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A New Species and a New Subspecies of the Stargazer Genus *Gnathagnus* from Northwestern Australia

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Abstract Heretofore the genus *Gnathagnus* (Uranoscopidae) has been composed of three species: *G. elongatus* (Temminck et Schlegel) from northern Australia to Japan, *G. innotabilis* (Waite) from Australasia, and *G. egregius* (Jordan et Thompson) from the western Atlantic Ocean. In this paper, a new species and a new subspecies from northwestern Australia are described and a key to the known species and subspecies of the genus is presented.

The members of the genus *Gnathagnus* Gill, 1861 (Uranoscopidae, Perciformes) change morphologically with growth to such an extent that the young have been regarded as a different genus and species from the adult on two occasions. Amaoka et al. (1986) pointed out that *Ariscopus iburius* Jordan et Snyder, 1902 is the young of *G. elongatus* (Temminck et Schlegel, 1843). Myers (1946) stated that *Benthoscopus laticeps* Longley et Hildebrand, 1940 is the adult of *Execestides egregius* Jordan et Thompson, 1905 and that both *Benthoscopus* Longley et Hildebrand, 1940 and *Execestides* Jordan et Thompson, 1905 should be transferred to *Gnathagnus*.

Although Whitley and Phillipps (1939) established the genus *Gnathagnoides* for *Gnathagnus innotabilis* (Waite, 1904), the differences are too slight to justify the generic separation as Mees (1960) pointed out. In addition, they divided *G. innotabilis* into two subspecies, *G. innotabilis innotabilis* from Australia and *G. innotabilis grandior* from New Zealand, only on the basis of size difference: The New Zealand form is larger than the Australian form. However, this does not seem to be the case. The largest specimens from New Zealand and Australia used in the present study are almost equal in size (321 vs. 345 mm SL) and both are usually of nearly the maximum size when they are caught (the New Zealand form attains a length of 45 cm according to Ayling and Cox, 1982; the Australian form, 40 cm according to Last et al., 1983). Thus, as Mees stated, *G. innotabilis grandior* is identical to *G. innotabilis innotabilis*.

As a result, the four generic, three species and a subspecies names have been shown to represent three species of the genus *Gnathagnus*. During the course of this study, an undescribed species in this genus from Australia was found and the Australian form of *G. elongatus* was recognized to be different from the Japanese form in several morphometrical features. In this paper, the two are described, the latter as a new subspecies, and all species and subspecies are compared.

Materials examined

The study materials are deposited in the following institutions: AMS: Australian Museum, Sydney; BSKU: Department of Biology, Faculty of Science, Kochi University, Kochi; CAS-SU: California Academy of Sciences, California; CSIRO: Commonwealth Scientific and Industrial Research Organization, Hobart; FSFL: Far Seas Fisheries Research Laboratory, Shimizu; HCM: this abbreviation is tentatively given by the present author for a specimen of Hakodate City Museum, Hakodate; IORD: Institute of Oceanic Research and Development, Tokai University, Shimizu; MSM: Marine Science Museum, Tokai University, Shimizu; NSMT: National Science Museum, Tokyo; NMNZ: National Museum of New Zealand, Wellington; USNM: U. S. National Museum of Natural History, Smithsonian Institution, Washington; WAM: Western Australian Museum, Perth; ZUMT: Department of Zoology, University Museum, University of Tokyo, Tokyo.

Comparative material. *Gnathagnus innotabilis* from southeastern Australia: AMS-E 4942, 90.7 mm SL, East of Babel I., Bass Strait, 120–135 m, by "Endeavour", 1914; AMS-I 6755–7 (3 syntypes), 108–123 mm SL, off Narrabeen, near Sydney, N.S.W., 33°43′S, 151°19′E, reg. Apr. 1904; AMS-IB 6998, 86.8 mm SL, off Port Stephens, N.S.W., 32°S, 152°E, trawl, by B. Mitchell,

19 Feb. 1964; CSIRO-C 703 and 704, 87.7 and 97.6 mm SL, data unknown; CSIRO-C 4784, 322 mm SL, 35°39′S, 150°39′E, 300–400 m, 30 Aug. 1976; CSIRO-CA 499, 193 mm SL, east coast of Tasmania, 41°29′S, 148°22′E, 50–52 m, 6 Nov. 1978; CSIRO-CA 3761, 186 mm SL, off east coast of Tasmania, 42°32′S, 148°19′E, 100 m, 7 Nov. 1978; FSFL-EB 728, 345 mm SL, 34°58.2′S, 151°06.7′E, 381 m, 31 Dec. 1975; FSFL-ED 059, 324 mm SL, 34°47.0′S, 151°15.2′E, 166 m, 31 Dec. 1975.

New Zealand: IORD85-33 (from NMNZ), 245 mm SL, Bay of Plenty; NMNZ-P 2904, 220 mm SL, Cape Campbell, 41°44′S, 174°16′E, 73.2 m, 11 Dec. 1959; NMNZ-P 4838, 341 mm SL, east of Aldermans, 36°58′S, 176°05′E, 146 m, 13 Sep. 1968; NMNZ-P 11115, 46.2 mm SL, Bay of Plenty, 37°46.7′–45.7′S, 176°40.3′E, 38 m, 7 May 1975; NMNZ-P 16110, 176 mm SL, off Slipper I., 37°27.2′–25.3′S, 176°27.2–24.3′E, 187–193 m, 22 Sep. 1984; NMNZ-P 16118, 105 mm SL, off Tauranga Harbor, 37°46.7′–46.2′S, 176°58.0′–54.2′E, 60–78 m, 18 Sep. 1984; NMNZ-P 16176, 309 mm SL, off Motuhora I., 37°41.3′–42.0′S, 177°35.9′–31.9′E, 89–98 m, 17 Sep. 1984.

Gnathagnus egregius: CAS-SU 8411 (holotype of *Execestides egregius*), 45.5 mm SL, Reef at Garden Key, Tortugas, Fla.; IORD51-1 (orig. USNM 186210), 77.9 mm SL, M/V "Oregon" Stn. 331, south of Pensacola, 30°03′N, 96°56′W, 40′ flat trawl, 4 May 1951; IORD62-1 (from USNM), 137 mm SL, M/V "Oregon" Stn. 3649, east of Mississippi Delta, 29°13′N, 88°07′W, 275 m, 24 July 1962; IORD62-2 (orig. one among three of USNM 188012), 235 mm SL, off Mississippi Delta, 29°10.5′N, 88°08.5′E, 23 Oct. 1962; radiograph of USNM 108879 (holotype of *Benthoscopus laticeps*), 200 mm SL, south of Tortugas, Fla., between 165 and 320 m; USNM 188012 (2 among 3 specimens), 230 and 264 mm SL, off Mississippi Delta, 29°10.5′N, 88°08.5′E, 23 Oct. 1962.

