

A New Species of the Ophidiid Genus *Neobythites* (Teleostei: Ophidiiformes) from Tosa Bay, Kochi Prefecture, Japan

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Abstract A new ophidiid species, *Neobythites machidai*, is based on 7 specimens (63.0–93.5 mm SL), collected from Tosa Bay (139–176 m depth), Kochi Prefecture, southern Japan. It is most similar to *N. bimarginatus*, known from off New Caledonia, by having many pectoral-fin rays (>30), preopercle without spines and black bands in middle part of dorsal and anal fins. However, *N. machidai* differs from *N. bimarginatus* by pelvic-fin length 8.5–11.5% SL (vs. 11.5–13.5% SL in the latter species), longest gill filament 6.9–10.0% HL (vs. 4.8–6.3% HL), each side of triangular vomerine tooth patch concave (vs. slightly convex), snout shorter than horizontal eye window (vs. snout longer than eye), and 11–13 (vs. 6–7) light spots on middle part of body. Additionally, they differ in many characters such as number of dorsal-fin rays, pectoral-fin rays and total vertebrae and preanal length.

Key words: *Neobythites machidai*, Ophidiidae, new species, Japan.

The genus *Neobythites* Goode and Bean, 1885 is characterized by having a strong opercular spine, hind margin of preopercle with 0 to 2 spines (rarely 3), two median basibranchial tooth patches, and two rays in each pelvic fin. The genus consists of 51 species and is the largest in the Ophidiidae (Nielsen, 2002; Nielsen *et al.*, 2009). However, only four species are known from Japanese waters (Nakabo, 2002; Okamoto *et al.*, 2011): *Neobythites australiensis* Nielsen, 2002; *Neobythites sivicola* (Jordan and Snyder, 1901); *Neobythites stigmosus* Machida, 1984; *Neobythites unimaculatus* Smith and Radcliffe in Radcliffe, 1913. In 2002–2008, seven *Neobythites* specimens were collected from Tosa Bay (depth 139–176 m), Kochi Prefecture, southern Japan. These specimens have a black band in the middle part of dorsal and anal fins and no pre-

opercular spines, characters that until now have been recognized as unique for *Neobythites bimarginatus* Fourmanoir and Rivaton, 1979 known from off New Caledonia. However, the Japanese specimens differ from *N. bimarginatus* in many meristic and morphometric characters. Consequently, they are here described as a new species of the genus *Neobythites*.

Materials and Methods

Counts and measurements mainly follow Nielsen (2002). Nielsen (2002) gave morphometric characters less than 10% SL with 0.1% accuracy, between 10 and 50% SL with 0.5%, 50 to 100% with 1% and standard length with 0.5 mm accuracy. Snout length, postorbital length, interorbital length, and pectoral fin length follow

Hubbs and Lagler (1958). Prepelvic length is measured from upper jaw symphysis to origin of pelvic fin. Vertebrae and unpaired fin rays are counted from radiographs. Vomerine and basi-branchial tooth patches are directly observed under microscope. Standard length and head length are abbreviated as SL and HL, respectively. Specimens examined are deposited in Laboratory of Marine Biology, Faculty of Science, Kochi University (BSKU), Muséum National d'Histoire Naturelle, Paris (MNHN), National Museum of Nature and Science, Tsukuba (NSMT), and Zoological Museum, University of Copenhagen (ZMUC).

Neobythites machidai sp. nov.

(New Japanese name: Machida-itachiuo)

(Figs. 1–3)

Holotype. NSMT-P 106558 (formerly BSKU 96032), 93.5 mm SL, female, 33°5.91'N, 133°7.59'E–33°4.46'N, 133°5.95'E, Tosa Bay, Kochi Prefecture, Japan, 154–158 m, R/V *Kotaka-Mar*, otter trawl, coll. by K. Nashida and N. Nakayama, 26 August 2008.

