

## *Glossanodon microcephalus*, a New Argentine Fish from Japan and the South China Sea (Protacanthopterygii: Argentinidae)

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**Abstract** A new argentinid species, *Glossanodon microcephalus*, is described based on 30 specimens (53–97 mm SL) from Tosa Bay, off Kochi Prefecture, Shikoku Island, southern Japan, and from the southwest South China Sea. The new species clearly differs from its congeners in having the following combination of characters: dorsal-fin rays 11–12; anal-fin rays 10–12; pectoral-fin rays 17–19; pelvic-fin rays 10–12; branchiostegal rays 5; gill-rakers on first arch 27–30; vertebrae 44–46; small conical teeth in 1–2 and 1–3 irregular rows on vomer and palatines respectively; 10–21 small conical teeth on lower jaws, and 3–7 on tip of tongue; head length 25–27% SL; snout length 30–33% HL; anus immediately anterior to anal-fin origin; a longitudinal black stripe above lateral line interrupted, alternately composed of short bars and faint blotches; dense pigmentation just behind chin; no melanophore on isthmus to abdomen; maturation at small size (the minimum sizes of mature males and females are 65 mm SL and 72 mm SL respectively). The new species is a benthopelagic dweller on muddy and sandy bottoms in depths of about 100–200 m.

**Key words:** Argentinidae, *Glossanodon*, new species, Japan, South China Sea, precocious.

Argentines of the genus *Glossanodon* Guichenot, 1867 are small benthopelagic fishes (attaining ca. 7–20 cm SL), occurring on offshore bottoms and sea mounts of tropical to temperate waters in world oceans (Kobilyansky, 1998). The genus is composed of 14 known species, classified into two subgenera: *Glossanodon* Guichenot, 1867 and the monotypic *Prosoarchus* Cohen, 1958 containing *Glossanodon pygmaeus* Cohen, 1958 (Endo and Nashida, 2010). Further, the 13 species of the subgenus *Glossanodon* are tentatively divided into three species groups by Kobilyansky (1998), and one species recently described by Endo and Nashida (2010): “*polli*” group (8 species), “*leioglossus*” group (2 species), and “*lineatus*” group (3 species). Of these, three Japanese species, *Glossanodon kotakamaru* Endo and Nashida, 2010, *Glossanodon semifasciatus* (Kishinouye, 1904), and *Glossanodon lineatus*

(Matsubara, 1943) belong to the “*polli*” group, “*leioglossus*” group, and “*lineatus*” group respectively.

During bottom trawl surveys by the R/V *Kotaka-maru* in central Tosa Bay from 2007 to 2010, and from sampling at the Mimase fish market of Kochi City in March of 2010, we obtained about 100 small specimens of a *Glossanodon* species (46–97 mm SL). While somewhat similar to the young of *G. semifasciatus*, they differ from their congeners in having a smaller head, a shorter snout, an interrupted longitudinal dark stripe above the lateral line, and lower counts of all fin-rays, gill-rakers, and vertebrae. In addition, most specimens about 70 mm SL and larger were mature, suggesting that this is a small *Glossanodon* species. Subsequent to collecting the specimens, we found three specimens of *Glossanodon* (72–78 mm SL) deposited in the fish

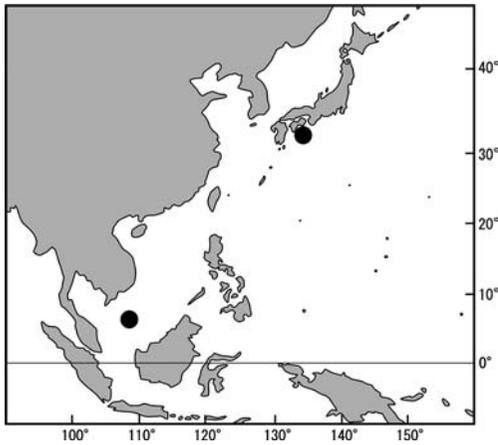


Fig. 1. Map showing two localities of *Glossanodon microcephalus* sp. nov.

collection of Kochi University (BSKU) that were collected by the R/V *Hakuho-maru* from the South China Sea in 1972 (Fig. 1). These subsequent specimens were considered conspecific with the specimens recently collected from Tosa Bay and from the Mimase fish market, and we herein describe this new species.

### Materials and Methods

Specimens examined are deposited in the following institutions: Australian Museum, Sydney (AMS); Laboratory of Marine Biology, Faculty of Sciences, Kochi University (BSKU); National Museum of Nature and Science (NSMT, formerly National Science Museum, Tokyo). Otter trawls by the R/V *Kotaka-maru* (NRIFS: National Research Institute of Fisheries Science, Japan) in central Tosa Bay were planned and operated by K. Nashida (NRIFS).