Gnathagnus elongatus elongatus from Hokkaido, Japan: CAS-SU 6544 (holotype of *Ariscopus iburius*), 59.8 mm SL, off Iburi, Volcano Bay; HCM 30290 (not a type specimen, but referred to in the original description of *A. iburius*), 53.1 mm SL, data same as holotype.

The Pacific coast of Japan: BSKU 36802, 36205 and and 36207, 224–308 mm SL, a fish market in Kochi Pref., 19 Jan. and 11 Mar. 1982; IORD69-4, 82.4 mm SL, Kounoura, Mie Pref., 25 June 1969; IORD69-5–7, 40.7–48.6 mm SL, Kumanonada, Kii Pen., Dec. 1969; IORD78-174, 282 mm SL, Kyushu-Palau Ridge, 23 Jan.–20 Feb. 1978; IORD79-68, 180 mm SL, off Miho Pen., Suruga Bay, 15 m, 20 Apr. 1979; IORD79-109, 238 mm SL, off Okitsu, Suruga Bay, 100 m, 13 May 1979; IORD79-132, 107 mm SL, inside water of Miho Pen., 10–20 m, 31 May 1979; IORD79-156, 208 mm SL, off Okitsu, Suruga Bay, 60–75 m, 25 June 1979; IORD79-257, 237 mm SL, off Okitsu, Suruga Bay, 150 m, 9 Oct. 1979; IORD79-264, 250 mm SL, off Miho Pen., Suruga Bay, 45–90 m, 29 Oct. 1979; IORD79-272, 248 mm SL, off Miho Pen., Suruga Bay, 70–150 m, 4 Nov. 1979; IORD79-274, 191 mm SL, off Miho Pen., Suruga Bay, 12 Nov. 1979; IORD79-291 and 292, 174 and 122 mm SL, Owase, Mie Pref., 200 m, 15 Nov. 1979; IORD80-7, 75.3 mm SL, inside water of Miho Pen., Suruga Bay, 10–20 m, 20 March 1980; IORD80-8, 70.2 mm SL, off Miho Pen., Suruga Bay, 31 March 1980; IORD80-26–36, 3 specimens, 50.0–61.5 mm SL and 8 specimens, 140–279 mm SL, Owase, Mie Pref., 100–200 m, 23 Feb., 1980; IORD80-43, 119 mm SL, off Miho Pen., Suruga Bay, 9 May 1980; IORD80-160, 41.5 mm SL, Sagami Bay, 8 Dec. 1980; IORD81-264–266, 107–114 mm SL, Numazu Fish Market, Suruga Bay, 27 Oct. 1981; IORD81-350, 370 mm SL, central part of Suruga Bay, 35°00.7′N–138°32.8′E, trawl, 22 Sept. 1981; IORD82-354 and 355, 140 and 167 mm SL, off Fuji River, Suruga Bay, 225 m, 8 Dec. 1982; IORD82-374 and 375, 230 and ca. 240 mm SL, central part of Suruga Bay, 34°52.15′N, 138°31.32′E, trawl, 10 Jan. 1982: IORD83-12–15, 60.9–210 mm SL, Suruga Bay, by deep trawl, 10 May 1983; IORD83-322, 171 mm SL, off Miho Pen, Suruga Bay, 45 m, 14 Sep. 1983; MSM-72-249, 242 mm SL, Shige fish market, Numazu, Suruga Bay, 28 March 1972; MSM-73-25 and 26, 55.6 and 60.2 mm SL, Shige fish market, Numazu, Suruga Bay, 19 Jan. 1973; MSM-80-175, 108 mm SL, Numazu, Suruga Bay, trawl, 4 Nov. 1980; NSMT-P 29559, 69.3 mm SL, coast of Miho Pen., Suruga Bay, by beach seine pulled from about 10 m in depth, 2 May 1972; NSMT-P 29577, 114 mm SL, off Okitsu, Suruga Bay, 5 Mar. 1972; USNM 296639 (orig. IORD79-258), 227 mm SL, off Okitsu, Suruga Bay, 150 m, 11 Oct. 1979; USNM 296634 (orig. IORD82-12), 103 mm SL, coast of Miho Pen., Suruga Bay, by beach seine pulled from about 10 m in depth, 21 Apr. 1982; USNM 296635 (orig. IORD82-356), 166 mm SL, off Fuji River, Suruga Bay, 225 m, 8 Dec. 1982; ZUMT 21997 and 21998, 52.7 and 53.2 mm SL, Wakayama Pref.

The Japan Sea coast: MSM-71-225, 231 mm SL, detailed data unknown, May 1971; MSM-71-751, 230 mm SL, detailed data unknown, Nov. 1971; ZUMT 19267, 59.7 mm SL, Wajima, Ishikawa Pref.

The East China Sea: BSKU 34725 and 34726, 254 and 187 mm SL, 29°19.15′N, 127°15.5′E, 230–250 m, 19 Dec. 1979; BSKU 33733, 233 mm SL, 30°04.64′N, 127°40.70′E, 220–245 m, 27 Oct. 1979.

Methods of counting and measuring

Standard methods (Hubbs and Lagler, 1970) were used for counting and measuring in addition to those given by Kishimoto (1984, 1987), although