Paratypes. 6 specimens collected from Tosa Bay: BSKU 64445, 74.5 mm SL, 33°5.9'N, 133°7.4'E–33°4.8'N, 133°6.0'E, 149–150 m, R/V *Kotaka-Mar*, 19 May 2003; BSKU 66949, 63.0 mm SL, 33°5.9'N, 133°5.4'E–33°4.9'N,

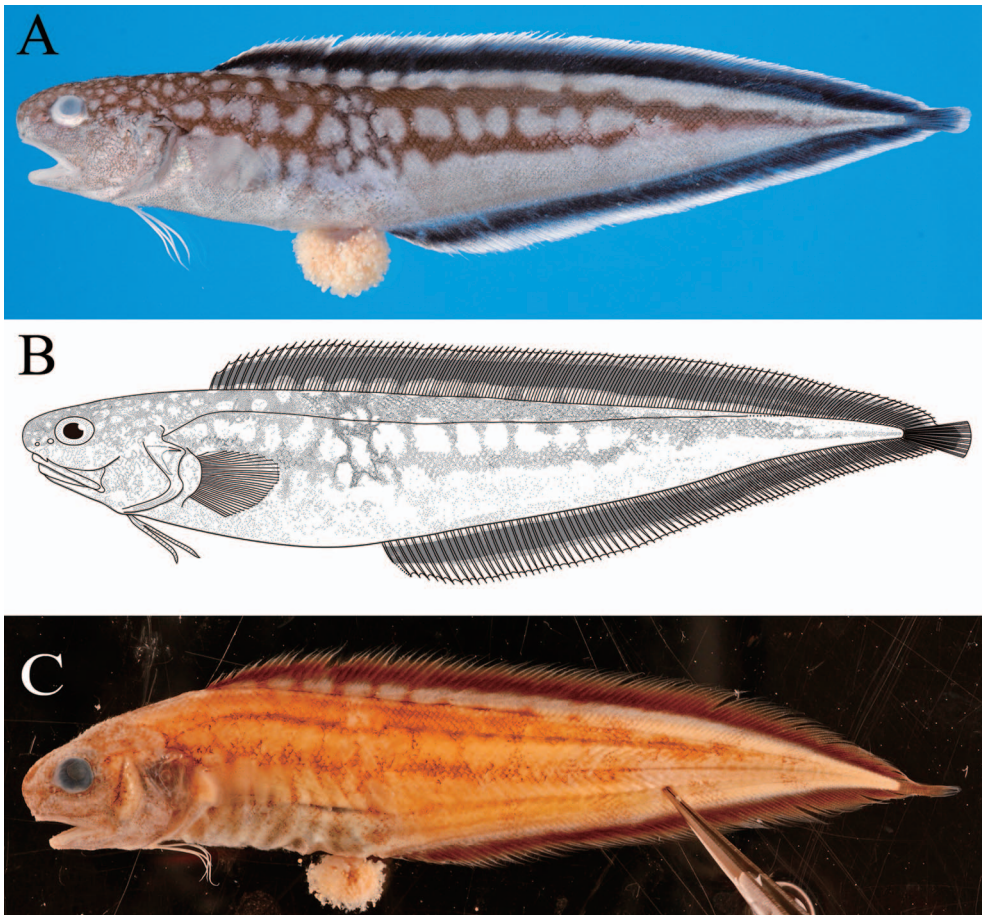


Fig. 1. Holotype of *Neobythites machidai* sp. nov., NSMT-P 106558, female, 93.5 mm SL. A, newly caught (photo by N. Nakayama); B, newly caught (illustration without protruding ovaries); C, preserved for three years.

Table 1. Comparison of counts and measurements between *Neobythites machidai* sp. nov. and *N. bimarginatus* (average value given in parentheses). Data of holotype and 9 of 11 nontype specimens from Nielsen (2002). Asterisk indicates data from two specimens (BSKU 104883 and ZMUC P771155).

