

SHORT REPORT

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New record of Spotstripe snapper, *Lutjanus ophuysenii* (Perciformes: Lutjanidae) from Korea

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Abstract

Three specimens of *Lutjanus ophuysenii* (217.8–226.7 mm in standard length) were collected by a gill net at Korea between August 2015 and July 2016. This species has not previously been recorded from Korea. *L. ophuysenii* is very similar to *Lutjanus vitta*. But several morphological characteristics distinguish the two species, including the number of lateral line scales (46–49 scales in *L. ophuysenii*; 49–52 scales in *L. vitta*), a black spot in the middle part of the longitudinal stripe (present in *L. ophuysenii*; absent in *L. vitta*), and the absence of a scale on posterior end of the preopercle in *L. ophuysenii* (present in *L. vitta*). The Korean name proposed for *L. ophuysenii* is “Jeom-jul-tung-dom.”

Keywords: *Lutjanus ophuysenii*, Lutjanidae, Korean fauna, New record

Background

The family Lutjanidae in the order Perciformes comprises 17 genera and 185 species worldwide (Nelson 2006), of these, 51 species representing 11 genera occur in Japan (Nakabo 2013) and 14 species representing 6 genera occur in Korea (Kim et al. 2015, 2011, 2007, 2005). Members of the family occur in tropical and subtropical regions of the Pacific, Indian, and Atlantic oceans. And they inhabit the shallow waters around coral reefs to depths of ca. 550 m. The genus *Lutjanus* occur in the Yellow Sea, the southern East Sea, and the Pacific and Indian oceans. Chyung (1977) and Kim et al. (2005) made morphological description of four species of the genus *Lutjanus* in Korea: *Lutjanus rivulatus* (Cuvier 1828), *Lutjanus vitta* (Quoy and Gaimard 1824), *Lutjanus monostigma* (Cuvier 1828), and *Lutjanus russelli* (Bleeker 1849). Recently, Kim et al. (2007) and Kim et al. (2012) reported the occurrence of five species previously unrecorded in Korea: *Lutjanus argentimaculatus* (Forsskål 1775), *Lutjanus fulviflamma* (Forsskål 1775), *Lutjanus quinquelineatus* (Bloch 1790), *Lutjanus malabaricus* (Schneider 1801), and *Lutjanus stellatus* (Akazaki 1983).

Three specimens representing the genus *Lutjanus* were collected in a gill net from Korea between August

2015 and July 2016. On the basis of morphological and molecular characteristics, the specimens were identified as *Lutjanus ophuysenii*, which has not been reported in Korea. *L. ophuysenii* is morphologically similar to *L. vitta*, and this has led to taxonomic confusion. The morphological and molecular characteristics conform that the three specimens are *L. ophuysenii*, and we propose a Korean name “Jeom-jul-tung-dom” for the species in the Korean fish fauna.

Methods

Three specimens collected in Korea between August 2015 and July 2016 were identified as *L. ophuysenii* (Fig. 1). The specimens were fixed in 10% formalin and then in 70% ethanol. Methods for making counts and measurements followed Allen and Talbot (1985) and Hubbs and Lagler (2004), with measurements performed to the nearest 0.1 mm by a Vernier caliper. Vertebrae were counted from radiographs (Softex HA-100, Japan). The specimens were stored at Pukyong National University (PKU 13174 and PKU 58149) and Marine Biodiversity of Korea (MABIK PI-00045859).

Genomic DNA was extracted from muscle tissue using Chelex 100 resin (Bio-Rad, Hercules, CA, USA). The polymerase chain reaction (PCR) was made by the universal primer VF2 (5-TCAACCAACCACAAAGACA TTGGCAC-3) and FishR2 (5-ACTTCAGGGTGACCGA

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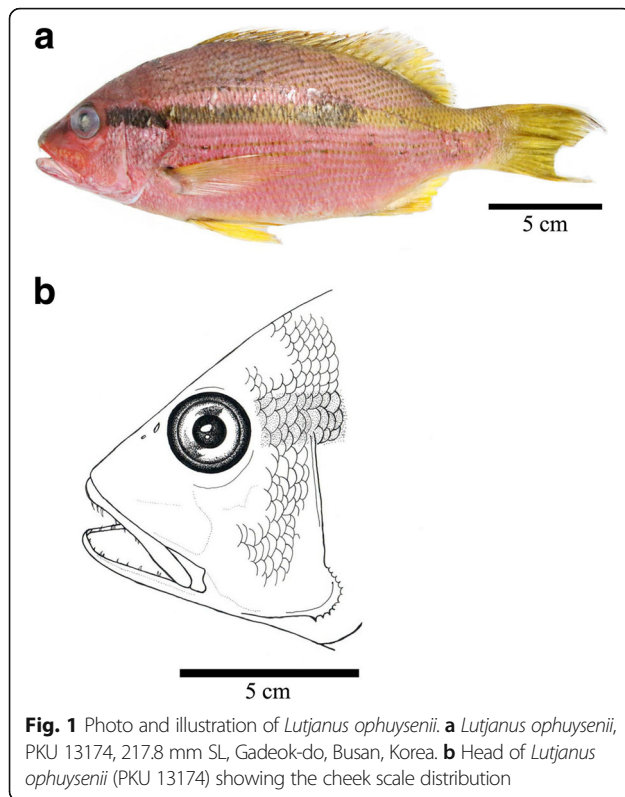


