

First records of a bothid flounder, *Engyprosopon macrolepis*, from Japan (Teleostei, Pleuronectiformes, Bothidae)

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Abstract A small bothid fish, *Engyprosopon macrolepis* (Regan, 1908), is first reported from Japan on the basis of four specimens (51.9–72.9 mm SL), being collected at depths of 10–18 m on sandy bottoms from Okinoshima Island, Kochi Prefecture, Shikoku Island, Japan. The specimens have the following combination of characters: dorsal-fin soft rays 77–82; anal-fin soft rays 57–59; two dark bands across interorbital region; gill rakers on first arch 0 + 7–8; two teeth rows on upper jaw; orbital spines and one rostral spine on ocular side; unfringed ocular flaps in males; dark marking on blind side of body in males, extended with growth from a wide horizontal bar at middle to almost all areas except abdomen. They also represent the northernmost record of the species and include the largest male recorded. In addition, the new Japanese name “Hoshizora-daruma-garei” is proposed for the species.

Key words: *Engyprosopon macrolepis*, Bothidae, new record, Kochi, Japan.

Introduction

The bothid genus *Engyprosopon* Günther, 1862 is composed of 30 valid species, being distributed widely in shallow coastal waters of the Indo-Pacific region (Eschmeyer, 2012). The genus is characterized by having an oval to nearly circular, thin, small body with the tip of the isthmus below the middle of the lower eye, developed teeth rows on both sides of the jaws (1–2 on upper and 1 on lower), a widely concave space between the eyes, and large ctenoid scales with short spines on the ocular side; adult males have a stronger rostral spine on the snout and a wider interorbital space than other specimens (Amaoka, 1984; Amaoka *et al.*, 1993). Among 30 valid species, seven are known from Japanese waters (Nakabo, 2002; Amaoka *et al.*, 2008): *Engyprosopon grandisquama* (Temminck and

Schlegel, 1846), *Engyprosopon multisquama* Amaoka, 1963, *Engyprosopon maldlivensis* (Regan, 1908), *Engyprosopon xystrias* Hubbs, 1915, *Engyprosopon longipelvis* Amaoka, 1969, *Engyprosopon hureaui* Quéro and Golani, 1990, and *Engyprosopon kushimotoensis* Amaoka, Kaga and Misaki, 2008.

During SCUBA samplings of fishes by Laboratory of Marine Biology, Faculty of Science, Kochi University around Okinoshima Island, southwest of Kochi, Shikoku Island (Fig. 1), in 2004, 2008 and 2009, four small bothid specimens were collected at depths of 10–18 m on sandy bottoms around large rocks; these specimens were identified as *Engyprosopon macrolepis* (Regan, 1908). We herein report its first record from Japan and the extension of its range northwards in the Pacific, and propose its new Japanese name based on the new specimens.

Counts and measurements followed Amaoka *et al.* (1993). Fin rays and vertebrae were counted from radiographs. Standard length and head length are abbreviated as SL and HL respectively. The specimens examined were deposited in fish collections of the following institutions: Laboratory of Marine Biology, Faculty of Science, Kochi University (BSKU); National Museum of Nature and Science, Tsukuba (NSMT); and Fisheries Science Center, Hokkaido University Museum, Hakodate (HUMZ).

***Engyprosopon macrolepis* (Regan, 1908)**

[New Japanese name: Hoshizora-daruma-garei]

(Figs. 1–6)

Scaeops macrolepis Regan, 1908: 233, pl. 27, fig. 4.

Engyprosopon macrolepis: Norman, 1934: 214, fig. 162; Norman, 1939: 100; Fowler, 1956: 168, fig. 87; Hensley, 1986: 858; Hensley and Randall, 1990: 674, figs. 1–4; Amaoka *et al.*, 1993: 398, figs. 11–13; Hensley and Amaoka, 2001: 3831; Amaoka, 2000: 645; Randall, 2005: 615.

Engyprosopon sp.: Randall and Anderson, 1993: 39.