	<i>N. machidai</i> sp. nov.		<i>N. bimarginatus</i>		
	Holotype	Paratypes (n = 6)	Holotype	Paratype	Nontypes (n = 11)
Standard length (mm)	93.5	63.0–90.0	109	97.0	76–110
Counts					
Dorsal-fin rays	106	102–106 (103.5)	107	107	106–110 (107.8)
Anal-fin rays	86	82–86 (84.2)	86	89	86–90 (87.5)
Pectoral-fin rays	33	33–37 (34)	33	33	32–33 (32.8)
Pelvic-fin rays	2	2	2	2	2
Caudal-fin rays	8	8	8	8	8
Total vertebrae	60	58–59 (58.8)	59	61	59–62 (60.5)
Gill rakers	8	6–8 (7.2)	9	8	8–11 (9.3)
Preopercular spines	0	0	0	0	0
Pseudobranchial filaments	2	2–3 (2.2)	2	2	2
Vertebra number below origin of dorsal fin	4	3 (3)	4	4	3–4 (3.4)
Dorsal ray number above origin of anal fin	23	22–24 (23.5)	25	24	23–25 (23.8)
Vertebra number above origin of anal fin	15	15 (15)	14	16	14–16 (15.5)
Measurements					
Percent of SL					
Head length	20.5	19.0–20.0 (19.5)	19.5	20.0	19.0–21.0 (20.0)
Snout length	4.3	3.1–4.3 (3.7)	—	4.9	4.8–4.9*
Upper jaw length	9.4	8.0–8.6 (8.4)	8.9	9.0	8.9–10.5 (9.7)
Horizontal eye window	4.9	4.4–4.7 (4.6)	4.0	4.4	4.0–5.3 (4.8)
Postorbital length	11.5	11.0 (11.0)	—	11.5	11.5–12.0*
Interorbital length	4.6	3.6–4.6 (3.9)	—	3.2	3.1–3.9*
Pectoral-fin length	10.5	8.9–12.0 (11.0)	—	9.6	9.6–12.5*
Pelvic-fin length	11.0	8.3–11.5 (10.0)	12.0	12.0	11.5–13.5 (12.0)
Predorsal length	21.5	19.0–20.0 (19.5)	20.5	22.0	19.0–23.5 (21.5)
Body depth at dorsal-fin origin	15.5	14.5–16.0 (15.0)	—	16.5	14.0–19.0*
Prepelvic-fin length	13.5	12.0–13.0 (12.5)	—	14.5	12.0–14.0*
Base of ventral fin to anal-fin origin	22.0	21.5–26.5 (24.0)	25.0	25.0	23.5–29.0 (25.5)
Preanal length	36.5	35.0–39.0 (37.0)	39.5	38.5	37.0–43.5 (40.0)
Body depth at anal fin origin	16.0	13.5–17.0 (15.0)	16.0	14.5	14.5–17.5 (15.5)
Percent of HL					
Longest filaments on anterior gill arch	7.4	6.9–10.0 (8.0)	6.5	5.1	4.8–6.3 (5.4)

133°5.9'E, 147–150 m, R/V *Kotaka-Maru*, 29 June 2002; BSKU 74521, 70.5 mm SL, 33°6.0'N, 133°7.9'E–33°6.1'N, 133°6.5'E, 139–145 m, R/V *Kotaka-Maru*, 19 May 2003; BSKU 77927, 72.5 mm SL, 33°6.0'N, 133°7.6'E–33°5.1'N, 133°6.2'E, 150 m, R/V *Kotaka-Maru*, 17 April 2006; BSKU 102732, 65.0 mm SL, 33°5.4'N, 133°7.9'E–33°5.9'N, 133°8.7'E, 175–176 m, R/V *Kotaka-Maru*, 3 February 2003; ZMUC P771708, 90.0 mm SL, 33°3.9'N, 133°4.4'E–33°2.6'N, 133°2.7'E, 149–150 m, R/V *Kotaka-Maru*, 19 May 2003.

