

First Record of *Gymnogobius cylindricus* (Perciformes: Gobiidae) from Incheon River Estuary, Jeonbuk-do, Korea

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ABSTRACT Based on a single specimen (49.9 mm SL) collected from Incheon River estuary, southwestern Korea, *Gymnogobius cylindricus* was described as the first record from Korea as well as the westernmost record of the world. The species is characterized by having a large maxilla extend far beyond posterior margin of eye, dorsal fin with VI-I, 12 rays, anal fin with I, 11 rays, and without dark blotches and dots on lower part of body and caudal fin, respectively. A new Korean name, "Ga-neun-sal-mang-dug" is proposed for the species.

Key words : *Gymnogobius cylindricus*, new record, Gobiidae, Korea, description

INTRODUCTION

The Asian goby genus *Gymnogobius* Gill, 1863 is characterized by having anteriormost pterygiophore of the first dorsal fin inserted in the fourth interneural space, notched tongue, cheek and opercles without scales, anterior oculoscapular canal present [except *G. castaneus* (O'Shaughnessy, 1875)], posterior oculoscapular and preopercular canals absent, pectoral fin without filamentous projections, and gill opening not confined to side of head and consists of 16 valid species worldwide currently (Stevenson, 2002; Zhao *et al.*, 2007). In the western coast of Korea, three species of *G. breunigii* (Steindachner, 1880), *G. macrognathos* (Bleeker, 1860), and *G. urotaenia* (Hilgendorf, 1879) were reported out of already known eight species from Korea including *G. taranetzi* (Pinchuk, 1978) recently added (Kim *et al.*, 2005; Lee, 2010; Lee, 2012).

During an investigation of ichthyofauna of Korea, we found a single specimen of *Gymnogobius* from the catch of wild glass eel fishery conducted at the Incheon River estuary, southwestern coast of Korea. The specimen was subsequently identified as *G. cylindricus* (Tomiyama, 1936), representing the first record from Korea as well

as the westernmost record of the world. To date, the species has been distributed in Seto Inland Sea coasts of Hyogo, Okayama and Hiroshima Prefectures as well as in the Ariake Sound coast of Saga Prefecture, Japan and also recognized as probably endemic to Japan (Stevenson, 2002; Suzuki *et al.*, 2006). In this study, we describe the detailed external morphology of *G. cylindricus* based on a single specimen collected from Korea. Counts and measurements are those of Hubbs and Lagler (1964). The relation between the pterygiophores of the dorsal fins and vertebrae (P-V) and notations of cephalic sensory canals and papillae follow those of Akihito *et al.* (2002). Vertical fins and vertebrae were counted by radiographs. Specimen examined is deposited at the National Institute of Biological Resources (NIBR-P), Korea as voucher.

Gymnogobius cylindricus (Tomiyama, 1936)

(New Korean name: Ga-neun-sal-mang-dug)

(Figs. 1, 2; Table 1)

Chaenogobius cylindricus Tomiyama, 1936: 92, fig. 39 (type locality: Hiroshima, Japan); Suzuki and Masuda, 1993: 2 (Hyogo, Japan).

Gymnogobius cylindricus: Stevenson, 2002: 280 (Japan); Suzuki *et al.*, 2006: 125 (Japan); Inui, 2007: 242 (Mie Prefecture, Japan); Arao, 2008: 173 (Aichi Prefecture, Japan).

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Fig. 1. *Gymnogobius cylindricus* (Tomiyama), NIBR-P20318, 49.9 mm SL, collected from Incheon River estuary, southwestern coast of Korea. Photograph by H.B. Song.

Material examined. NIBR-P20318, 49.9 mm in standard length (SL), male, N 35° 32' 40.93'' N, 126° 35' 07.47'' E, Yonggi-ri, Shimwon-myeon, Gochang-gun, Jeonbuk-do, Korea, Incheon River estuary, 19 April 2011, collected by Ho-Bok Song and Seung-Ho Choi.

Description. Dorsal fin rays VI-I, 12; anal fin rays I, 11; pectoral fin rays 19, uppermost two and lowermost rays unbranched; pelvic fin rays I, 5; branched caudal fin rays 7+6, unbranched caudal fin rays 12+9; gill rakers 2+9=11; vertebrae 15+17=32; P-V 4/II II 0 I 0 0 /12. Proportional measurements in percentage of SL: body depth 13.2; body width 11.6; head length 28.5; head width 16.4; orbital diameter 4.0; interorbital width 2.6; upper jaw length 17.8; postorbital length 18.4; snout to origin of first dorsal fin 39.3; snout to origin of second dorsal fin 58.5; snout to origin of pectoral fin 29.5; snout to origin of pelvic fin 27.3; snout to origin of anal fin 64.3; base of first dorsal fin 13.6; base of second dorsal fin 25.7; base of anal fin 18.4; length of pectoral fin 20.2; length of caudal fin 22.6; depth of caudal peduncle 8.2; length of caudal peduncle 17.4.

