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A New Species of the Genus *Paradiplogrammus* (Callionymidae) from the Western Pacific

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Abstract A new species of the family Callionymidae, *Paradiplogrammus*, was taken from the Great Barrier Reef, the Gulf of Thailand and Iriomote Island, the Ryukyu Islands. The species seems to mature at a standard length of about 20 mm. The male has a peculiar snout; its tip strongly curved downward like a bird's beak.

A new species of the family Callionymidae is described here on the bases of specimens taken from three localities of the western Pacific Region: Clack Reef, the Great Barrier Reef, Queensland, Australia; Chumphon Province, Gulf of Thailand, Thailand; and Iriomote Island, the Ryukyu Islands, Japan. This species belongs to the genus *Paradiplogrammus* Nakabo, 1982, because it has the preoperculomandibular canal not connected to the postocular commissure, no lateral line commissure on dorsal surface of caudal peduncle, posterior tip of preopercular spine curved upward, and 8 dorsal and 7 anal rays. Most species of the genus *Paradiplogrammus* have a very small body size. This species is the smallest in the genus; it seems to mature at a standard length of about 20 mm, indicated by the fact that the male specimens of this size show remarkable secondary sexual characters.

Proportional measurements are shown in Table 1. Methods of counts and measurements follow Nakabo (1982). Vertebral numbers are counted from the soft-X ray negatives.

Paradiplogrammus parvus sp. nov.
(New Japanese name: Kogata-hanabi-numeri)
(Figs. 1–4)

Paradiplogrammus sp. Nakabo, 1982: 80.
Callionymus enneactis: Fricke, 1983: 137 (in part).

Holotype. QM (Queensland Museum) I 17256, a male, 22.3 mm in standard length, north side of Clack Reef, Great Barrier Reef, Queensland, Australia (14°03′S, 144°15′E), at 1.5–7.5 m depth, Mar. 24th, 1979.

Paratypes. QM I 15432, I 17255, 2 males and 2 females, 14.9–20.0 mm, with the same deta as the holotype. CAS (California Academy of Sciences) 46879, a male, 20.0 mm, Chumphon Prov., Gulf of Thailand (10°23′24″N, 99°17′45″E), live coral and sand, collected by Fehlmann et al., May 18th, 1960. CAS 50730, 2 males and 4 females, 10.8–20.0 mm, Chumphon Prov., Gulf of Thailand (10°26′04″N, 99°17′33″E) 3 m depth, collected by Fehlmann et al., May 17th, 1960. URM (Department of Marine Science, University of the Ryukyus)-P 5195, a male, 19.0 mm, Amitori Bay, Iriomote Island, Ryukyu Islands, Japan, Jun. 6th, 1982.

Diagnosis. This new species differs from other species of *Paradiplogrammus* in the following points; 1) preopercular spine with 3–4 processes curved upward on its inner side (in adult specimens), and an antrorse process at its base absent or very small, 2) creamy white body color, 3) tip of snout strongly curved downward like a bird's beak in males, and 4) very small body size at maturation, ca. 20 mm in standard length.

Description of the holotype (male). D IV, 8; A 7; P_1 ii+15; P_2 I, 5; C i+7+ii; vertebral number, 7+14.

Body elongate and depressed. Head depressed. Eye large. Interorbital space narrow and concave. Gill-openning oval, located in the middle between dorsoposterior edge of eye and upper origin of pectoral fin. Preopercular spine with 4 processes curved upward on inner side; at base an antrorse process absent (Fig. 1 C); posterior tip curved upward. Tip of snout curved downward like a bird's beak. Upper jaw protractile, its posterior end reaching anterior edge of eye. Nostril being a very short tube. Teeth on jaws villiform in broad bands. Palatine and vomer toothless. Anal papilla conical and elongate. Cephalic lateral line system

