

## *Gobiodon winterbottomi*, a New Goby (Actinopterygii: Perciformes: Gobiidae) from Iriomote-jima Island, the Ryukyu Islands, Japan

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**Abstract** The gobiid fish *Gobiodon winterbottomi* is described as a new species from three specimens (19.0–32.9 mm SL) collected from *Echinopora lamellose*, the plate-shaped coral of the family Faviidae, in 5 m depth on the reef slope off Iriomote-jima Island, the Ryukyu Islands, Japan. It is characterized by the following in combination: the jaw teeth subequal in shape and size; lack of post-symphysial canine teeth; lack of an interopercle-isthmus groove; a narrow gill opening; lack of elongated dorsal-fin spines; large second dorsal, anal and pelvic fins; 15 or 16 pectoral-fin rays; and head, body and fins gray, absence of stripes or other markings when fresh or alive.

**Key words:** *Gobiodon winterbottomi*, new species, Gobiidae, Ryukyu Islands, Japan.

*Gobiodon* Bleeker, 1856 is an Indo-Pacific gobiid fish genus, comprising often colorful, tropical species living in obligate commensal association with reef-building corals. *Gobiodon* can be recognized by having the following combination of characters: developed cephalic sensory canal pores; reduced cephalic sensory papillae pattern; narrow gill opening restricted to base of pectoral fin; generally a scaleless body covered by a thick mucus layer; small pelvic fins joined to form a cup-shaped disc; and generally small jaw teeth, with the exception of one or two pairs of developed canine teeth posterior to the dentary symphysis in some species (Harold and Winterbottom, 1995, 1999; Suzuki and Shibukawa in Senou, 2004). *Paragobiodon* Bleeker, 1873 is similar to *Gobiodon*, but it differs from *Gobiodon* in having large body scales and numerous fleshy papillae on the head.

*Gobiodon* may contain more than 30 nominal species. According to Harold *et al.* (2008), of these, 19 described species are currently recognized as valid: *Gobiodon acicularis* Harold and Winterbottom, 1995, *Gobiodon albofasciatus*

Sawada and Arai, 1972 (validity questionable), *Gobiodon axillaris* De Viz, 1884, *Gobiodon brochus* (Harold and Winterbottom, 1999), *Gobiodon ceramensis* (Bleeker, 1853), *Gobiodon citrinus* (Rüppell, 1838), *Gobiodon erythrospilus* Bleeker, 1875, *Gobiodon fulvus* Herre, 1927, *Gobiodon heterospilos* Bleeker, 1856, *Gobiodon histrio* (Valenciennes in Cuvier and Valenciennes, 1837), *Gobiodon micropus* Günther, 1861, *Gobiodon oculolineatus* Wu, 1979, *Gobiodon okinawae* Sawada, Arai and Abe, 1972, *Gobiodon prolixus* Winterbottom and Harold, 2005, *Gobiodon quinquestrigatus* (Valenciennes, 1837 in Cuvier and Valenciennes, 1837), *Gobiodon reticulatus* Playfair in Playfair and Günther, 1867, *Gobiodon rivulatus* (Rüppell, 1830), *Gobiodon spilophthalmus* Fowler, 1944, and *Gobiodon unicolor* (Castelnau, 1873).

In Japan, 13 nominal species and 10 unidentified species of *Gobiodon* are known: *G. albofasciatus*, *G. axillaris* (= *Gobiodon atrangulatus* Garman, 1903), *G. ceramensis* (= *Gobiodon* sp. 4 sensu Suzuki and Shibukawa, 2004 in Senou), *G. erythrospilus*, *G. fulvus* (= *Gobiodon* sp. 3

sensu Akihito *et al.*, 2002), *G. histrio*, *G. micropus*, *G. oculolineatus*, *G. okinawae*, *G. prolixus* (= *Gobiodon* sp. 2 sensu Suzuki and Shibukawa in Senou, 2004), *G. quinquestrigatus*, *G. rivulatus* (= *Gobiodon* sp. C sensu Suzuki and Shibukawa in Senou, 2004), *G. unicolor*, *Gobiodon* sp. A, *Gobiodon* sp. B, *Gobiodon* sp. D, *Gobiodon* sp. E, *Gobiodon* sp. 1, *Gobiodon* sp. 3, *Gobiodon* sp. 5, *Gobiodon* sp. 6, *Gobiodon* sp. 7 and *Gobiodon* sp. 8 (the undescribed species sensu Suzuki and Shibukawa in Senou, 2004) (Akihito *et al.*, 2002; Munday *et al.*, 1999; Suzuki and Shibukawa in Senou, 2004; Winterbottom and Harold, 2005; Suzuki, unpublished)

In this paper, we describe a new species of *Gobiodon* collected from *Echinopora lamellose*, the plate-shaped coral of the family Faviidae, in 5 m depth on the reef slope off Iriomote-jima Island, the Ryukyu Islands, Japan. It was first reported by Suzuki and Shibukawa in Senou (2004) as "*Gobiodon* sp. 3".

