

**First Records of Two Bothid Flounders,
Grammatobothus polyophthalmus
and *Arnoglossus tapeinosoma*, from Japan**

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During the studies of Japanese pleuronectiforms, we caught two bothid species previously unknown from Japanese waters, *Grammatobothus polyophthalmus* (Bleeker, 1866) from the Ryukyu Islands and *Arnoglossus tapeinosoma* (Bleeker, 1866) from Tosa Bay, Kochi Prefecture. The former species is widely distributed from the Indian Ocean throughout the Malay Peninsula and Archipelago to Australia and the South China Sea (Norman, 1934; Kyushin et al., 1982). The second species was known from the Persian Gulf to the South China Sea (Norman, 1934; Shen, 1966, 1983). Since our new locality records for these two species represent the northern limits of distribution and their first records from Japan, short descriptions, figures and some comments are given herein.

Counts and measurements follow Hubbs and Lagler (1949), with the addition that length of the pelvic-fin base is measured from the base of the first ray to that of the last ray. Vertebrae were counted from radiographs. Institutional abbreviations follow Leviton et al. (1985).

Grammatobothus polyophthalmus (Bleeker, 1866)
(Japanese name: Mitsume-darumagarei)
(Fig. 1)

Materials examined. Males: URM-P 15309, 1 specimen, 159.0 mm SL, Dec. 23, 1985; URM-P 17123, 1, 160.2, April 7, 1986; URM-P 17116, 17228, 2, 135.0–143.0, April 15, 1986; URM-P 17230, 1, 150.1, April 18, 1986. Females: URM-P 17124, 1, 169.9, collected with URM-P 17123; URM-P 17229, 1, 158.0, collected with URM-P 17230. All specimens were caught by gill net and subsequently collected from Chinen Fish Market, Okinawa Island.

Diagnosis. Dorsal fin rays 84–86, second to tenth rays prolonged; 3 large prominent ocelli, two anteriormost above and below pectoral fin and posteriormost midway along straight portion of lateral line.

Description. Means are given in parentheses. D 84–86 (84.6); A 65–68 (66.7); P₁ 15–17 (15.4) on ocular side, 12–14 (13.1) on blind side; scales in lateral line 75–77 (76.0); gill rakers 0–3+7–8 (2.3+7.4); vertebrae 10+27–28=37–38 (37.9).

Body depth 1.59–1.76 (1.70) in SL; head length 3.67–3.96 (3.87). All further measurements expressed as times in head length: snout length 3.97–4.34 (4.12); upper-eye diameter 3.70–4.05 (3.87); lower-eye diameter 3.68–3.97 (3.80); interorbital width 15.21–22.93 (19.91); upper-jaw length 2.77–3.19 (3.06) on ocular side, 3.09–3.45 (3.31) on blind side; lower-jaw length 2.25–2.43 (2.33) on ocular side, 2.13–2.29 (2.20) on blind side; caudal-peduncle depth 2.24–2.58 (2.43); pectoral-fin length 0.49–1.43 (0.97) on ocular side, 1.76–2.26 (1.94) on blind side; pelvic-fin length 1.62–2.16 (1.87) on ocular side, 2.12–2.85 (2.49) on blind side; length of pelvic-fin base 3.13–3.74 (3.45) on ocular side, 4.35–5.00 (4.72) on blind side; longest dorsal-fin ray (except for anterior elongate rays) 1.90–2.25 (2.05); longest anal-fin ray 1.90–2.28 (2.01); width of curve in lateral line 1.65–1.81 (1.72); height of curve in lateral line 3.71–4.85 (4.43); length of 1st dorsal-fin ray 2.55–3.21 (3.03); 2nd 1.84–2.38 (2.14); 3rd 0.98–1.81 (1.30); 4th 0.96–1.63 (1.21); 5th 0.96–1.65 (1.21); 6th 1.09–1.84 (1.33); 7th 1.15–1.96 (1.42); 8th 1.38–2.26 (1.69); 9th 1.71–2.26 (1.89); 10th 1.71–2.26 (1.96).

Body deeply ovate, nearly circular, its depth much more than half of SL. Upper profile of head deeply notched in front of interorbital space. Snout shorter than eye diameter. Eyes separated by narrow concave space without sexual differences, lower eye slightly before upper.

Mouth moderate, oblique and gently curved; maxilla extending to below or a little beyond anterior margin of lower eye. A blunt prominence on maxillary head, produced in front of lower eye. Teeth uniserial in both jaws, those on upper jaw gradually becoming smaller posteriorly, those on lower jaw subequal to each other in size, being approximately similar to anterior teeth on upper jaw. Gill rakers short without serrations, some on upper limb.

