

First Record of the Escolar *Lepidocybium flavobrunneum* (Perciformes: Gempylidae) from Jeju Island, Korea

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ABSTRACT A single specimen of *Lepidocybium flavobrunneum* (910.0 mm standard length) in the family Gempylidae, was collected off northwestern Jeju Island, Korea on April 28, 2016. The species is characterized by a blackish body, very low first dorsal fin spines, second dorsal fin rays followed by six finlets, anal fins followed by five finlets, caudal peduncle with a large keel flanked by two small supplementary keels, and a lateral line with an irregular wave pattern. Here, we propose the new Korean names “Heuk-gal-chi-ggo-chi-sok” for the genus *Lepidocybium* and “Heuk-gal-chi-ggo-chi” for the species *L. flavobrunneum*.

Key words: *Lepidocybium flavobrunneum*, Escolar, Gempylidae, Jeju Island, Korea

INTRODUCTION

The Gempylidae comprises 24 species belonging to six genera worldwide (Nelson *et al.*, 2016; Froese and Pauly, 2019), and three species from three genera have been recognized in Korea to date [*Rexea prometheoides* (Bleeker, 1856); *Thyrstitoides marleyi* (Fowler, 1929); and *Gempylus serpens* Cuvier, 1829] (Myoung *et al.*, 2013). They have slightly compressed fusiform bodies, exposed maxilla, strong teeth, very small or no pelvic fins (Smith, 1997) and are distributed in tropical and subtropical waters worldwide (Nakamura and Parin, 1993). The gempylid genus *Lepidocybium* Gill, 1862 includes a single species, *Lepidocybium flavobrunneum* (Smith, 1843) (Froese and Pauly, 2019). It has a lateral line with an irregular wave pattern and a caudal peduncle with a large keel flanked by two small supplementary keels (Gill, 1862; Nakamura and Parin, 2001). In this study, a single specimen of *L. flavobrunneum* was collected off the northwestern coast of Jeju Island on April 28, 2016. Here, we describe its morphology in detail as the first record from Korea.

MATERIALS AND METHODS

We caught a single specimen [910.0 mm standard length (SL)] of *L. flavobrunneum* using a longline off the northwestern coast of Jeju Island, Korea on April 28, 2016 (Fig. 1). We then performed morphological analyses that includ-

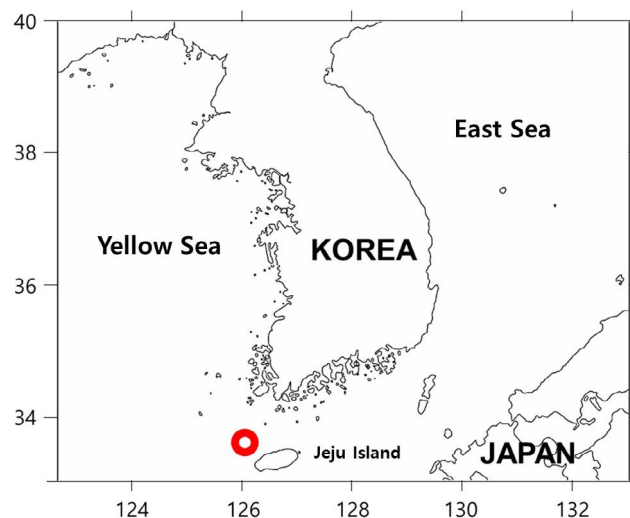


Fig. 1. Sampling location of *Lepidocybium flavobrunneum*, 910.0 mm SL, Jeju Island, Korea.

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ed five counts and 24 measurements. Counting, measuring, and identification procedures followed those in Nakamura and Parin (2001) and Nakabo and Doiuchi (2013). Each body part was measured to the nearest 0.1 mm using digital Vernier calipers. The data were converted to percentages of total and standard lengths. The specimen was deposited in the Marine Fish Resource Bank of Korea at Pukyong National University (PKU), Busan, Korea.

RESULTS AND DISCUSSION

Genus *Lepidocybium* Gill, 1862

(New Korean name: Heuk-gal-chi-ggo-chi-sok)

Lepidocybium Gill, 1862: 125 (type species: *Cybium flavobrunneum* Smith, 1843).

Body slightly compressed, fusiform; both jaws with strong fang-like teeth, much larger teeth in lower jaw; first dorsal fin with short spine, second dorsal and anal fins followed by four to five finlets; lateral line with irregular wave pattern, caudal peduncle with large keel flanked by two small supplementary keels (Gill, 1862; Nakamura and Parin, 2001).