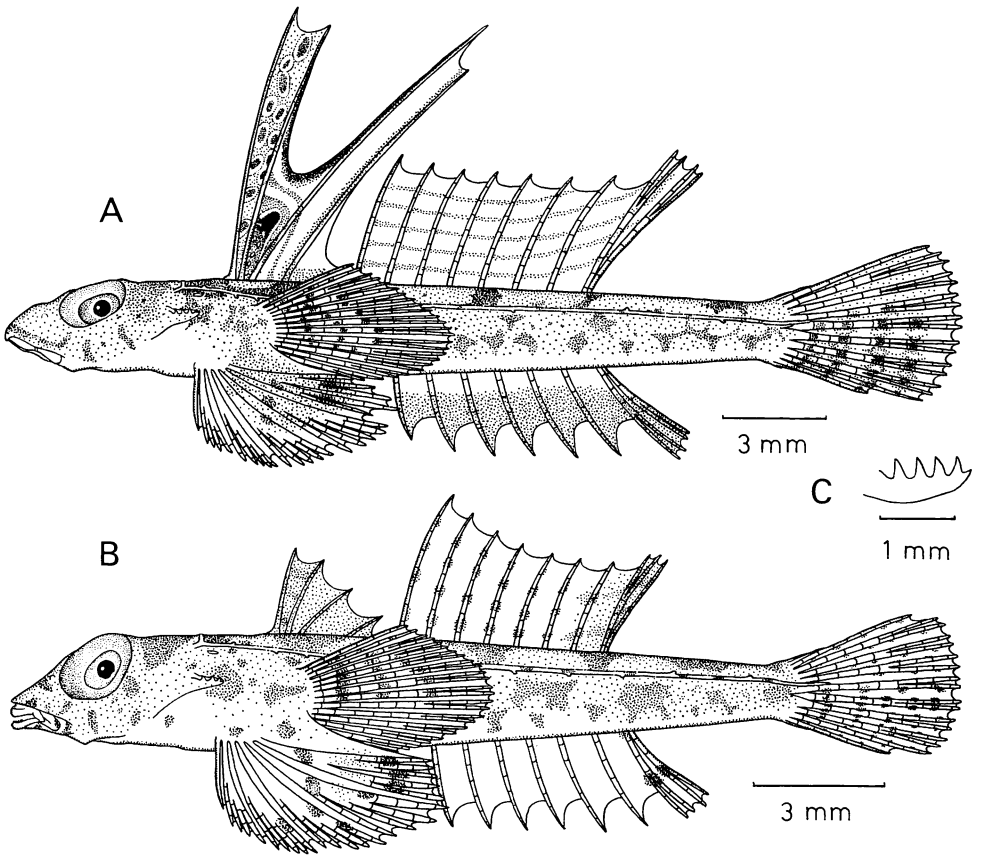

Fig. 1. *Paradiplogrammus parvus* sp. nov., from the Great Barrier Reef. A, lateral view of the holotype, male, QM I 17256, 22.3 mm SL. B, lateral view of the paratype, female, QM I 17255, 17.5 mm SL. C, left preopercular spine of the holotype.

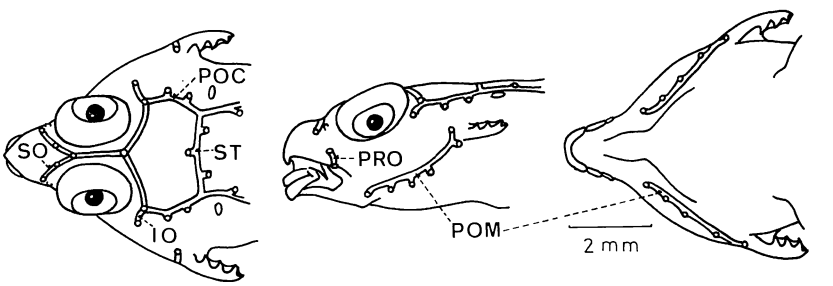

Fig. 2. The cephalic lateral line of *Paradiplogrammus parvus* sp. nov. Dorsal, lateral and ventral views. IO, infraorbital canal; POC, postocular commissure; POM, preoperculomandibular canal; PRO, preorbital canal; SO, supraorbital canal; ST, supratemporal canal.

developed (Fig. 2); infraorbital canal simple, reaching only posteroventral edge of eye; postocular commissure not connected with preoperculomandibular canal. Lateral line extending beyond caudal peduncle, not interconnected on dorsal surface of caudal peduncle.

First dorsal fin beginning above upper origin of pectoral fin, very high and membrane between

Table 1. Proportional measurements as the percent of standard length in *Paradiplogrammus parvus* sp. nov. Data show ranges; the means and sample sizes are in parentheses.

