

First record of *Ruvettus pretiosus* (Teleostei: Gempylidae) from the Yaeyama Islands, Ryukyu Archipelago, Japan

By

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Abstract A single specimen of the oilfish *Ruvettus pretiosus* Cocco, 1833 collected off Ishigaki-jima Island, Yaeyama Islands, the southern-most island group of the Ryukyu Archipelago, represents the first record of the species from that group. Previously, the only specimen-based record of the species from Okinawa Prefecture had been reported from Kume-jima Island, Okinawa Islands. The present specimen is fully described.

Key words: fish fauna, distribution, Actinopterygii, Okinawa, Scombroidei

Introduction

The snake mackerel *Ruvettus pretiosus* Cocco, 1833, commonly referred to as “oilfish” or “escolar”, is a circumglobal species of Gempylidae, being the sole representative of a monotypic genus (Nakamura and Parin 1993, 2001; Campbell et al. 2018; Harrington et al. 2021). Feeding mainly on fishes, squids and crustaceans, the species usually inhabits the near sea bottom in depths of 200–400 m, although occasionally migrating to depths shallower than 100 m at night (Pakhorukov and Boltachev 2001; Parin and Nakamura 2002, 2016; Vianna et al. 2012). Although caught by long-line, hook, or trawl and used as food in tropical areas, such as Taiwan (Chiang et al. 2014; Wong and Ho 2019, 2020), the flesh of *R. pretiosus* contains large amounts of wax esters that cannot be digested when eaten, thereby causing severe diarrhea. In response to a mass food poisoning incident, resulting from the consumption of *R. pretiosus*, in Tokyo in Oct. 1969, the species was designated in Japan as a “harmful food”, and its distribution for consumption prohibited since 1970 (Nevenzel et al. 1965; Veterinary Sanitation Division, Environmental Health Bureau, Ministry of Health and Welfare 1970; Sapporo City 2019; Oikawa 2021).

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However, the oil of the species was used for lighting in Kitadaito-jima Island, Daito Islands when the generator was destroyed during WWII (Okuhira 2003; Fujita 2010). Although *R. pretiosus* is frequently fished, being called “Ingandaruma”, “Inguwandarame”, or “Ingandarumi” in Okinawa Prefecture (Kishinouye 1902; Kimura 1926; Tsujimoto and Koyanagi 1937; Tsujimoto 1938; Iida 2009), a specimen-based record for that prefecture exists only from Kume-jima Island, Okinawa Islands (Hata et al. 2022a). A single specimen of *R. pretiosus*, recently, caught off Ishigaki-jima Island, Yaeyama Islands, therefore represents the first record of the species from the Yaeyama Islands, and is herein described in detail.

Material and methods

Methods for counts and proportional measurements essentially followed Nakamura et al. (1983), with some modifications: second dorsal-fin base length was measured from second dorsal fin origin to end of second dorsal-fin base (finlets not included); anal-fin base length was measured from anal-fin origin to anal-fin base end (finlets not included); caudal-peduncle length was measured from posteriormost point of anal-fin base (finlets not included). All measurements were made with calipers to the nearest 0.1 mm. Abbreviations: SL (standard length), CBM (Natural History Museum & Institute, Chiba), NSMT (National Museum of Nature and Science, Tsukuba), and ZUMT (Department of Zoology, University Museum, University of Tokyo, Tokyo, Japan). Genomic DNA was obtained from a piece of muscle preserved in 99% ethanol. The method of DNA extraction and mitochondrial genome sequencing followed Hata et al. (2022b) The sequence was subsequently registered in the DDBJ/EMBL/NCBI database [LC720455 (NSMT-P 143546)].

Results

Ruvettus pretiosus Cocco, 1833
(Standard Japanese name: Baramutsu)

(Fig. 1)

Material examined NSMT-P 143546, 831.0 mm SL, approx. 9 km south of Ishigaki-jima Island, Yaeyama Islands, Ryukyu Archipelago, Japan, 650 m depth, 9 Dec. 2021 (10:35 am), line-fishing [bait: fillet of Roudi Escolar, *Promethichthys prometheus* (Cuvier, 1832)], coll. by H.



Figure 1. Fresh specimen of *Ruvettus pretiosus* from Ishigaki-jima Island, Yaeyama Islands, Ryukyu Archipelago, Japan (NSMT-P 143546, 831.0 mm standard length; A: left side; B: right side).