Fig. 1 Photo and illustration of *Lutjanus ophuysenii*. **a** *Lutjanus ophuysenii*, PKU 13174, 217.8 mm SL, Gadeok-do, Busan, Korea. **b** Head of *Lutjanus ophuysenii* (PKU 13174) showing the cheek scale distribution

AGAATCAGAA-3) to amplify the mitochondrial DNA cytochrome c oxidase subunit I (COI) (Ivanova et al. 2007; Ward et al. 2005). The condition of PCR, purification of PCR products, and sequencing were followed by the method of Ji et al. (2016). The sequences were aligned using ClustalW (Thompson et al. 1994) in BioEdit version 7 (Hall 1999). Comparisons were conducted using the sequences of six species of the genus *Lutjanus* in the National Center for Biological Information database: *L. vitta* (KP194726, KC970486, JN208424), *L. ophuysenii* (LC085448), *L. monostigma* (JQ350098, JQ350096, JQ350095), *L. fulviflamma* (KP194911, KP194573, KP194190), *L. quinquelineatus* (KP009621, KF714960, KF009620), and *L. argentimaculatus* (KP194776, KF714960, KF714959). Genetic distances were calculated by the Kimura-2-parameter model (Kimura 1980) in MEGA 5 (Tamura et al. 2011).

Results and discussion

Lutjanus ophuysenii (Bleeker 1860)

(Korean name: *Jeom-jul-tung-dom*) (Fig. 1)

Mesoprion ophuysenii: Bleeker, 1860: 74 (type locality: Benkulen, Sumatra, Indonesia; Nagasaki, Japan)

L. ophuysenii: Iwatsuki et al. 1993: 48 (Japan); Lee and Cheng 1996: 340 (Taiwan); Sadovy and Cornish 2000: 121 (Hong Kong); Shimizu 2001: 30 (Japan); Nakabo and Shimada 2013: 918 (Japan)

Material examined

PKU 13174, 1 specimen, 217.8 mm SL, Gadeok-do, Busan, Korea, 3 August 2015, collected by Jin-Koo Kim and Woojun Lee; PKU 58149, 1 specimen, 218.5 mm SL, Pohang, Gyeongsangbuk-do, Korea, 19 July 2016, collected by Seoknam Kwak; MABIK PI-00045859 (formerly PKU 55757), 1 specimen, 226.7 mm SL, Gadeok-do, Busan, Korea, 7 September 2015, collected by Jin-Koo Kim and Woojun Lee.

Description

Dorsal fin rays X, 13; anal fin rays III, 8; pectoral fin rays 15–16; lateral line scales 47–48; horizontal scale rows above and below lateral line scales 8 and 15–17, respectively; scale rows on cheek 6; total gill rakers on first gill arch 7 + 13–14; body depth 2.76–2.9; head length 2.67–2.95, both in SL; snout length 2.81–3.07; eye diameter 4.5–4.72; interorbital distance 3.47–3.74; maxillary length 2.22–2.4; preorbital depth 3.69–3.95, all in head length (Table 1).

Body slightly oval; head and tail moderately compressed; line connecting mouth and dorsal fin origin gradual; eyes large (21.1–21.9% of head length) and rounded, located above posterior margin of upper jaw; upper jaw similar in length to lower jaw; mouth pointed; single row of conical and curved teeth in each jaw; upper teeth larger than lower teeth; vomerine teeth arrow-shaped; two pairs of nostrils, located in front of the eye; anterior nostril slightly long and oval; posterior nostril round; notch on posterior margin of preopercle shallow; small spine on posterior end of preopercle; preopercle covered with scales, except for posterior end; body covered with ctenoid scales; base of dorsal and anal soft ray, pectoral, and caudal fin covered with scales; caudal fin slightly emarginated.

Coloration

When fresh, generally light reddish; all fins yellowish; a number of oblique brown stripes above lateral line; anterior margin of stripe parallel with lateral line; longitudinal band extending from the eye to caudal peduncle; posterior margin of longitudinal band faint; black spot on middle part of longitudinal band; a number of straight lines below longitudinal band.