Material examined. 4 specimens from Okinoshima Island, Sukumo City, Kochi Prefecture, Japan: BSKU 72022, 72.9 mm SL, male, north of Moshima port (32°44'49"N, 132°32'46"E), 10–14 m, hand-net, 20 July 2004; NSMT-P 90816, 51.9 mm SL, female, north of Moshima port, 10 m, hand-net, 23 July 2008; NSMT-P 96359, 58.3 mm SL, male, NSMT-P 96360, 52.1 mm SL, male, Koyano (32°43'52"N, 132°32'18"E), 18 m, hand-net, 24 Sept. 2009.

Description. Based on three males (52.1, 58.3 and 72.9 mm SL) and one female (51.9 mm SL). Dorsal-fin rays 77–82; anal-fin rays 57–59; pectoral fin rays 11–12 on ocular side, 9–11 on blind side; pelvic fin rays 6 on ocular side, 5–6 on blind side; caudal-fin rays 3 + 11 + 3; lateral-line scales 47–52; gill rakers on first arch 0 + 7–8; vertebrae 9 + 24.

Proportions are shown as % of SL: HL 25.0–26.7; body height 54.1–57.5; snout length 6.3–6.9; upper-eye diameter 6.9–7.7; lower-eye diam-

eter 6.9–7.7; interorbital width 7.3–9.9 in males, 4.4 in female; upper-jaw length ocular side 8.1–9.8, blind side 8.5–9.4; lower-jaw length ocular side 6.9–8.5, blind side 6.3–8.3; caudal peduncle depth 13.3–15.0; pectoral-fin length in males 35.5–40.7 on ocular side, 12.2–16.3 on blind side, in female 20.2 on ocular side, 10.6 on blind side; pelvic-fin length in males 10.7–11.0 on ocular side, 10.0–10.9 on blind side, in female 9.8 on ocular side, 9.3 on blind side; length of longest dorsal-fin ray 11.4–13.4; length of longest anal-fin ray 11.3–12.9; length of mid-caudal-fin ray 20.8–24.7; lateral-line curve width 13.3–14.8.

Body deeply ovate, deepest slightly anterior to middle. Dorsal outline of head steep in males, slope rather gentle in female, indented above anterior nostril. Caudal peduncle deep, its depth 54.9–61.2% HL. Dorsal-fin origin located in front of eyes, just above anterior nostril on blind side. First dorsal-fin ray shorter than second. Anal-fin origin below posterior rim of opercle. Longest ray of dorsal and anal fins at middle of respective fin base. Pectoral fin on ocular side long, second ray greatly elongated, thread-like, longest in both sexes, its length 142.3–170.2% HL (0.6–0.7 in HL) in males, 77.8% HL (0.6–0.7 in HL) in female. Pectoral fin on blind side short, its length 46.8–50.0% HL in males, 40.7% HL in female. Pelvic-fin origin on ocular side located on tip of isthmus, its origin on blind side near fourth pelvic-fin ray on ocular side. All fin rays except caudal fin unbranched. Caudal fin rounded to slightly pointed, fin rays branched excluding upper and lower three rays.

Snout slightly shorter than eye, its length 79.0–94.0% of eye diameter. A strong rostral spine near tip of snout in males, absent in female. Nostrils on ocular side just above a horizontal line between rostral spines and medial bony ridge of lower eye; anterior nostril tube-like with short posterior flap, its diameter about half that of posterior nostril. Nostrils on blind side minute, very close to each other; anterior nostril with long posterior flap. Eyes large, lower eye slightly in front of upper eye, diameters almost equal, 76.5–84.7% of upper-jaw length on ocular side.

