

New Record of *Neoclinus chihiroe* (Perciformes: Chaenopsidae) from Dokdo, East Sea, Korea

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ABSTRACT A single specimen (52.5 mm SL) of *Neoclinus chihiroe*, belonging to the family Chaenopsidae, was firstly collected from Dokdo, East Sea of Korea on 9 December 2020. This species was characterized by a black spot between the first and the second dorsal spines, and a black spot on upper part of opercular membrane. The species was morphologically similar to *N. okazaki*, but distinctly distinguished by pectoral fin base without a black dot. This study documents the first record of *N. chihiroe* in Korean waters and suggests the new Korean name 'Dong-hae-bi-neul-be-do-la-chi' for the species.

Key words: *Neoclinus chihiroe*, Chaenopsidae, new record, Dokdo, East Sea

INTRODUCTION

The family Chaenopsidae (Perciformes) comprises 96 species and 14 genera worldwide, while eight species and one genus occur in Japan, and only one species, *Neoclinus bryope* was recorded in Korean waters (Kim and Kang, 1991; Aizawa and Doiuchi, 2013; Nelson *et al.*, 2016). The chaenopsid fishes are tropical and mainly distributed in warm North and South American waters (Nelson *et al.*, 2016). Generally, they have a big mouth, supraorbital, nasal cirri variously present or absent, and relatively small-sized (Murase *et al.*, 2015).

Neoclinus chihiroe was firstly reported as a new species in southern Japanese waters (Fukao, 1987) and also recorded in some Japanese documents thereafter (Fukao and Okazaki, 1987, 1990; Hongjamrassilp *et al.*, 2020), but there still has been a lack of data on their occurrence elsewhere. This species is distributed in northwest Pacific, especially along the coast of Japan (Fukao and Okazaki, 1987) and is in the category of least concern (LC) in the

list of IUCN (Williams and Craig, 2014). This species is expected to live all over Japan waters constituting a population. However, there are mentions that local protection is required depending on the area in which they live (Williams and Craig, 2014).

The genus *Neoclinus* usually inhabit between rock matrix (Fukao, 1990), but also uses distinctive materials as shelters, including the vacant of gastropods (Fukao and Okazaki, 1987) and empty worm tubes (Stephens and Springer, 1971), occasionally artificial shelters like discarded cans and bottles (McCleneghan and Ames, 1976). Such a hiding behavior is a life history strategy to protect their bodies from potential predators and make it easier to care of their spawned eggs (Murase and Sunobe, 2011; Froese and Pauly, 2019). They attached spawned egg masses around their shelters and protected for several days (Murase and Sunobe, 2011). Because of this spawning behavior, they expected limited egg dispersal ability (Hongjamrassilp *et al.*, 2020). Nonetheless, there still have been a lack of available data on their biology and ecology. Therefore, additional information is required for the establishment of strategy protecting and managing their habitats.

Historically, only one species of chaenopsid fishes (i.e., *N. bryope*) has been reported in Korean waters (Kim and

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Kang, 1991; MABIK, 2020). In the present study, a single specimens of *N. chihiroe* was collected from Dokdo, Korea. Therefore, we described its morphological characteristics and reported the first record based on a specimen from Korean waters.

MATERIALS AND METHODS

One specimen of *N. chihiroe* was collected from the Dokdo (37°14'23.29"N 131°51'52.92"E), Ulleung-gun, Gyeongsangbuk-do, Korea, via SCUBA diving on 9 December 2020 (Fig. 1). In the laboratory, meristic counts and measurements were followed by Hubbs and Lagler's (1958) methods. Prior to alcohol fixation, the specimen was anesthetized with ice and then each body part was measured to the nearest 0.1 mm using digital Vernier calipers. The specimen was preserved in 99% ethanol and deposited at Marine Biodiversity Institute of Korea (MABIK).

RESULTS AND DISCUSSION

Taxonomic accounts

Neoclinus chihiroe Fukao, 1987

(New Korean name: Dong-hae-bi-neul-be-do-la-chi)
(Fig. 2; Table 1)

Neoclinus chihiroe Fukao, 1987: 301 (type locality: Shirahama, Wakayama Prefecture, Japan); Fukao and Okazaki, 1990: 243 (Japan); Murase *et al.*, 2010: 66 (Japan); Aizawa and Doiuchi, 2013: 1294 (Japan).

