



New record of *Engyprosopon macrolepis* (Regan, 1908) from Taiwan (Pleuronectiformes: Bothidae)

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Abstract

Specimens of the largescale dwarf flounder, *Engyprosopon macrolepis* (Regan, 1908) (Pleuronectiformes: Bothidae), were collected from the fishery landing of Chi-kan, Peng-hu Islands, western Taiwan. Although this species has been recorded from western Pacific Ocean including the Philippines and Japan, it has never been recorded from Taiwanese waters. Therefore, our specimens represent the first record for Taiwanese waters and fill a gap in the distribution of this species between the two countries. A detailed description of the specimens, including coloration of the fresh condition is provided and compared to the data of specimens collected in other regions. With the addition of *E. macrolepis*, a total of 11 species of *Engyprosopon* are recorded from Taiwanese waters, and we suggest that more species are expected to occur off Taiwan.

Key words: Actinopterygii, biogeography, ichthyology, taxonomy, left-eye flounder

Introduction

The circumglobal left-eye flatfish family Bothidae, currently comprises 20 genera and 169 species (Fricke *et al.* 2024), with new species continuously being described (Amaoka & Ho 2019, 2022). Species of Bothidae are characterized by having eyes usually sinistral, pelvic-fin bases asymmetric, the origin of the ocular-side pelvic fin anterior to that of the blind side, without fin spines, both dorsal and anal fins not confluent with caudal fin, and caudal-fin rays usually 17 (Amaoka 1969; Hensley & Amaoka 2001; Amaoka & Ho 2019). The taxonomy of Bothidae in Taiwanese waters is well studied. Recently, Amaoka & Ho (2018) first reviewed members of the genus *Engyprosopon* Günther, 1862 from Taiwanese waters, and recognized nine species including two new species and four new records in it. Subsequently, Amaoka & Ho (2019) reviewed the family Bothidae and recognized 42 species within 15 genera from Taiwanese waters. Moreover, they revised the literature records in Taiwan and provided descriptions, distributions for each species, and a key to all genera and species known from Taiwanese waters. After that, Amaoka & Ho (2022) described a new species, *Engyprosopon keliaoense*, making the total number of bothid species to 43 in Taiwan.

The genus *Engyprosopon* is characterized by having the tip of isthmus below the middle of the lower eye, usually with a concave interorbital space being wider in males than in females, ocular-side scales large and with short and feeble ctenii, caudal skeleton with deep clefts and the blind side of the body stained with dark pigments in male (Amaoka *et al.* 1993; Amaoka & Ho 2018). Among the species, *Engyprosopon macrolepis* (Regan, 1908) was originally described from the Cargados Carajos Shoals, western Indian Ocean. This species was poorly known until Hensley & Randall (1990) provided a redescription based on specimens collected from the Comoro Islands, Red Sea, and the Philippines. Recently, Katayama *et al.* (2012) reported specimens from Kochi, Japan, representing the northernmost record of this species.

During a survey of bycatch fishes collected in the fishery for silver-stripe round herrings (*Spratelloides gracilis* (Temminck & Schlegel, 1846)) from 2021 to 2023 (HCH unpubl. data), four specimens of *Engyprosopon*, were collected from Chi-kan, Peng-hu Islands. They are identified as *E. macrolepis* by having orange spots on the blind side of the cheek and several unique characteristics. Although this species has been recorded elsewhere in western Pacific Ocean, it has never been recorded from Taiwan. Therefore, the specimens fill the distribution gap of this species in western Pacific Ocean. A detailed description of the specimens is provided.

Materials and Methods

Specimens were fixed in 4% formaldehyde and subsequently transferred to 70% ethanol for preservation. Specimens examined in this study are deposited in the Pisces Collection of the National Museum of Marine Biology and Aquarium, Pingtung, Taiwan (NMMB-P).