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Description Counts and measurements, expressed as percentages of SL, are given in Table 1. Body subcylindrical, rather compressed; dorsal profile gradually elevated from snout tip to sixth dorsal-fin spine origin, thereafter gently lowering to caudal-fin base. Ventral profile gently lowering from lower-jaw tip to pelvic-fin insertion, subsequently nearly straight to anal-fin origin, thereafter rising slightly to caudal-fin base. Hard keel on ventral surface from pelvic fin to anus. Origin of first dorsal fin slightly anterior to posterior margin of opercle. Dorsal contour of spinous portion of dorsal fin gradually elevated from fin origin to sixth spine tip, thereafter lowering to end of fin base. Second dorsal fin originating just posterior to end of first dorsal-fin base. Initial three soft rays of second dorsal fin unbranched, all other rays branched. Second dorsal fin triangular, its dorsal contour rising from fin origin to fifth fin ray tip, thereafter lowering to tip of last ray. Two finlets posteriorly following second dorsal fin, the posterior finlet clearly the longer. Dorsal-most point of pectoral-fin insertion just below origin of second spine of first dorsal fin. Dorsal, ventral, and posterior margins of pectoral fins nearly straight. Posterior tip of pectoral fin almost reaching to vertical through origin of seventh spine of first dorsal fin. Uppermost two rays of pectoral fin unbranched, all other rays branched. Anteriormost point of pelvic-fin insertion slightly posterior to origin of third spine of first dorsal fin. Posterior tip of depressed pelvic fin

Table 1. Counts and measurements of *Ruvettus pretiosus* from Ishigaki-jima Island, Yaeyama Islands, Ryukyu Archipelago, Japan. Abbreviations: 1D–P1 (distance from first dorsal-fin origin to pectoral-fin insertion); 1D–P2 (distance from first dorsal-fin origin to pelvic-fin insertion); 1D–A (distance between origins of first dorsal and anal fins); P1–P2 (distance between insertions of pectoral and pelvic fins); 2D–A (distance between origins of second dorsal and anal fins); P1–A (distance from pectoral-fin insertion to anal-fin origin).

NSMT-P 143546	
Standard length (SL ; mm)	831.0
Counts	
Dorsal-fin rays	XIV, 17
Dorsal finlets	2
Anal-fin rays	II, 15
Anal finlets	2
Pectoral-fin rays	12
Pelvic- fin rays	I, 5
Measurements	
As % of SL	
Head length	27.1
Orbit diameter	5.4
Fleshy interorbital width	6.5
Boney interorbital width	6.1
Body depth at pelvic-fin base	17.9
Body depth at anal-fin origin	15.8
Pectoral-fin length	13.7
Pelvic-fin length	7.2
Upper caudal-fin lobe length	20.4
Lower caudal-fin lobe length	22.2
Snout length	9.2
Postorbital length	12.9
Upper-jaw length	14.4
Suborbital width	1.2
First pre-dorsal-fin length	25.1
Second pre-dorsal-fin length	67.9
First dorsal-fin base length	44.3
Second dorsal-fin base length	19.2
Pre-pectoral-fin length	26.8
Pre-pelvic-fin length	29.0
Pre-anal-fin length	70.2
Pre-anus length	66.3
Anal-fin base length	14.8
Caudal-peduncle length	10.9

Caudal-peduncle depth	4.4
Width of caudal peduncle	3.8
Fork length	107.4
1D–P1	11.7
1D–P2	18.4
1D–A	47.6
P1–P2	8.8
2D–A	16.3
P1–A	44.9