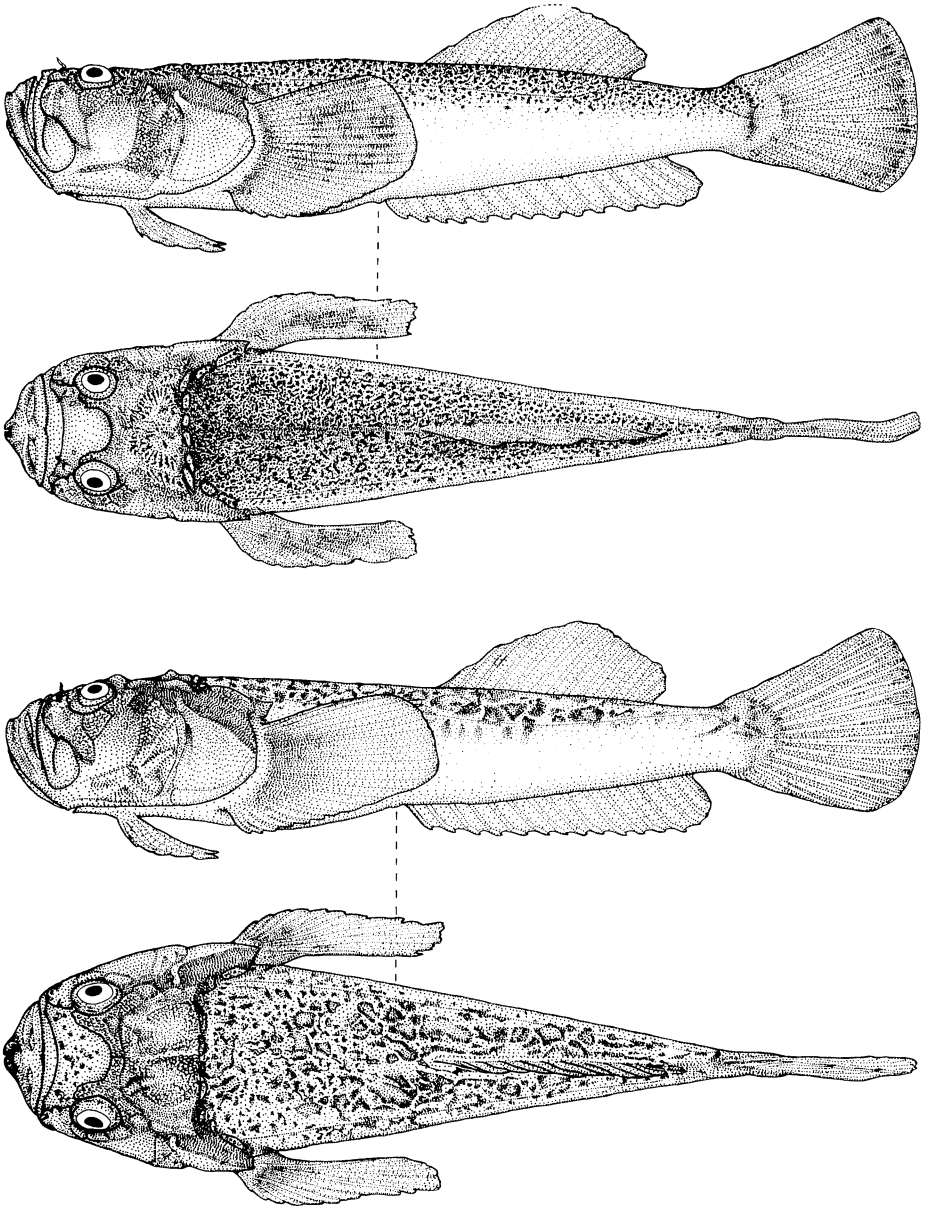

Fig. 1. Type specimens of *Gnathagnus cribratus* sp. nov. Top two: holotype, 197 mm SL, WAM-P 28071–009; bottom two: paratype, 120 mm SL, WAM-P 28086–007.

the rear end of the gill flap was adopted here as the end point in measuring the head length and the length of the postorbital part of the head.

Gnathagnus cribratus sp. nov.

(Fig. 1)

Holotype. WAM-P 28071-009, 197 mm SL, ca. 90 km southwest of Rowley Shoals, northwestern Australia, 18°08′S, 118°31′E, 350–354 m, beam trawl, 17 Aug. 1983.

Paratypes. All from north-western Australia. AMS-I 22808–008, 122 mm SL, North West Shelf, 220 km N. of Port Hedland, 17°59′S, 118°07′E, 404–420 m, Engel trawl, by CSIRO R/V "Soela" S02.82.17–18, 3 Apr. 1982; AMS-I 22821–050, 129 mm SL, North West Shelf, 190 km NW of Port Hedland, 18°16′S, 118°16′E, 298–320 m, Engel trawl, by R/V "Soela", 10 Apr. 1982;

AMS-I 23425-010, 103 mm SL, North West Shelf, 18°46′S, 117°00′E, 400 m, midwater trawl, by R/V "Soela", 1 Aug. 1982; CSIRO-CA 4235, 227 mm SL, off Rowley Shoals, 18°03′S, 118°13′E, 418 m, prawn Trawl, 5 Feb. 1983; WAM-P 28071-026, two specimens of 124 and 131 mm SL, same data as holotype; WAM-P 28086-007, 120 mm SL, ca. 25 km southwest of Rowley Shoals, 17°49′S, 118°41′E, 308–310 m, prawn trawl, 21 Aug. 1983.

Diagnosis. This species differs from the other species of the genus in having the following characters: D. 13–14 (usually 13); A. 15–16 (usually 16); P_1. 23–25. Top of head deeply concave behind interorbital fossa in specimens smaller than 130 mm SL. Predorsal length 54–56% (at SL> 120 mm), width of interorbital fossa 6.1–7.2%, both of SL. Body dotted with squared spots. Vertebrae 27; dorsal pterygiophores 18–20 (usually 19); anal pterygiophores 14–15 (usually 15). First dorsal fin ray articulated to posterior end of seventh pterygiophore.

Description. Morphometric and meristic data are summarized in Tables 1 and 2.

Head and anterior body broad, depressed and flattened dorsally, tapering gradually to the tail; caudal peduncle slightly compressed. Body covered with small, randomly arranged cycloid scales; head, cheek, belly and all fin bases naked except for caudal fin base; tubiform scales entirely embedded along lateral line. Lateral line beginning at postero-interior margin of supracleithrum, gradually approaching end of dorsal fin base, extending over two central caudal fin rays almost to fin apex; no sensory pores crowded on caudal base. Belly and lower tail without dermal folds.

Dorsal fin single, its base longer than height, middle ray longest. Anal fin base much longer than height, posterior ray longest. Pectoral fin very broad, dorsal half square, middle ray longest. Pelvic fins close together, situated on isthmus; spine short, feeble, free from 1st segmented ray. Membranes of anal, pelvic and lower half of pectoral fins fleshy and thickened.

Bones of head exposed, minutely sculptured, composed of tubercles united to radial ridges, separated by smooth intervals. Dorsal surface of skull nearly flattened in the holotype and largest paratype, but in six smaller paratypes (103–131 mm SL), prominent horizontal bony ridges developed on pterotic and parietal bones; a similar prominent semicircular ridge on posterior rim of orbit (frontal). Central top of head behind interorbital fossa slightly concave but more deeply depressed in smaller paratypes.