Counts and measurements follow Hubbs & Lagler (1974) and Amaoka *et al.* (1993). Numbers of caudal-fin rays are presented as upper unbranched rays + middle branched rays + lower unbranched rays. The numbers of gill rakers were taken from the outer face of the first gill arch on the ocular side, with the raker at the angle included in the lower-raker count. Numbers of lateral-line scales are presented as: scales before caudal-fin base + scales on caudal-fin base. Scale pockets were counted when scales were detached due to bottom-trawl operations. Vertebral formulae and axial skeletons were determined using X-radiographs taken by a digital X-ray machine set up in the National Museum of Marine Biology and Aquarium. Measurements were taken using digital calipers rounding to the nearest 0.1 mm. Measurement data were expressed as ratios or percentages of standard length (SL) and head length (HL), except where otherwise indicated. The distribution map was obtained from Ocean Data View (Schlitzer, 2023). Data of other specimens were retrieved from Hensley & Randall (1990), Amaoka *et al.* (1993), Katayama *et al.* (2012), and Amaoka (2016).

Results

Family Bothidae

Engyprosopon macrolepis (Regan, 1908)

English name: Largescale dwarf flounder

Chinese name: 大鱗短鰓鯧

Figs 1–3. Tables. 1 & 2

Scaeops macrolepis Regan, 1908:233 (original description; type locality: Cargados Carajos Shoals, Indian Ocean, depth 20–30 fathoms [36.6–54.9 m]).

Engyprosopon macrolepis: Norman 1934:214 (new combination). Norman 1939:100 (Gulf of Aden). Fowler 1956:168 (Red Sea). Hensley in Smith & Heemstra 1986: 858. Hensley & Randall 1990:674 (redescription). Amaoka *et al.* 1993:398 (New Caledonia). Hensley & Amaoka 2001:3831 (Western Central Pacific). Amaoka in Randall & Lim 2000:645 (South China Sea). Randall 2005:615 (South Pacific Ocean). Katayama *et al.* 2012:173 (new record from Japan). Yoshigou & Yoshino 2015:5 (Ryukyu Islands). Amaoka 2016:99 (Japan). Hensley & Amaoka 2022:337 (Western Indian Ocean).

Specimens examined. NMMB-P 39332, 2 specimens, 1 male, 45.0 mm SL, and 1 female, 39.3 mm SL, 14 Jun. 2023. NMMB-P 40031, 1 male, 55.4 mm SL, 13 Jul. 2021. NMMB-P 40032, 1 male, 53.1 mm SL, Jul. 2021. All collected from Chi-kan, Peng-hu Islands, western Taiwan, ca. 23°39'58.2"N 119°36'25.9"E, coll. H.-C. Ho.

Description of Taiwanese specimens. Meristic and morphometric data are provided in Tables 1 & 2. Dorsal-fin rays 75–79. Anal-fin rays 55–60. Caudal-fin rays 3+11+3. Ocular-side pectoral-fin rays 11–12; blind-side pectoral-fin rays 9. Ocular-side pelvic-fin rays 6; blind-side pelvic-fin rays 6. Gill rakers 0+6–8=6–8. Lateral-line scales 40–48, not including 1–2 scales on caudal fin. Vertebrae 10+24=34 (n=2).