Lepidocybium flavobrunneum (Smith, 1843)

(New Korean name: Heuk-gal-chi-ggo-chi)

(Figs. 2, 3; Table 1)

Table 1. Comparison of counts and measurements of *Lepidocybium flavobrunneum*

Morphological characters	Present study	Smith (1843)	Paulin and Habib (1980)	Quigley and Flannery (2005)	Nashad <i>et al.</i> (2018)
Sampling region	Korea	South Africa	New Zealand	Irish water	India
No. of specimens	1	1	2	1	1
Total length (TL, mm)	1065.0	609.6	–	1450.0	485
Standard length (SL, mm)	910.0	–	745~900.0	1240.0	408
Counts					
First dorsal fin rays	XIII	–	IX	XIII	IX
Second dorsal fin rays	17+6	?+5	17~18+5	18+6	18+6
Pectoral fin rays	16	–	16~17	16	16
Pelvic fin rays	I, 5	–	I, 5	I, 5	I, 5
Anal fin rays	II, 13+5	?+4	II, 13~14+4	II, 14+5	II, 14+4
Measurements (In % of TL/SL*)					
Head length	24.9/29.1*	–	26.8~27.4*	–	26.0/30.9*
Pre-first dorsal distance	27.2/31.9*	27.1	30.0~30.7*	–	26.4/31.4*
Base of first dorsal	16.4/19.2*	–	–	–	–
Pre-second dorsal distance	49.3/57.7*	46.5	–	–	46.4/55.1*
Base of second dorsal	16.0/18.7*	–	–	–	15.5/18.4*
Snout to pectoral	25.8/30.2*	–	28.4~28.5*	–	–
Snout to anal	60.6/70.9*	56.3	67.1~68.9*	–	60.0/71.3*
Pelvic origin to anal	33.8/39.6*	–	–	–	–
Base of anal	11.3/13.2*	–	–	–	10.3/12.3*
Length of pectoral fin	12.4/14.5*	–	–	–	12.8/15.2*
Length of anal	9.6/11.2*	–	–	–	–
Height of body	21.6/25.3*	16.7	23.2~24.6*	–	19.8/23.5*
Width of body	14.1/16.5*	–	–	–	–
Snout	10.1/11.9*	9.4	10.6~10.8*	–	9.3/11.0*
Eye	3.8/4.4*	–	4.4~4.9*	–	5.4/6.4*
Interorbital distance	7.7/9.0*	–	7.7~8.3*	–	8.0/9.6*
Suborbital length	1.4/1.6*	–	–	–	–
Postorbital length	11.3/13.2*	–	–	–	–
Upper jaw length	10.8/12.6*	–	11.4~11.8*	–	9.1/10.8*
Height of head at occiput	16.4/19.2*	–	–	–	–
Width of head	9.9/11.5*	–	–	–	–

Asterisk (*) indicates the body proportion of standard length (SL).

Cybium flavobrunneum Smith, 1843: no pagination (type locality: Cape of Good Hope, South Africa, southeastern Atlantic).

Lepidocybium flavobrunneum: Paulin and Habib, 1980: 405 (New Zealand); Azevedo and Heemstra, 1995: 3 (Azores); Quigley and Flannery, 2005: 128 (Ireland); Nakabo and Doiuchi, 2013: 1640 (Japan); Nashad *et al.*, 2018: 1409 (India).

Material examined. PKU 62091, 910.0 mm SL, caught by a longline, off northwestern coast of Jeju Island (33°33' 35.8"N 125°57'22.7"E), 28 April, 2016, collected by W.J. Lee.

Description. Counts and measurements are shown in Table 1. Body slightly compressed and fusiform, body depth high; head and eyes large; snout relatively small (Fig. 2A); two pairs of nostril openings, anterior nostril small and ovoid, and posterior nostril slender and elongated, anterior nostril smaller than posterior. Mouth large and terminal, upper jaw extends toward anterior margin of eye; posterior of maxilla rounded, its tip curved downward (Fig. 2B); lower jaw protrudes slightly compared with upper jaw; both jaws with strong canine teeth in a single row, much larger lower jaw, tip forward to oral cavity (Fig. 2C); vomer and palatines with a single row of strong canine teeth (Fig. 2D). Operculum large, margins rounded, without

spines; gill rakers rudimentary, very short and rounded (Fig. 2E), upper part covered with small spines. First dorsal fin very low, well-separated from second dorsal fin, its origin located in the upper middle of pectoral fin; pelvic fins relatively short, their origin slightly behind origin of pectoral fin; caudal fin deeply forked. Caudal peduncle with prominent large keel flanked by two small supplementary keels, lateral line with irregular wave pattern (Fig. 3); body and head covered with small cycloid scales, but scales absent on snout, upper jaw, and mandible.