Material examined. MABIK PI00049711, one specimen, 52.5 mm SL, collected by hand net in SCUBA, Dokdo, Ulleung-gun, Gyeongsangbuk-do, Korea (37°14'23.29"N 131°51'52.92"E), 15~20 m depth, 9 December 2020 (Fig. 1).

Description. Body measurements of the specimen shown in Table 1. Overall body elongated and compressed. Eyes protruded and posterior tip of upper jaw beyond the eyes. Dorsal fin single, its membrane slightly notched and soft ray part of dorsal fin higher than spinous dorsal fin. Origin of dorsal fin located forward from origin of pectoral fin. Origin of soft ray part of dorsal fin located behind middle of body. Caudal fin separated from dorsal and/or anal fins. Caudal fin rounded. Anal fin serrated, and its origin located to behind anus. Pelvic fins located before

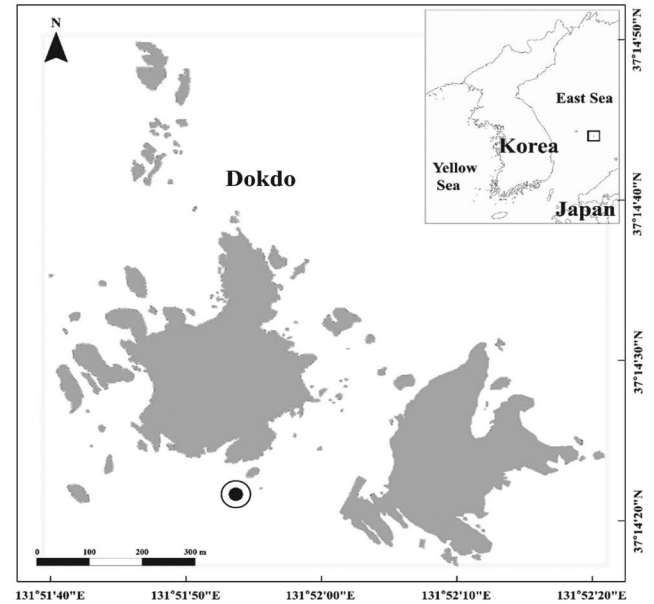


Fig. 1. Map showing the sampling area of *Neoclinus chihiroe* from Dokdo, Korea (●).

pectoral fins. Pectoral fin rounded. Three pairs of supra-orbital cirri arranged in single row and much branched; first cirri longer and branched the most than second and/or third cirri. The specimen has one pair of nasal cirri.

Coloration. Body color uniformly orange (Fig. 2). Dark orange color presented on the dorsal part of the body, but a bright orange color on the belly. A number of small black dots scattered in the central body. Dorsal fin yellowish, and black spot showed between first and second dorsal spines. Upper half of body darker than lower half. White dots scattered on the whole-head and upper body part. Red dots scattered around the gill cover. Upper part of opercular membrane has a black spot. Two black stripes appeared lightly on the spinous ray part of dorsal fin. Overall pectoral fin orange. There was no black dot at the base of pectoral fin. Pelvic fins covered in black on an orange background. Anal fin has a one vertical black line on an orange background, and the black line became lighter as it goes toward the caudal fin. Overall caudal fin bright orange.

Distribution. Dokdo, Korea (present study), Japan (Fukao, 1987; Aizawa, 2002; Murase *et al.*, 2010; Aizawa and Doiuchi, 2013).

Remarks. In this study, a single specimen of chaenopsid fishes was collected from Dokdo with body elongate and compressed, scales absent, no lateral line and supraorbital, and nasal cirri variously present, and classified as *Neoclinus* species by its overall body morphology (Willwams,

Table 1. Morphometric measurements of *Neoclinus chihiroe* in comparison with previous records