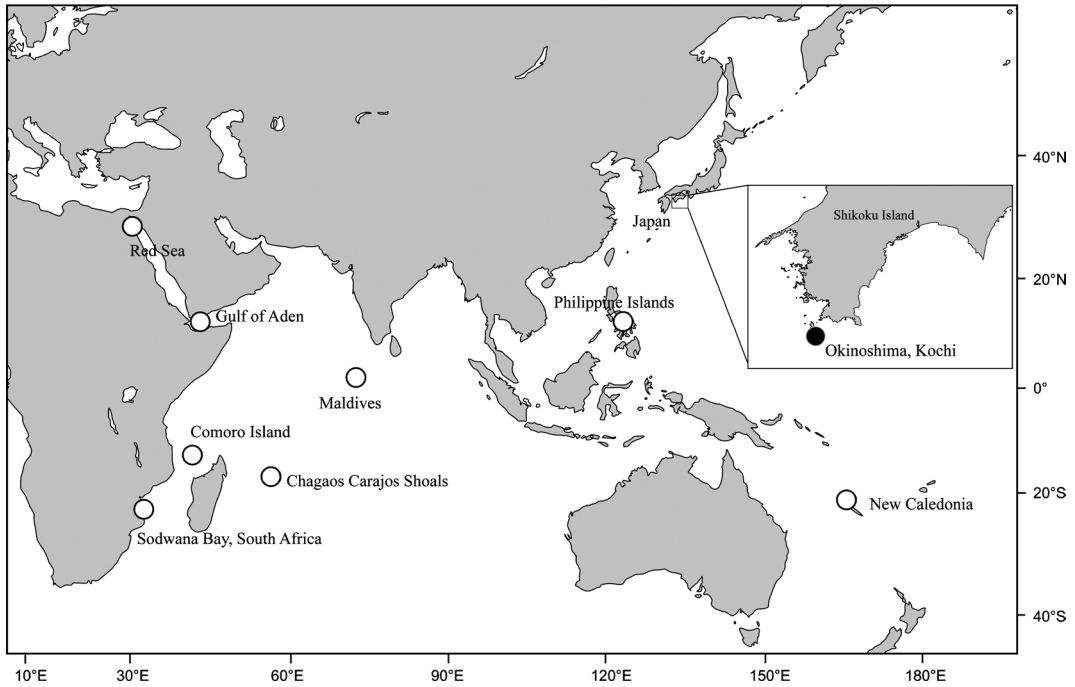


Fig. 1. Map showing nine localities of *Engyprosopon macrolepis*. Solid and open circles indicate the present specimens and previously published records (Hensley and Randall, 1990; Amaoka *et al.*, 1993) respectively.

Anterior and medial rims of each eye forming distinct bony ridges; 1–2 large spines on anterior ridge of upper eye (2 in the largest male) and 1 on anterior of medial ridge of lower eye, 1–3 small spines on medial ridge of lower eye in males (increased with growth). Interorbital region weakly concave, relative width increasing with growth, its width 27.3–39.6% HL in males, 17.0% in female. A large, unfringed flap present on posterolateral of upper eye and posteroventral of lower eye in males, flap absent in female. Mouth small, oblique, posterior end of upper jaw on ocular side beyond a vertical line through anterior rim of lower eye. Small conical teeth on upper and lower jaws biserial and uniserial respectively. Gill rakers on first arch restricted to lower limb, their length shorter than length of longest gill-filament; each raker covered with dermal membrane, having 0–4 small teeth on posterior margin (Fig. 3). Scales ctenoid on ocular side, cycloid on blind side; no scales on anterior region around eyes and jaws; interorbital space on ocular side covered with about 6 scale

rows in males, about 4 rows in female (Fig. 4). Lateral line developed, strongly curved above pectoral fin on ocular side, degenerated on blind side.

Color when fresh (Figs. 2, 5). Ground color of head, body and fins (except pectoral fin on ocular side) yellowish brown; many scattered white, brown and blackish small to eye-sized spots and rings. In males, a series of small reddish orange spots along ocular flaps; anterior of interorbital region on ocular side with many small purplish black spots; body on blind side with a large dark marking, extended with growth from a wide horizontal bar at middle to almost all area except abdomen and caudal peduncle (Fig. 2B, 2D); snout, jaws and cheek on blind side with yellowish to darkish orange spots (Figs. 2B, 2D, 5).