Gill opening ending dorsally somewhat above pectoral fin origin; posterior margin of gill flap smooth; gill membranes united to isthmus with a connecting fold; branchiostegal membrane without papillae. Opercle broad with radiating striae and a blunt projection posteriorly; upper edge directed downward without bony ridges (in smaller paratypes a bony ridge developed along upper edge). Preopercle smooth on lower edge and angle (in smaller paratypes a bony ridge developed from angle forward and obliquely), with bony cross ridges posteriorly. Subopercle with smooth edge, ossified on about anterior two-thirds of lower part; remaining portion cartilaginous, enlarged along lower edge of opercle posteriorly to a small projection of its end. Interopercle ossified with smooth edge, not covered by preopercle. Six branchiostegal rays. Pseudobranchiae present.

Interorbital space noticeably broad, with wide, short, deep and U-shaped fossa (interorbital fossa) for receiving the ascending processes of premaxillae, the fossa almost extending to a line joining posterior margins of eyes (variously into posterior half of orbit in the paratypes). Eye large, dorsolateral, non-telescopic, without membranous tentacle and grainy row. Infraorbital bones extensive; lacrymal larger than first infraorbital, elongated postero-ventrally, with three bony knobs on anterior edge. Exposed portion of nasal bone minute and ossified but probably cartilaginous, elongated longitudinally under the skin; anterior nasal valve tubiform with a slender filament; posterior nostril slit-like; lacking internal naris and electric organ. Plectroid dilatations of dentaries meeting narrowly on upper part of medial rims. No mental barbel. Mouth protractile, large and vertical; lips without fimbriae or fimbrial ridges. Central tip of respiratory valve inside lower jaw slightly produced.

Premaxillary teeth caniniform, almost always biserial. Teeth on anterior half of dentary resembling those of premaxilla, teeth on posterior half stronger and widely spaced in a single series. A broad band of conical teeth on prevomer. Palatine with five to seven conical teeth in two series. A pair of deep cavities between anterior skull and ascending processes of premaxillae.

Cleithral spine rudimentary, slightly flat and triangular, adpressed to body, not covered with

Table 1. Meristic data for the genus *Gnathagnus*. Numbers of specimens expamined are indicated in brackets. SL, standard length; D, A and P_1, dorsal, anal and pectoral fin rays, respectively; C, branched caudal rays; V, vertebrae including ural centrum; DPT and ATP, proximal pterygiophores of dorsal and anal fins; DR/DPT, dorsal pterygiophore articulating with first dorsal ray. *Holotypes of *Benthoscopus laticeps* and *Execestides egregius*. **Holotype of *Ariscopus iburius*.

	G. innotabilis		*G. cribratus*		*G. egregius*		*G. elongatus elongatus*		*G. e. australiensis*	
	Syntypes	Non-types	Holotype	Paratypes	*Holotypes	Non-types	**Holotype	Non-types	Holotype	Paratypes
SL (mm)	108–123	46.2–345	197	103–227	45.5–200	77.9–264	59.8	40.7–305	214	103–213
D		11 (2)								
	12 (3)	12 (14)				12 (3)		12 (1)		
			13	13 (5)	13 (1)	13 (2)	13	13 (54)	13	13 (8)
				14 (2)	14 (1)			14 (8)		
										15 (1)
A		15 (2)	15			15 (1)				
	16 (3)	16 (14)		16 (7)	16 (2)	16 (4)		16 (1)		
							17	17 (60)	17	17 (9)
								18 (3)		
P_1	21 (2)	21 (9)				21 (1)		21 (1)		
	22 (1)	22 (7)			22 (1)	22 (3)	22	22 (19)		22 (1)
				23 (1)		23 (1)		23 (35)	23	23 (4)
				24 (4)				24 (9)		24 (4)
			25	25 (2)						
C	5+5 (3)	5+5 (14)	5+5	5+5 (6)	5+5 (1)	5+5 (2)	?	5+5 (28)	5+5	5+5 (7)
				5+6 (1)		5+6 (1)		6+5 (1)		5+6 (1)
						6+6 (1)				
V	27 (3)	27 (15)	27	27 (7)						
		28 (1)			28 (2)	28 (5)	28	28 (44)	28	28 (9)
								29 (1)		
DPT		18 (2)		18 (1)		18 (1)				
	19 (3)	19 (14)	19	19 (3)		19 (2)		19 (1)		
				20 (2)	20 (2)	20 (2)	20	20 (39)	20	20 (7)
								21 (3)		21 (1)
APT		14 (2)	14			14 (1)				
	15 (3)	15 (14)		15 (7)	15 (2)	15 (4)				
							16	16 (41)	16	16 (8)
								17 (2)		
DR/DPT			7th	7th (6)	7th (1)			7th (3)		7th (1)
	8th (3)	8th (16)			8th (1)	8th (5)	8th	8th (41)	8th	8th (7)

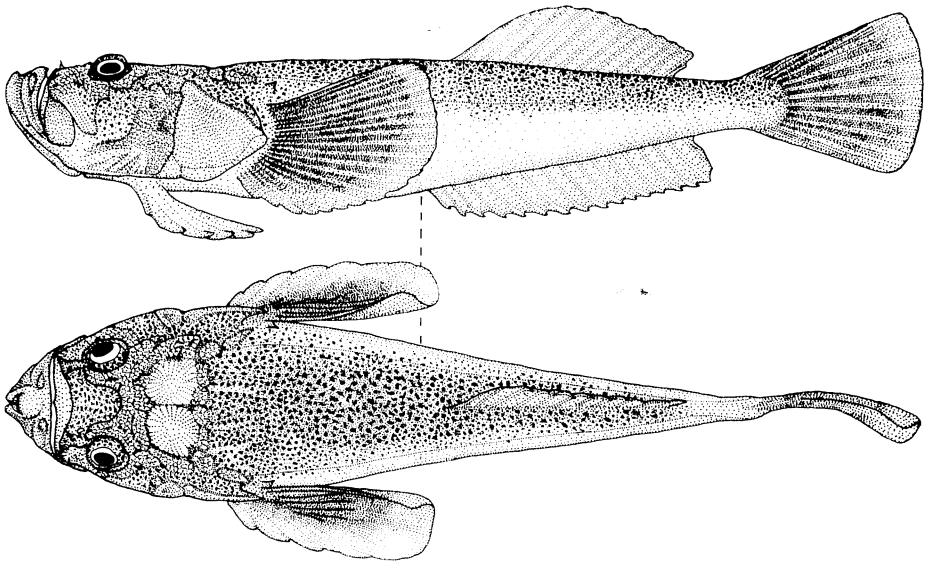

Fig. 2. Holotype of *Gnathagnus elongatus australiensis* subsp. nov., AMS-I 22821-014, 214 mm SL.

fringed dermal appendage; cleithral processes (ventral projection of the bones) always covered with connecting fold of gill membranes; supracleithrum without spine; basipterygium hidden under skin, without exposed process.