	Holotype	Paratypes				
	Great Barrier Reef		Gulf of Thailand	Iriomote I., Ryukyu Is.	Great Barrier Reef	Gulf of Thailand
	male				female	
No. fish	1	2	3	1	2	4
Standard length (mm)	22.3	19.7–20.0	16.7–20.0	19.0	14.9–17.5	10.8–17.4
Body width	20.0	20.3–21.5 (20.9, 2)	20.5–22.2 (21.2, 3)	21.1	23.4–26.2 (24.8, 2)	20.7–21.5 (21.2, 4)
Body depth	13.0	15.2–15.5 (15.4, 2)	13.5–15.0 (14.3, 3)	15.3	15.4–16.1 (15.8, 2)	13.4–14.9 (14.2, 4)
Caudal peduncle depth	7.6	8.0– 8.6 (8.3, 2)	7.0– 8.0 (7.6, 3)	7.4	6.9– 9.4 (8.2, 2)	6.9– 8.3 (7.7, 4)
Predorsal length	29.6	32.0–33.0 (32.5, 2)	30.0–32.9 (31.5, 3)	33.2	34.2–34.3 (34.3, 2)	35.1–37.0 (36.0, 4)
Caudal fin length	24.7	25.9–30.0 (28.0, 2)	26.0–28.1 (27.4, 3)	28.4	22.9–27.5 (25.2, 2)	25.0–29.3 (27.7, 4)
Head length	26.0	27.4–29.5 (28.5, 2)	26.0–28.7 (27.6, 3)	26.8	28.0–28.9 (28.5, 2)	28.5–31.5 (29.8, 4)
Eye diameter	9.0	10.0–10.2 (10.1, 2)	10.0–10.8 (10.3, 3)	10.5	10.9–12.8 (10.9, 2)	11.5–13.0 (11.9, 4)
Snout length	8.1	9.1– 9.5 (9.3, 2)	9.0–10.0 (9.5, 3)	9.5	7.4– 7.4 (7.4, 2)	7.7– 9.3 (8.6, 4)
Upper jaw length	8.5	6.5– 8.1 (7.3, 2)	8.0– 9.0 (8.3, 3)	9.5	7.4– 8.0 (7.7, 2)	8.0– 9.3 (8.7, 4)
Interorbital width	0.4	1.5– 2.5 (2.0, 2)	0.5– 0.6 (0.5, 3)	0.5	1.1– 1.3 (1.2, 2)	0.4– 0.8 (0.6, 4)
1st dorsal spine length	36.8	38.6–40.5 (39.5, 2)	30.5–34.0 (32.3, 3)	34.7	10.7–11.4 (11.1, 2)	9.8–11.5 (10.6, 4)
2nd dorsal spine length	35.4	37.1–39.5 (38.3, 2)	29.3–34.5 (31.3, 3)	33.7	10.3–10.7 (10.5, 2)	7.4–10.9 (9.1, 4)
3rd dorsal spine length	45.3	48.7–50.0 (49.4, 2)	40.7–45.0 (43.6, 3)	41.1	8.6– 9.4 (9.0, 2)	5.6– 8.6 (7.3, 4)
4th dorsal spine length	35.9	36.5–39.5 (38.0, 2)	30.5–36.0 (32.3, 3)	36.8	4.6– 6.7 (5.7, 2)	2.8– 6.9 (4.9, 4)
1st dorsal ray length	17.9	20.0–20.8 (20.4, 2)	18.0–19.5 (18.7, 3)	18.4	19.5–20.0 (19.8, 2)	17.6–20.7 (18.9, 4)
Last dorsal ray length	22.4	23.0–24.4 (23.7, 2)	19.8–21.0 (20.9, 3)	23.7	12.8–14.9 (13.4, 2)	10.2–15.5 (12.6, 4)
1st anal ray length	9.0	10.5–10.7 (10.6, 2)	10.0–11.0 (10.6, 3)	10.5	10.7–10.9 (10.8, 2)	8.9–10.9 (10.0, 4)
Last anal ray length	15.7	15.7–19.0 (17.4, 2)	15.6–17.0 (16.5, 3)	15.8	12.8–13.7 (13.3, 2)	12.0–14.4 (13.4, 4)
Pectoral fin length	24.2	22.8–26.5 (24.7, 2)	25.0–26.5 (25.5, 3)	24.2	22.1–23.4 (22.8, 2)	22.3–25.9 (24.6, 4)
Pelvic fin length	27.4	29.9–31.5 (30.7, 2)	32.0–33.5 (32.7, 3)	28.9	28.2–30.3 (29.3, 2)	30.8–33.9 (32.5, 4)
Preopercular spine length	—	—	6.5– 7.5 (7.0, 2)	—	—	—
Anal papilla length	3.4	4.1– 4.5 (4.3, 2)	3.0– 4.5 (3.5, 3)	4.7	—	—