Generally yellowish (including all fins) following fixation in formalin; brown oblique stripe above lateral line; longitudinal band on center of body; black spot on middle part of longitudinal band; a number of straight lines below longitudinal band; ventral margin of straight line not clear.

Distribution

Korea Strait, southern Korea (the present study); southern Japan (Iwatsuki et al. 1993); western part of Taiwan (Lee

Table 1 Comparison of morphological characters of *Lutjanus ophuysenii*

Morphological characters	<i>Lutjanus ophuysenii</i>				
	Present study	Bleeker (1860)	Iwatsuki et al. (1993)	Lee and Cheng (1996)	Shimada (2013)
Number of specimens	3	–	42	25	–
Standard length (mm)	217.8–226.7	–	56.5–337.5	182–256	–
Counts					
Dorsal fin rays	X, 13	X, 13	X, 12–13	X, 12–13	X, 12–13
Anal fin rays	III, 8	III, 8	III, 8	III, 8	III, 8
Pectoral rays	15–16	16	16–17	–	16–17
Lateral line scales	47–48	–	46–49	47–49	46–49
Gill rakers	7 + 13–14	–	6–7 + 13–16	7–8 + 7–13	–
Vertebrae	23	–	–	–	–
Standard length					
Body depth	2.76–2.95	–	2.12–3.17	–	–
Head length	2.67–2.81	–	2.15–3.31	–	–
Head length					
Eye diameter	4.5–5.11	–	3.38–5.74	–	–
Snout length	2.89–3.07	–	2.78–3.70	–	–
Interorbital width	3.48–3.74	–	3.57–5.72	–	–
Maxillary length	2.22–2.4	–	2.07–2.82	–	–
Preorbital depth	3.69–3.95	–	4.3–7.5	4.61–7.52	–

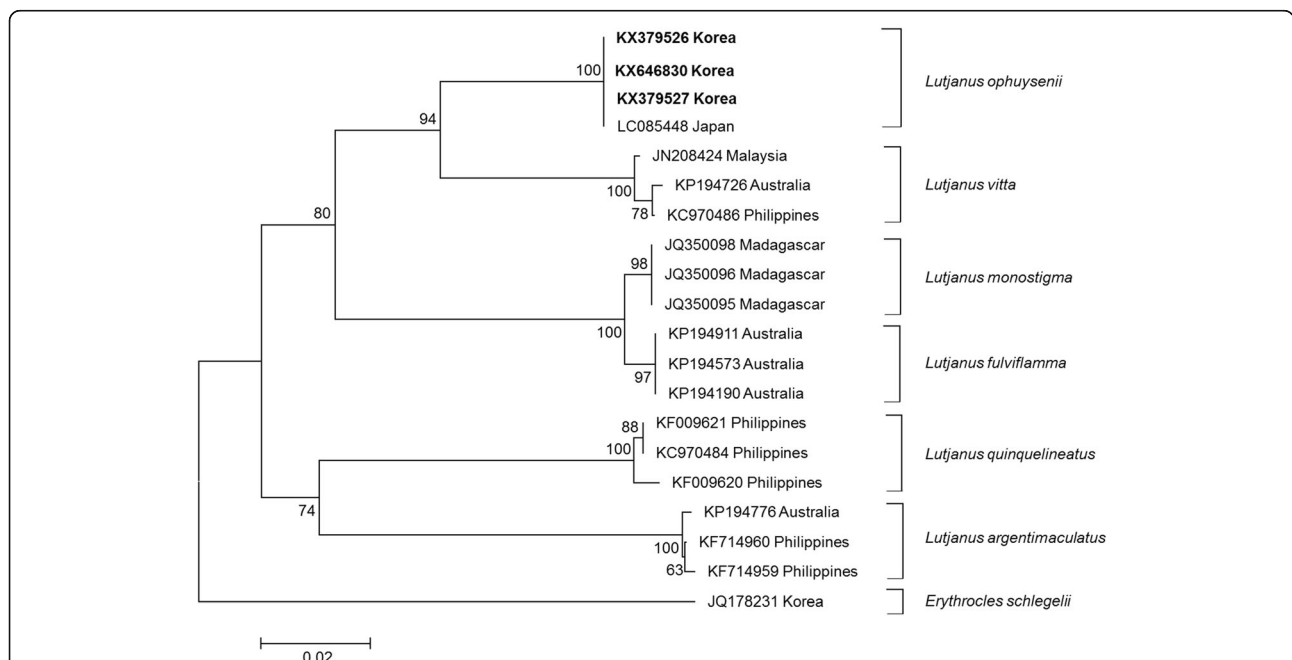


Fig. 2 Neighbor joining tree showing the relationships among six species of the genus *Lutjanus* including *Lutjanus ophuysenii* (three Korean specimens and one Japanese specimen). *Erythrocles schlegelii* was included as an outgroup. Numbers at branches indicate bootstrap probabilities based on 10,000 bootstrap replications. The bar indicates a genetic distance of 0.02