## Materials and Methods

Type specimens of the new species are deposited in Kanagawa Prefectural Museum of Natural History (KPM) and the National Museum of Nature and Science, Tsukuba (NSMT).

Methods for counts and measurements follow Suzuki and Randall (2011). Cephalic sensory systems of the head were described from preserved material stained with a cyanine blue solution, with notations following Akihito (1984), as does the notation of pattern of interdigitation of the dorsal-fin proximal pterygiophores between the neural spines (P–V). P–V and vertebral counts were obtained from radiographs. Counts of gill-rakers, segmented caudal rays, procurent caudal rays, and tooth morphology were obtained from a paratype stained with alizarin red. Description of the color when fresh (immediately following capture, pre-fixation) was based on color slides. Color descriptions when alive were based on the underwater photographs in Yano in Senou (2004). The names of colors follow the recommendations of the Japan Color Research

Table 1. Measurements (% SL) for *Gobiodon winterbottomi*.

Sex	Holotype	Paratypes	
	KMP-NI 5887 female	NSMT-P 106563 male	KMP-NI 5889 juvenile
Standard length (mm)	32.9	27.7	19.0
Body depth of pelvic-fin origin	39.9	37.3	39.0
Body depth of anal-fin origin	36.7	32.2	34.0
Body width of pectoral-fin origin	20.8	15.1	19.5
Head length (including gill membrane)	28.3	30.5	34.0
Head width	19.9	17.1	21.0
Snout length	7.2	8.2	9.0
Orbit diameter	9.8	9.9	12.0
Bony interorbital width	7.8	7.5	8.8
Upper jaw length	7.2	8.6	8.0
Caudal peduncle depth	16.5	15.1	17.5
Caudal peduncle length	23.1	23.6	23.0
Predorsal length	37.0	38.0	42.0
Preanal length	57.2	56.5	69.5
Prepelvic length	34.7	34.2	40.0
Base of dorsal fins	59.8	55.8	52.5
First dorsal spine	20.5	18.8	22.5
Longest dorsal ray	25.7	27.4	23.8
Base of anal fin	24.6	23.3	24.3
Longest anal ray	29.2	29.5	27.5
Caudal-fin length	29.5	29.8	34.0
Longest ray of pectoral-fin length	33.5	33.6	35.0
Pelvic-fin length	20.5	19.5	21.0

Institute (1995). Measurements are given in Table 1. In the description, data for the holotype are given first, followed by data for the paratypes in parentheses if different.

***Gobiodon winterbottomi* sp. nov.**

(New Japanese name: Ohire-kobanhaze)

(Figs. 1–3)

*Gobiodon* sp. 3: Suzuki and Shibukawa in Senou, 2004: 179 (underwater photograph, Iriomote-jima Island, the Ryukyu Islands, Japan, 5 m depth, photo by Korechika Yano).

**Holotype.** KPM-NI 5887, female, 32.9 mm SL, Funauki inlet, Iriomote-jima Island, Yaeyama Islands, the Ryukyu Islands, Japan, 5 m depth, 21 Nov. 1998.

**Paratypes.** NSMT-P 106563 (ex KPM-NI 5888), male, 27.7 mm SL, cleared and stained, and KPM-NI 5889, juvenile, 19.0 mm SL, same data as the holotype.

**Diagnosis.** *Gobiodon winterbottomi* differs from the other described species of the genus in the following combination of characters: the jaw teeth subequal in shape and size; lack of post-symphysial canine teeth; lack of an interopercle-isthmus groove; a narrow gill opening; lack of elongated dorsal-fin spines; large second dorsal, anal and pelvic fins: second dorsal and anal fins reaching posteriorly to or beyond middle of caudal-fin base when appressed; pelvic fins reaching posteriorly to middle to posterior half of genital papilla; 15 or 16 pectoral-fin rays; and head, body and fins gray, absence of stripes or other markings when fresh or alive.

**Description.** Dorsal fin VI-I, 10; anal-fin I, 9; pectoral fin 15 (16 in one); pelvic fin I, 5; branched caudal-fin rays 8 + 7 (8 + 6 in one); P-V 3 / II III I 0 / 9; vertebrae 10 + 16 = 26.