not reaching to vertical through posterior tip of pectoral fin. Pelvic fin triangular, outer margin lowering from fin insertion to tip of first soft ray, thereafter rising to last fin-ray tip. All soft rays of pelvic fin branched. Anal-fin origin slightly posterior to origin of second dorsal fin. Posterio-most point of anal-fin base slightly anterior to end of second dorsal-fin base. Ventral contour of anal fin steeply lowering from fin origin to third soft ray tip, subsequently rising to last fin ray tip. All soft rays of anal fin branched. Two finlets behind anal fin, posterior finlet clearly the longer. Caudal fin forked, posterior tips of both lobes pointed. Anterior and posterior margins of both lobes of caudal fin nearly straight. Laterally positioned eye and iris rounded, slightly elongated vertically. Interorbital space flat. Nostrils paired, just anterior to eye. Anterior nostril oval, posterior slit-like, elongated vertically. Distance from snout tip to anterior margin of anterior nostril 6.0% of SL. Distance from posterior margin of anterior nostril to anterior margin of posterior nostril 2.5% of SL. Distance from posterior margin of posterior nostril to anterior margin of orbit 0.8% of SL. Mouth large, posterior tip of maxilla beyond vertical through posterior margin of eye. Uniserial robust conical teeth on both jaws and palatines. Three pairs of larger conical teeth anteriorly on premaxilla. Single conical tooth on center of vomer. No teeth on tongue. Single row of small, bifurcated spine-like gill rakers on outer sides of first, second, and third gill arch. Longer gill raker presented on angle of first gill arch. Fourth gill arch without gill rakers, smooth. Pseudobranchial filaments exposed on inner surface of opercle. Posterior margins of opercle, preopercle, and interopercle convex, rounded, smooth. Two weak spines directed posteriorly on upper part of opercle. Anus just before anal-fin origin, oval, anteriorly-posteriorly elongated. Body entirely covered with rough scales, interspersed with spinous bony tubercles. All fins, axil areas of pectoral and pelvic fins, branchial membrane, branchiostegal rays scaleless. Head, isthmus, and both jaws covered entirely with scales, except tips of both jaws. Lateral line single, but obscure, originating on upper part of cleithrum, extending nearly straight along body, terminating at caudal-fin base.

Coloration of fresh specimen—Body uniformly dark brown. Posterior margins of opercle and pectoral and caudal fins, dorsal margin of second dorsal fin, and ventral margin of anal fins black. Spine on each body scale white. Teeth on both jaws white. Pupil black, iris whitish.

Distribution *Ruvettus pretiosus* is widely distributed in tropical and temperate waters of the world at depth of 100–850 m (Lee and Yang 1983; Nakamura and Parin 1993, 2001; Nakamura 1995; Bettoso and Dulčić 1999; Best 1999; Parin and Nakamura 2002, 2016; Nakabo and Doiuchi 2013; Dulčić et al. 2014; Chiang et al. 2014; Gómez-Cubillos and Grijalba-Bendeck, 2016; Kim and Song 2017; Wang and Ho 2019, 2020; Uysal and Turan 2020; Hata et al. 2022a). In Japanese waters, the species is distributed off the Pacific coast of Hokkaido and Honshu, from Tohoku District to Tosa Bay, the Japan Sea coast of Hyogo Pref. (Hamasaka Town), western coast of Satsuma Peninsula, Koshiki Islands, East China Sea, Kyushu-Palau Ridge, Ogasawara Islands, Central and Western Mariana ridges, Daito Islands, and Ryukyu Archipelago from Osumi Islands to Yaeyama Islands (Kishinouye 1902; Kimura 1926; Kamohara 1938; Kamohara and Yamakawa 1968; Yamakawa 1979; Nakamura 1982, 1984, 1997; Machida 1984; Kawasaki 1991; Imamura 1997; IMARS 2001, 2004, 2007; Shinohara et al. 2001, 2005, 2009, 2011, 2014; Maeda and Tsutsui 2003; Senou et al. 2006; Morioka 2007; Iida 2009; Kubodera 2010; Miura 2012; Nakabo

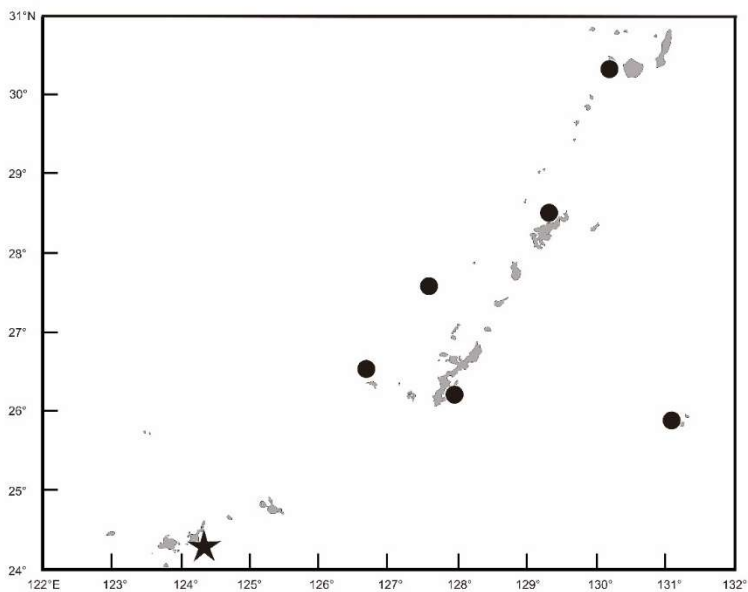


Figure 2. Distributional records of *Ruvettus pretiosus* in the Ryukyu Archipelago. Star and circles represent locality of the specimen examined in this study, and previously reported records, respectively.