Scales on ocular side ctenoid with a row of short spinules on apical margin; cycloid on blind side.

Second to tenth dorsal-fin rays prolonged (fourth

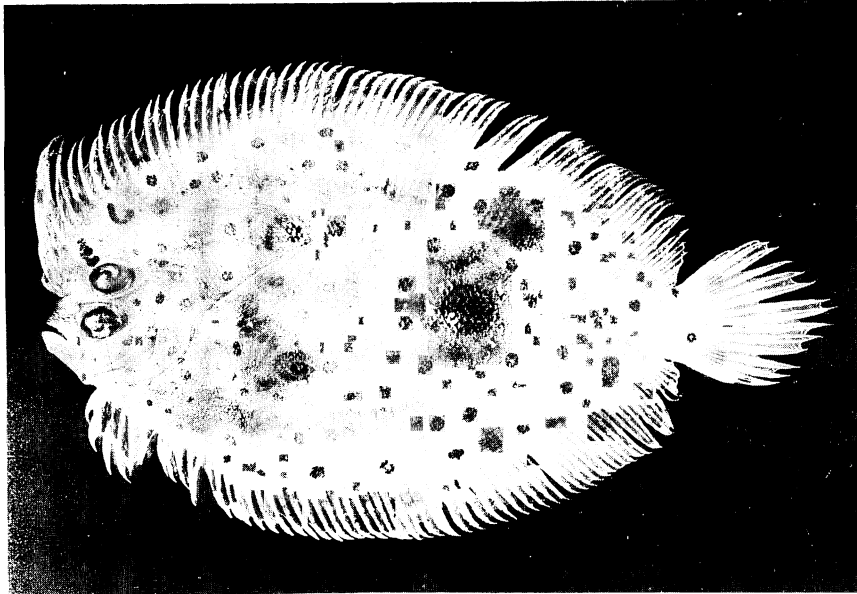


Fig. 1. *Grammatobothus polyophthalmus* from Okinawa Island, Japan, URM-P 17230, male, 150.1 mm SL.

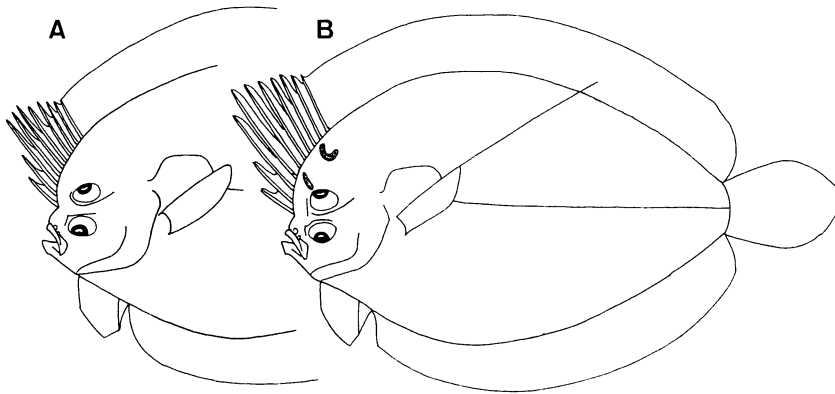


Fig. 2. Sexual dimorphism (A, female; B, male) of *Grammatobothus polyophthalmus*.

or fifth longest in both sexes), with membrane between prolonged rays deeply incised; in males prolonged rays longer than in females, and membrane on posterior surfaces of prolonged rays expanded, forming pinniform rays (Figs. 2, 3). Second ray of pectoral fin on ocular side prolonged only in males, sometimes forming a long filament, extending for anterior 2/3 of body; no elongated pectoral-fin rays in females (Figs. 2, 4). Pelvic fin on ocular side beginning below middle of lower eye, third or fourth ray on ocular side opposite to first ray on blind side. Upper- and lowermost two or three rays of caudal fin

simple, remaining rays branched.

Urogenital papilla opening above second anal-fin ray, vent on blind side opposite papilla.