Proximal dorsal pterygiophores in front of dorsal fin broader than posterior ones; first one inserted between third and fourth neural spines. The first proximal anal pterygiophore supporting two soft rays; fifth one (first to follow a complete hemal spine) lying behind the hemal spine of 13th vertebra. Last pterygiophores of dorsal and anal fins with a stay. Two postcleithra.

Color in fresh specimens: Unknown.

Color in preservative: Ventral half of body pale; dorsal half brownish, very minutely vermiculated with pale brown. Dorsal fin membrane pale, rays dark brown. Anal and pelvic fins pale. Pectoral fin uniformly dark brown with pale margin. Basal part of caudal fin dark brown, becoming pale distally. In the smallest paratype, dorsal half of body pale with square-ring-shaped dark spots, larger than iris; spots minute and more numerous in larger specimens; CSIRO specimen without visible spots.

Size: Attains at least 23 cm SL, 30 cm TL.

Distribution. This species is only known from the continental shelf of northwestern Australia.

Etymology. The new species is named from the Latin *cribratus*, meaning "provided with sieve meshes" referring to the color-pattern of the young.

Remarks. This species shares with other members of the genus *Gnathagnus* the unique formation with growth of plectroid dilatations on the anterior edge of the dentary. It is modally separable from others in the genus in having a combination of the highest number of pectoral fin rays, the articulation of the first dorsal fin ray with the posterior end of the seventh pterygiophore and a unique color pattern of the young. However, it is difficult to distinguish the adult of this species from *G. egregius* and *G. elongatus* only by external features, because the ranges of individual variation are overlapping one another. This species is distinguishable from the two species by fewer vertebrae and fewer dorsal fin pterygiophores, and from *G. elongatus* by fewer anal fin pterygiophores.

Although specimens smaller than 120 mm SL are unknown, *G. cribratus* probably has a winglike projection produced horizontally from the preopercular angle as seen in smaller specimens of *G. egregius*, since a particularly high bony ridge is present in this location in larger specimens of both species.

Table 2. Morphometric features for the genus *Gnathagnus*. Measurements are experssed as % of standard length. Applicable range of standard length is indicated in brackets. Values of smaller specimens have been omitted as they represent a growth curve with a different inclination. N, numbers of specimens examined; SL, standard length; TL, total length; PD, predorsal length; BDG, greatest depth of body; BDA, body depth at anal fin origin; CP, least depth of caudal peduncle; P_1L, pectoral fin length; P_2A, distance between pelvic and anal fin origins; P_2L, pelvic fin length; CL, caudal fin length; DR, longest dorsal soft ray length; AR, longest anal soft ray length; DB, basal length of dorsal fin; AB, basal length of anal fin; HL, head length; HW, greatest width of head; OH, opercular height; OW, opercular width; ML, maxillary length; MW, maxillary width; SNL, snout length; IS, length of interorbital space; IFW, width of interorbital fossa; IFL, length of interorbital fossa; OD, orbit diameter; IL, least depth of infraorbitals; IG, greatest depth of infraorbitals; CS, cleithral spine length. *Holotype of *Ariscopus iburius*.

	G. innotabilis		*G. cribratus*		*G. egregius*		*G. elongatus elongatus*		*G. e. australiensis*	
	Syntypes	Non-types	Holotype	Paratypes	Holotype	Non-types	*Holotype	Non-types	Holotype	Paratypes
N	3	16	1	7	1	3	1	63	1	10
SL (mm)	108–123	46 2–345	197	103–227	45.5	77.9–264	59.8	40.7–305	214	103–213
TL	129–131	123–131	130	127–131	—	131–135	126	123–131	131	128–133
PD	58–60	56–62 (SL>90)	54	54–56 (SL>120)	70	59–60	64	53–57 (SL>70)	56	52–57
BDG	17–23	16–23 (SL>100)	19	16–21 (SL>120)	33	23–24	26	16–25 (SL>80)	21	15–23
BDA	17–20	15–19 (SL>100)	19	15–23	28	20–22	26	16–22 (SL>100)	19	15–21
CP	8.7–9.2	−SL/120+10 ±1 (SL>80)	8.8	−SL/120+11 ±1	12	−SL/120+12.5 ±0.5	11	−SL/120+7.5 ±1.5	7.2	−SL/120+7 ±1
P_1L	25–28	23–29	27	24–29	28	27–28	25	21–30	25	22–28
P_2L	21–23	19–23	17	16–21	18	17–19	20	14–19 (SL>70)	18	15–20
CL	23–25	−SL/85+26±2	23	−SL/85+26±2	—	−SL/85+30±2	23	−SL/85+26±2	23	−SL/85+26±2
DR	17–18	−SL/80+18 ±1.5	14	14–16	15	15–17	17	−SL/80+17±2	14	−SL/80+16.5 ±1
AR	12–13	11–14	10	10–12	17	11–12	11	8.7–11 (SL>100)	11	10–12
DB	25–27	25–29 (SL>100)	30	28–33	23	27–30	29	30–34 (SL>70)	31	28–34
AB	36–38	35–40 (SL>100)	41	39–42	28	39–40	35	39–45 (SL>70)	39	41–44
HL	38–39	35–38 (SL>170)	32	−SL/25+41±2	51	36–38	38	30–33 (SL>100)	33	−SL/25+41±2
HW	32–33	29–35 (SL>100)	27	28–32	46	26–29	32	23–29 (SL>70)	28	26–33
OH	13–14	11–13 (SL>170)	12	13–15 (SL>131) 12.5 (SL=227)	18	13–14	16	11–13 (SL>100)	11	11–13
OW	12–14	10–12 (SL>170)	11	11–13	20	13–15	13	10–12 (SL>100)	12	11–14
ML	17–18	−2SL/175+20 ±2	16	−2SL/175+19.5 ±1.5	22	−2SL/175+18.5 ±1	18	−2SL/175+18 ±2 (SL>70)	15	−2SL/175+18 ±1
MW	5.5–6.0	4.6–6.4 (SL>80)	6.4	5.6–6.8	5.5	6.1–6.5	5.2	4.5–6.0	6.0	5.6–6.4
SNL	9.0–9.6	8.3–9.9 (SL>90)	7.3	6.6–8.2	11	6.7–7.3	8.7	5.9–7.7 (SL>70)	6.7	6.0–7.5
IS	13–14	11–13 (SL>170)	8.1	8.7–11	19	8.5–8.7	14	8.2–9.9 (SL>105)	8.3	7.8–9.2
IFW	5.7–6.9	5.8–7.6 (SL>80)	6.1	6.1–7.2	9.7	5.4–6.0	7.2	5.0–6.5 (SL>70)	5.0	4.8–5.7
IFL	10–11	9.6–11 (SL>80)	10	9.6–11	11	10	10	8.1–10	9.2	9.1–11
OD	7.5–7.8	5.9–8.1 (SL>90)	6.5	6.6–8.0	12	6.4–6.8	8.7	5.5–7.2 (SL>100)	6.5	6.4–7.7
IL	2.4–2.9	2.1–3.2 (SL>80)	1.9	2.2–2.8	3.5	3.4–3.7	2.3	2.1–3.0 (SL>50)	2.1	1.5–2.8
IG	7.7–8.7	−SL/90+10 ±1 (SL>80)	7.9	−SL/90+10±1	11	8.1–9.2	9.7	−SL/90+10±1	7.5	−SL/90+10±1
CS	2.8–3.0	2.1–3.0	3.8	3.4–4.9	5.3	4.6–5.5	3.5	2.4–4.3	3.8	3.3–5.0
P_2A	42–44	39–44 (SL>100)	38	38–42	44	36–39	43	31–38 (SL>70)	41	37–44

