



## A new species of the codlet genus *Bregmaceros* from the western Pacific Ocean (Gadiformes: Bregmacerotidae)

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### Abstract

*Bregmaceros retrodorsalis* sp. nov., a new codlet species is described based on specimens from shallow to deep waters off Japan and Melanesia. It differs from all congeners by having the origin of second dorsal-fin well posterior, above bases of 5th to 7th anal-fin rays and combination of the following characters: a pointed snout distinctly longer than eye diameter; upper lobe of opercle branched distally; body relatively slender, its depth 10.0–13.0% SL; 13 principal caudal-fin rays (middle 11 branched); 52–57 second dorsal-fin rays; 58–63 anal-fin rays; 16–18 transverse scale rows below dorsal-fin origin; 86–93 longitudinal scale rows along body axis; vertebrae 55–58; entire body evenly covered with melanophores, those on lateral sides forming regular longitudinal rows, one melanophores per scale; head and isthmus entirely, but loosely, covered with variably sized melanophores.

**Key words:** Actinopterygii, Paracanthopterygii, taxonomy, ichthyology, Japan, Melanesia

### Introduction

The codlet family Bregmacerotidae is a group of small fishes (less than 15 cm total length) inhabiting the worldwide tropical to temperate waters, ranging from the surface to the sea bottom at depths not exceeding 1000 m (Cohen *et al.*, 1990; Torii *et al.*, 2003b). Some species tend to have a very wide distribution range (*i.e.*, *B. nectabanus*) (Harold & Golani, 2016), whereas others have a more restricted range (*i.e.*, *B. lanceolatus*; Ho, pers. obser.). Also, some species are known to perform diel vertical migration (*e.g.*, Wilson, 1972; Morohoshi and Sasaki, 2003). The family currently comprises 14 valid species and most of them are still poorly known (Torii *et al.*, 2003a; Harold & Golani, 2016).

The diversity of the Bregmacerotidae is greatly under-estimated. For example, in his unpublished thesis, Aki-hisa Torii recognized 11 undescribed species. However, only a single species, *Bregmaceros pseudolanceolatus* Torii, Javonillo & Azawa, 2004, was eventually described. Taxonomic studies appear to have stopped since then and the only recent work is that of Harold & Golani (2016) who provided a record of *B. nectabanus* from the Mediterranean Sea.

In this work we examined a large number of specimens from several fish collections and found a very distinct species of *Bregmaceros* that differs from all its congeners in having a distinctly pointed snout, a posterior dorsal-fin origin, many longitudinal rows of melanophores on the sides, and a slender body. Together with other diagnostic characters, it is described as a new species herein.

### Methods and materials

The method of taking measurements and counts follows Torii *et al.* (2003) and Harold & Golani (2016). Most specimens were stained with Alizarin Red S and Cyanine for precise counts and observation. Vertebral counts were counted from x-ray films or phototgraphs taken with a digital x-ray machine. Only selected type specimens were

measured and counted based on their preservation condition. Specimens examined were from the collections of the Muséum national d'Histoire naturelle, Paris (MNHN); Department of Biological Science, Kochi University, Kochi (BSKU), and National Museum of Marine Biology & Aquarium, Pingtung, Taiwan (NMMB-P). Data for comparison are adopted from the original descriptions by Masuda *et al.* (1986) and Torii *et al.* (2003a). Comparative material was listed in Ho *et al.* (2011).