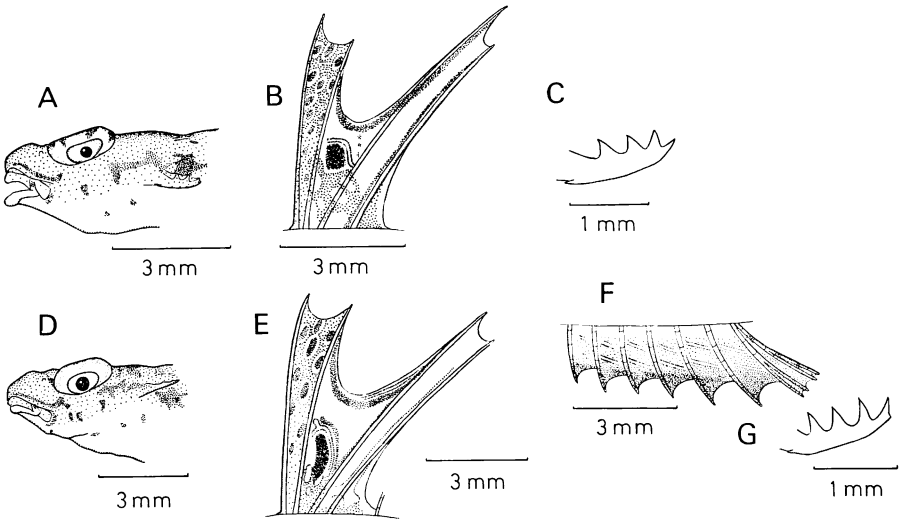

Fig. 3. *Paradiplogrammus parvus* sp. nov., the paratypes, from the Gulf of Thailand (A–C), and Iriomote Island, the Ryukyu Islands (D–G). A, lateral view of head of CAS 50730, a male, 16.7 mm SL. B, 1st dorsal fin of CAS 50730, a male, 20.0 mm SL. C, preopercular spine of CAS 46879, a male, 20.0 mm SL. D, lateral view of head of URM-P 5195, a male, 19.0 mm SL. E, 1st dorsal fin of URM-P 5195. F, anal fin of URM-P 5195. G, preopercular spine of URM-P 5195.

2nd and 3rd spines deeply notched. Second dorsal fin slightly elevated anteriorly and posteriorly; dorsal rays unbranched except the last; tips of both branches of last ray branched. Anal rays increasing in length posteriorly and unbranched except the last; tips of both branches of last ray branched. Pectoral fin rounded, reaching 3rd anal ray. Pelvic fin rounded, reaching 1st anal ray, and connected by membrane to lower part of pectoral fin base. Caudal fin rounded.

Color in 70% alcohol: Body creamy white marbled with light brown above. Ceiling and floor of mouth white. A dark line running along upper jaw, curving toward eye above end of maxillary. First membrane of 1st dorsal fin with many small dark spots, 2nd membrane with a black ocellus margined by white and with dark upper margin. Second dorsal fin with 5 longitudinal dark lines. Upper half of pectoral fin with many small dark spots. Pelvic fin with some dark spots and its posterior half slightly dark. Anal fin dark on distal half. Caudal fin with many small dark spots.

Description of the paratypes. D IV, 8–9 (mostly 8); A 6–7 (mostly 7); P_1 i–ii+14–17 (mostly ii+15).

Upcurved processes on the upper side of preopercular spine increasing in number with growth (Fig. 4); 3 processes in the specimens of 16.7–20.0 mm in standard length, 1–2 in the specimens of 10.8–13.0 mm. Antrorse process at base of preopercular spine absent (QM I 15432 and 17255, CAS 50730 except for a male of 16.7 mm) or very small (CAS 46879, a male of 16.7 mm in CAS 50730) (Fig. 3C, G). Anal papilla longer in males than in females.

First dorsal fin of males from Great Barrier Reef (Fig. 1 A) somewhat higher than those from Gulf of Thailand and Iriomote Island, Ryukyu Islands (Fig. 3 B, E). First dorsal fin low and small in females. Tip of posterior branch of last dorsal ray simple in QM I 17255.