Dorsal profile of head steep and strongly convex. Mouth small, terminal; maxilla reaching posterior to vertical between anterior edge and center of pupil (anterior edge in one; nearly reaching in one juvenile). Ventral end of gill opening at level of base of 13th pectoral-fin ray (12th in one; 10th in juvenile). Anterior nostril

tubular, at level of ventral edge of orbit; posterior nostril with raised rim, at level of middle edge of orbit. Lack of an interopercle-isthmus groove. Anterior oculoscapular canal with pores B', C (single in two), D(s), E, F and H'; preopercular canal with M', N and O' (one paratype missing pore N and O' in left side; the juvenile missing canals in both side). The pattern of the cephalic sensory systems illustrated in Fig. 1.

The following characters are described based on the cleared and stained paratype (KPM-NI 5888). Procurrent caudal rays + segmented caudal rays  $v + 9 + 8 + v$ . Gill rakers 1 + 2. Upper jaw teeth subequal, small, conical to slightly

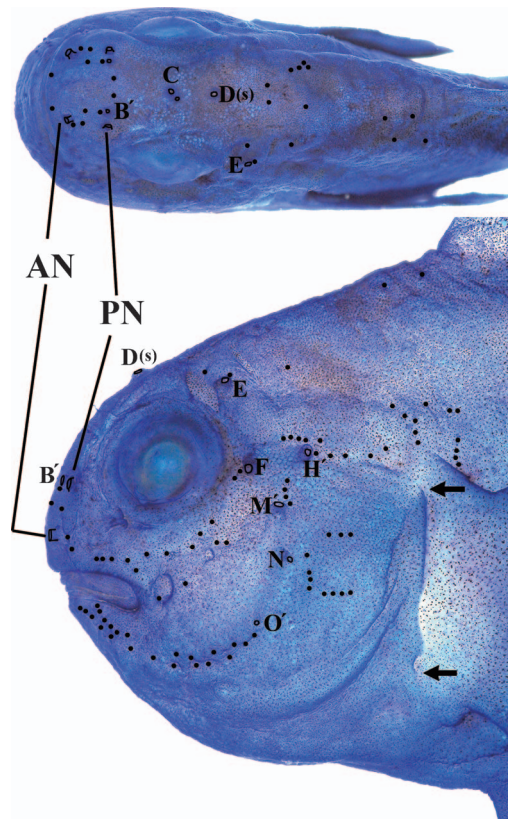


Fig. 1. The cephalic sensory system of *Gobiodon winterbottomi*, KPM-NI 5887, holotype, 32.9 mm SL. Dorsal (top), lateral (middle) and ventral (bottom) views of head. The letters indicate the cephalic sensory canal pores. Dots represent the sensory papillae. AN and PN indicate anterior and posterior naris, respectively. Arrows show position where gill membrane is attached to base of pectoral fin.

recurved, arranged in 2 or 3 irregular inner rows; lower jaw teeth similar to those of upper jaw; post-symphysial canine teeth absent.

First dorsal fin trapezoid in shape with straight distal margin, originating directly over the upper base of pectoral fins; second spine of first dorsal fin longest (first and second spines in one), but not elongate and filamentous, not reaching posteriorly to second dorsal fin when adpressed; spines decreasing in length posteriorly; height of first dorsal fin less than that of second dorsal fin and attached to it via low membrane. Sixth segmented ray of second dorsal fin longest (fourth segmented ray in one, eighth segmented ray in one), end of second dorsal fin extending posteriorly beyond middle of caudal-fin base when adpressed (reaching in one; not reaching in juve-

nile); height of second dorsal fin less than that of anal fin. Anal fin origin directly below base of first segmented ray of second dorsal fin; sixth segmented ray longest (seventh segmented ray in two), reaching posteriorly to middle of caudal-fin base when adpressed (extending beyond in one; not reaching in juvenile); all dorsal- and anal-fin segmented rays branched, the last ray to base; distal margins of second dorsal and anal fins slightly convex. Base of uppermost ray of pectoral fin directly below base of second spine of first dorsal fin; posterior margin of pectoral fin elliptic (pointed posteriorly in one); all rays branched; fin reaching posteriorly to vertical through base of fourth ray of second dorsal fin (fifth in two). Origin of pelvic fins directly below base of second spine of first dorsal fin; all rays branched;