## Family Bregmacerotidae

### *Bregmaceros retrodorsalis* Ho & Endo, sp. nov.

New English name: Back-fin codlet

New Japanese name: Gomafu-saiuo

Figs. 1–3; Table 1

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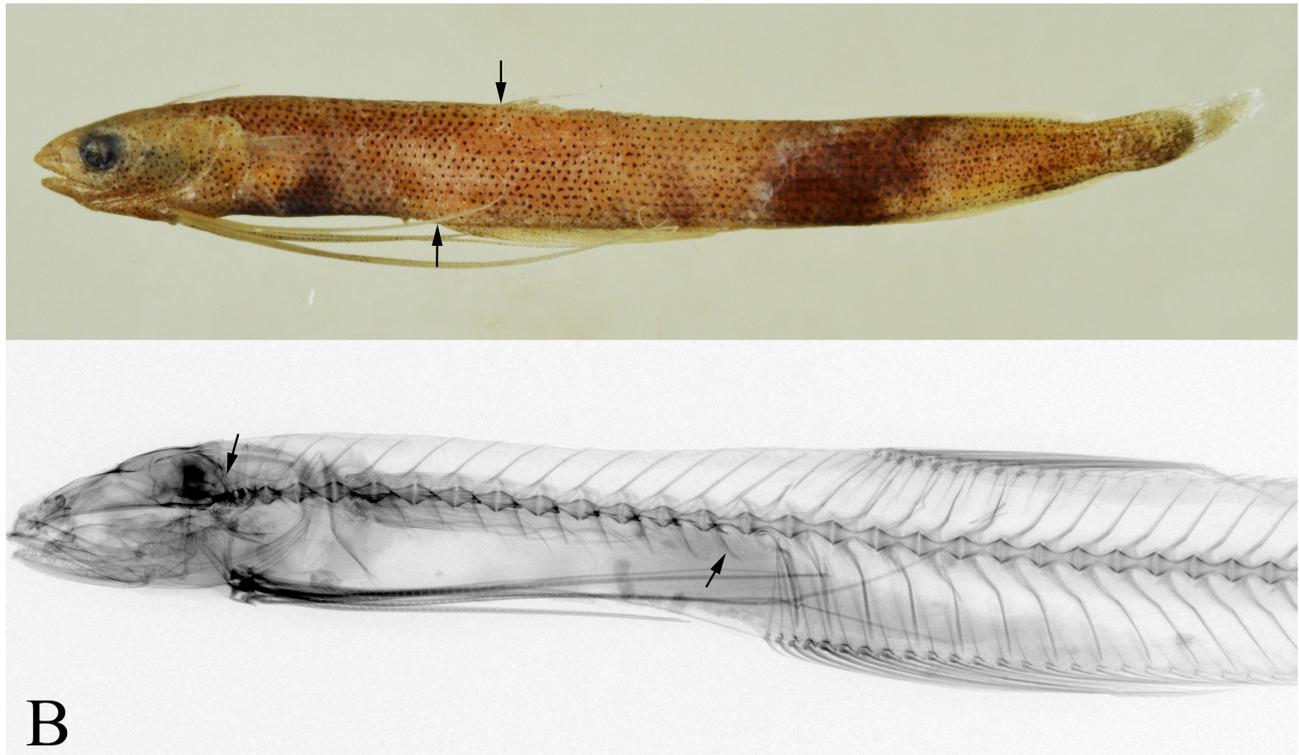
**Holotype.** MNHN 2002-3218 (64.0 mm SL), northern New Caledonia, Coral Sea, 19°01'58.8"S, 163°18'00"E, 250–290 m, 17 Sep. 1985.

**Paratypes.** Twenty-one specimens, 39.3–63.8 mm SL: BSKU 125261 (1, 52.1), BSKU 125262 (1, 54.8), BSKU 125263 (1, 50.8), BSKU 125264 (1, 53.3), BSKU 125265 (1, 45.1), BSKU 125266 (1, 49.7), BSKU 125267 (1, 49.9), BSKU 125268 (1, 42.4), Tosa Bay, off Kochi, Shikoku Island, Japan, 33°18.6'N, 133°36.3'E–33°16.9'N, 133°39.9'E, 24–50 m (118–157 m at bottom), time: 19:39–20:44, R/V Tenyo-maru, T2-2, midwater trawl, 27 Nov. 2000; NSMT-P 135958 (1, 46.9), Tosa Bay, 32°54.4'N, 133°17.4'E–32°55.1'N, 133°13.6'E, 30–38 m (142–166 m at bottom), time: 19:15–20:21, R/V Tenyo-maru, MT6, midwater trawl, 27 Nov. 1999; NSMT-P 135959 (1, 55.7), Tosa Bay, 33°08.9'N, 133°21.6'E–33°07.1'N, 133°25.4'E, 25–45 m (117–141 m at bottom), time: 19:47–20:58, R/V Tenyo-maru, T3-2, midwater trawl, 28 Nov. 2000; MNHN 1997-3928 (1, 63.8), Vanuatu, 20°19'1.2"S, 169°49'1.2"E, 360–408 m, MUSORSTOM 8, DW-0964, 20 Sep. 1994; MNHN 1998-1079 (1, 38.0), Wallis & Futuna, Futuna Is., 14°19'4.8"S, 178°04'4.8"W, 245–440 m, MUSORSTOM 7, CP-508, 11 May 1992; MNHN 2002-3138 (1, 59.7, stained), Chesterfield, 22°10'19.2"S, 159°22'8.4"E, 340 m, MUSORSTOM 5, CP-309, 12 Oct. 1986; MNHN 2002-3152 (1, 54.2, stained), New Caledonia, 18°58'58.8"S, 163°25'1.2"E, 320 m, MUSORSTOM 4, CP-192, 19 Sep. 1985; MNHN 2002-3202 (5, 39.3–54.4), New Caledonia, 19°00'3.6"S, 163°18'50.4"E, 385 m, MUSORSTOM 4, CC-174, 17 Sep. 1985; MNHN 2020-0027 (2, 48.7–60.6), collected with holotype.