Counts and measurements follow Cohen (1958) and Kobilyansky (1998), which were discussed by Endo and Nashida (2010). Proportions in the diagnosis and description are based on 24 adult specimens ranging from 72–97 mm SL. The longest ray of each fin was not measured because of damaged (lacking) distal sections except in a few specimens. Observation of dentition and bony elements were made by Alizarin Red S



Fig. 2. *Glossanodon microcephalus* sp. nov., NSMT-P 106647, holotype, 97 mm SL in fresh (above and middle) and in preserved (below) condition. Photographed by N. Nakayama (above and middle) and H. Endo (below).

stained specimens except in the holotype. Total length, standard length, and head length are abbreviated as TL, SL, and HL respectively. Fin rays and vertebrae were counted from radiographs.

### *Glossanodon microcephalus* sp. nov.

(New English name: Small-head argentine)

(New Japanese name: Tsumari-nigisu)

(Figs. 2–7, Tables 1–3)

*Glossanodon semifasciatus* (not Kishinouye, 1904): Takagi *et al.*, 2010: 179 (photograph of fresh specimen trawled off southwest of Shikoku, landed at Fukaura fishing port, Ainan-cho, Ehime, Shikoku Island, Japan).

**Holotype.** NSMT-P 106647 (formerly BSKU 103750), 97 mm SL, female, Tosa Bay, 33°18.3'N, 133°36.9'E–33°19.7'N, 133°38.1'E, 120–116 m, R/V *Kotaka-maru*, bottom trawl, St.

T1'-1, coll. by K. Nashida and K. Kenmotsu, 6 July 2010.

**Paratypes.** 29 specimens. Tosa Bay (27 specimens): AMS I. 45674-001 (formerly BSKU 104074, BSKU 104075), 88 mm SL, female, 89 mm SL, male, 33°18.39'N, 133°36.25'E–33°16.85'N, 133°34.08'E, 120–122 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and K. Kenmotsu, 8 Mar. 2010; BSKU 90672 (stained), 64 mm SL, female, 33°16.45'N, 133°32.77'E–33°15.27'N, 133°31.60'E, 119–122 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-2, coll. by K. Nashida and N. Nakayama, 13 June 2007; BSKU 90673 (stained), 66 mm SL, female, 33°13.86'N, 133°34.35'E–33°12.60'N, 133°32.56'E, 149–151 m, R/V *Kotaka-maru*, bottom trawl, St. T3-2, coll. by K. Nashida and N. Nakayama, 13 June 2007; BSKU 92320, 91 mm SL, male, BSKU 92321, 73 mm SL, female, BSKU 92323, 93 mm SL, female, 33°13.85'N, 133°34.30'E–33°12.63'N, 133°32.25'E, 148–156–143 m, R/V *Kotaka-maru*, bottom trawl, St. T3-2, coll. by K. Nashida and N. Nakayama, 23 Aug. 2007; BSKU 101347, 77 mm SL, male, BSKU 101348, 59 mm SL, sex unknown, BSKU 101349, 81 mm SL, female, 33°18.15'N, 133°35.86'E–33°16.98'N, 133°33.54'E, 120–119 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and S. Yamamoto, 16 Nov. 2009; BSKU 102586, 88 mm SL, male, 33°18.42'N, 133°36.28'E–33°17.19'N, 133°34.17'E, 120–121 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and S. Yamamoto, 15 Jan. 2010; BSKU 102896, 82 mm SL, male, 33°17.78'N, 133°35.49'E–33°16.34'N, 133°34.40'E, 121–123 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and K. Kenmotsu, 15 Apr. 2010; BSKU 104068, 87 mm SL, female, BSKU 104069, 85 mm SL, female, BSKU 104070, 89 mm SL, female, BSKU 104071, 92 mm SL, female, BSKU 104072, 96 mm SL, female, BSKU 104073, 85 mm SL, male, same data as AMS I. 45674-001; BSKU 104076, 83 mm SL, male, BSKU 104077, 85 mm SL, male, BSKU 104078, 81 mm SL, male, BSKU 104079, 88 mm SL, male, 33°18.39'N,



Fig. 3. *Glossanodon microcephalus* sp. nov., BSKU 17163, paratype, 75 mm SL, male, in preserved condition. Photographed by H. Endo.