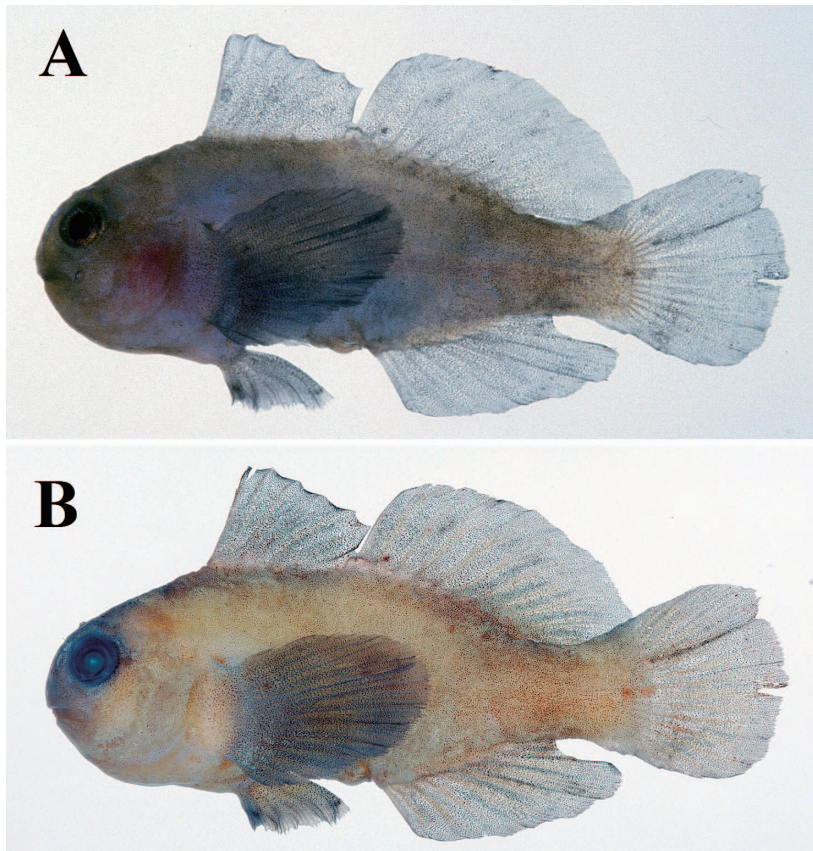


Fig. 2. *Gobiodon winterbottomi*, KPM-NI 5887, holotype, 32.9mm SL, Funauki inlet, Iriomote-jima Island, Yaeyama Islands, the Ryukyu Islands, Japan. A: fresh specimen, photo by H. Senou. B: alcohol preserved specimen, photo by T. Suzuki.

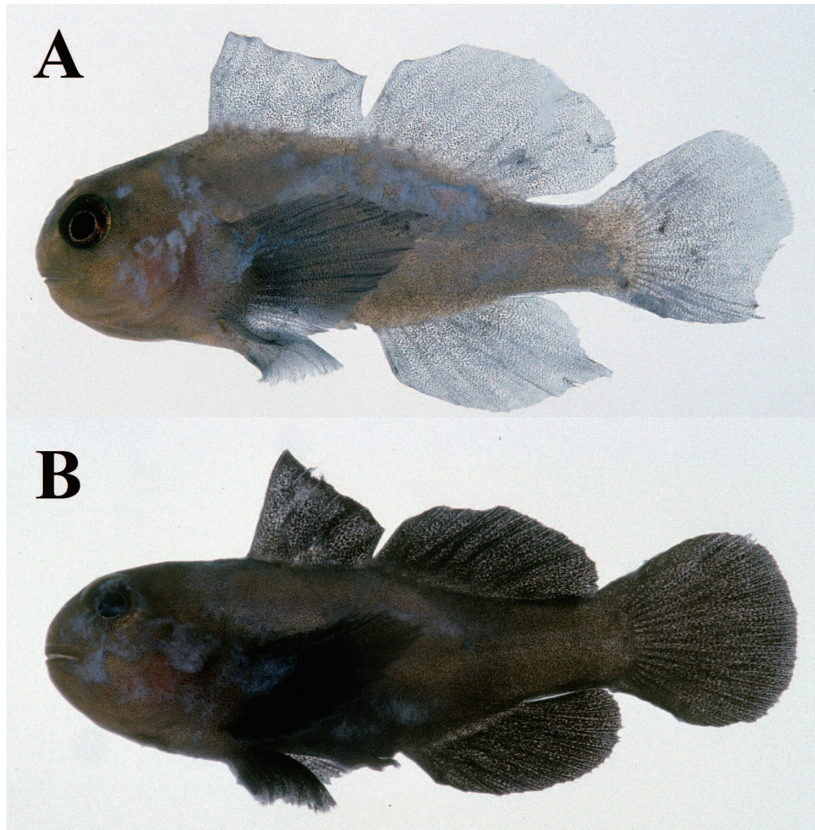


Fig. 3. *Gobiodon winterbottomi*, fresh specimens of paratypes, Funauki inlet, Iriomote-jima Island, Yaeyama Islands, the Ryukyu Islands, Japan. A: NSMT-P 106563, male, 27.7 mm SL, photo by H. Senou. B: KPM-NI 5889, juvenile, 19.0 mm SL, photo by H. Senou.