**Non-types.** BSKU 61029 (3), Tosa Bay, off Kochi, Shikoku Island, Japan, 33°23.2'N, 133°50.4'E–33°20.4'N, 133°51.9'E, 24–52 m (100–166 m at bottom), time: 17:45–18:49, R/V Tenyo-maru, T1-1, midwater trawl, 26 Nov. 2000; BSKU 61030 (2), Tosa Bay, 33°22.2'N, 133°46.3'E–33°19.4'N, 133°46.1'E, 26–54 m (117–174 m at bottom), time: 19:59–21:04, R/V Tenyo-maru, T1-2, midwater trawl, 26 Nov. 2000; BSKU 61031 (19), Tosa Bay, 33°18.6'N, 133°36.3'E–33°16.9'N, 133°39.9'E, 24–50 m (118–157 m at bottom), time: 19:39–20:44, R/V Tenyo-maru, T2-2, midwater trawl, 27 Nov. 2000; BSKU 61032 (1), Tosa Bay, 33°13.1'N, 133°27.3'E–33°09.9'N, 133°28.5'E, 10–45 m (119–140 m at bottom), time: 19:21–20:17, R/V Tenyo-maru, T2-4, midwater trawl, 1 Dec. 2000; BSKU 61033 (1), Tosa Bay, 33°09.3'N, 133°19.9'E–33°07.8'N, 133°23.8'E, 20–40 m (103–125 m at bottom), time: 17:35–18:37, R/V Tenyo-maru, T3-1, midwater trawl, 28 Nov. 2000; BSKU 61034 (7), Tosa Bay, 33°08.9'N, 133°21.6'E–33°07.1'N, 133°25.4'E, 25–45 m (117–141 m at bottom), time: 19:47–20:58, R/V Tenyo-maru, T3-2, midwater trawl, 28 Nov. 2000; BSKU 61035 (61), Tosa Bay, 33°08.9'N, 133°21.6'E–33°07.1'N, 133°25.4'E, 25–45 m (117–141 m at bottom), time: 17:35–18:37, R/V Tenyo-maru, T3-4, midwater trawl, 30 Nov. 2000; BSKU 78674 (2), Tosa Bay, off Kochi City, R/V Kotaka-maru, 300 m, 9 Mar. 1998; BSKU 125257 (2), BSKU 125303 (4), Tosa Bay, 32°51.5'N, 133°08.7'E–32°49.9'N, 133°12.5'E, 30–38 m (125–161 m at bottom), time: 19:14–20:18, R/V Tenyo-maru, T4-2, midwater trawl, 29 Nov. 2000. BSKU 125258 (2), Tosa Bay, 33°21.0'N, 133°52.1'E–33°20.3'N, 133°47.3'E, 22–28 m (142–150 m at bottom), time: 17:28–18:32, R/V Tenyo-maru, MT1, midwater trawl, 23 Nov. 1999; BSKU 125259 (2), Tosa Bay, 33°20.6'N, 133°46.6'E–33°20.5'N, 133°48.1'E, 60–127 m (141–145 m at bottom), time: 18:46–19:39, R/V Tenyo-maru, MT2, midwater trawl, 23 Nov. 1999; BSKU 125260 (13), BSKU 125271 (3), Tosa Bay, 32°54.4'N, 133°17.4'E–33°55.1'N, 133°13.6'E, 30–38 m (142–166 m at bottom), time: 18:46–19:39, R/V Tenyo-maru, MT6, 33°18.6'N, 133°36.3'E–33°16.8'N, 133°36.8'E, Tosa Bay, 27 Nov. 1999; BSKU 125272 (1), western Tosa Bay, east of Tosa-shimizu City, Kochi, ca. 100–200 m at bottom, R/V Soyo-maru (T4), 25 Mar. 2003; BSKU 125256 (1), out of BSKU 61031; NMMB-P30973 (14), out of BSKU 61035; MNHN 1997-3930 (1), Wallis

and Futuna, 14°19'4.8"S, 178°4'4.8"W, 245–440 m, MUSORSTOM 7, CP-508, 11 May 1992; MNHN 1998-1122 (3, 40.1–59.0), Vanuatu, 15°09'00"S, 167°15'00"E, 425–455 m, MUSORSTOM 8, CP-1088, 6 Oct. 1994; MNHN 1998-1229 (42.1), Wallis & Futuna, 14°19'4.8"S, 178°04'4.8"W, 245–440 m, MUSORSTOM 7, CP-508, 11 May 1992; MNHN 2002-3183 (1, 75.2, dry), New Caledonia, 20°47'34.8"S, 167°05'9.6"E, 390 m, MUSORSTOM 6, DW-391, 13 Feb. 1989; MNHN 2002-3255 (1, 56.9, dry), New Caledonia, 19°01'1.2"S, 163°16'1.2"E, 275–330 m, MUSORSTOM 4, CP-172, 17 Sep. 1985; MNHN 2020-0028 (3, 45.1–54.3), out of MNHN 2002-3202.