Coloration. Body uniformly blackish when fresh (Fig. 2A) and a light blackish color after fixation.

Distribution. Jeju Island, Korea (present study) and known from tropical and temperal waters worldwide, except for the northern coast of the Indian Ocean (Scott and Scott, 1988; Parin, 1990; Nakamura and Parin, 1993).

Remarks. The specimen collected in this study belongs to the genus *Lepidocybium* as both jaws contain strong fang-like teeth, with much larger teeth in the lower jaw (Gill, 1862). Additionally, the specimen matches the original description of *L. flavobrunneum* (Smith, 1843) well; notably, it has a caudal peduncle with a prominent large keel that is flanked by two small supplementary keels, a lateral line with an irregular wave pattern, and blackish body color. Most of the morphological characters are consistent with previous descriptions of *L. flavobrunneum* (Paulin

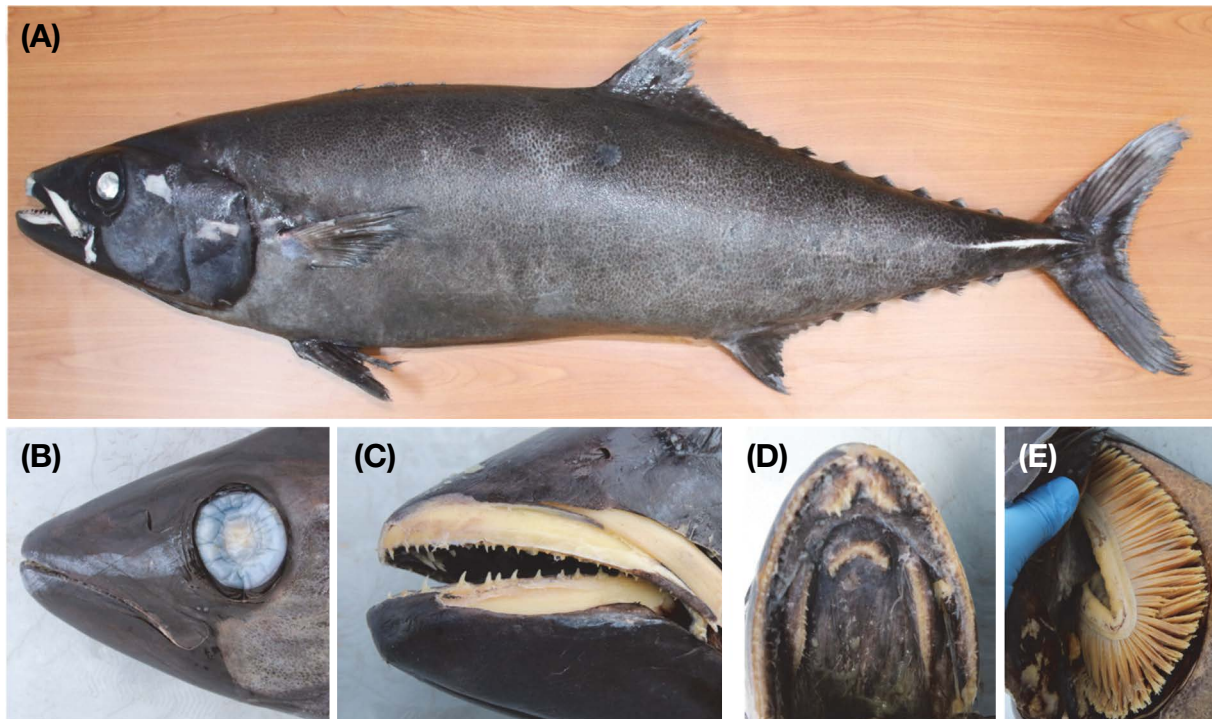


Fig. 2. *Lepidocybium flavobrunneum* (Smith, 1843), PKU 62091, 910 mm SL, Jeju Island, Korea. (A) Overall view of body; (B) Head shape; (C) Jaws and teeth; (D) Oral cavities; (E) Gill rakers.