Gnathagnus elongatus australiensis
subsp. nov.
(Fig. 2)

Holotype. AMS-I 22821-014, 214 mm SL, 18°10′S, 118°18′E, Northwest Shelf, western Australia, 299 m, bottom trawl by FRV "Soela", 10 Apr. 1982.

Paratypes. AMS-I 22821-051, 3 specimens, 163–209 mm SL, same data as holotype; AMS-I 23423-002, 103 mm SL, North West Shelf, by FRV "Soela", 1 Aug. 1982; WAM-P 19119-001, 213 mm SL, Timor Sea, 13°43′S, 128°38′E; WAM-P 28072-006, 155 and 159 mm SL, ca. 50 km southwest of Rowley Shoals, 449 m, 18 Aug. 1983; WAM-P 28086-001, 141 and 202 mm SL, ca. 25 km southwest of Rowley Shoals, 17°49′S, 118°41′E, 308–310 m, 21 Aug. 1983.

Diagnosis. This subspecies differs from the other species of the genus in having the following characters: D. 13–15 (usually 13); A. 17; P_1. 22–24. Top of head weakly concave behind interorbital fossa. Predorsal length 52–57%, width of interorbital fossa 4.8–5.7%, both of SL. Body dotted with round or oval black spots. Vertebrae 28; dorsal pterygiophores 20–21 (usually 20); anal pterygiophores 16. First dorsal fin ray articulated to posterior end of seventh or eighth (usually eighth) dorsal pterygiophore. This subspecies differs from the nominotypical subspecies only in some proportional measurements (Fig. 3): postorbital part of head shorter; opercle broader; separation between pelvic and anal origins broader.

Description. Morphometric and meristic data are summarized in Tables 1 and 2.

Head and anterior body broad, depressed and flattened dorsally, tapering gradually to the tail; caudal peduncle slightly compressed. Body covered with small, randomly arranged cycloid scales; head, cheek, belly and all fin bases naked except for caudal fin base; tubiform scales entirely embedded along lateral line. Lateral line beginning at postero-interior margin of supracleithrum, gradually approaching end of dorsal fin base, extending over two central caudal rays almost to fin apex. No sensory pores crowded on caudal fin base. Belly and lower tail without dermal folds.

Dorsal fin single, its base longer than height, middle ray longest. Anal fin base much longer than height, posterior ray longest. Pectoral fin very broad, dorsal half square, middle ray longest. Pelvic fins close together, situated on isthmus; spine short, feeble, free from first segmented ray. Membranes of anal, pelvic and lower half of pectoral fins fleshy and thickened.

Bones of head exposed, minutely sculptured, composed of tubercles united to radial ridges, separated by smooth intervals. Dorsal surface of skull nearly flattened in the holotype and three larger paratypes, but in six smaller paratypes (103–169 mm SL), prominent horizontal bony ridges developed on parietal and pterotic bones; a similar prominent semicircular ridge poorly developed on posterior rim of orbit (frontal). Central top of head behind interorbital fossa weakly concave, but more deeply depressed in smaller paratypes.

Gill opening ending dorsally somewhat above pectoral fin origin; posterior margin of gill flap smooth; gill membranes united to isthmus with a connecting fold; branchiostegal membrane without papillae. Opercle broad with radiating striae and a blunt projection posteriorly; upper edge directed downward, without bony ridge. Preopercle smooth on lower edge and angle (in two smallest paratypes a bony ridge faintly developed), with bony cross ridges posteriorly. Subopercle with smooth edge, ossified on about two-thirds of the anterior lower part; remaining portion cartilaginous, enlarged along lower edge of opercle posteriorly to a small projection of its end. Interopercle ossified with smooth edge, not covered by preopercle. Six branchiostegal rays. Pseudobranchiae present.