**Non-types (tentative identification).** MNHN 2002-0218 (1, 68.8), MUSORSTOM 4, CC-202, 18°58'1.2"S, 163°10'58.8"E, New Caledonia, 580 m, 20 Sep. 1985. MNHN 2002-3082 (1, 49.6), Bordau 1, cp-1501, 18°40'1.2"S, 178°30'00"E, Fiji, 350–357 m, 12 Mar. 1999. MNHN 2002-3118 (1, 26.8), Bordau 1, DW-1499, 18°39'00"S, 178°25'58.8"W, Fiji, 389–400 m, 12 Mar. 1999. MNHN 2002-3181 (1, 72.3), MUSORSTOM 4, CC-201, 18°55'58.8"S, 163°13'58.8"E, New Caledonia, 500 m, 20 Sep. 1985. MNH2003-2343 (9, 34.7–51.6), MUSORSTOM 4, CP-169, 18°54'3.6"S, 163°10'58.8"E, 600 m, New Caledonia, 17 Sep. 1985.

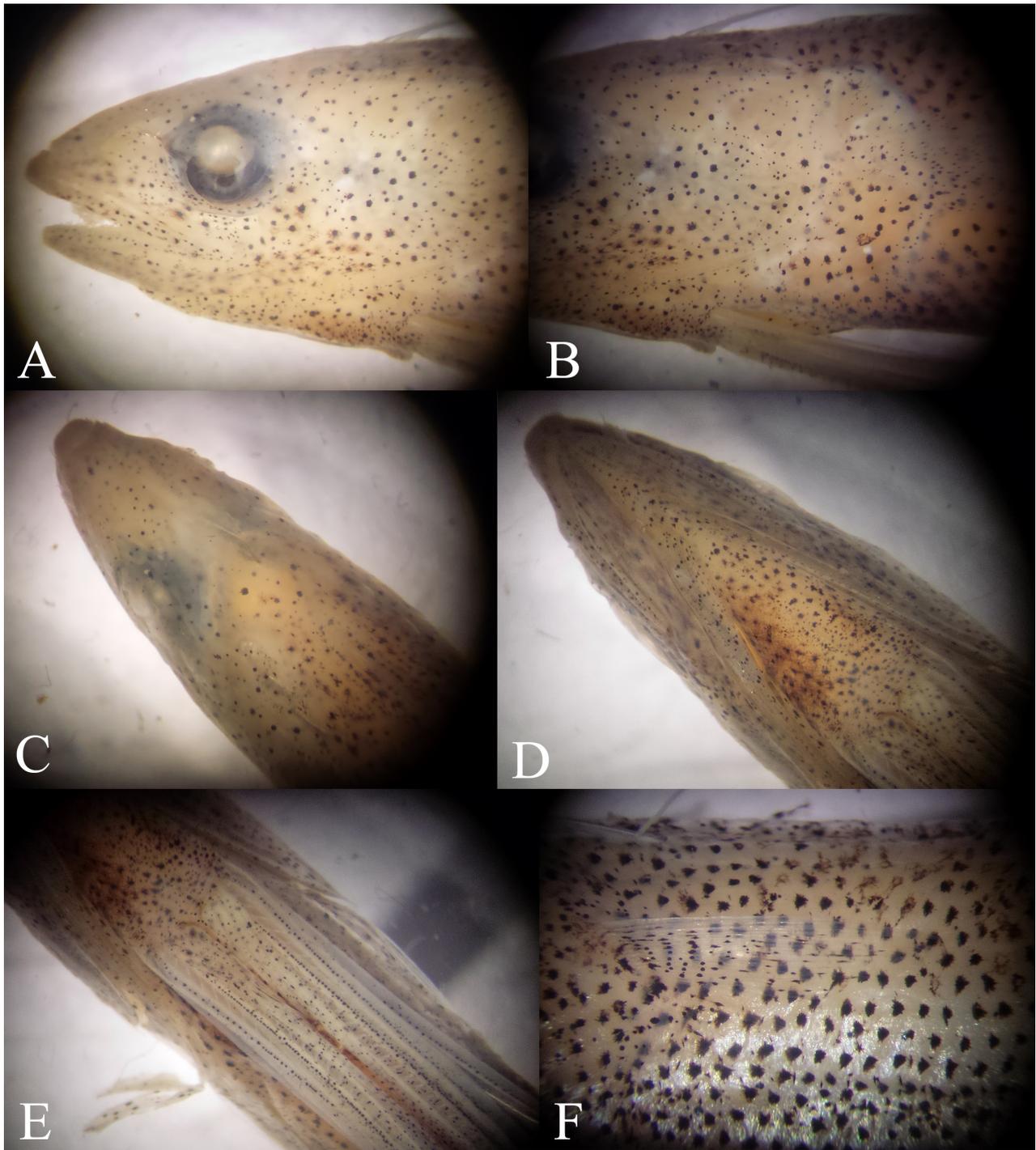


**FIGURE 1.** *Bregmaceros retrodorsalis* sp. nov. A. holotype, MNHN 2002-3218, 64.0 mm SL, arrows indicate the origins of dorsal fin (above) and anal fin (below). B. MNHN 2002-3152, 54.2 mm SL, paratype, arrows indicate the first neural spine (above) and the parapophysis of the last prehaemal vertebrae (below). Not to scale.

**Diagnosis.** A species of *Bregmaceros* with origin of second dorsal-fin well posterior, above bases of 5th to 7th anal-fin rays and combination of the following characters: a pointed snout distinctly longer than eye diameter; upper lobe of opercle branched distally; body relatively slender, its depth 10.0–13.0% SL; 13 principal caudal-fin rays (middle 11 branched); 52–57 second dorsal-fin rays; 58–63 anal-fin rays; 16–18 transverse scale rows below origin of second dorsal-fin; 86–93 longitudinal scale rows along body axis; vertebrae 55–58; entire body evenly covered with melanophores, those on lateral sides forming regular longitudinal rows, one melanophores per scale; head and isthmus entirely, but loosely, covered with variably sized melanophores.

**Description.** Meristic characters and body proportions of the holotype and selected paratypes are presented in Table 1. The following data are based on the holotype with data of selected paratypes in parentheses for ranges if required.

Second dorsal-fin rays 54 (52–57); anal-fin rays 62 (58–63); pectoral-fin rays 18 (16–18); principal caudal-fin rays 13, middle 11 rays branched, middle 7 rays supported by hypural plate; total caudal-fin rays 30 (27–31). Prehaemal vertebrae 15 (14–15); caudal vertebrae 42 (40–43); total vertebrae 57 (55–58). Scales in longitudinal row along body axis 93 (86–93); transverse scale row between origins of dorsal and anal fins 17 (16–18).