Color in formalin: General ground color on ocular side pale brownish, with three large, prominent dark ocelli, two anteriormost above and below pectoral fin, posteriormost midway along straight portion of lateral line; head and body covered more or less regularly with many small, distinct, dark spots, with obscure markings along dorsal and ventral body margins; one or two distinct chromosome-shaped dark bars above upper eye in males (Fig. 2); dorsal,

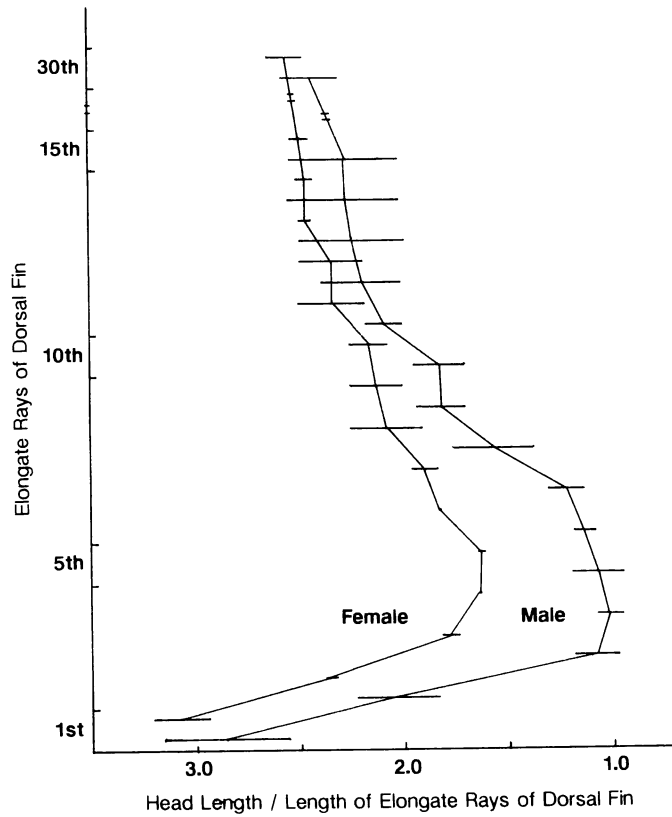


Fig. 3. Sexual dimorphism of length of dorsal fin rays in *Grammatobothus polyophthalmus*. Horizontal lines show the range for each ray.

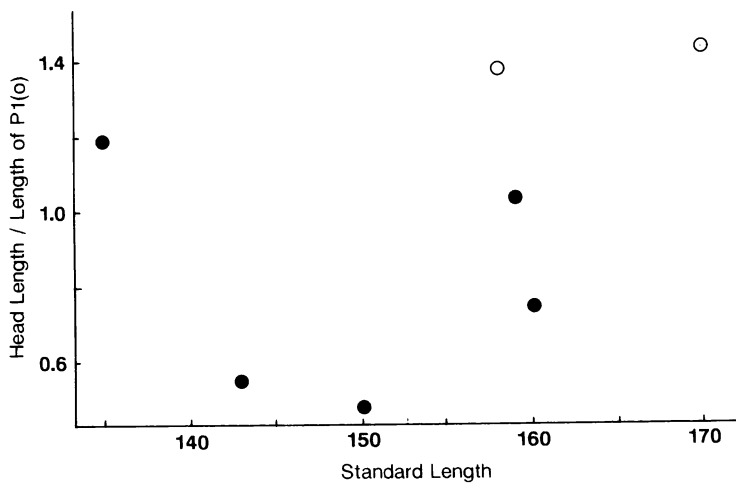


Fig. 4. Relationships between pectoral-fin length on ocular side and standard length in *Grammatobothus polyophthalmus*. Solid circles indicate males; open circles, females.

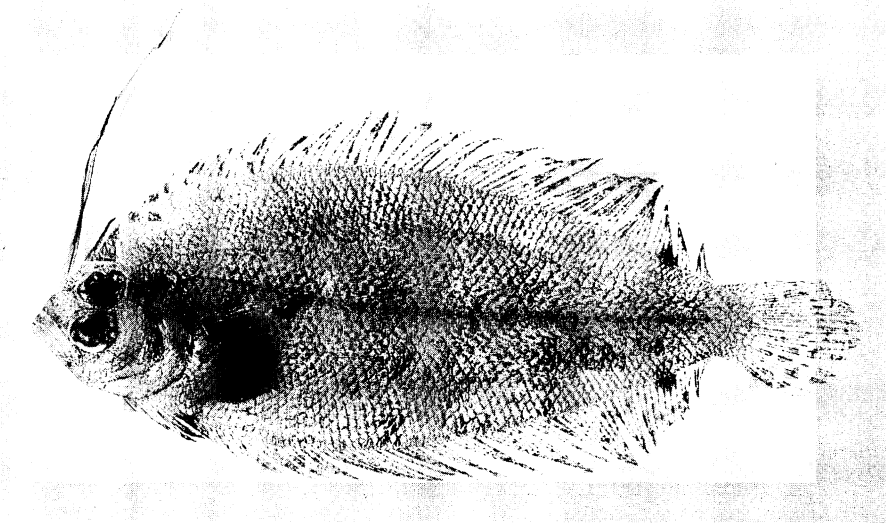


Fig. 5. *Arnoglossus tapeinosoma* from Tosa Bay, Japan, BSKU 49947, male, 58.4 mm SL.

anal and ocular-side pelvic fins with indistinct dusky spots and markings; caudal fin with a pair of marks a little behind base; ocular-side pectoral fin with broad pale cross-bars.