Diagnosis. A species of the genus *Neobythites* with the following combination of characters: dorsal-fin rays 102–106; anal-fin rays 82–86; pectoral-fin rays 33–37; total vertebrae 58–60;

long gill rakers 6–8; pseudobranchial filaments 2–3; snout shorter than horizontal eye window; posterior margin of preopercle without spines; pelvic-fin length 8.3–11.5% SL; longest gill filament 6.9–10.0% HL; vomerine tooth patch triangular with each side concave; proximal and distal parts of dorsal and anal fins pale, and middle part black; series of 11–13 pale spots on middle part of body.

Description. Counts and measurements are given in Table 1. Condition of holotype given first, followed by those of paratypes in parentheses, if different. Body elongate and compressed. Head relatively short 20.5 (19.0–20.0)% of SL. Snout rounded, shorter than horizontal eye window. Anterior nostril small placed midway

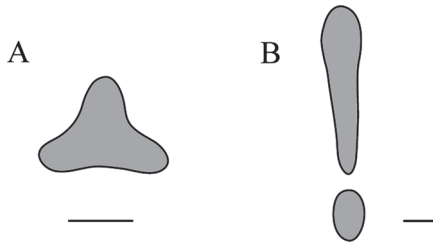


Fig. 2. Vomerine (A) and basibranchial (B) tooth patches in *Neobythites machidai* sp. nov., NSMT-P 106558, holotype. Scales indicate 1 mm.

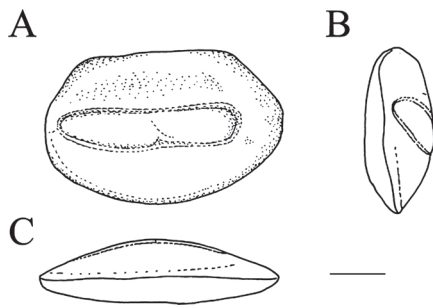


Fig. 3. Right otolith of *Neobythites machidai* sp. nov., paratype, ZMUC P771708, 90.0 mm SL. A, median view; B, frontal view; C, ventral view. Scale indicates 1 mm.

between tip of snout and posterior nostril; posterior nostril slightly larger placed just in front of eye. Mouth small, subterminal; maxilla extending slightly beyond posterior margin of eye window; upper jaw 2.2 (1.9–2.7) times length of snout. Vomerine, palatine and basibranchial tooth patches covered with small, granular teeth. Vomerine tooth patch triangular, each side concave (Fig. 2). Anterior part of palatine tooth patch broad, posterior part narrow. Two median basibranchial tooth patches; anterior patch with broad anterior part and narrow posterior part; posterior patch elliptical and 1/4 to 1/3 the length of the anterior (Fig. 2). Eye circular, relatively large; horizontal eye window 1.2 (1.1–1.4) times length of snout. A falcated opercular spine; its posterodorsal tip almost extending to posterior margin of opercle. No spines on posterior margin of preopercle. Gill opening wide, reaching dorsal

edge of pectoral-fin base. Developed gill rakers on first arch slender. Pseudobranchial filaments short. Otolith short, 1.5 times as long as high; dorsal rim of otolith flat, ventral rounded (Fig. 3). Small cycloid scales present on head, body, and dorsal and anal fin bases. Lateral line runs from upper angle of gill opening, obscure on posterior part of body. Pectoral fin short 2.4 (1.9–2.6) times length of horizontal eye window. Dorsal- and anal-fin bases long, continuous with caudal fin; length of dorsal-fin base 3.9 (4.0–4.4) times head length, origin of dorsal fin above pectoral-fin base; anal-fin base 2.9 (2.9–3.4) times head length. Pelvic fin inserted below hind margin of preopercle, tip not reaching anus; two pelvic-fin rays connected by fin membrane except tips; length of inner ray 50 (36.0–53)% of distance between pelvic-fin base and anal-fin origin, slightly longer than outer ray. Caudal fin slender, length 1.8 (1.7–2.1) times horizontal eye window.