133°36.25'E–33°16.85'N, 133°34.08'E, 120–122 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and K. Kenmotsu, 8 Mar. 2010; BSKU 104080, 89 mm SL, female, BSKU 104081, 91 mm SL, female, BSKU 104082, 76 mm SL, male, BSKU 104083, 72 mm SL, female, 33°18.0'N, 133°35.2'E–33°17.0'N, 133°33.3'E, 118–118 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and K. Kenmotsu, 1 June 2010; NSMT-P 106648 (formerly BSKU 101346), 85 mm SL, male, same data as BSKU 102586; NSMT-P 106649 (formerly BSKU 102588), 53 mm SL, sex unknown, same data as BSKU 103286. South China Sea (2 specimens): BSKU 17162, 78 mm SL, female, BSKU 17163, 75 mm SL, male, 06°51.6'N, 108°47.2'E–06°51.6'N, 108°48.9'E, 137–135 m (shelf edge), R/V *Hakuho-maru* (KH-72-1), St. 50, beam trawl, coll. by O. Okamura, 10–11 July 1972.

**Non-types.** 72 specimens. Tosa Bay: BSKU 101349, 82 mm SL, female, same data as NSMT-P 106648; BSKU 102672, 88 mm SL, male, central Tosa Bay, 120 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida, 12 Feb. 2010; BSKU 104187, 87 mm SL, male, 33°18.7'N, 133°36.7'E–33°19.6'N, 133°38.2'E, 120–116 m, R/V *Kotaka-maru*, bottom trawl, St. T1'-1, coll. by K. Nashida and K. Kenmotsu, 1 Sept. 2010; BSKU 104223 (stained), 65 mm SL, male, BSKU 104224 (stained and dissected), 93 mm SL, female, BSKU 104225 (stained), 84 mm SL, male, BSKU 104226 (stained), 86 mm SL, male, BSKU 104227 (stained), 90 mm SL, male, BSKU 104228 (10 stained specimens), 81–95 mm SL, BSKU 106339 (21 specimens), 74–95 mm SL, Mimase fish market,

Table 1. Counts, dentition and depth ranges of 4 *Glossanodon* species. Data from the followings: 1: —Cohen (1958), 2—Kobilyansky (1998), and 3—this study. Numbers of teeth on lower jaw in parentheses.

	<i>G. microcephalus</i>	<i>G. leioglossus</i>	<i>G. semifasciatus</i>	<i>G. pseudolineatus</i>
No. of specimens	30	4	32	5
SL (mm)	53–97	51–111	94–206	72–80
Dorsal-fin rays	11–12	13–14	11–13	10–11
Anal-fin rays	10–12	11–13	11–13	10
Pectoral-fin rays	17–19	20–22	18–22	18–19
Pelvic-fin rays	10–12	12	10–12	11
Gill-rakers on 1st arch	27–30	36	35–40	24–26
Branchiostegal rays	5	5	5	4
Vertebrae	44–46	49	46–49	43–44
Lateral-line scales	44–45	—	50–53	—
Teeth on lower jaw	entirely (10–17)	partly (2–8)	partly (0–10)	entirely
Teeth on tongue	4–6	2–3	2–6	2–3
Depth ranges (m)	116–156	80–360	70–240	150–156
References	3	1	1, 3	2

Kochi City, Kochi Prefecture, Japan, offshore trawl by Kousei-maru, coll. by N. Nakayama and M. Doi, 19 March 2010; BSKU 106340 (18 specimens), 46–88 mm SL, same data as BSKU 104068; BSKU 106341 (11 specimens), 78–93 mm SL, males, BSKU 106342 (3 specimens), 90–93 mm SL, females, same data as holotype. South China Sea: BSKU 17164, 72 mm SL (damaged), male, same data as BSKU 17162 and BSKU 17163.

**Diagnosis.** A new species of *Glossanodon* with the following combination of characters: dorsal-fin rays 11–12; anal-fin rays 10–12; pectoral-fin rays 17–19; pelvic-fin rays 10–12; branchiostegal rays 5; gill-rakers on first arch 27–30; vertebrae 44–46; small conical teeth in 1–2 and 1–3 irregular rows on vomer and palatines respectively; 10–21 small conical teeth on lower jaw, and 3–7 on tip of tongue; head length 25–27% SL; snout length 30–33% HL; anus located immediately anterior to anal-fin origin; a longitudinal black stripe above lateral line, interrupted, alternately composed of short bars and faint blotches; anterior part of gular just behind chin densely pigmented; isthmus to thorax, and abdominal region unpigmented externally.