pelvic fins joined medially, cup-shaped; frenum and basal membrane complete and well developed; pelvic fins reaching posteriorly to middle of genital papilla when adpressed (to posterior half of genital papilla in one; to anus in juvenile). Posterior margin of caudal fin rounded.

*Color when fresh* (Figs. 2A, 3). Head and body light brownish gray (dark brownish gray in juvenile). Fins light gray (black in juvenile). No stripes or other markings.

*Color in alcohol* (Fig. 2B). Head and body yellowish gray (grayish brown in juvenile). Fins light gray (grayish brown in juvenile). No stripes or other markings.

*Color when alive*. Head, body and fins dark brownish gray to black. No stripes or other markings (Yano in Senou, 2004: 179).

**Distribution.** Iriomote-jima Island, Yaeyama Islands, the Ryukyu Islands, Japan.

*Habitat.* According to Suzuki and Shibukawa in Senou (2004), *G. winterbottomi* occurs on coral reefs of the reef slope at depths of 5–8 m. Individuals only live as commensals on the plate-shaped coral, *Echinopora lamellosa*.

**Etymology.** The new species is named after Dr. Richard Winterbottom (ROM), in honor of his great contribution to our knowledge of the systematics of the Gobioidaei.

**Comparisons.** *Gobiodon winterbottomi* is very similar to *G. acicularis*, adult *G. albofasciatus*, *G. ceramensis* and adult *G. spilophthalmus* with which it shares a relatively overall uniform pigmentation of head, body and fins, the lack of an interopercle-isthmus groove, and the distal mar-

gin of the first dorsal fin except first spine straight (Harold and Winterbottom, 1995; Sawada and Arai, 1972; Shibukawa *et al.*, 2003; Suzuki and Shibukawa, 2004; Yoshino and Yamamoto, 1984; in this study). But the former differs from the latter four species in having large second dorsal, anal and pelvic fins in adult: second dorsal and anal fins reaching posteriorly to or beyond middle of caudal-fin base when appressed (vs. not reaching to middle of caudal-fin base in the latter), pelvic fins reaching posteriorly to middle to posterior half of genital papilla (vs. not reaching to anus or reaching to base of genital papilla, see Harold and Winterbottom, 1995; Sawada and Arai, 1972; Shibukawa *et al.*, 2003; Suzuki and Shibukawa, 2004; Yoshino and Yamamoto, 1984; in this study). Moreover, *G. winterbottomi* differs from *G. acicularis* in lacking highly elongated dorsal-fin spines (see Harold and Winterbottom, 1995). It differs from *G. albofasciatus* and *G. spilophthalmus* in the absence of stripes or other markings on head, body and fins in juvenile (vs. body pale with two black stripes, and head and caudal fin with many black spots in juvenile *G. albofasciatus* and *G. spilophthalmus*, see Fowler, 1944; Sawada and Arai, 1972; Shibukawa *et al.*, 2003; Yoshino and Yamamoto, 1984). It differs from *G. ceramensis* in lacking post-symphysial canine teeth (vs. the teeth present).

*Gobiodon winterbottomi* is only found on *Echinopora lamellosa* on the reef slope; whereas *G. acicularis* is only seen on the tree-like forms of *Echinopora horrida*, *Echinopora mammiformis* and *Hydnophora rigida* in lagoons or inshore; *G. ceramensis* frequently inhabits the tree-like form of *Stylophora pistillata* in lagoons and sheltered areas; *G. spilophthalmus* is found on a wide variety of coral species usually in lagoons or sheltered areas; and *G. albofasciatus* is found on the tree-like forms of *Acropora* in lagoon and sheltered areas (Mundy *et al.*, 1999; Suzuki and Shibukawa, 2004; Yoshino and Yamamoto, 1984).

**Comparative material.** *Gobiodon ceramensis*: OMNH (the Osaka Natural History Museum) -P

34041-34043, 3 specimens (34.6–35.0 mm SL), 6–7 m depth, Kabira Inlet, Ishigaki-jima Island, the Ryukyu Islands, Japan, 17 Aug. 1993.

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