Color in preservative. Ground color of head and body on ocular side yellowish brown with many dark scattered spots; a series of indistinct dark spots on body near dorsal- and anal-fin bases; indistinct blackish blotches on lateral line, first blotch large and on end of curved section,

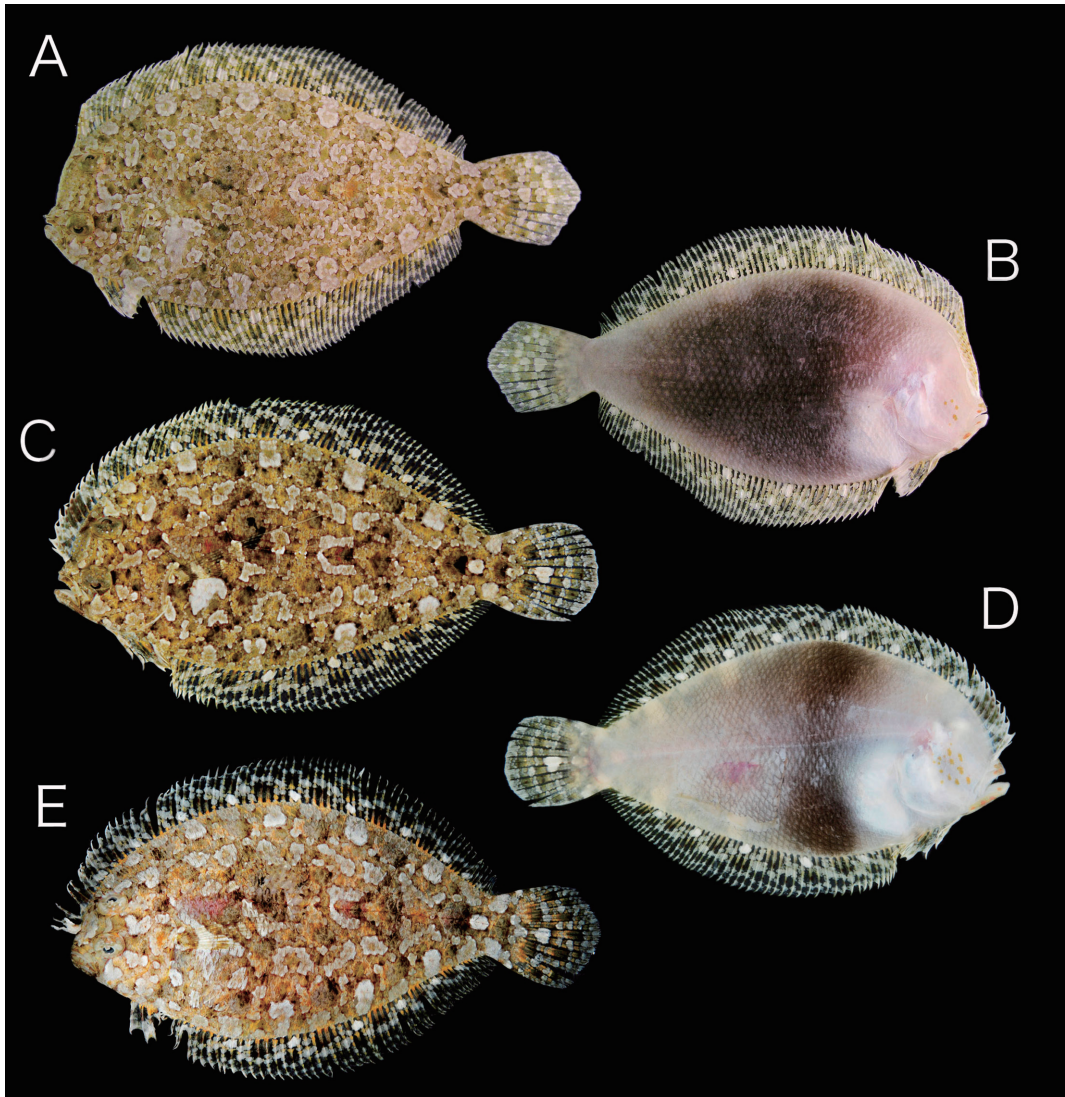


Fig. 2. *Engyprosopon macrolepis*. A, B: BSKU 72022, 72.9 mm SL, male, ocular (left) and blind (right) sides; C, D: NSMT-P 96360, 52.1 mm SL, male, ocular (left) and blind (right) sides; E: NSMT-P 90816, 51.9 mm SL, female, ocular side. Photographed by H. Endo.