Sexual dimorphism: Males of this species have the second to tenth dorsal-fin rays more prolonged than females (Figs. 2, 3). Moreover, the membranes on the posterior surfaces of the prolonged rays are more expanded than in females, thus forming pinniform rays (Fig. 2). The pectoral fin on the ocular side is prolonged in males. The 2nd ray is elongated into a filament (47.0–52.0% of SL) in two males, but it is not filamentous in the three other males examined (21.5–34.3%). In females the pectoral fin is never elongated (18.1–19.7%) (Fig. 4). The male fishes have one or two conspicuous, dark bars, somewhat reminiscent of chromosomes; such bars were not seen in the females (Fig. 2).

Remarks. Three species are known in this genus: *Grammatobothus polyophthalmus* from the Indian Ocean to the South China Sea and Australia, *G. pennatus* from northern Australia, and *G. krempfi* from the South China Sea. *G. polyophthalmus* is easily separable from the other two species on the basis of meristic counts and by the prolonged second to tenth dorsal fin rays.

Previously, sexual dimorphism in this species had been recorded only for the upper ray of the pectoral fin on the ocular side in some males. It is now apparent that sexual dimorphism occurs in the elon-

gated dorsal fin rays and their fin-membranes, and in head markings above the upper eye.

This species has been frequently collected from various localities of the Indo-Australian Archipelago and the South China Sea (Norman, 1934; Kyushin et al., 1982; Gloerfelt-Tarp and Kailola, 1984; Sainsbury et al., 1985). Its distributional range is now extended northward to Okinawa Island, Japan.

Arnoglossus tapeinosoma (Bleeker, 1866)
(New Japanese name: Niten-nagadarumagarei)
(Fig. 5)

Materials examined. BSKU 43329, 1 specimen, 45.0 mm SL, off Kochi, (33°24.77'N, 133°35.13'E–33°23.77'N, 133°32.43'E), 60 m depth, Oct. 23, 1986; BSKU 47429, 1, 69.9, off Kochi (33°24.38'N, 133°34.10'E–33°23.78'N, 133°32.85'E), 60 m, Oct. 6, 1989; BSKU 47430, 1, 54.2, off Kochi (33°23.15'N, 133°36.29'E–33°22.82'N, 133°34.93'E), 75 m, Oct. 6, 1989; BSKU 47431, 1, 56.0, off Kochi (33°23.15'N, 133°36.02'E–33°22.69'N, 133°34.92'E), 75 m, Dec. 22, 1989; BSKU 49947, 1, 58.4, off Kochi (33°27.07'N, 133°32.26'E–33°25.57'N, 133°32.20'E), 45 m, Dec. 4, 1991. All specimens were caught by beam-trawl in Tosa Bay, by Kochi University research ship, "Toyohata-maru."

Diagnosis. A dwarf, slender bothid flounder with the four anteriormost dorsal rays elongated strikingly; a large, dark spot basally on the posterior portions of the dorsal and anal fins.

Description. Means are given in parentheses. D

93–98 (95.0); A 72–77 (74.4); P₁ 13–14 (13.2) on ocular side, 9–12 (10.0) on blind side; scales in lateral line 54–59 (56.6); gill rakers 0+10–13 (0+10.8); vertebrae 10+31–32=41–42 (41.2).

Body depth 2.44–2.83 (2.60) in SL; head length 3.60–4.14 (3.80). All further measurements expressed as times in head length: snout length 3.85–4.84 (4.22); upper eye diameter 3.06–3.75 (3.48); lower-eye diameter 3.06–3.66 (3.43); upper-jaw length 2.45–2.73 (2.54) on ocular side, 2.54–2.94 (2.77) on blind side; lower-jaw length 1.88–1.95 (1.90) on ocular side, 2.05–2.11 (2.08) on blind side; caudal-peduncle depth 2.41–2.55 (2.49); pectoral-fin length 1.50–1.74 (1.63) on ocular side, 2.32–2.73 (2.46) on blind side; pelvic-fin length 2.41–3.21 (2.70) on ocular side, 2.50–2.98 (2.77) on blind side; length of pelvic-fin base 2.73–3.07 (2.89) on ocular side, 4.45–6.00 (5.20) on blind side; longest dorsal-fin ray 1.71–2.05 (1.88); longest anal-fin ray 1.69–1.92 (1.86); 1st dorsal-fin ray 0.59–3.05 (1.67); 2nd 0.55–2.66 (1.65); 3rd 0.65–4.03 (2.36); 4th 0.83–4.03 (2.29); 5th 1.92–3.13 (2.59).