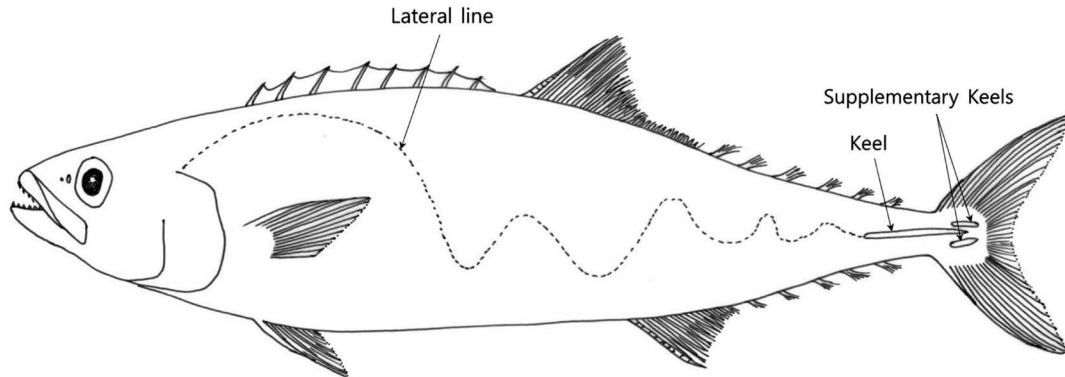


Fig. 3. Illustration of *Lepidocybium flavobrunneum* (PKU 62091, 910 mm SL) showing the irregular wave pattern of lateral line.

and Habib, 1980; Quigley and Flannery, 2005; Nashad *et al.*, 2018; Table 1). As body size increases, the proportions of some body parts tend to increase (snout, upper jaw, pre-second dorsal fin, and anal fin base length) or decrease (interorbital, head, and pectoral fin length). However, when meristic characters are compared, Irish specimens and the specimen in this study have an anal fin followed by five finlets, whereas South African, New Zealand, and Indian specimens each have four finlets (Table 1). There are also some measurement differences; *i.e.*, our specimen has a longer preanal length [60.6% of total length (TL)] and a lower body depth (21.6% of TL) compared to the South African specimen (56.3% and 16.7% of TL, respectively) (Table 1). The Indian specimen has bigger eyes (6.4% of SL) compared to the other specimens (less than 5.0% of SL), and some body parts of the New Zealand specimens - the interorbital, head, pre-pectoral, and preanal lengths - are smaller than in other specimens (Table 1). The Atlantic and Indo-Pacific populations of *L. flavobrunneum* differ anatomically (e.g., the location of the first dorsal pterygiophore) and genetically (4.85% in mtDNA control region) (Collette *et al.*, 1984; Brendtro *et al.*, 2008). Further studies of the geographic variation in the species are required, using more specimens as well as anatomical and molecular data. This species is readily distinguished from the escolar species *G. serpens*, *R. prometheoides*, and *T. marleyi* in having three caudal peduncle keels (*vs.* no caudal peduncle keel), and a lateral line with an irregular wave pattern (*vs.* curved, straight, or separated lines) (Myoung *et al.*, 2013). We propose the new Korean names 'Heuk-gal-chi-ggo-chi-sok' for the genus *Lepidocybium* and 'Heuk-gal-chi-ggo-chi' for *L. flavobrunneum* because it has uniformly blackish body color, following guidelines of the National Fisheries Research and Development Institute (2010).

ACKNOWLEDGEMENTS

This research was supported by the Marine Biotechnology Program of the Korea Institute of Marine Science and Technology Promotion (KIMST) funded by the Ministry of Oceans and Fisheries (MOF) (No. 20170431).

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한국 제주도 근해에서 채집된 갈치꼬치과(Gempylidae) 어류 1 미기록종, *Lepidocybium flavobrunneum*

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요 약 : 농어목(Perciformes) 갈치꼬치과(Gempylidae)에 속하는 *Lepidocybium flavobrunneum* 1개체 (체장 910 mm)가 2016년 4월 28일 한국 제주도 해역에서 처음 채집되었다. 본 종은 등지느러미 극조가 매우 짧으며 등지느러미와 뒷지느러미 뒤쪽에 각각 6개와 5개의 토막지느러미를 가진다. 또한 꼬리자루에 강한 측융기선 1개와 그 뒤쪽에 2개의 작은 돌기가 있고, 체측에는 불규칙한 파상무늬의 측선이 구불구불하게 뻗어 있다. 이 종의 새로운 속명과 국명으로 '흑갈치꼬치속' 및 '흑갈치꼬치'를 제안한다.

찾아보기 낱말 : *Lepidocybium flavobrunneum*, 흑갈치꼬치, 흑갈치꼬치과, 제주도, 한국