and Doiuchi 2013; Ikeda and Nakabo 2015; Nakae et al. 2018; Miyazaki et al. 2019; Nakamura et al. 2020; Koeda et al. 2021; Hata 2022; Hata et al. 2022a; this study).

Identification The present specimen was identified as *Ruvettus pretiosus* on the basis of the following combination of characters, which closely matched the diagnostic features of *R. pretiosus* given by Nakamura and Parin (1993, 2001), and Nakabo and Doiuchi (2013), having the following characters: rough skin covered with medium sized scales interspersed with spinous bony tubercles; keel on abdomen; lateral line obscure, single, not sinuous; caudal peduncle without lateral keels; dorsal fin with 14 spines and 17 soft rays and two finlets. In addition, the gene sequence determined for the specimen indicated a close affinity with NSMT-P 62521 (registration number AP012506, 1,075 bp) (Miya et al. 2013) and CBM-ZF 12750 (AB972230, 168 bp), both registered as *R. pretiosus* in the DDBJ/EMBL/NCBI database.

Remarks As stated in “Introduction”, most records of *R. pretiosus* from Okinawa Prefecture were not based on voucher specimens or lack precise collection locality data. Kimura (1926) reported the composition of fat in the muscle of the species [as *Ruvettus tydemani* Weber, 1913; regarded as a junior synonym of *R. pretiosus* (Matsubara 1955; Nakamura 1982; Nakamura and Parin 1993)] based on an individual of collected approx. 3.7 km off the Daito Islands, and Mori et al. (1966) and Sato and Tsuchiya (1969) reported the compositions of flesh and fatty acids of the species, respectively, from an individual caught off the coast of Okinawa Prefecture, but without detailing the collection locality. Although Yoshino et al. (1975) included the species in a list of fishes of the Ryukyu Archipelago, they gave neither precise locality nor supporting references or specimen details. Kawasaki (1991) reported six individuals collected from the East China Sea, approx. 70 km northwest of Iheya-jima Island, Okinawa Islands, at a depth of 690–720 m, but whether or not the specimens were retained is unknown. Iida (2009) reported that the species was frequently fished around Minamidaito-jima Island, Daito Islands, including a photograph. Miura (2012) reported an individual of the species landed at Chinen Fish Market, Okinawa-jima Island, Okinawa Islands, but the individual was not retained, and Hata et al. (2022a) reported a specimen collected from Kume-jima Island, Okinawa Islands on Oct. 1929 (ZUMT 63238, 441.2 mm SL). The last-mentioned is believed to be the only specimen-based record of the species from Okinawa Prefecture. Because *R. pretiosus* is not listed in any ichthyofaunal surveys of the Yaeyama Islands (e.g., Koeda et al. 2016; Koeda and Akita 2018; Shimose 2021), the present specimen represents the first record of the species from the Yaeyama

Islands and second specimen-based record of the species from Okinawa Prefecture. However, *R. pretiosus* has been recorded from adjacent waters, off the Satsunan Islands [Kishinouye (1902): fished from approx. 110 m south of Kuchierabu-jima Island, Osumi Islands at a depth of approx. 220 m; and Kamohara and Yamakawa (1968): collected from Naze, Amami-oshima Island, Amami Islands], and Taiwanese waters (Lee and Yang 1983; Chiang et al. 2014; Wong and Ho 2019, 2020). Therefore, the record of *R. pretiosus* from Yaeyama Islands suggests that the species is widely distributed in the area from the Amami Islands to Taiwan (Fig. 2). Nakamura et al. (2020), who reported the first records of *R. pretiosus* around Kyushu, speculated that previous non-reporting of the species, despite frequent captures in Kagoshima Prefecture, simply reflected the prohibited commercial distribution of the fish, which is probably also applicable to the few specimen-based records from Okinawa Prefecture.

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