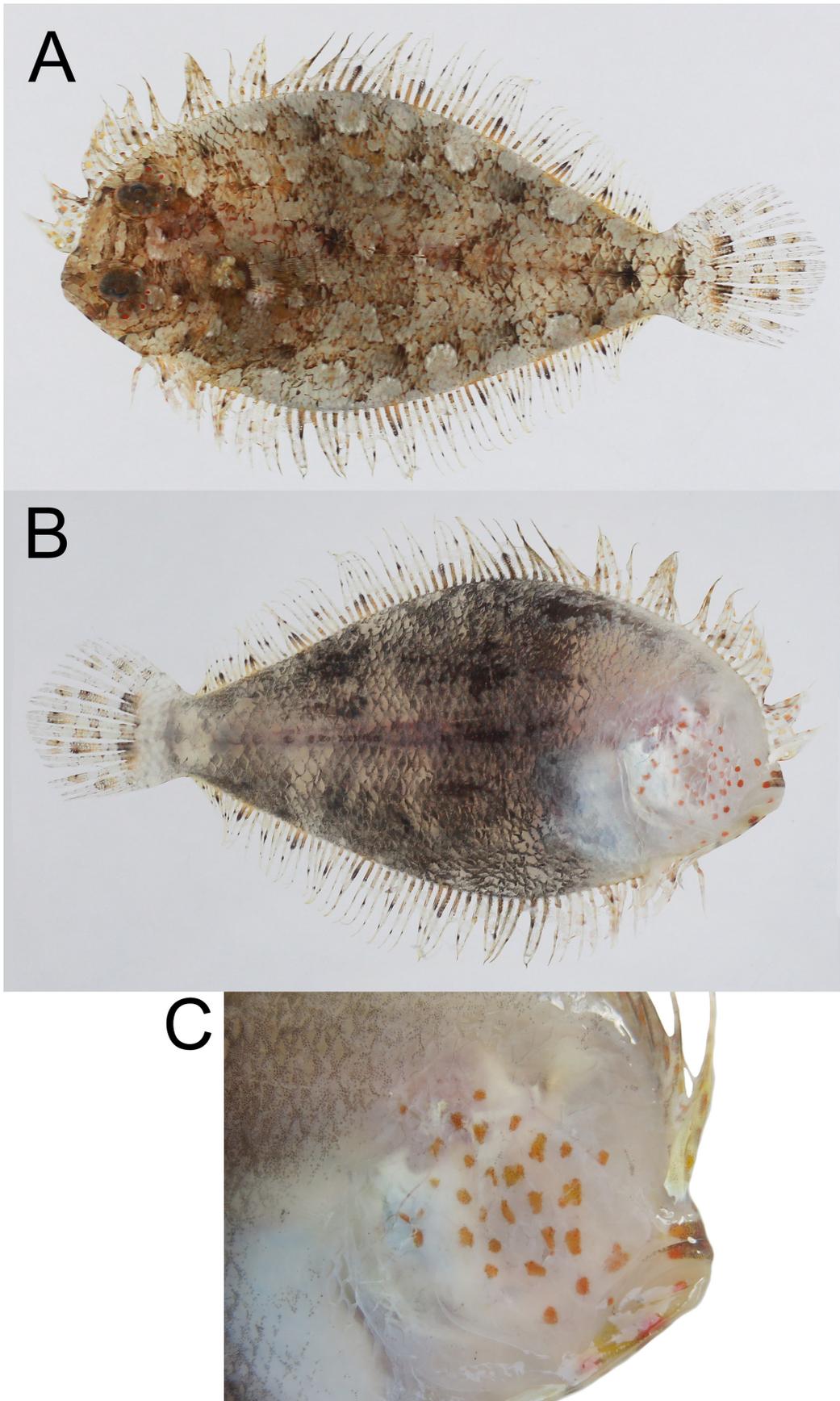


FIGURE 1. Fresh specimen of *Engyprosopon macrolepis* (Regan, 1908). **A.** Ocular side. **B.** Blind side. **C.** Close-up image of cheek region on blind side. **A, B.** NMMB-P 39332, male, 45.0 mm SL. **C.** NMMB-P 40031, 55.4 mm SL.