**Description.** Proportions and counts are shown in Tables 1–3. Data for the holotype are given in brackets. Body slender, moderately deep, depth at dorsal-fin base about 13–14% SL, nearly

square in cross-section at pectoral-fin origin. Dorsal-fin origin above joint between 15th and 16th vertebrae to middle of 16th vertebra [between 15th and 16th], predorsal length shorter than postdorsal. First two dorsal fin-rays unbranched, others bifurcated: 1st ray short (5.2% SL in NSMT-P 106648), slender, unsegmented; 2nd elongated (10.9% SL in BSKU 102586). Adipose fin slender, moderate in size, origin located above middle of anal-fin base. Anal-fin origin below 35th vertebrae. Dorsal-fin base somewhat longer than anal-fin base. Caudal peduncle moderately long, depth 57–68% of length [57]. Pectoral fin positioned ventrolaterally, its base at an angle of about 35 degrees. Pre-pectoral length almost equal to HL. Pelvic-fin origin below 6th dorsal-fin ray and 18th vertebra; anterior tip of pelvic girdle below 15th vertebra; length from pectoral- to pelvic-fin origins shorter than that from pelvic to anal fin. Caudal fin forked.

Head small, length 25–27% SL. Nape flattened, nearly square in cross-section. Cephalic lateral-line system on dorsal side of occipital region well developed with numerous branched tubes and pores; skin naked, fragile, damaged in most specimens (Fig. 4). Snout short, lateral profile nearly an equilateral triangle, its length almost equal to eye diameter. Eye moderately large, about one-fourth of HL. Interorbital width

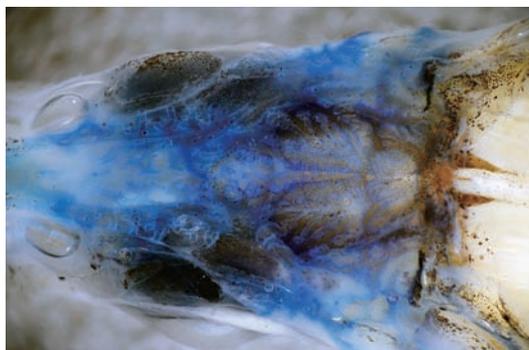


Fig. 4. Cephalic sensory canals and pores on nape of *Glossanodon microcephalus* sp. nov., holotype, NSMT-P 106647, 97 mm SL (stained by cyanine). Photographed by H. Endo.

slightly less than eye diameter. Mouth moderately small, most of maxillary covered dorso-laterally by lachrymal. Lower jaw projecting slightly beyond upper, extending posteriorly to vertical line at anterior rim of eye. No teeth on upper jaws. 10–21 small conical teeth entirely on lower jaw [left 12, right 14]. 1–2 rows and 1–3 irregular rows of small conical teeth arrayed on vomer (about 5–30 teeth, generally 10–20) and palatines (about 15–30 teeth) respectively [5 on vomer and 2 irregular rows of about 25 teeth on each palatine]. 3–7 (generally 4–5) small canine-like conical teeth present on tip of tongue [4]. Gill rakers elongate, lath-like, closely arranged. Branchiostegal rays thin, flat: 1st slender, reduced, 2nd to 5th expanded; first two attached medially on ceratohyal, others laterally on epihyal (Fig. 5). Anus immediately anterior to anal-fin origin. Pyloric caeca 10–11 (10 in BSKU 104224 and BSKU 104225, and 11 in BSKU 104226, BSKU 104227, BSKU 104228-9, and BSKU 104228-10).

Scales large, deciduous; lateral-line scales elongate transversely, posterior margins with a medial dent; 44–45 lateral-line scales (in 11 specimens; scale pockets were difficult to count in most specimens) [44].

*Color when fresh* (Fig. 2). Head and body whitish and silvery. Lateral head from lachrymal to opercular region, iris, and a longitudinal band on side of body bright silver: the band narrow

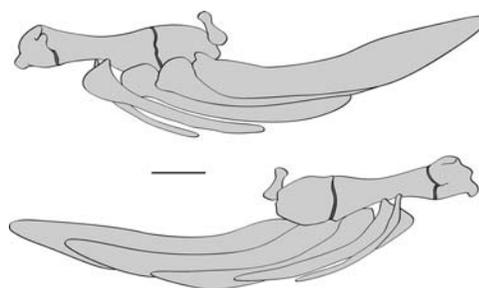


Fig. 5. Hyoid arch of *Glossanodon microcephalus* sp. nov., BSKU 104224, 93 mm SL, left lateral (above) and medial (below) views. Bar indicates 2 mm.

near each end, widest at the middle of dorsal- and anal-fin origins. Anterior of snout, upper jaws, and pupil, and dorsal of eye, side of nape, and supracleithrum blackish. A longitudinal broken stripe above lateral line dark, sparsely pigmented: alternately composed of short bars and blotches, rather obscure near head. All fin bases except adipose fins blackish: densely black near base of first two dorsal-fin rays; a blotch on upper lobe of caudal-fin base yellowish; lower lobe of caudal fin near its base with a blackish triangular blotch.