remaining 3–5 blotches on straight section including its large one on midpoint triangular in shape; two narrow dark bands on interorbital space. Vertical fins and pelvic fin on ocular side with small dark spots. Caudal fin with a pair of large indistinct spots. Pectoral fin with some dark bands. Ground color of head and body on blind side light yellowish-white, dark marking in males well remained.

Distribution. Known widely from the Indo-

West Pacific: Japan (Okinoshima Island, Kochi), the Philippines, Coral Sea (Chesterfield Plateau and New Caledonia), Red Sea (Gulf of Aqaba), Gulf of Aden, Maldives, Mauritius (Cargados Carajos Shoals), Comoros Islands and South Africa (Sodwana Bay), at depths of 3–91 m (Regan, 1908; Norman, 1934, 1939; Hensley, 1986; Hensley and Randall, 1990; Amaoka *et al.*, 1993; Randall and Anderson, 1993; Hensley and Amaoka, 2001; Randall, 2005; this study) (Fig. 1).

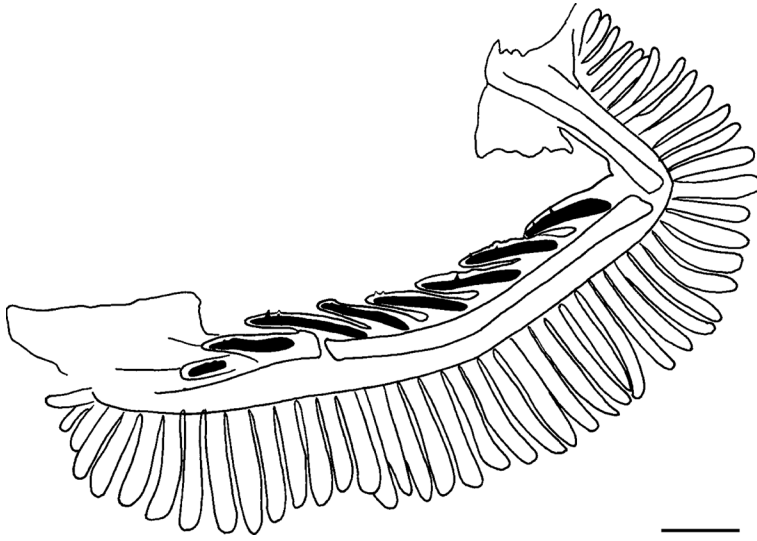


Fig. 3. First gill arch (left, lateral view) of *Engyprosopon macrolepis*, BSKU 72022. Drawn by T. Yamakawa. Bar indicates 1 mm.

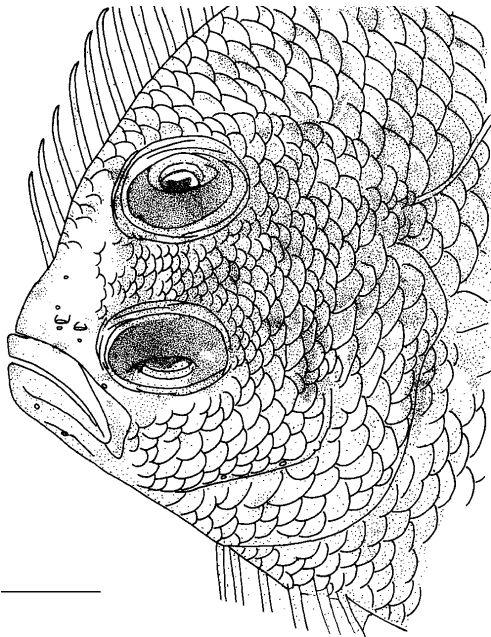


Fig. 4. Squamation on the ocular side of head of *Engyprosopon macrolepis*, NSMT-P 90816, 51.9 mm SL, female. Drawn by T. Yamakawa. Bar indicates 3 mm.