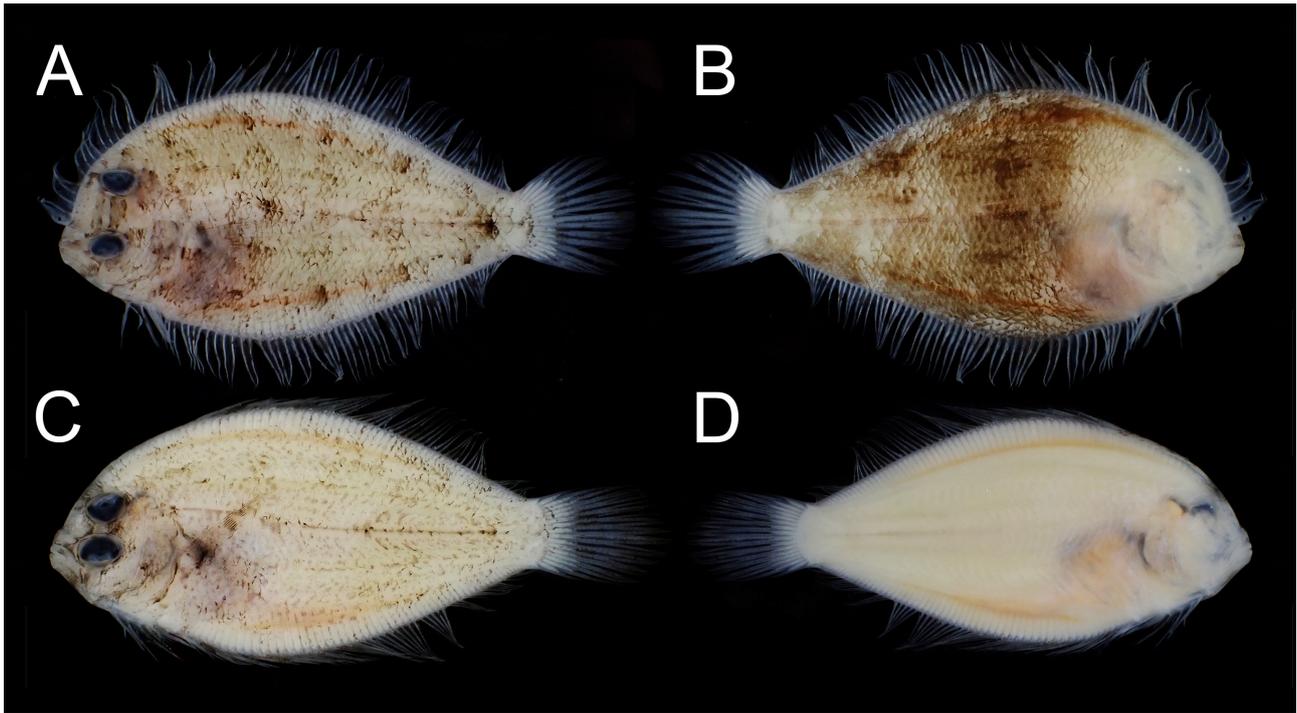


FIGURE 2. Preserved specimens of *Engyprosopon macrolepis* (Regan, 1908), NMMB-P 39332, showing ocular (A, C) and blind sides (B, D). A, B. Male, 45.0 mm SL. C, D. Female, 39.3 mm SL.