*Color in alcohol* (Figs. 2–4, 6). Body light yellow to ochre (all bright silver coloration faded). Iris darkish with white crescent above whitish pupil. Anterior snout, anterior rim of lachrymal, premaxillary, anteroventral of maxillary, anteriormost portion of gular region just behind chin densely pigmented. Anterior of dentary and mandibular rami sparsely pigmented. Posteroventral corner of orbit (anterior surface of 4th suborbital within the orbital cavity) densely pigmented. Buccal cavity partly pigmented on posterior of lower jaw, palatines and ectopterygoids. No melanophores on gular region except just behind chin, branchiostegal membrane, and ventral side of body from isthmus to anus. Ventral margins of interopercle and subopercle, and posterior rim of opercle with some melanophores. Dorsal-most part of opercle, upper part of supracleithrum, posttemporal, and supratemporals densely pigmented. Opercle mostly translucent except the

Table 2. Proportional measurements and counts of *Glossanodon microcephalus* and *G. pseudolineatus*. Asterisk indicates data from the original description.

	<i>G. microcephalus</i>				<i>G. pseudolineatus</i>	
	Holotype	Paratypes			Holotype*	Paratypes*
	NSMT-P 106647	23 Japanese spec.	4 smaller Japanese spec.	2 spec. from South China Sea	AMS I. 22805-027	4 spec.
Standard length (mm)	97	72–96	53–66	75–78	79	72–80
As % of standard length						
Predorsal length	46.4	46.4–48.7	45.1–47.6	46.4–47.3	47.8	47.8–49.0
Preanal length	84.3	82.3–85.5	81.5–86.0	83.9–84.4	82.0	80.4–81.9
Prepectoral length	25.5	25.2–26.4	26.3–27.6	26.3–27.8	26.6	25.9–27.8
Prepelvic length	51.4	49.9–53.9	49.9–51.8	52.2–52.5	52.2	49.6–51.4
Postanal length	16.1	14.5–17.7	17.3–18.5	16.4–16.5	18.0	18.1–18.6
Postdorsal length	53.7	52.4–55.0	53.5–55.2	51.5–52.8	53.9	53.1–55.6
Snout to adipose-fin origin	87.0	85.8–88.0	84.4–88.2	85.1–86.4	—	—
Dorsal- to adipose-fin origins	40.8	39.2–41.5	38.7–41.2	38.0–39.9	39.7	40.4–41.8
Pectoral- to pelvic-fin origins	26.2	24.2–27.8	23.8–25.7	25.1–26.6	26.3	25.1–28.8
Pelvic- to anal-fin origins	33.3	32.6–34.9	32.0–33.1	31.6–32.3	29.1	30.0–31.7
Anus to anal-fin origin	3.1	2.5–3.8	2.8–3.5	3.0–3.2	2.5	2.6–2.8
Body depth at pectoral-fin base	12.2	10.7–14.1	11.8–12.9	12.1	13.5	12.8–14.0
Body width at pectoral-fin base	10.6	8.9–11.6	9.2–10.8	9.6–9.7	11.0	10.8
Body depth at dorsal-fin base	13.9	12.9–15.5	12.4–13.6	13.3–13.5	16.1	14.9–15.6
Caudal-peduncle depth	6.3	5.7–6.5	6.2–6.7	6.2–6.3	7.0	6.8–7.3
Caudal-peduncle length	9.9	8.6–10.3	10.0–10.7	9.4–9.7	9.5	8.8–9.0
Length of dorsal-fin base	7.8	7.8–9.1	8.3–8.6	7.7–8.1	9.4	8.2–9.0
Length of anal-fin base	7.3	7.0–8.5	7.3–8.5	6.6–7.0	7.5	7.2–7.8
Head length	26.0	24.6–26.7	25.6–26.7	25.7–27.2	26.6	25.9–27.8
As % of head length						
Eye diameter	30.6	29.8–31.8	29.6–31.4	29.4–30.1	32.9	31.6–33.0
Pupil diameter	15.9	14.4–16.1	14.0–15.0	13.5–15.6	15.7	14.2–16.3
Snout length	29.8	29.8–33.2	31.4–32.9	32.6–32.7	32.4	29.2–31.9
Interorbital width	23.4	21.5–25.6	24.2–24.4	20.9–21.8	22.9	21.1–21.8
Snout to maxillary end	25.4	24.2–26.4	25.7–27.2	25.9–27.5	25.7	25.5–28.7
Maxillary depth	11.5	9.7–11.8	9.8–11.4	10.9–10.9	12.4	11.6–12.8
Lower jaw length	36.5	36.3–38.7	37.3–38.6	35.2–36.0	36.7	34.7–36.7
Meristics						
Dorsal-fin rays	11	11–12	11	11	11	10
Anal-fin rays	11	10–12	10–11	11	10	10
Pectoral-fin rays	18	17–19	17–19	18	18	18–19
Pelvic-fin rays (left/right)	10/11	10–12	10–11	11–12	11	11
Vertebrae	31 + 13 = 44	30–31 + 13–14 = 44–45	31 + 13–14 = 44–45	31–32 + 14 = 45–46	30 + 13 = 43	30 + 13–14 = 43–44
Gill-rakers on 1st arch	8 + 20 = 28	8–9 + 19–21 = 27–30		8 + 20 = 28	24	24–26

