish-orange fins) (Allen and Erdmann 2012; this study).

In Japanese waters, *O. chrysotaenia* was first recorded by Yoshida *et al.* (2010: fig. 6) (as *Apogon chrysotaenia*) from Isso, northern Yaku Island, Osumi Islands on the basis of an underwater photograph taken at a depth of 20 m on 11 July 2004. Subsequently, the species has been observed by S. Harazaki (the second author of the present study) at depths of 18–35 m at Yaku Island in January 2005, March, September, and November 2009, September and December 2018, and January and February 2019 (Fig. 2), a total of some 20 individuals of *O. chrysotaenia* therefore being confirmed as occurring at Yaku Island since 2004. However, all individuals were observed over short periods, a few weeks only, before disappearing from the discovery sites, suggesting that *O. chrysotaenia* was transported by the Kuroshio Current to Yaku Island from Taiwan and/or the Philippines, rather than being part of a permanent population at Yaku Island. In February 2019, 10 individuals were observed off Isso, Yaku Island, including the two collected and described herein. The latter represent the first specimen-based records of the species from Japanese waters.

A new standard Japanese name, Yakushima-date-ishimochi, is proposed for *O. chrysotaenia*, on the basis of the Yakushima specimen (KAUM–I. 127634), “date” meaning “flashy” in reference to the body coloration, and “ishimochi” being a common Japanese name for cardinalfishes.
The three specimens (ASIZT P. 55979, 55980) reported by Shao and Chen (1986) as Apogon multilineatus Bleeker, 1874 from Hsiao-liu-chiu Island, Taiwan, were re-identified here as O. chrysotaenia.

**Assessment of holotype.** *Ostorhinchus chrysotaenia* was originally described as *Apogon chrysotaenia* by Bleeker (1851) from a single specimen (88 mm TL) from Jakarta, Java, Indonesia. Bleeker (1871–1876) later reported the species as *Amia chrysotaenia* on the basis of the holotype (88 mm TL) and an additional specimen (90 mm TL). Subsequently, Hubrecht (1879) also referred to two Bleeker specimens as *Amia chrysotaenia* (collection A in group I). Both specimens are currently held at RMNH, being registered together as RMNH.PISC 5598 (65.2 mm SL [Fig. 3A] and 65.5 mm SL [Fig. 3B]) and contained in a single jar. Although the caudal fin was damaged in both specimens, their original TL could be estimated from measurements of two undamaged specimens of *O. chrysotaenia* (68.8–72.3 mm SL) examined during the present study (TL 1.3 times SL). Because the estimated TL (ca. 84.8 and 85.2 mm) of the two Bleeker specimens (RMNH.PISC 5598) are close to those (88 and 90 mm TL) given by Bleeker (1871–1876), the smaller specimen (65.2 mm SL; Fig. 3A) is herein regarded as the holotype of *Apogon chrysotaenia*. Bleeker’s (1871–1876) figure of *O. chrysotaenia* (as *Amia chrysotaenia*) is here considered to have been based on the holotype, owing to Bleeker’s habit of creating figures using the first specimen of each species in his “Atlas”.

**Comparative material examined.** *Ostorhinchus chrysotaenia*. 9 specimens, 23.9–68.7 mm SL. BPBM 37003, 64.6 mm SL, Milne Bay, Papua New Guinea, 10°33′E, 30°55′S, 09°11′09″N, 02°07′′′09″S, 02°02′′′S, 123°27′E, 1.0–2.0 m, 6 November 1998; W AM 001, 3 specimens, 58.6–68.7 mm SL, Treko Islands, Indonesia. BPBM 37012, 55.2 mm TL, western New Guinea, 1°35′25″S, 124°43′10″E, 64.7 mm SL [Fig. 3B] and contained in a single jar. Although the caudal fin was damaged in both specimens, their original TL could be estimated from measurements of two undamaged specimens of *O. chrysotaenia* (68.8–72.3 mm SL) examined during the present study (TL 1.3 times SL). Because the estimated TL (ca. 84.8 and 85.2 mm) of the two Bleeker specimens (RMNH.PISC 5598) are close to those (88 and 90 mm TL) given by Bleeker (1871–1876), the smaller specimen (65.2 mm SL; Fig. 3A) is herein regarded as the holotype of *Apogon chrysotaenia*. Bleeker’s (1871–1876) figure of *O. chrysotaenia* (as *Amia chrysotaenia*) is here considered to have been based on the holotype, owing to Bleeker’s habit of creating figures using the first specimen of each species in his “Atlas”.

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