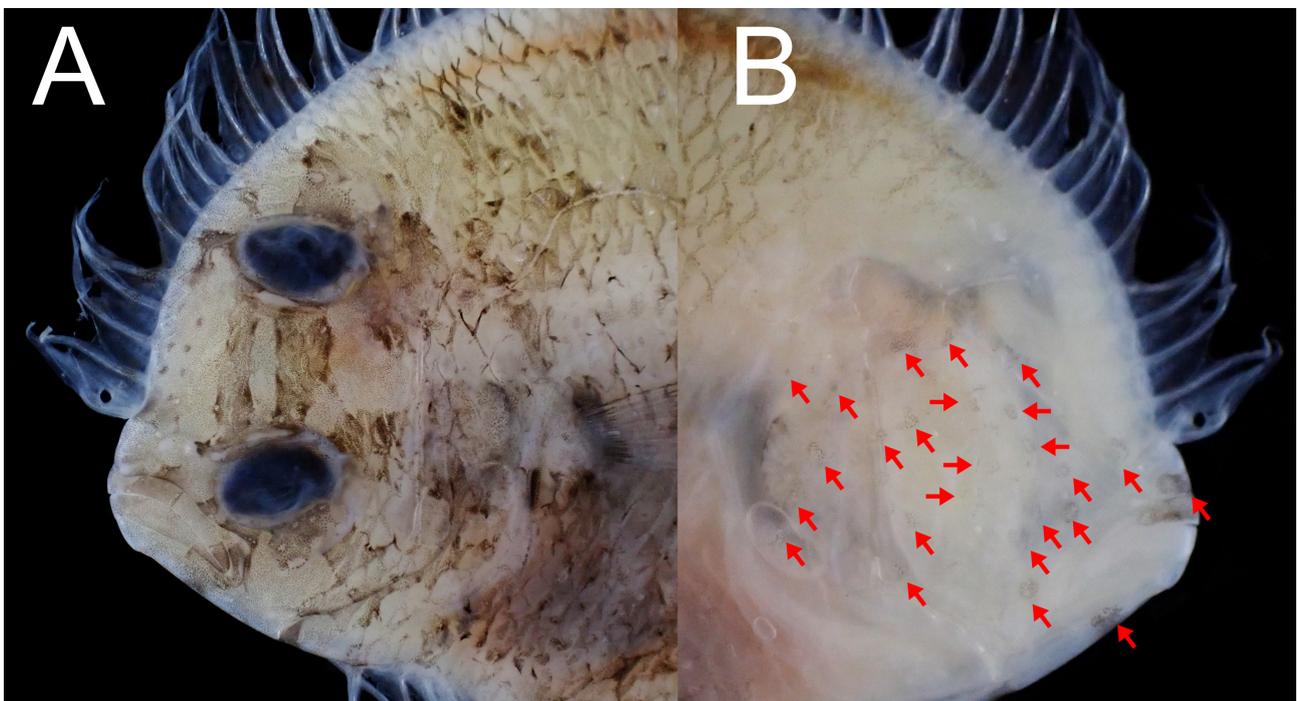


FIGURE 3. Close-up image of *Engyprosopon macrolepis* (Regan, 1908), NMMB-P 39332, male, 45.0 mm SL, preserved. A. Ocular side of head. B. Cheek region on blind side, with black melanophores indicated with arrow. Figures not to scale.

Body ovate, greatest depth 1.8–2.2 in SL; its dorsal and ventral profiles convex and nearly symmetric. Head length 3.6–3.9 in SL; anterior profile of head steep, and with slight concavity above snout, in front of interorbital space. Snout length 4.0–4.6 in HL, distinctly shorter than both eyes. Rostral spine present in male. Eyes sinistral,

upper-eye and lower-eye diameter 3.1–3.4 and 3.0–3.3 in HL, respectively; anterior margin of upper eye slightly posterior to vertical through anterior margin of lower eye. Orbital spines present on both eyes in male. Ocular flap present in male, situated at posterodorsal and posteroventral corner of upper and lower eye, respectively. Interorbital space separated by concavity, its width 2.6–3.6 (male) or 12.0 (female) in HL. Two nostrils on ocular side: anterior nostril forming tube and short flap, situated on snout; posterior nostril forming pore, situated in front of lower eye; nostrils on blind side present, minute, both situated just below dorsal-fin origin.

Mouth oblique and large; upper-jaw length on ocular side 2.7–2.9 in HL; its anterior tip slightly in advance of lower-jaw tip when closed; its posterior tip reaching point at one-third of lower eye. Upper-jaw teeth uniserial on both ocular and blind sides, slightly and gradually larger anteriorly. Lower-jaw teeth uniserial on both ocular and blind side jaws.

Gill rakers present on outer-three arches; those on first arch laterally compressed; all rakers smooth, not serrated on inner sides; those on second arch about same size as those on first arch; those on third arch shorter than first and second arches; upper limb of all four arches without rakers. Scales on ocular side deciduous, with very short ctenii; scales absent on snout and both ocular-side jaws; scales on blind side cycloid and deciduous.

Dorsal-fin origin before midline of interorbital space, above ocular-side anterior nostril; anterior rays not elongated; longest ray (ca. 40th–45th ray) at point slightly posterior to vertical through middle of body. Anal-fin origin at vertical through base of pectoral-fin origin on ocular side; its shape subsymmetrical to that of dorsal fin. Pectoral fin on ocular side filamentous, longer in male than in females, its length 0.6–0.8 and 1.1 in HL, respectively; pectoral fin on blind side short, length 2.0–2.2 in HL. Origin of pelvic fin on ocular side at tip of isthmus; origin of pelvic fin on blind side opposite to middle of fourth and fifth rays on ocular side. Tip of isthmus slightly before vertical through middle of lower eye. Caudal fin rounded, length 1.0–1.2 in HL. All rays simple except middle 11 caudal-fin rays branched.