Interorbital space noticeably broad, with wide, short, deep and U-shaped fossa for receiving the ascending processes of premaxillae, the fossa almost extending to a line joining posterior margins of the cornea (slightly varies between posterior margins of cornea and orbit in the paratypes). Eye large, positioned dorso-laterally, non-telescopic, without membranous tentacle and grainy row. Infraorbital bones extensive; lacrymal larger than first infraorbital, elongated postero-ventrally, with three bony knobs on anterior edge. Exposed portion of nasal bone minute and ossified but probably cartilaginous and elongated longitudinally under the skin; anterior nasal valve tubiform with a slender filament; posterior nostril slit-like; lacking internal naris and electric organ. Plectroid dilatations of dentaries meeting narrowly on upper part of medial rims. No mental barbel. Mouth protractile, large and vertical; lips without fimbriae or fimbrial ridges. Inside of mouth of the holotype not observed due to inaccessibility, but in the paratypes, central tip of respiratory

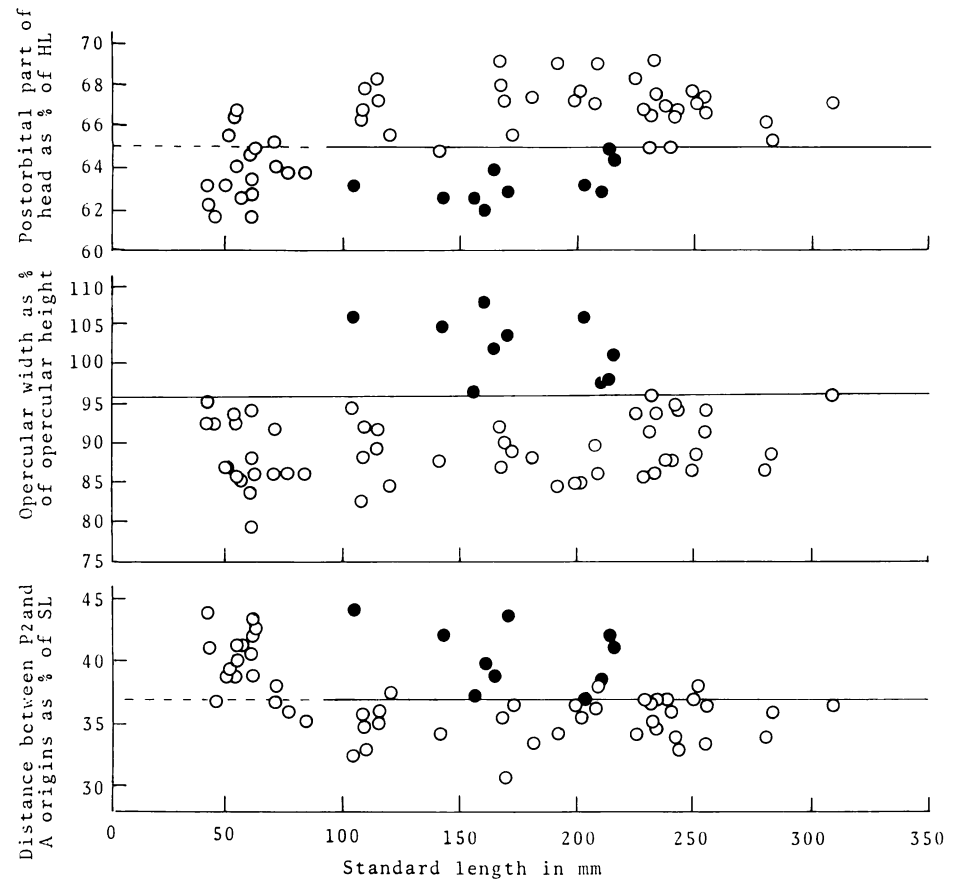

Fig. 3. Three morphometric features of *Gnathagnus elongatus elongatus* (○) and *G. e. australiensis* subsp. nov. (●).

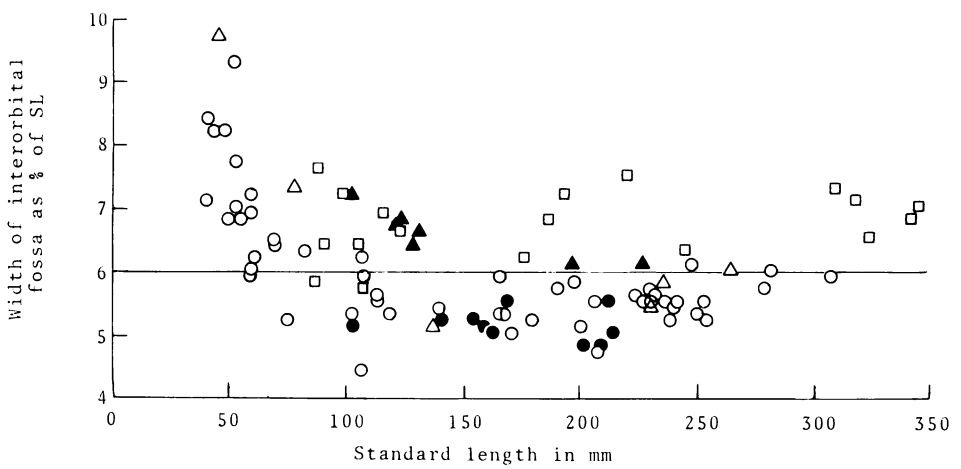

Fig. 4. Relationship of width of interorbital fossa and standard length in *Gnathagnus innotabilis* (□), *G. cribratus* sp. nov. (▲), *G. egregius* (△), *G. elongatus elongatus* (○) and *G. e. australiensis* subsp. nov. (●).

valve inside lower jaw slightly produced. Premaxillary teeth caniniform, almost always biserial. Teeth on anterior half of dentary resembling those on premaxilla; teeth on posterior half larger, widely spaced in single series. Several conical teeth arranged sparsely in a pair of broad bands on prevomer; three to five conical teeth arranged in a single row on palatine. A pair of deep cavities between anterior skull and ascending processes of premaxillae.

Cleithral spine rudimentary, slightly flat and triangular, adpressed to body, not covered with fringed dermal appendage; cleithral processes always covered with connecting fold of gill membranes; supracleithrum without spine; basipterygium hidden under skin without exposed processes.

Proximal dorsal pterygiophores ahead of dorsal fin broader than posterior ones; first one inserted between third and fourth neural spines. The first proximal anal pterygiophore supporting two soft rays; fifth one (first to follow a complete hemal spine) lying behind the hemal spine of the 13th vertebra. Last pterygiophores of doral and anal fins with a stay. Two postcleithra.

Color in fresh specimens: Unknown.

Color in preservative: Head and body somewhat dark brown with blackish spots above; ventral half pale. Dorsal fin brown. Caudal and pectoral fins dark brown with pale margins. Pelvic and anal fins pale, latter with a dark band on basal half.

Size: Attains at least 214 mm SL, 281 mm TL.

Distribution. This subspecies is only known from the continental slope of northwestern Australia.

Etymology. The name *australiensis* refers to the locality.