Body elongate and cylindrical with slender caudal peduncle. Head somewhat broad and rather depressed. Eye moderate and interorbital region narrow and nearly flat, its width less than orbital diameter. Mouth large, directed slightly upward; lower jaw included; posterior tip of maxilla extend far beyond a vertical at posterior margin of eye, its posterior portion separated from cheek. Teeth on upper jaw with small conical arranged irregularly three to four rows, and those on outer row enlarged and lower jaw with small conical arranged irregularly four to five rows. Tongue notched. Gill membranes attached to isthmus; gill rakers short, slender, and without tooth patches. Dorsal fin two and well separated each other. Pectoral fin large and round, its posterior tip reaching a vertical at last spine of first dorsal fin. Anal fin approximately equal in height with second dorsal fin, its origin posterior to third soft ray of second dorsal fin. Caudal fin round. Genital papilla small and conical.

Pattern of cephalic sensory canal systems: anterior oculoscapular canal with C', D (single), and F'; posterior oculoscapular and preopercular canals absent. Sensory papillae: three longitudinal rows of papillae on cheek,

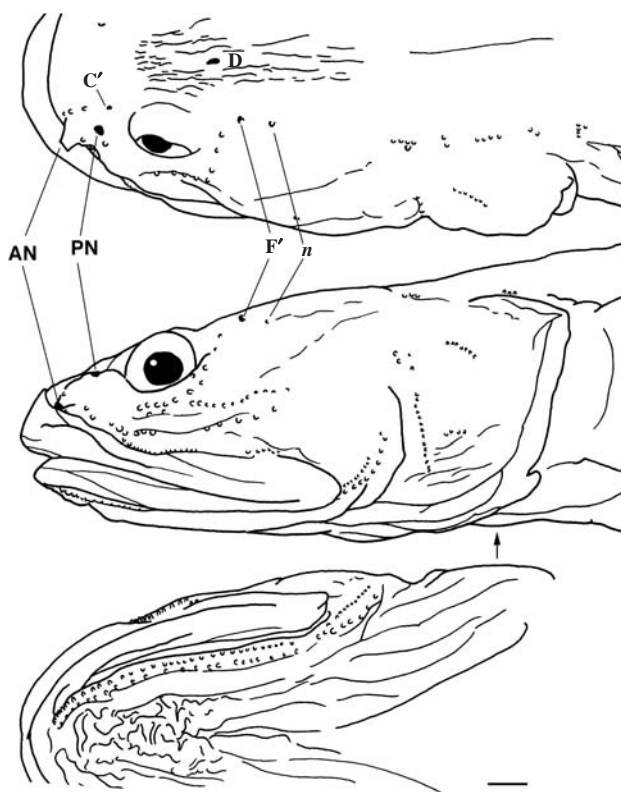


Fig. 2. Sensory canal pores and papillae of *Gymnogobius cylindricus*, NIBR-P20318, 49.9 mm SL. AN, anterior nostrils; C, anterior interorbital pore; D, posterior interorbital pore; F, postorbital pore; n, anterior transverse row of occipital series of sensory papillae; PN, posterior nostrils. Arrow shows point where gill membranes attached to isthmus. Scale bar indicates 1 mm.

transverse rows absent on cheek (Fig. 2).

Color when fresh. Head and body yellowish brown with reddish brown irregular patches on dorsolateral body. Irregular blackish spots on mid-lateral line from opercle to base of caudal fin. First and second dorsal fins with reddish brown dots along each fin ray. Caudal fin except lower portion with reddish brown dots along each fin ray. Other fins transparent without any dark blotches or dots.