Table 2 Comparison of morphological characters between *Lutjanus ophuysenii* and *Lutjanus vitta*

Morphological characters	<i>L. ophuysenii</i>		<i>L. vitta</i>	
	Present study		Chyung (1977)	Iwatsuki et al. (1993)
Voucher number	PKU 13174	PKU 55759		
Standard length (mm)	217.8	226.7		70.0–230.0
Counts				
Dorsal fin rays	X, 13	X, 13	X, 13	X, 12–13
Anal fin rays	III, 8	III, 8	III, 7–8	III, 8
Pectoral fin rays	16	15	16–17	16–17
Lateral line scales	47	48	49–53	49–52
Gill rakers	7 + 13	7 + 14	17–22	6–8 + 10–15
Vertebrae	23	23	–	–

and Cheng 1996); Hong Kong (Sadovy and Cornish 2000); South China Sea (Wang et al. 2010).

Remarks

Three specimens collected from Busan, Korea, were identified as *L. ophuysenii*, on the basis of the following characteristics: dorsal fin rays X, 13; anal fin rays III, 8; vomerine teeth arrow-shaped; and black spot on the middle part of longitudinal stripe (Table 1). Most measurements and morphological characteristics were consistent with the original description (Bleeker 1860) and other studies (Shimada 2013; Lee and Cheng 1996; Iwatsuki et al. 1993), but different slightly from that of Iwatsuki et al. (1993) with respect to eye diameter and from those of Iwatsuki et al. (1993) and Lee and Cheng (1996) with respect to the preorbital depth. These morphometric differences seem to represent intraspecific variation from the viewpoint of their genetic correspondence (Fig. 2).

Because *L. ophuysenii* is very similar to *L. vitta*, Allen and Talbot (1985) considered that they were the same species. However, Iwatsuki et al. (1993) proposed taxonomic characteristics that can distinguish the two species. Our specimens were distinguished from *L. vitta* by the number of lateral line scales (46–49 in *L. ophuysenii*, 49–52 in *L. vitta*), the occurrence of a black spot at the middle part of the longitudinal stripe (present in *L. ophuysenii*, absent in *L. vitta*), and the occurrence of a scale at the posterior end of the preopercle (absent in *L. ophuysenii*, present in *L. vitta*) (Table 2). In addition, the two species have different distribution ranges (southern East Sea, East China Sea, and Yellow Sea for *L. ophuysenii*, but southern Ryukyu Island, Taiwan, and the Indo-West Pacific for *L. vitta*) (Iwatsuki et al. 1993). *L. vitta* was first reported in Korea by Chyung (1977), being inconsistent with the distribution of *L. vitta* already mentioned by Iwatsuki et al. (1993). The illustrations and descriptions of Chyung's (1977) *L. vitta*, such as the absence of a spot on the longitudinal stripe and the number of lateral line scales (49–53), confirm that the species reported by

Chyung (1977) is *L. vitta*. However, detailed distribution range of this species will be required for the further research.

To identify the two specimens genetically in detail, we analyzed 479 base pairs of the mitochondrial DNA COI gene. The DNA sequences corresponded to those of *L. ophuysenii* from Japan (LC085448) and considerably differed from those of *L. vitta* ($d = 0.066–0.071$). Thus, the three specimens in the present study were identified as *L. ophuysenii* using both morphological and molecular methods (Fig. 2). We propose the Korean name “*Jeom-jul-tung-dom*” for *L. ophuysenii* in having a distinct black spot at the middle part of the longitudinal stripe.

Conclusion

Three specimens of the genus *Lutjanus* collected from Korea between August 2015 and July 2016 were identified as *L. ophuysenii* in having 46–49 lateral line scales, a distinct black spot at the middle part of the longitudinal stripe, and a scale at the posterior end of the preopercle. An analysis of 479 base pairs of the mitochondrial DNA COI gene showed that sequences corresponded to those of *L. ophuysenii* from Japan.

Abbreviations

COI: Cytochrome c oxidase subunit 1; d : Genetic distance; PCR: Polymerase chain reaction

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Availability of data and materials

All datasets analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

HNK performed the experiments and wrote the manuscript. JKK suggested all the aspects of the study design and commented on the earlier drafts of the manuscript. Both authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Not applicable.

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