One of seven specimens (holotype, NSMT-P 106558) has egg mass protruding from body (Figs. 1A, 1C).

Color when fresh (Figs. 1A, B). Ground color of body and head light gray. Upper part of head and dorsal part of body brownish with light gray spots; spots on head small; a series of 11–13 spots on middle part of body. Pectoral and pelvic fins white. A broad black transverse band on middle part of dorsal and anal fins; bases of dorsal and anal fins right gray; margins white. Caudal fin black except for white margin.

Color of preserved specimens (Fig. 1C). After 3–9 years of preservation, ground color of body and head pale brown. Upper part of body relatively dark. Median part of body with 11–13 indistinct, pale spots.

Distribution. Tosa Bay, Kochi prefecture, Japan at depths of 139–176 m.

Etymology. Named for Dr. Yoshihiko Machida, professor emeritus of Kochi University (BSKU) for his contributions to taxonomy of ophidiid fishes in Japan.

Remarks. *Neobythites machidai* is characterized by a distinct black longitudinal band in middle of dorsal and anal fins. In the genus *Neobythites*,

such a character has until now been uniquely known to *N. bimarginatus*. *Neobythites machidai* is furthermore similar to *N. bimarginatus* by having preopercle without spines and many pectoral-fin rays (Table 1). *Neobythites machidai* is, however, different from *N. bimarginatus* by length of gill filaments 6.9–10.0% HL (vs. 4.8–6.3% HL in latter species), each side of triangular vomerine tooth patch concave (vs. slightly convex) (Fig. 2), and snout shorter than eye (vs. snout longer than eye). Moreover, they differ in some meristic and proportional characters, for example, dorsal-fin rays (*N. machidai* 102–106 vs. *N. bimarginatus* 106–110), anal-fin rays (82–86 vs. 86–90), gill rakers (6–8 vs. 8–11), pelvic-fin length (8.3–11.5% SL vs. 11.5–13.5% SL), and preanal length (35.0–39.0% SL vs. 37.0–43.5% SL). Additionally, *N. machidai* differs from *N. bimarginatus* in color pattern of body. *Neobythites machidai* has a series of 11–13 light spots on middle part of body while *N. bimarginatus* has 6–7 spots on anterior part of body (Fourmanoir and Rivaton, 1979; Nielsen, 1997, 2002).

Some species of *Neobythites* grow to more than 300 mm SL and specimens over 100 mm SL were reported in all species except for *Neobythites multidigitatus* Nielsen, 1999 and *N. natalensis* Nielsen, 1995 (Nielsen, 1999, 2002). Specimens of *N. machidai* are only known from 63.0–93.5 mm SL. The holotype (93.5 mm SL) with protruding egg mass (Figs. 1A, 1C) shows maturity at small standard length.

Neobythites machidai was collected from 139–176 m depth. The habitat depth overlaps the other four species of Japanese *Neobythites* (*N. australiensis* ca. 100–350 m; *N. sivicola* 73–200 m; *N. stigmosus* 161–474 m; *N. unimaculatus* 146–567 m) (Nielsen, 2002; Okamoto *et al.*, 2011). Nielsen (2002) indicated 42–350 m as the habitat depth of *N. australiensis* in “Distribution” (p. 22). This is misprint for 242–350 m, correct stated in “Material examined” (p. 20).

Comparative materials. *Neobythites bimarginatus*: MNHN-1978-473, paratype, 97.1 mm SL, West of Pins Island, New Caledonia, 360 m, 13 April 1978. BSKU 104883, 73.1 mm SL,

22°13.6'S, 159°23.9'E, New Caledonia, 320 m, 12 October 1986. ZMUC P771155, 85.0 mm SL, 23°18.15'S, 168°3.58'E, South of New Caledonia, 296 m, 31 October 1986.

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