In females, 1st dorsal fin uniformly dark except 1st membrane with 3 broad longitudinal darker bars; 2nd dorsal fin with 3 or 4 dark spots on each ray. Anal fin in males from Gulf of Thailand and Iriomote Island dark on distall half with two oblique white lines on each membrane (Fig. 3F). In females, anal fin transparent with 3 small dark spots on last ray.

Other characters agree well with the holotype.

Etymology. The species name, *parvus*, refers to small size of this species.

Remarks. This new species is closely related to *Paradiplogrammus enneactis* (Bleeker), which is redescribed and classified into two allopatric subspecies, *P. e. enneactis* (Bleeker) and *P. e. calliste* (Jordan et Fowler) by Nakabo (1983), in the following points; 1) 1st dorsal fin in males high with a deeply notched 2nd membrane, 2) 1st dorsal fin membrane of males with several small darker spots, and 3) posteriormost part of anal fin in females with some small dark spots.

P. parvus, however, differs from *P. enneactis* in having 1) a beak-like snout in males, 2) an antrorse process at the base of preopercular spine absent, or a very small (in the latter very large and stout), 3) a black ocellus on 2nd membrane of 1st dorsal fin in males (on 3rd membrane), 4) creamy white body color, and 5) a small mature size, 16–20 mm in standard length (in *P. enneactis enneactis*, 25–30 mm; in *P. enneactis calliste*, 45–60 mm).

Fricke (1983) suggested that the population to be described by me as *P. parvus* is a subspecies of *P. enneactis* on the basis of the difference in the shape of the preopercular spine between them.

I do not agree with Fricke's treatment about *P. parvus*. The geographic distribution of *P. parvus* overlaps that of *P. enneactis*: the collecting site of *P. parvus* (CAS 50730) is the same of *P. e. enneactis* (CAS 46862) (formerly, these two were in the same bottle labeled CAS 46862 as *Callionymus enneactis*). This fact shows that *P. parvus* is not a subspecies of *P. enneactis*. On the other hand, it seems possible to recognize *P. parvus* as an intraspecific variant of *P. enneactis*. This possibility is easily rejected in the following discussion.

On the basis of two reasons, *P. parvus* is distinct from *P. enneactis*. 1) In *P. parvus*, the number of upward processes of the preopercular spine increases rapidly with growth, but in *P. e. enneactis* it remains 2 from 11 to 35 mm in standard length and in *P. e. calliste* it remains almost 3 (in some specimens, 2 or 4) from 20 to 65 mm (Fig. 4). The mature sizes of them differ from each other as noted above. But, there is a difference in the ontogenetic development in the number of the upward processes between *P. parvus* and *P. enneactis* (*P. e. enneactis* and *P. e. calliste*). This means that *P. parvus* should not be treated as an intraspecific variant of *P. enneactis*. 2) There are two main differences between them in the secondary sexual characters of males: snout and location of a black ocellus in the 1st dorsal fin, which suggest the reproductive isolation between *P. parvus* and *P. enneactis*.

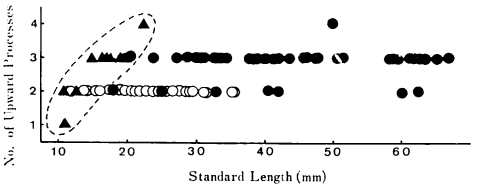

Fig. 4. Relationship between the number of the upward processes of the preopercular spine and the standard length in the two species and two subspecies of the genus *Paradiplogrammus*. Solid triangles, *P. parvus*; open circles, *P. enneactis enneactis*; solid circles, *P. e. calliste*.

Species that mature at a small size like *P. parvus* are found in other genera of the Callionymidae: *Diplogrammus dubiosus* (Parr), *Diplogrammus pygmaeus* Fricke, *Minysynchiropus laddi* (Schultz) and *Minysynchiropus kiyoae* (Fricke et Zaiser). All of the above species are distributed in tropical waters, and inhabit coral and rocky reefs, especially around islands. It is very interesting that the dwarf species of the Callionymidae are found in the similar habitats of the tropical waters.

Differences of the 1st dorsal fin height and of the coloration of the anal fin between male specimens from the Great Barrier Reef and those from the Gulf of Thailand and Iriomote Island, the Ryukyu Islands, may be due to geographic variation. Further research based on many specimens is needed.