TABLE 1. Meristic characters of *Engyprosopon macrolepis* (Regan, 1908). Abbreviations: B=blind side; F=female; J=juvenile; M=male; O=ocular side.

—	This study				Hensley & Randall (1990)	Amaoka <i>et al.</i> (1993)	Katayama <i>et al.</i> (2012)	Amaoka (2016)
	NMMB-P 39332	NMMB-P 40031	NMMB-P 40032		n=32	n=33	n=4	—
Sex	M	F	M	M	20M; 11F; 1 unknown	11M; 22F	3M; 1F	—
Dorsal-fin rays	78	76	79	75	76–85	74–84	77–82	74–84
Pectoral-fin rays (O)	11	12	11	12	11–13	10–12	11–12	10–12
Pectoral-fin rays (B)	9	9	10	10	9–11	8–10	9–11	8–10
Pelvic-fin rays (O)	6	6	6	6	6	6	6	-
Pelvic-fin rays (B)	6	6	6	6	6	6	5–6	-
Anal-fin rays	60	55	60	56	58–63	56–64	57–59	56–64
Caudal-fin rays	3+11+3	3+11+3	3+11+3	N/A	-	2–3+11–12+2–3	-	-
Gill rakers	0+8	0+6	0+7	0+7	0+6–8	0+6–8	0+7–8	0+6–8
Lateral-line scales	43+1	40+1	48+2	N/A	43–51	40–49	47–52	40–49
Vertebrae	10+24=34	10+24=34	10+24=34	N/A	-	10–11+23–25=33–35	9+24=33	10–11+23–26=33–36

TABLE 2. Morphometric characters of *Engyprosopon macrolepis* (Regan, 1908). Abbreviations: B=blind side; F=female; J=juvenile; M=male; O=ocular side.

—	This study				Hensley & Randall (1990)	Amaoka <i>et al.</i> (1993)	Katayama <i>et al.</i> (2012)	
	NMMB-P 39332	NMMB-P 40031	NMMB-P 40032		n=32	Holotype n=33	n=4	
Sex	M	F	M	M	20M; 11F; 1 unknown	M	11M; 22F	3M; 1F
SL (mm)	45.0	39.3	55.4	53.1	22.9–60.9	49	33.4–58.7	51.9–72.9
%SL								
HL	28.0	26.2	26.0	27.9	25.5–29.9	28.9	26.9–31.2	25.0–26.7
Body depth	49.4	46.1	50.9	57.1	45.3–56.5	50.8	46.7–53.5	54.1–57.5
Snout length	6.2	5.7	6.2	7.0	5.2–7.0	6.5	5.9–7.5	6.3–6.9
Upper-eye diameter	8.5	8.4	8.3	8.3	6.7–9.7	8.4	7.6–10.0	6.9–7.7
Lower-eye diameter	8.8	8.9	8.7	8.6	6.5–9.3	8.6	7.6–10.3	6.9–7.7
Interorbital width (M)	7.8	-	9.8	9.6	4.9–10.3	9.6	3.5–8.3	7.3–9.9
Interorbital width (F & J)	-	2.2	-	-	0.9–3.8	-	1.8–4.9	4.4
Upper-jaw length (O)	10.0	9.3	9.6	9.7	8.8–11.2	10.2	9.8–11.8	8.1–9.8
Upper-jaw length (B)	9.5	9.1	8.9	9.5	8.6–10.5	9.6	9.2–12.2	8.5–9.4
Lower-jaw length (O)	13.0	12.6	12.6	13.2	12.0–14.7	13.5	13.1–15.7	6.9–8.5
Lower-jaw length (B)	13.6	13.3	12.8	14.1	12.5–15.3	13.9	13.6–16.4	6.3–8.3
Caudal-peduncle depth	12.6	12.9	13.6	9.9	11.7–14.4	12.7	11.1–13.9	3.3–15.0
Pectoral-fin length (M; O)	33.0	-	38.3	47.5	30.2–47.2	33.5	22.5–46.7	35.5–40.7
Pectoral-fin length (F & J; O)	-	24.5	-	-	26.4–34.1	-	19.8–40.7	20.2
Pectoral-fin length (B)	12.9	11.7	12.8	13.3	10.6–13.9	12.9	10.8–13.8	12.2–16.3 (M); 10.6 (F)
Pelvic-fin base (O)	10.1	10.9	10.1	10.3	8.7–10.9	9.2	8.7–11.0	-
Pelvic-fin base (B)	3.2	3.2	3.5	3.1	2.6–3.7	3.5	2.9–3.8	-
Longest dorsal-fin ray	13.6	14.4	14.5	15.0	10.4–13.1	14.3	12.3–14.9	11.4–13.4
Longest anal-fin ray	12.8	13.5	13.2	14.4	9.8–13.6	13.5	12.8–16.0	11.3–12.9
Caudal-fin length	24.2	25.6	24.0	N/A	21.1–25.9	25.7	22.6–27.0	20.8–24.7