**FIGURE 2.** Close-up photographs of *Bregmaceros retrodorsalis* **sp. nov.**, MNHN 2002-3152, paratype, 54.2 mm SL. A. head, lateral. B. gill cover. C. dorsal surface of head. D. ventral surface of head. E. anterior portion of pelvic fins. F. pectoral-fin region. A–E: anterior to left; not to scale.

Body rather slender compared to other congeners, slightly compressed, body width slightly more than half of body depth at anal-fin origin. Snout pointed and conical, its tip projecting slightly beyond that of jaw; snout length distinctly longer than eye diameter. Mouth slightly oblique, subterminal. Tip of upper jaw ending posteriorly below a vertical between center of eye and posterior margin of pupil. Interorbital smoothly convex. Adipose eyelid covering most of eye, its opening oval on ventral portion of eye. Two nostrils just anterior to eye. Premaxillary with band of 2 or 3 irregular rows of stout teeth, those on inner row slightly larger than on outer row. Lower jaw with 2 irregular rows of conical teeth, those on inner row much larger than those on outer row and upper jaw. Vomer with

medium-sized conical teeth arranged irregularly. Gill arches with small conical teeth arranged in multiple irregular rows.

Pectoral fin moderately large, about 1.7 (1.5–1.9) in HL, distal margin pointed, upper rays longer, gradually shorter ventrally, all rays unbranched. Caudal fin emarginated, middle rays relatively short. Pelvic fins jugular in position, tip of longest ray reaching posterior lobe of anal fin; 3 outermost rays greatly elongated, finely segmented, all simple; inner rays short, complexly branched. First dorsal fin a slender occipital ray with tip reaching nearly origin of second dorsal fin. Origin of second dorsal fin well behind that of anal fin, above 6th (5th to 7th; rarely 4th) anal-fin rays. Second dorsal and anal fins with long bases, nearly identical in profile; base of second dorsal fin distinctly shorter than that of anal fin; both fins divided into three confluent sections: anterior lobe high, triangular; middle portion low, consisting of rudimentary unsegmented rays; and posterior lobe of moderate height.

Lateral-line origin at posttemporal, about midpoint between dorsal edge of gill cover and insertion of occipital ray; running along dorsum from above posterior margin of gill cover to about middle of posterior lobe of second dorsal fin, and declining diagonally, ending shortly behind declining point. Lateral-line scales half tube-shaped, with pores on lower side.