Comparative material. *P. enneactis enneactis*: CAS-SU 30665, 45 males and 11 females, 17.7–35.3 mm in standard length, Singapore, coll. by A. W. Herre; CAS-SU 60947, a male, 40.6 mm, North of Yeung Chow I., Plover Cove, Hongkong (22°27′52″N, 114°13′08″E), coll. by Bolin et al., Jan. 6th, 1958; CAS 35158, a female, 20.6 mm, Johns Is., Singapore, low tide, muddy, coll. by F. B. Steiner, Oct. 19th, 1975; CAS 46862, 4 males and 4 females, 11.7–17.4 mm, Chumphon Prov., Gulf of Thailand (10°26′04″N, 99°17′33″E), 3 m depth, coll. by Fehlmann et al., May 17th, 1960; CAS 46869, a male, 21.2 mm, Goh Kram Is., Gulf of Thailand

(12°41′05″N, 100°47′48″E), 3 m depth, coll. by Fehlmann et al., Oct. 25th, 1957; CAS 46872, 2 males and a female, 18.6–31.7 mm, Goh Samet I., Gulf of Thailand (12°31′38″N, 101°26′46″E), 3 m depth, coll. by Fehlmann et al., Dec. 19th, 1957; CAS 46885, 2 males and a female, 16.3–31.2 mm, Chumphon Prov., Goh Kawtian, Gulf of Thailand (10°25′29″N, 99°16′52″E), 0–1.5 m depth, coll. by Fehlmann et al., May 20th, 1960; CAS 46902, a male, 28.5 mm, Rayong Prov., near Ban Phe Fisheries Training Center, Gulf of Thailand (12°35′40″N, 101°25′43″E), coll. by Pairojana and Song, Apr. 28th, 1960. *P. enneactis calliste*: specimens shown in p. 220 of Nakabo (1983).

Acknowledgments

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Literature cited

Bleeker, P. 1879. Révision des espèces insulindiennes de la famille des Callionymoïdes. Versl. Meded. Akad. Afd. Nat., 2nd ser., 14: 79–107.

Fricke, R. 1981. *Diplogrammus* (*Climacogrammus*) *pygmaeus* sp. nov., a new callionymid fish (Pisces, Perciformes, Callionymoidei) from the south Arabian Coast, northwestern Indian Ocean. J. Nat. Hist., 15: 685–692.

Fricke, R. 1983. Revision of the Indo-Pacific genera and species of the dragonet family Callionymidae. Theses Zoologicae, vol. 3, J. Cramer, Braunschweig 774 pp.

Fricke, R. and M. J. Zaiser. 1983. A new callionymid fish, *Synchiropus kiyoae*, from the Izu Islands, Japan. Japan. J. Ichthyol., 30 (2): 122–128.

Nakabo, T. 1982. Revision of genera of the dragonets (Pisces: Callionymidae). Publ. Seto Mar. Biol. Lab., 27 (1/3): 77–131.

Nakabo, T. 1983. Revision of the dragonets (Pisces: Callionymidae) found in the waters of Japan. Publ. Seto Mar. Biol. Lab., 27 (4/6): 193–259.

Parr, A. E. 1930. Teleostean shore and shallow-water fishes from the Bahamas and Turks Islands. Bull. Bingham. Oceanogr. Coll., 3 (4): 1–148.

Schultz, L. P. 1960. Family Callionymidae. *In* L. P. Schultz and collaborators, Fishes of Marshall and Marianas Islands, vol. 2, U. S. Natn. Mus. Bull., 202 (2): 397–410.

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西部太平洋域から採集されたネズッポ科ハナビヌメリ属魚類の1新種

中坊徹次

西部太平洋域の，グレート・バリア・リーフ，シャム湾，沖縄県西表島の3地点から得られた，ネズッポ科ハナビヌメリ属魚類の1新種 *Paradiplogrammus parvuus*（新称：コガタハナビヌメリ）を記載した．

本種は非常に小さな種類で，標準体長約 20 mm で成熟に達すると思われる．本種の形態的特徴は，1) 前鰓蓋骨棘には基部に前向突起がないか，または，あっても極めて小さい，さらに内側に 3～4 本の上向突起があり，後端は上方に強くまがる；2) 液浸標本では体色は白色で，背側にうすい大理石様の褐色斑がある；3) 雄の吻端は猛禽類の嘴のように下方に強くまがる，等である．

グレート・バリア・リーフから得られた標本と，シャム湾と西表島から得られた標本とは，雄の第1背鰭の高さ，雄の臀鰭の斑紋において，ごくわずかな相違を示したので，それらを記しておいた．

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