Morphological characteristics	Present study	Fukao, 1987	Murase <i>et al.</i> , 2015
Sex (number of specimens)	Male (1)	Male (1)	Male (3)
Counts			
Dorsal rays	XXIII, 17	XXIV, 16	XXIII-XXV, 15-16
Anal rays	II, 27	II, 28	II, 27-29
Pectoral rays	12	13-13	13
Pelvic rays	I, 3	I, 3-I, 3	3
Principal caudal rays	7+6=13	7+6=13	7+6=13
Measurements (in mm)			
Standard length	52.5	45.1	44.4~52.9
% of standard length			
Total length	117.3	115.7	116.3~117.1
Head length	25.5	23.1	26.0~27.3
Body depth	15.1	16.0	15.1~16.7
Body depth at anal origin	15.2	13.7	–
Head depth	16.7	–	16.8~17.6
Head width	16.3	16.0	–
Eye diameter	6.1	6.0	6.2~7.3
Interorbital width	1.4	–	1.1*
Snout length	4.5	–	4.5~5.3
Upper-jaw length	13.3	13.1	14.6~15.4
Pre-dorsal fin length	16.8	17.7	17.8~18.5
Pre-anal fin length	42.7	42.4	42.7~43.9
Caudal-peduncle length	5.0	4.9	5.2~5.9
Caudal-peduncle depth	7.6	7.5	8.1~8.8
Length of dorsal fin base	81.3	80.3	80.6~81.7
Length of anal fin base	55.8	55.9	52.4~53.8
Length of 1st dorsal fin spine	12.8	–	10.4~13.0
Length of last dorsal fin spine	7.6	–	7.2**
Length of 1st dorsal fin soft ray	10.3	–	9.8~10.4
Length of 1st anal fin spine	3.0	4.7	2.9~4.4
Length of 1st anal fin soft ray	7.6	7.1	7.5~7.7
Pectoral fin length	14.1	13.7	15.5~17.8
Pelvic fin length	13.7	12.0	12.9~14.9
Longest dorsal spine length	14.9 (3rd)	12.2 (3rd)	–
Longest dorsal soft ray length	12.6 (9th)	10.9 (9th)	–

*All three individuals showed same percentage of interorbital width.

**Only a single individual has been measured among the three.

2002; Nelson *et al.*, 2016). The body morphometrics of the specimen was well matched the original description of *N. chihiroe* (Fukao, 1987) as follows; there was a black spot between first and second dorsal spines, and also was on the upper part of opercular membrane, pectoral fin base without black dot (Aizawa and Doiuchi, 2013). According to the original description (Fukao, 1987; Murase *et al.*, 2015), the species has 13 pectoral rays, whereas the present specimen showed slightly discordance in the number

of pectoral rays (12, Table 1). The body depth at anal origin of the specimen in this study was slightly longer (15.2% SL) than previous record (13.7% SL in Fukao, 1987), but the predorsal fin length slightly shorter (16.8% SL vs. 17.8~18.5% SL in Murase *et al.*, 2015). However, these differences are regarded within ranges of intra-specific variations. Nonetheless, it was consistent with *N. chihiroe* in that the main features of black spot on upper part of opercular membrane, no black dot on the base of pectoral