upper part and rim. A longitudinal broken stripe above lateral line, composed of densely pigmented short bars and blotches, on a continuous pale stripe finely pigmented: first two bars and blotches pale. Dorsal midline of body pigmented internally except behind adipose fin. Ventral midline behind anal fin moderately to heavily pigmented internally. All fin bases pigmented: densely on first two rays of dorsal, pectoral, pel-

vic, and anal fin; internally on adipose fin; 2 blackish blotches present externally on upper and lower caudal fin base, lower heavily pigmented internally. Dorsal-fin membrane unpigmented; posterior margin of dorsal-fin rays sparsely pigmented except distal half of middle rays and all of last 3 rays. Pectoral-fin membrane partly pigmented near base [pigmentation absent on one-third of lower rays]. Dorsal and ventral sides of



Fig. 6. Ventral view of head of *Glossanodon microcephalus* sp. nov., BSKU 104079, 88 mm SL (above) and *Glossanodon semifasciatus*, BSKU 92324, 94 mm SL (below). Photographed by H. Endo.

caudal-fin branched rays moderately to densely pigmented. A series of melanophores on lateral midline of body near caudal fin, connected posteriorly to pigmented area around caudal fin base. Peritoneum blackish, densely pigmented with silvery layer restricted ventrally anterior to pelvic-fin bases: internal pigmentation on midline from abdomen to anus visible externally through thin muscle layer and transparent region immediately anterior to anus. Stomach unpigmented.

**Distribution.** *Glossanodon microcephalus* has been recorded from muddy and sandy bottoms of central Tosa Bay, off Kochi, in depths of 116–156 m (R/V *Kotaka-maru*) and the South China Sea in depths of 135–137 m (R/V *Hakuho-maru*) (Fig. 1). Although the Mimase's offshore trawlers usually fish around 200–300 m (maximum depth is ca. 420 m) in Tosa Bay, the depth data of the

present specimens collected at the fish market were uncertain (see Remarks).

**Etymology.** The species name “*microcephalus*” is from the Greek *micro*, small, and *cephalon*, head, in reference to the small head in comparison with those of most congeners.

**Remarks.** The new species conforms to the genus *Glossanodon* in having a narrow space between the maxillary heads, and characteristic dentition on the vomer, palatines, and tongue (Cohen, 1958: 143). Further, *G. microcephalus* belongs to the subgenus *Glossanodon* in having the anus located immediately anterior to the anal-fin origin (vs. well-separated from the origin in *Prosoarchus*) and 18–25 pectoral-fin rays (vs. 12–14 in *Prosoarchus*).

Among species of the subgenus *Glossanodon*, *G. microcephalus* is clearly distinguished from the 8 species of the “*polli*” group in having 44–46 vertebrae [vs. 49–52 (unknown in *Glossanodon polli* Cohen, 1958)], 27–30 gill-rakers (vs. 32–40 in 5 species, 30–36 in *Glossanodon elongatus* Kobilyansky, 1998), 19–21 gill-rakers on lower rim (vs. 23 in *Glossanodon mildredae* Cohen and Atsuides, 1969, 21–24 in *Glossanodon struhsakeri* Cohen, 1970), fewer counts of pectoral- and pelvic-fin rays, more teeth on the tongue, a unique interrupted dark stripe on sides of the body (vs. a continuous stripe), no melanophores on isthmus to thorax, and other pigmentation (Cohen, 1958, 1970; Cohen and Atsuides, 1969; Parin and Shcherbachev, 1982; Kobilyansky, 1998; Endo and Nashida, 2010: table 1; Table 1).

Additionally, *G. microcephalus* is clearly separated from 3 species of the “*lineatus*” group, *Glossanodon danieli* Parin and Shcherbachev,

Table 3. Frequency distributions of 6 counts of *Glossanodon microcephalus* based on type specimens. Paired fins were counted both sides.