Remarks. Among the genus *Engyprosopon*, only two species, *E. macrolepis* and *Engyprosopon xenandrus* Gilbert, 1905 (endemic to the Hawaiian Islands), have ocular flaps in males

(Amaoka *et al.*, 1993: fig. 12). The former clearly differs from the latter in having unfringed ocular flaps (vs. fringed), lower gill-raker counts (6–8 vs. 10–12) and longer pectoral fins on the ocular side in adults (males 0.6–0.9 in HL and females 0.8–1.1 vs. 1.4–1.5 and 1.3–1.4) (Hensley and Randall, 1990). The diagnostic characters of the Japanese specimens agree well with those of *E. macrolepis* redescribed by Hensley and Randall (1990): *e.g.*, 77–82 dorsal-fin rays (the known range of the species 76–85), 57–59 anal-fin rays (58–63), 0 + 7–8 gill rakers on first arch (0 + 6–8), prolonged pectoral fin on ocular side in males and large orbital flaps without fringe behind eyes in males. In addition, the female shows completely same pattern of color markings on ocular side as in the males (Fig. 2), and collected at same sampling site of the largest male.

The present specimens also showed some sexual dimorphisms and morphological variations with growth, which Hensley and Randall (1990) and Hensley and Amaoka (2001) also described. As noted by Hensley and Randall (1990: 677), the darkening on the blind side of the body in males was observed also in the present specimens: it appeared as a transverse band at the

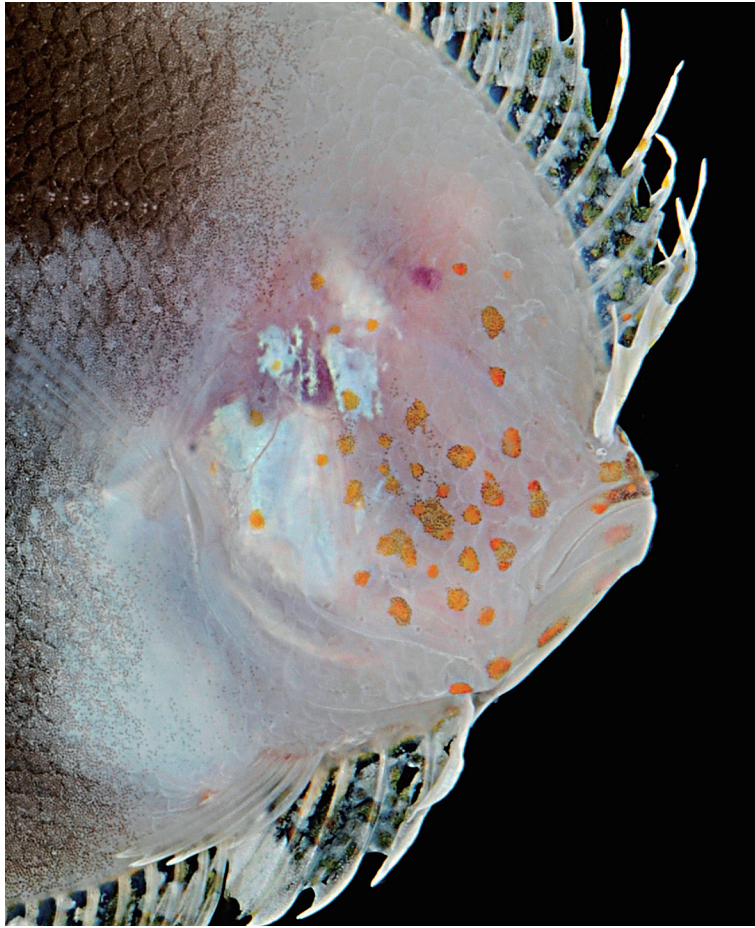


Fig. 5. Blind side of head of *Engyprosopon macrolepis* (NSMT-P96359, male) in fresh condition.