Coloration

When fresh (Fig. 1A): body on ocular side light brown, scattered with irregular-shaped dark and pale spots, and smaller orange or yellow spots between those larger spots; a series of five obtuse dark blotches along dorsal and ventral margins of body and a dark blotch on both origin of straight part and near end of lateral line; two dark bands on interorbital space; red spots with white margin on ocular flap in male; a dark narrow vertical band on end of body; all fins with many yellow, dark or light-brown spots; a pair of dark spots on anterior one-third of caudal fin. Posterior two-third of body on blind side stained with dark pigments but anterior one-third of body white in male (Fig. 1B), and uniformly white in female; blind-side cheek, both lips, and ventral margin of body before pelvic fin with small orange spots in male (Fig. 1C).

When preserved (Fig. 2): body on ocular side uniformly pale, scattered with black spots; all fins dusky or scattered with dark spots; blind side dusky or pale in male and female, respectively; interorbital space with two dark bands (Fig. 3A); blind-side cheek, both lips and ventral margin before pelvic fin with small dusky spots in male (Fig. 3B).

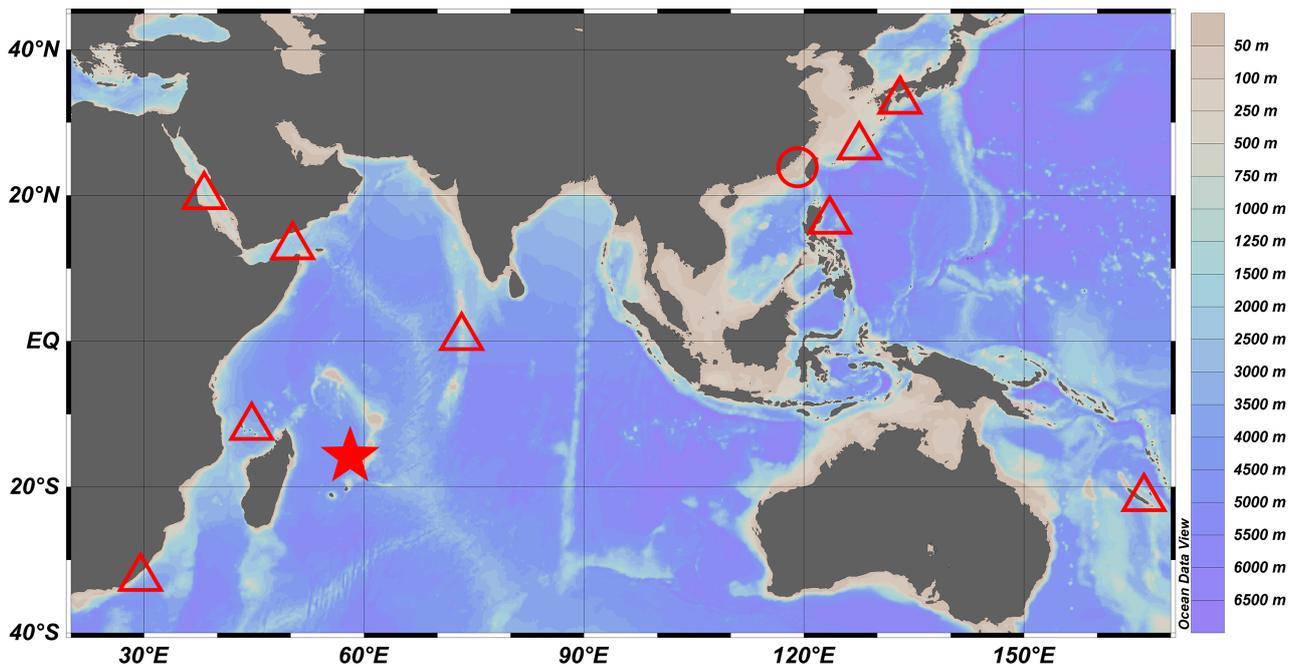


FIGURE 4. Distribution map of *Engyprosopon macrolepis* (Regan, 1908). Circle= present study; Star=type locality; triangle=other records.

Distribution

Widely distributed in the Indo-West Pacific Ocean (Fig. 4), including Japan (Katayama *et al.* 2012; Yoshigou & Yoshino 2015), Taiwan (this study), The Philippines (Hensley & Randall 1990), New Caledonia (Amaoka *et al.* 1993), Gulf of Aden (Norman 1934; Hensley & Randall 1990), Maldives (Hensley & Amaoka 2022), Red Sea (Fowler 1956; Hensley & Amaoka 2022), and South Africa (Hensley & Amaoka 2022). Inhabits on sandy bottoms at depths of 3–91 m. Our specimens were collected with the silver-stripe round herring, *Spratelloides gracilis* from depths less than 30 m.

Discussion

Our specimens are identified as *Engyprosopon macrolepis* in having margins of caudal fin without a pair of black blotches, gill rakers smooth on inner face, upper-jaw teeth uniserial, gill rakers 0 + 6–8, lateral-line scales 40–48 + 1–2, upper-jaw length 9.3–10.0% SL, lower-jaw length 12.6–13.2% SL, interorbital space with two dark bands, ocular flap present in male specimen, and numerous orange spots on blind-side cheek in males when fresh (Hensley & Randall 1990; Hensley & Amaoka 2001; Amaoka 2016).