A shallow groove bordered by a pair of longitudinal ridges (=lateral line), to house occipital ray along dorsum from behind insertion of that ray to origin of second dorsal fin; followed by shallow groove along each side of the fin.

A pair of broad dermal flaps bordering a groove along ventral contour from insertion of pelvic fin to posterior end of anterior lobe of anal fin; the groove scaleless, broad and flat, except a very low ridge along middle of groove, slightly enlarged just after insertion of pelvic fin and before anus, the later ending with a small flap.

Opercle deeply forked; upper lobe thin and slender, divided into 2–4 branches distally; lower lobe moderately broad, smoothly convex along anterior margin and lower end pointed or slightly forked; length of upper lobe 1.5 (1.3–1.5) times that of lower lobe. Axillary flap with a small triangular projection on its lower half.

Scales on sides of body mostly rectangular, slightly oblong, small, cycloid and deciduous; circuli on each scale concentric around focus on exposed part, longitudinally straight and truncated at anterior border on covered part. Circuli in form of interrupted lines, semi-circular on exposed part, straight on the covered parts. About 17 or 18 circuli (or 34–36 longitudinal stripes on a vertical line through middle of scales) on trunk scales (three specimens, 38.0, 54.2 mm and 59.7 mm SL, respectively, with scales stained and examined).

A long triangular, weakly hooked parapophysis at anterior portion of each prehaemal vertebra (Fig. 1B), except for absent on few anterior ones. Sensory pores on mandibular canal tubular.

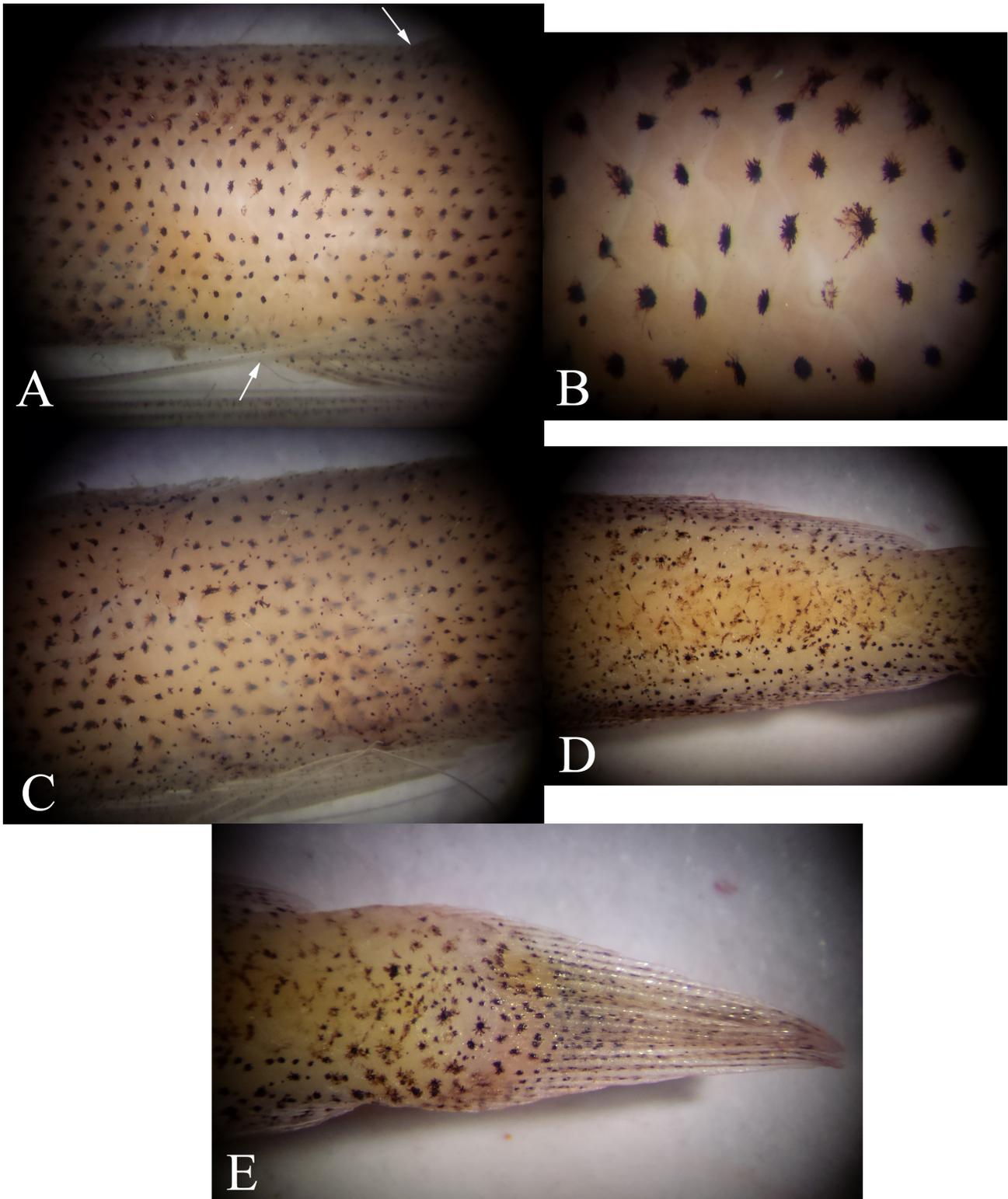
Coloration (Figs. 1A, 2–3) in preserved specimens. In adults, ground color pale, nearly evenly covered by punctate melanophores; not especially dark anywhere. Head and body evenly covered by variably sized melanophores. Some large melanophores around eye and gill cover; isthmus densely covered by tiny melanophores. Pectoral fin with small dots at base and central regions; clear on margin. Pelvic, second dorsal, anal, caudal fins densely covered by tiny melanophores. Body mainly covered by regular longitudinal rows of large melanophores laterally, arranged in about 15 rows at its deepest part; a single melanophores associated per scale, situated at center of posterior margin of each scale; these melanophores are positioned on scale pockets and covered by the scales and therefore are still visible when scales are lost. Peritoneum pale; pyloric caeca pale, intestine pale; stomach black with pale thin layer on surface. Ventral groove with scattered moderately large melanophores. Flap along ventral groove with tiny melanophores.