widest part of the body in the smallest male of 52.1 mm SL (Fig. 2D), and extended to almost all areas excluding abdomen and caudal peduncle as in the largest male of 72.9 mm SL (Fig. 2B). Further, the proportion of the interorbital width in males increased with growth until about 60 mm SL (Fig. 6). In addition, the spines on the orbital bony ridges in males apparently enlarged and increased in number with growth. Regarding the pigmentation of the head on the ocular side in males as noted by Amaoka *et al.* (1993: fig. 12A, “dorsal margin of upper eye and both jaws in ocular side dark”), the same condition was observed here only in the male of 52.1 mm SL, not in the larger specimens of 58.3 mm SL and 72.9 mm SL. Hence, this dark pigmentation possibly faded with growth. Concerning the squama-

tion of the interorbital region on the ocular side in females, Hensley and Randall (1990) illustrated a female of 41.7 mm SL from Comoro Islands, the eastern Indian Ocean (CAS 32559), showing a single scale row, but our female and those from New Caledonia in Amaoka *et al.* (1993) showed about 4 scale rows (Fig. 4). The difference may be caused by geographical variation between the western Pacific and eastern Indian Oceans, or the body size of their specimens examined. On the other hand, the males have about 6 scale rows without variation.

For *E. macrolepis*, the present specimens represent both the first record from Japan and the northernmost locality for the species, significantly extending its range north from the Philippines. In addition, the male of 72.9 mm SL

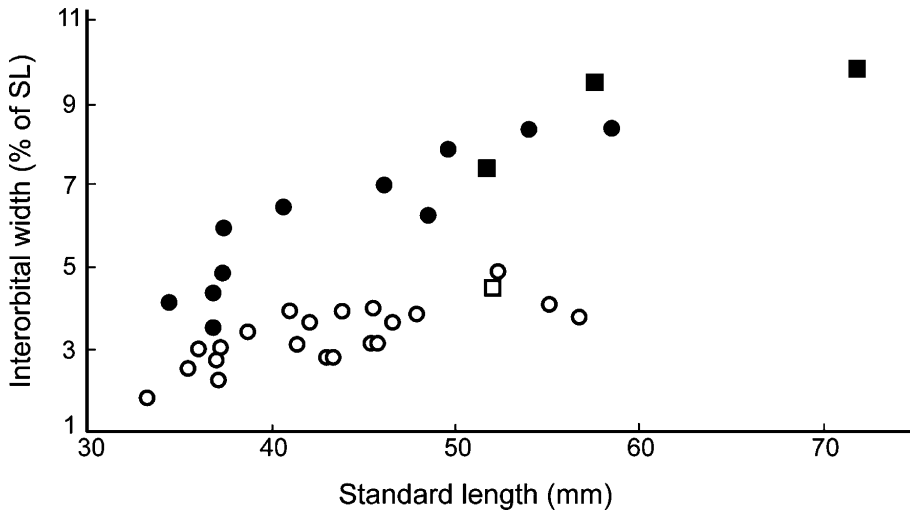


Fig. 6. Relationship between standard length (SL) and interorbital width in *Engyprosopon macrolepis*. Symbols represent the specimens from Okinoshima Island (squares) and New Caledonia (circles), and males (solid) and females (open). Data of New Caledonian specimens from Amaoka *et al.* (1993).

(BSKU 72022) is the largest among known specimens (*e.g.*, 22.9–60.9 mm SL in Hensley and Randall, 1990; 34.5–58.7 mm SL in Amaoka *et al.*, 1993).

A new Japanese name, “Hoshizora-darumagarei”, is provided for the species. Many white spots scattered on ocular side of the species remind us of “a starry sky”, namely “Hoshizora” in Japanese and “darumagarei” means “a bothid fish”.