Compared to previous data (Hensley & Randall 1990; Amaoka *et al.* 1993; Katayama *et al.* 2012; Amaoka 2016; Tables 1 & 2), our specimens agree well with them, with the exception that the female specimen possesses slightly fewer anal-fin rays (55, vs. 56–64; Table 1). This is considered to be intraspecific variation. Notably, Katayama *et al.* (2012) reported nine precaudal vertebrae for their specimens, which is lower than our specimens (10) and those in Amaoka (2016) (10–11). In fact, the condition of 9 precaudal vertebrae has not been reported in other species of *Engyprosopon* (e.g., Amaoka *et al.* 1993; Amaoka 2016; Amaoka & Ho 2018, 2022), and we suggest that a re-examination of the specimens is needed to determine whether this represents a rare condition, or if this count is in error, since the first vertebra is very short in the family Bothidae, and it is somewhat difficult to recognize and easily overlooked.

As a result, a total of eleven species of *Engyprosopon* are recognized from Taiwanese waters (Amaoka & Ho 2018, 2022; Amaoka 2019; this study), and we suggest that more species may be discovered in the future.

For example, *Engyprosopon hureaui* Quéro & Golani, 1990, a species widely distributed in the Indo-West Pacific (Hensley & Amaoka 2001; Amaoka 2016; Hensley & Amaoka 2022), has never been recorded from Taiwan. Therefore, we may expect its occurrence in Taiwanese waters.

Acknowledgements

This study is supported by Center for University Social Responsibility, Ministry of Education, Taiwan. We thank team members of Fish Says (Ocean Friends, Co. Ltd.) for assistance in sample collection and taking photographs; P.-N. Lee (NMMBA) for curatorial assistance; M.-H. Jiang for assistance in taking X-radiographs. This study was supported by National Penghu University of Science and Technology under the project: Living with the sea: Bycatch utilization and marine education in Penghu, NPU 113G0009-3-2.

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