Fin rays	Dorsal		Anal			Pectoral			Pelvic			
	Counts	11	12	10	11	12	17	18	19	10	11	12
No. of specimens	27	3	5	22	3	14	43	3	6	45	9	
	Gill-rakers				Vertebrae							
Counts	27	28	29	30	44	45	46					
No. of specimens	6	11	6	2	20	7	1					

1982, *G. lineatus*, and *Glossanodon pseudolineatus* Kobilyansky, 1998 in having 5 branchiostegal rays (vs. 4), 44–46 vertebrae (vs. 55–57 in the former two, 43–44 in the last), 27–30 gill-rakers (vs. 32–34 in the first, 24–26 in the last), 3–7 teeth on the tongue (vs. 0 in the first two, 2–3 in the last), and a unique interrupted dark stripe on sides of body (vs. a broad continuous band in the first, a continuous stripe with pale blotches in the second, and 7–8 large dark spots in the third) (Parin and Shcherbachev, 1982; Kobilyansky, 1998; Endo and Nashida, 2010: table 1; Table 1). Although this group is well characterized by having 4 branchiostegal rays, Kobilyansky (1998) noted that *G. pseudolineatus* differs greatly from the other two species in having lower counts of vertebrae and gill-rakers, teeth on the tongue, and in pigmentation of the body and organs. In spite of the clear differences in the branchiostegal number and the markings on the body, *G. pseudolineatus* somewhat resembles the new species in having the lower counts above-mentioned, in dentition on the tongue and lower jaw, and in most proportions except caudal peduncle depth and eye diameter (Tables 1, 2). Among the subgenus *Glossanodon*, the loss of the first reduced branchiostegal ray, resulting in a reduction from 5 to 4, might have occurred separately in different lineages.

Moreover, *G. microcephalus* probably belongs to the “*leioglossus*” group in having the following combination of characters as mentioned by Kobilyansky (1998): 5 branchiostegal rays, teeth on the tongue, silver peritoneum covered with melanophores, a dark stripe on the sides of the body, and no dark spots on the isthmus to thorax between the pectoral-fin bases. The new species, however, is easily distinguished from 2 species of this group, *G. leioglossus* (Valenciennes in Cuvier and Valenciennes, 1848) and *G. semifasciatus*, in having lower counts of dorsal- and pectoral-fin rays, gill-rakers, vertebrae, and lateral-line scales, 10–11 pyloric caeca (vs. 15–18 in the latter), a shorter head (HL 25–27% SL vs. 30–32 in the former, 27–29 in the latter), a shorter snout (its length 7.7–8.4 % SL vs. 9.0–10.3 in the for-



Fig. 7. Gonads of *Glossanodon microcephalus* sp. nov., BSKU 104223, non-type, 65 mm SL, male (above) and BSKU 104083, paratype, 72 mm SL, female (below) in preserved condition. Photographed by H. Endo.

mer, 9.7–11.3 in the latter), a longitudinal interrupted stripe (vs. 7–8 round spots on the dorsal sides of the body in adults), and an unpigmented stomach (pigmented in the former) (Matsubara, 1943; Cohen, 1958; Endo and Nashida, 2010: table 1; Fig. 2, Tables 1, 2). Among Japanese species, *G. microcephalus* is somewhat similar to young of *G. semifasciatus*, but is easily distinguished in having a pigmented spot on the anterior tip of the gular just behind the chin (vs. absent in *G. semifasciatus*).

The dwarf species, *G. pygmaeus*, is known to mature around 80 mm SL (Cohen, 1958), but *G. microcephalus* apparently matures at a smaller size: developed gonads were found in a male of 65 mm SL (BSKU 104223) and a female of 72 mm SL (BSKU 104083) (Fig. 7). In addition, ripe gonads in both sexes of *G. microcephalus* more than 80 mm SL fill the abdominal cavity, and females around 90 mm SL possess ripe eggs of nearly 1 mm in diameter. In 3 females of 64, 66, and 73 mm SL (BSKU 90672, BSKU 90673, and BSKU 92321), the ovaries are without eggs and apparently immature. Hence, *G. microcephalus* is also a dwarf species of *Glossanodon*, maturing around 70 mm SL, and reaching nearly 100 mm SL.

The cephalic lateral-line system on the dorsal side of the occipital region of *G. microcephalus* and *G. semifasciatus* has numerous branched tubes and pores (Fig. 4). The sensory system of *Glossanodon* species has not been previously reported, because the skin is delicate and is usually lost when the fish is trawled.