Comparative materials examined. *Engyprosopon macrolepis*. 5 specimens from Chesterfield and Bellona Plateaus off New Caledonia: HUMZ 124869, 45.7 mm SL, female, HUMZ 124870, 48.7 mm SL, female, HUMZ 124871, 52.5 mm SL, female, HUMZ 124872, 58.7 mm SL, male, HUMZ 124873, 56.8 mm SL, female.

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References

- Amaoka, K. 1984. Family Bothidae. In Masuda H., K. Amaoka, C. Araga, T. Uyeno and T. Yoshino (eds.): *The Fishes of the Japanese Archipelago*, pp. 331–340. Tokai University Press, Tokyo.
- Amaoka, K. 2000. Family Bothidae (lefteye flounders). In Randall J. E. and K. P. Lim (eds.): *A checklist of the fishes of the South China Sea*, p. 645. National University of Singapore, Singapore.
- Amaoka, K., T. Kaga and H. Misaki 2008. A new sinistral flounder, *Engyprosopon kushimotoensis*, from Kushimoto, Kii Peninsula (Pleuronectiformes: Bothidae). *Bulletin of the National Museum of Nature and Science. Series A., Supplement 2*: 107–113.

- Amaoka, K., E. Mihara and J. Rivaton 1993. Piscies, Pleuronectiformes: Flatfishes from the waters around New Caledonia. A revision of the genus *Engyprosopon*. In Crosnier A (ed.): Résultats des Campagnes Musorstom, Vol. 11. Mémoires du Muséum National d'Histoire Naturelle, Paris (N. S.) (Série A) Zoologie, 158: 377–426.
- Eschmeyer, W. N. (ed.) 2012. Catalog of fishes. California Academy of Sciences. Available from: <http://research.calacademy.org/research/Ichthyology/Catalog/fishcat-main.asp/> (accessed electronic version on 12 January 2012).
- Fowler, H. W. 1956. Fishes of the Red Sea and southern Arabia. The Weizman Science Press of Israel, Jerusalem. 240 pp.
- Hensley, D. A. 1986. Bothidae. In Smith M. M. and P. C. Heemstra (eds.): Smith's Sea Fishes, pp. 854–863. MacMillan South Africa Ltd., Grahamstown.
- Hensley, D. A. and K. Amaoka 2001. Family Bothidae. In Carpenter K. E. and V. H. Niem (eds.): FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, pp. 3799–3841. Bony Fishes Part 4. Vol. 6. FAO, Rome.
- Hensley, D. A. and J. E. Randall 1990. A redescription of *Engyprosopon macrolepis* (Teleostei: Bothidae). *Copeia*, 1990 (3): 674–680.
- Nakabo, T. 2002. Bothidae. In Nakabo T. (ed.): Fishes of Japan with Pictorial Keys to the Species, English edn, pp. 1358–1370, 1627–1628. Tokai University Press, Tokyo.
- Norman, J. R. 1934. A systematic monograph of the flatfishes (Heterosomata). 1. Psettodidae, Bathidae, Pleuronectidae. 459 pp. British Museum, London.
- Norman, J. R. 1939. Fishes. The John Murray Expedition 1933–34. Scientific Reports, John Murray Expedition, 7: 1–116.
- Randall, J. E. 2005. Reef and shore fishes of the South Pacific. New Caledonia to Tahiti and the Pitcairn Islands. xii + 707 pp. University of Hawai'i Press, Honolulu.
- Randall, J. E. and R. C. Anderson 1993. Annotated checklist of the epipelagic and shore fishes of the Maldives Islands. *Ichthyological Bulletin of the J. L. B. Smith Institute of Ichthyology*, 59: 1–47.
- Regan, C. T. 1908. Report on the marine fishes collected by Mr. J. Stanley Gardiner in the Indian Ocean. The Transactions of the Linnean Society of London. Second Series. *Zoology*, 12: 217–255.