Remarks. This subspecies and the nominotypical subspecies belong to the genus *Gnathagnus* as evidenced by their possession of plectroid dilatations of the dentaries. These differ from the other species of the genus by the characters presented in the aforementioned diagnosis. Although this subspecies does not differ from *G. elongatus elongatus* in meristic values or external appearance, the former is separable from the latter within the range from 100 to 220 mm SL, in having: the shorter postorbital part of the head 61.9–64.8% (64.7–69.0% in the latter) of HL; broader opercle, its width 96.5–107.8% (82.6–96.1%) of its height; and a greater distance between pelvic and anal fin origins 37.0–44.0% (30.7–37.9%) of SL (Fig. 3).

Tanaka (1931), Chu et al. (1962, 1963) and Pietsch (1989) thought that *Ariscopus iburius* was a junior synonym of *G. elongatus*, but they gave no clear notice. Amaoka et al. (1986) reported that *A. iburius* is a young stage of this species based on examination of the holotype and a specimen referred to in the original description.

The key to all the known species and subspecies of the genus *Gnathagnus* is provided as follows.

Key to the species of *Gnathagnus*

1a Width of interorbital fossa 6–8% of SL (at SL>100 mm, Fig. 4). Vertebrae 27. Dorsal pterygiophores 18–20 (usually 19), excluding stay 2

1b Width of interorbital fossa 4–6% of SL (SL>100 mm). Vertebrae 28. Dorsal pterygiophores 18–21 (usually 20), excluding stay..... 3

2a P_1. 21–22; D. 11–12 (usually 12). Lateral line well spaced from dorsal fin base. Top of head not concave behind interorbital fossa in all stages. Predorsal length 56–62% SL (SL>90 mm); width of interorbital space 11–13% SL (SL>170 mm); snout length 8.3–9.9% SL (SL>90 mm). Body dotted with black eye-spots in young, uniformly grayish brown in adults. First dorsal ray articulated with posterior tip of 8th pterygiophore (New Zealand to southeastern Australia)..... *G. innotabilis*

2b P_1. 23–25; D. 13–14. Lateral line close to posterior end of dorsal fin base. Top of head deeply concave behind interorbital fossa in young. Predorsal length 54–56% SL (SL>120 mm); width of interorbital space 8–11% SL; snout length 6.6–8.2% SL. Body with square ring spots, large in young, minute in adults. First dorsal ray articulated with posterior tip of 7th pterygiophore (northwestern Australia)..... *G. cribratus* sp. nov.

3a A. 15–16 (usually 16). Predorsal length 59–60% (SL>70 mm). Preopercle with a wing-like projection extending laterally from a line passing across angle of the bone, diminishing with growth. Body with wavy brown bands in young, minute wavy dashes in adults. Anal pterygiophores 14–15 (usually 15), ex-

cluding stay (western Atlantic)..... ..... *G. egregius*

3b A. 16–18 (usually 17). Predorsal length 52–57% SL (SL>70 mm). Preopercle with a blunt and big prominence, extending posteriorly from angle of the bone, diminishing with growth. Body scattered with black round spots. Anal pterygiophores 16–18 (usually 16), excluding stay..... 4

4a Postorbital distance 65–69% of HL; width of opercle 82–95% of HL; distance between pelvic and anal fin origins 30–38% of SL (SL>70 mm, Fig. 3) (Japan)..... ..... *G. elongatus elongatus*

4b Postorbital distance 62–65% of HL; width of opercle 95–108% of HL; distance between pelvic and anal fin origins 37–44% of SL (SL>70 mm) (northwesternAustralia) .... *G. elongatus australiensis* subsp. nov.

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北西オーストラリア産アオミシマ属の1新種と1新亜種

岸本浩和

ミシマオコゼ科アオミシマ属魚類にはオーストラリア北部から日本に分布するアオミシマ *Gnathangnus elongatus*, ニュージーランド・南東オーストラリア産 *G. innotabilis*, 西部大西洋産 *G. egregius* の3種が知られていた．ここにオーストラリア産1新種 *G. cribratus* と1新亜種 *G. elongatus australiensis* を記載し，これらを含めた全種の検索表を以下のように作成した．

1a　眼窩間陥入部の幅は体長の 6–8%, 脊椎骨数は 27, 背鰭担鰭骨数は通常 19……2

1b　眼窩間陥入部の幅は体長の 4–6%, 脊椎骨数は28, 背鰭担鰭骨数は通常 20……3

2a　胸鰭条数 21–22, 背鰭条数 11–12, 側線は背鰭基底から充分離れる．眼窩陥入部後方の頭頂部はくぼまない．背鰭前部長は体長の 56–62%, 眼窩間幅は 11–13%, 吻長は 8.3–9.9%, 幼魚期には黒色眼状斑があるが，成魚では一様な灰褐色．背鰭第1軟条は第8担鰭骨に関節する（ニュージーランドからオーストラリア南東部）…*G. innotabilis*

2b　胸鰭条数 23–25, 背鰭条数 13–14, 側線は背鰭基底の後端に接近する．眼窩陥入部後方の頭頂部は深くくぼむ．背鰭前部長は体長の 54–56%, 眼窩間幅は 8–11%, 吻長は 6.6–8.2%, 角形の輪状斑は幼魚期に大きく，成魚では微細．背鰭第1軟条は第7担鰭骨に関節する（オーストラリア北西部）……*G. cribratus* sp. nov.

3a　臀鰭条数 15–16（通常 16）．背鰭前部長は体長の 59–60%, 前鰓蓋骨に翼状突起があり，成長と共に短縮する．幼魚期は波状の褐色帯があり，成魚は小さな黒色波状斑点が密布する．臀鰭担鰭骨数14–15（通常 15）（西部大西洋）……*G. egregius*

3b　臀鰭条数 16–18（通常 17）．背鰭前部長は体長の 52–57%. 前鰓蓋骨隅角部に大きくて鈍い突起があり，成長と共に短縮する．黒色円形斑が密布する．臀鰭担鰭骨数 16–18（通常 16）……4

4a　頭部眼後長は長くその長さは頭長の 65–69%, 主鰓蓋骨は狭くその幅は頭長の 82–95%, 腹鰭と臀鰭の両起点間の距離は体長の 30–38%（日本）……アオミシマ *G. elongatus elongatus*

4b　頭部眼後長は短くその長さは頭長の 62–65%, 主鰓蓋骨は広くその幅は頭長の 95–108%, 腹鰭と臀鰭の両起点間の距離は体長の 37–44%（オーストラリア北西部）……*G. elongatus australiensis* subsp. nov.

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