The two known localities of *G. microcephalus*, southern Japan and the south of the South China Sea, suggest that the new species probably occurs widely on the continental shelf in the Northwestern Pacific from Japan to Southeast Asia near the equator. Around Japan, the species is known from Tosa Bay, off Kochi, south of Shikoku Island and from Ainan-cho, Ehime, southwest of Shikoku Island based on a photograph without voucher specimen (10 cm long, taken in March of 2008) (Takagi *et al.*, 2010). In Tosa Bay, the new species was not recorded prior to 2007, but 30 (46–92 mm SL) and 15 (80–97 mm SL, including the holotype) specimens were collected at depths of about 120 m by two tows of the R/V *Kotaka-maru* on 3 March and 6 July of 2010 respectively. Further, 36 specimens (65–95 mm SL) were collected at Mimase fish market on 19 March of 2010. Most of these were mature adults. During biological research of *G. semifasciatus* in Tosa Bay (via sampling at the Mimase fish market), Nashida *et al.* (2007) reported fishing depths of about 160–360 m (usually 200–250 m) by offshore trawlers from October to April in 2001 to 2007. Considering the depth records (116–156 m) of *G. microcephalus* by two research vessels and the fishing depths of *G. semifasciatus* in Nashida *et al.* (2007), *G. microcephalus* is apparently an inhabitant of the continental shelf in depths of about 100–200 m. On the other hand, no adults of *G. lineatus*, *G. kotakamaru*, and *G. semifasciatus* have been collected by R/V *Kotaka-maru* in depths of 100–200 m in Tosa Bay (Kitagawa and Okiyama, 1997; Nashida *et al.*, 2007; Endo and Nashida, 2010).

**Comparative materials.** *Glossanodon semifasciatus* (7 specimens): Tosa Bay, off Kochi, BSKU 53400 (166 mm SL), BSKU 78403 (142), BSKU 92322 (104), BSKU 92324 (94); Suruga Bay, off

Shizuoka, NSMT-P 50053 (133), NSMT-P 11187 (168); Wakasa Bay, off Kyoto, Japan Sea, NSMT-P 79780 (142). *Glossanodon australis* (2), *Glossanodon kotakamaru* (15), and *Glossanodon lineatus* (5) in Endo and Nashida (2010).

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### Literature Cited

- Cohen, D. M. 1958. A revision of the fishes of the subfamily Argentininae. *Bulletin of the Florida State Museum (Biological Sciences)*, 3(3): 93–173.
- Cohen, D. M. 1970. A new argentinid fish from Hawaii. *Pacific Science*, 24(3): 377–378.
- Cohen, D. M. and S. P. Atsuides. 1969. Additions to a revision of argentinine fishes. *Fishery Bulletin*, 68(1): 13–36.
- Cuvier, G. and A. Valenciennes. 1848. *Histoire naturelle des poissons*, vol. 21. Paris, xiv + 513 pp. (not seen)
- Endo, H. and K. Nashida. 2010. *Glossanodon kotakamaru*, a new argentine fish from southern Japan (Protacanthopterygii: Argentinidae). *Bulletin of National Museum of Nature and Science, Series A, Supplement* 4: 119–127.

- Guichenot, A. 1867. Ichthyologie. III. L'Argentine leiglosse, nouveau genre de salmonides. *Annals de la Société Linné Département Maine-et-Loire*, 9: 7–9. (not seen)
- Kishinouye, K. 1904. Nigisu. *Zoological Magazine*, 16: 110.
- Kitagawa, Y. and M. Okiyama. 1997. Larvae and juveniles of the argentinid, *Glossanodon lineatus*, with comments on ontogenetic pattern in the genus. *Bulletin of Marine Science*, 60(1): 37–46.
- Kobilyansky, S. G. 1998. Four new Indo–Pacific species and a new key to species of the genus *Glossanodon* (Argentinidae). *Journal of Ichthyology*, 38(6): 725–736.
- Matsubara, K. 1943. Ichthyological annotations from the depth of the Sea of Japan. I–VII. *The Journal of the Shigenkagaku Kenkyusyo*, 1(1): 37–82.
- Nashida, K., H. Sakaji and H. Honda. 2007. Spawning seasons of adult and growth of 0-year-old deepsea smelt *Glossanodon semifasciatus* in Tosa Bay, Pacific coast of Shikoku. *Bulletin of the Japanese Society of Fisheries and Oceanography*, 71(4): 270–278.
- Parin, N. V. and Y. N. Shcherbachev. 1982. Two new argentinie fishes of the genus *Glossanodon* from the eastern South Pacific. *Japanese Journal of Ichthyology*, 28(4): 381–384.
- Takagi, M., T. Hirata, S. Hirata and C. Nakata, eds. 2010. *Fishes of Ainan Ehime*. Soufusha shuppan, Matsuyama. 250 pp. (In Japanese.)

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