Body elliptical, its depth a little more than 1/3 of SL. Upper profile with a notch in front of middle of upper eye. Snout shorter than eye diameter. Eyes separated by a bony ridge, anterior margins of eyes at about same level or lower margin a little in advance of upper.

Mouth moderate, oblique; maxilla extending to or a little posterior to anterior margin of lower eye. Teeth small, uniserial and close-set in both jaws, without enlarged anterior teeth. Gill rakers slender, without serrations, developed only on lower limb.

Scales on ocular side ctenoid with a row of slender, moderately long spinules, cycloid on blind side. Anteriormost four dorsal-fin rays well prolonged, first or second ray longest, being longer than head length in larger specimens, shorter than head length in smaller specimens. Pectoral fin on ocular side short, slightly longer than half of head length. Pelvic fin on ocular side beginning below posterior margin of lower eye; fourth pelvic-fin ray on ocular side opposite to first ray on blind side. Upper- and lowermost two rays of caudal fin simple, remaining rays branched.

Urogenital papilla opening above origin of anal fin, vent on blind side opposite papilla.

Color in alcohol: General ground color of body on ocular side pale brownish, trace of a dark blotch at junction of straight and curved portions of lateral line, two small blotches on middle of straight portion

of lateral line; series of dark, distinct spots on dorsal and anal fins, large, conspicuous dark spot basally on posterior parts of dorsal and anal fins; distal margins of pectoral fin on ocular side and pelvic fins on both sides darkly pigmented.

Sexual dimorphism: The two larger specimens (58.4–69.9 mm SL) are probably males, because they have four elongated dorsal rays (1st ray 0.59–0.94 in head length, 2nd 0.55–0.99, 3rd 0.65–1.05, 4th 0.83–1.30). The first four rays in the remaining specimens (45.0–56.0 mm SL) are not so developed (1st ray 1.24–3.05 in head length, 2nd 1.90–2.66, 3rd 3.00–4.03, 4th 3.00–4.03). The small size of the specimens precluded sex determination.

Remarks. These specimens are easily identified as *Arnoglossus tapeinosoma* owing to their having four elongated anterior dorsal rays, a dark spot basally on the posterior parts of the dorsal and anal fins, and dark distal margins on the ocular-side pectoral fin and both pelvic fins.

This species is widely distributed from the Persian Gulf and Red Sea, through the northern Indian Ocean to the South China Sea (Norman, 1934; Punnopka, 1964; Shen, 1966; Amaoka, 1971; Kotthaus, 1977; Li, 1987). Shen (1983) recorded the species from Taiwan as a northern limit. In the present study the distributional range extends even more northward to Tosa Bay, Japan.

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日本初記録の2種のダルマガレイ科魚類, ミツメダルマガレイ及びニテナガダルマガレイ (新称)

尼岡邦夫・岡村 収・吉野哲夫

2種のダルマガレイ科魚類, ミツメダルマガレイ *Grammatobothus polyophthalmus* とニテナガダルマガレイ (新称) *Arnoglossus tapeinosoma* が日本から採集された。

前種は沖縄本島近海で刺網によって捕獲され, 知念魚市場から7個体得られた。本種は体側に3個の明瞭な眼状斑があること, 両眼間隔域は狭くくぼむが, その幅は雌雄で差が無いこと, 背鰭の前10軟条は伸長し, それらの軟条の鱗膜が深く切れ込み翼状を呈することなどによって特徴づけられる。本種には胸鰭の長さ(雄では雌よりも長い)以外にも, 二次性徴が存在することが判明した。雄では背鰭伸長軟条は雌よりも長く, それらの後縁の鱗膜(翼)は雌よりも広い。また, 雄には上眼の上方に2個の染色体状の暗色斑紋がある。インド洋からマレイ半島を経てオーストラリアや南シナ海までの分布が知られていた。

後種の5個体は高知大学調査船「豊旗丸」のビームトロールによって土佐湾の水深45-75mから採集された。本種は背鰭と臀鰭の後部の基底にそれぞれ1個の大きな黒色斑があること, 背鰭の前4軟条がよく伸長することなどによって特徴づけられる。本種にも二次性徴が存在し, 雄の背鰭伸長軟条は雌や未成魚よりも長い。本種の分布はベルシャ湾から南シナ海までであった。

今回の両種の記録は分布の北限であり, 日本から初めてである。

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