In juveniles smaller than 20 mm SL, body with fewer longitudinal rows of melanophores; all fins and ventral half of head devoid of pigments; caudal fin with a narrow band of melanophores. Melanophores gradually increasing in specimens between 20–30 mm SL, but lower half of head still with scattered melanophores. In specimens larger than 30 mm SL, entire body covered with melanophores, except for the distal tips of all fins.

**Distribution.** Known from southern Japan (Tosa Bay) and the tropical Pacific Ocean (Wallis & Futuna, Vanuatu, Fiji, New Caledonia, and Chesterfield). Bathymetric range 10–455 m, suggesting diel vertical migration in Tosa Bay.

**Etymology.** From Latin *retro*, back or behind, and *dorsum*, upper side of an animal, e.g. dorsal-fin in a fish; referring to the backward position of second dorsal fin.

**Comparison.** *Bregmaceros retrodorsalis* is distinct from all other species of *Bregmaceros* in having the second-dorsal-fin origin well behind that of the anal-fin, the former being above base of the 5th–7th (rarely 4th) rays of the anal fin; as a result there are about 2 vertebral columns between the origins of these two fins (Fig. 1B). Associated with this character is the predorsal length 105–113% of the preanal length.



**FIGURE 3.** Close-up photographs of *Bregmaceros retrodorsalis* **sp. nov.**, MNHN 2002-3152, paratype, 54.2 mm SL. A. anterior trunk region, arrows indicate the origins of second dorsal fin (upper) and anal fin (lower). B. anterior trunk region. C. anterior lobes of second dorsal and anal fins. D. posterior lobes of second dorsal and anal fins. E. caudal fin. Anterior to left, not to scale.

The new species is similar to the following species with the upper lobe of the opercle branched distally (e.g., fimbriate in Harold & Golani, 2016): *B. arabicus* D’Ancona & Cavinato, 1965, *B. lanceolatus* Shen, 1960, *B. nectabanus* Whitley 1941, *B. maclellandi* Thompson, 1840, *B. pescadorus* Shen, 1960, and *B. pseudolanceolatus* Torii *et al.*, 2004 (Torii *et al.*, 2004, Harold & Golani, 2016).

*Bregmaceros lanceolatus* and *B. pseudolanceolatus* have rounded or lanceolate caudal fins (e.g., middle rays longer than the outer rays) and scales on gill cover, and thus can be easily separated from *B. retrodorsalis*.

*Bregmaceros retrodorsalis* is most similar to *B. arabicus* in having longitudinal rows of pigment on the sides; but differs in having the origin of the second dorsal fin well posterior to that of the anal fin (vs. origin about same vertical); a long pointed snout, 1.2–1.5 times eye diameter (vs. blunt snout, about equal to eye diameter); 56–58 total vertebrae (vs. 52–54 in type series); second dorsal-fin rays 52–54 (vs. 50–60); anal-fin rays 58–62 (vs. 50–63); 17 or 18 (vs. 14–16) transverse scale rows (data from the original description). D’Ancona & Cavinato (1965) also mentioned that there is no longitudinal row of pigment on the abdominal region in the type series of *B. arabicus*. All specimens of the new species examined possess longitudinal rows of pigments in this same region.