Color after preservation. Head and body pale brown

Table 1. Comparison of counts and measurements in *Gymnogobius cylindricus* and its most similar species, *G. scrobiculatus*

	<i>Gymnogobius cylindricus</i>				<i>G. scrobiculatus</i>
	Present study	Tomiyama (1936)	Suzuki and Masuda (1993)	Stevenson (2002)	Stevenson (2002)
SL (mm)	49.9 (n=1)	55.0 (n=1)	47.3 ~ 54.6 (n=5)	49.2 ~ 52.0 (n=3)	24.0 ~ 33.8 (n=12)
Dorsal fin rays	VI-I, 12	VI-I, 11	VI-I, 11 ~ 13	VI-I, 11 ~ 13 (mainly VI-I, 13)	VI-I, 10 ~ 11 (VI-I, 10)
Anal fin rays	I, 11	I, 10	I, 9 ~ 11	I, 10 ~ 11 (I, 10)	I, 8-9 (I, 9)
Pectoral fin rays	19	–	17 ~ 18	16 ~ 18 (18)	17 ~ 18 (18)
Vertebrae	15+17	–	–	15+18	15+18
Dark pigment patches					
on lower body	Absent	Absent	Absent	Absent	Present
on lower caudal fin	Absent	Absent	Absent	Absent	Present

with dark blotches along the midline of body from posterior to gill opening to base of caudal fin. Dorsal fins with small dots scattered along fin rays. Two thirds of caudal fin with dotted along fin rays. Pectoral, pelvic, and anal fins transparent without any dark dots.

Distribution. Known from Japan (Stevenson, 2002; Suzuki *et al.*, 2006) and Korea (Incheon River estuary, west coast of the Korean Peninsula; present study).

Remarks. Morphological characteristics of the present specimen collected from the Incheon River estuary, Korea agree well to those of the previous records as well as the original description of *Gymnogobius cylindricus* with some exceptions (Table 1). The sensory pore D on anterior oculoscapular canal of the type specimen (ZUMT 30389) is opened as a pair (Suzuki and Masuda, 1993), whereas that of the present specimen is a single (Fig. 2). It is obvious that the pore D shows an intraspecific variation (single or a pair), as mentioned by Suzuki and Masuda (1993). Although Stevenson (2002) mentioned the interorbital portion of oculoscapular canal is replaced by longitudinal row of papillae, we could not find any papillae on the interorbital portion of oculoscapular canal in the present specimen collected from Korea. Additionally, scales on nape and predorsal regions were also not confirmed contrary to the statements by Inui (2007) as well as the original description of Tomiyama (1936). To determine the character states of scales of *G. cylindricus* from the Korean waters, further examination based on sufficient materials is needed. *G. cylindricus* is most similar to *G. scrobiculatus* (Takagi, 1957), but is easily distinguished from the latter by lack of dark pigment patches on both lower body and lower part of caudal fin as well as larger numbers of dorsal and anal fin rays (Stevenson, 2002). *G. cylindricus* is also differentiated from the congeners occurring in the Korean waters by the larger maxilla extending far beyond a vertical at posterior margin of eye (not reaching the middle of eye in *G. breunigii* and *G. taranetzi*), absence of the anterior oculoscapular canal

pore G (presence in *G. heptacanthus*, *G. mororanus*, *G. petschiliensis*, *G. opperiens* and *G. urotaenia*), and the longer upper jaw compared to lower jaw (short in *G. macrognathos*).

According to Suzuki *et al.* (2006), the species is inhabited in the holes excavated by the thalassinoid shrimps (*Upogebia major* and *Callianassa japonica*) on the soft muddy bottom. In Japan, *G. cylindricus* is ranked as a critical endangered species (CR) due to loss and/or decreasing of habitats for the species by dredging, reclamation, coastal contamination, and sea defense works (Ministry of the Environment, Japan, 2007), although IUCN threat status is currently not evaluated. The habitat of *G. cylindricus* seems to be affected by recent large-scaled reclamation work in Korea, therefore it is needed to clarify the current status of the species at the first occurrence location and its adjacent waters for sustainable conservation of the species as soon as possible.

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전북 인천강 하구역에서 출현한 망둑어과(농어목) 한국미기록종, *Gymnogobius cylindricus*

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요 약 : 우리나라 서남부의 인천강 하구역에 설치된 실뱀장어잡이 그물에서 망둑어과 꼭저구속 *Gymnogobius cylindricus* 1개체 (표준체장 49.9 mm)가 채집되어 한국미기록종 및 분포의 서방한계로 보고한다. 본 종은 머리가 납작하며 몸이 가늘고 긴 점, 등지느러미 기조수가 VI-I, 12, 뒷지느러미 기조수가 I, 11, 체측의 어두운 반점열이 몸의 복부에 도달하지 않는 점 및 꼬리지느러미 하방에 반점열이 없는 점이 특징이다. 본 종의 신한국명으로 “가는살망둑”을 제안한다.

찾아보기 낱말 : *Gymnogobius cylindricus*, 한국미기록종, 기재, 인천강, 가는살망둑