*Bregmaceros nectabanus* and *B. mclellandi* differ from the new species in coloration (lower half of trunk mostly devoid of pigment); rounded snout; less than 80 lateral scale rows; less than 55 total vertebrae; and a relatively short and deep body (Torii *et al.*, 2003; Harold & Golani, 2016).

**TABLE 1.** Morphometric and meristic data of *Bregmaceros retrodorsalis* sp. nov.

	Holotype	Paratypes			
		Tropical Pacific Ocean		Japan	
SL (mm)	64.0	38.0–64.0 (n=9)		42.4–55.7 (n=10)	
In % SL		Mean (Range)	SD	Mean (Range)	SD
Head length	17.8	17.4 (15.8–18.7)	0.9	15.7 (15.1–16.1)	0.3
Head depth	9.9	10.5 (9.0–11.6)	0.8	9.6 (9.2–10.3)	0.3
Upper fork of opercle	4.9	4.3 (3.5–4.9)	0.6	3.5 (3.1–3.8)	0.2
Lower fork of opercle	3.3	3.4 (3.0–3.9)	0.4	2.7 (2.5–2.8)	0.1
Body depth	12.2	11.4 (10.0–12.6)	0.8	11.8 (10.9–13.0)	0.8
Predorsal length (PDL)	41.7	40.7 (38.7–42.1)	1.2	39.5 (38.1–40.5)	0.9
Preanal length (PAL)	37.8	37.4 (35.3–38.3)	0.9	36.1 (35.6–36.9)	0.5
Pectoral-fin length	10.5	10.2 (9.4–11.1)	0.6	9.8 (8.6–10.4)	0.6
Caudal-peduncle depth	4.2	4.7 (4.1–5.3)	0.4	4.4 (4–4.8)	0.2
Eye diameter	3.9	4.0 (3.7–4.3)	0.2	3.6 (3.3–3.9)	0.2
Interorbital width	2.9	3.3 (2.9–3.8)	0.4	2.9 (2.6–3.1)	0.2
Snout length	4.5	5.0 (4.5–5.4)	0.3	4.3 (4.0–4.6)	0.2
Upper-jaw length	7.6	8.0 (6.7–8.6)	0.6	6.7 (5.8–7.0)	0.4
In % HL					
Eye diameter	21.8	22.9 (21.1–24.2)	1.2	23.0 (21.1–24.6)	1.2
Interorbital width	16.4	18.9 (15.5–22.6)	2.7	18.6 (17.2–20.1)	0.9
Snout length	25.2	28.9 (25.2–32.2)	2.0	27.4 (25.4–29.7)	1.2
Upper-jaw length	42.8	46.0 (42.5–50.0)	2.7	42.6 (37.2–44.9)	2.6
PDL/PAL	1.10	1.09 (1.05–1.13)		1.09 (1.07–1.11)	
Meristics					
Second dorsal-fin rays	54	52–55		53–57	
Anal-fin rays	62	58–62		57–63	
Pectoral-fin rays	18	16–18		16–17	
Principal caudal-fin rays	13	13		13	
Total caudal-fin rays	30	28–30		27–31	
Prehaemal vertebrae	15	14–15		14–15	
Caudal vertebrae	42	41–43		40–42	
Total vertebrae	57	55–58		55–56	
Longitudinal scales rows	93	86–93		87–88	
Transverse scale rows	17	16–18		17	

Based on the original description (Shen, 1960), the following characters of *B. pescadorus* differ from *B. retrodorsalis* as follows: body relatively deep (14.0–14.6% SL, calculated from Shen, 1960); 14–15 transverse scale rows; origin of second dorsal fin slightly before that of anal fin, preanal length equal to slightly more than predorsal length (e.g. the origin at about same vertical or slightly before anal-fin origin).

The remaining congeners have a simple upper lobe of the opercle (Harold & Golani, 2016) and lack longitudinal rows of melanophores on the lateral sides of the body (Ho, pers. data). *Bregmaceros retrodorsalis* is believed not to be contained in Torii's unpublished thesis.

**Remarks.** Some minor differences can be observed between the populations of Japan and the tropical Pacific Ocean. Although there is overlap, the specimens collected from off Japan have a slightly higher second dorsal-fin ray count (53–57) and fewer total vertebrae (55–56), compared to those collected from tropical Pacific Ocean (Table 1).

It is notable that some tentatively identified non-types (none collected together with the type series) with similar appearance of slender body and similar meristics, but have more dense chromatophores on body. Closed examination of these specimens revealed that they all have a simple upper lobe of the opercle and a slightly anterior position of dorsal-fin origin (above bases of 2nd–5th anal-fin rays). These specimens were also collected from slightly deeper water (375–600 m) than *B. retrodorsalis* (10–455 m). Although they are tentatively identified here as the same species, further genetic investigation may prove them to be different species.

## Acknowledgements

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