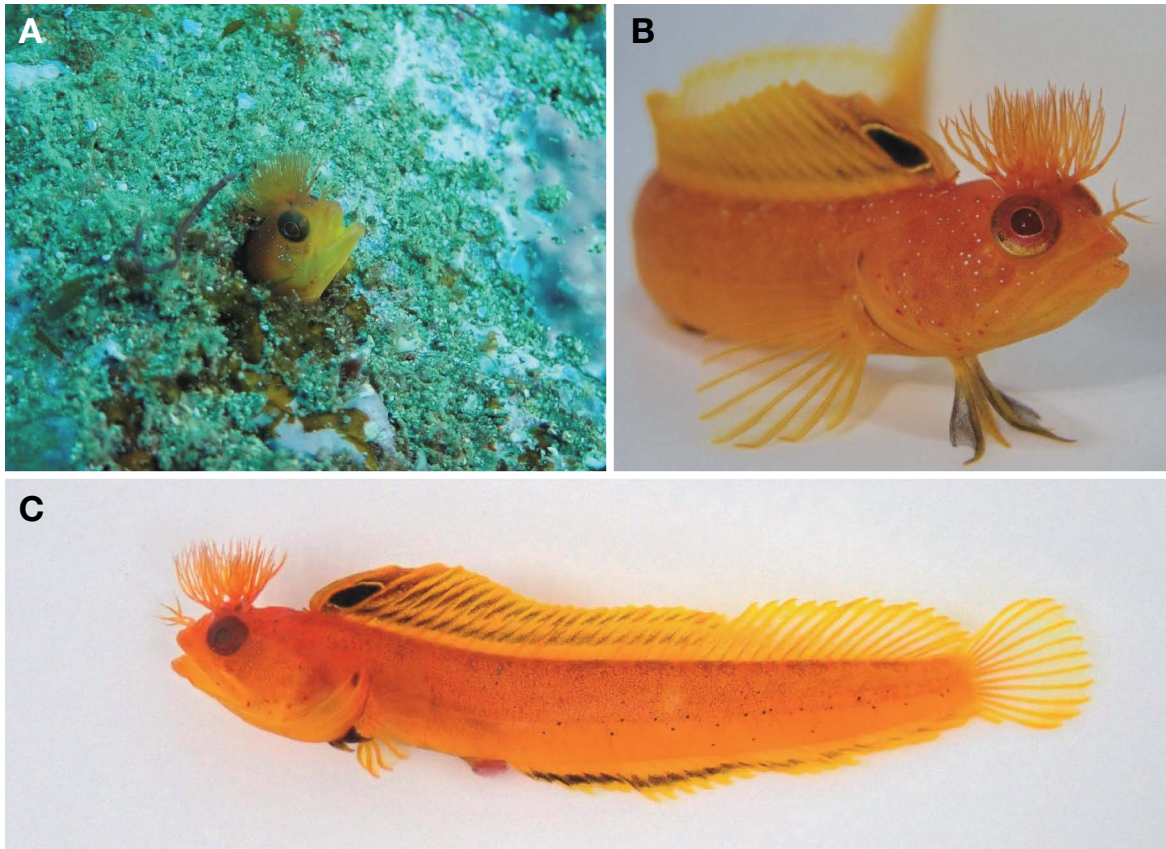


Fig. 2. *Neoclinus chihiroe*, fresh, MABIK PI00049711, 52.5 mm SL, Dokdo. A, an underwater photo; B and C, images taken in the laboratory.

fin (Aizawa and Doiuchi, 2013). The body morphology of *N. chihiroe* is almost similar to *N. okazakii* Fukao, 1987, but distinctly different from the basal color of pectoral fin (without black dot for *N. chihiroe* vs. with black dot for *N. okazakii*) (Aizawa, 2002; Aizawa and Doiuchi, 2013). Although a single species of *N. bryope* (Jordan and Snyder, 1902) in the genus *Neoclinus* has been recorded distributing in Korean waters (Kim and Kang, 1991), *N. chihiroe* is easily distinguished from the *N. bryope* by the presence of black spot on the upper part of opercular membrane (with black spot for *N. chihiroe* vs. without black spot for *N. bryope*) (Aizawa, 2002; Aizawa and Doiuchi, 2013). Therefore, this study documents the first record of *N. chihiroe* in Korean waters and suggests the new Korean name of ‘Dong-hae-bi-neul-be-do-la-chi’ for the species.

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한국 동해 독도에서 채집된 비늘베도라치과(Chaenopsidae) 어류 첫기록종, *Neoclinus chihiroe*

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요 약 : 농어목 비늘베도라치과에 속하는 *Neoclinus chihiroe* 1개체 (52.5 mm SL)가 2020년 12월 9일 독도에 서 잠수조사를 통해 처음 채집되었다. 이 종의 특징은 등지느러미 첫 번째 극조와 두 번째 극조 사이에 검은색 점을 가지고 있으며, 아가미 덮개 뒤편 위쪽에 검은색 점을 가지고 있었다. 이 종은 비늘베도라치과에 속하는 *N. okazakii*와 형태적으로 유사하였지만, 가슴지느러미 기부에 검은 점을 가지지 않는 점에서 구별된다. 이번 연구는 *N. chihiroe*의 국내 첫 출현을 보고하며 이 종의 새로운 국명은 ‘동해비늘베도라치’로 제안한다.

찾아보기 낱말 : 비늘베도라치과, *Neoclinus chihiroe*, 동해비늘베도라치, 첫기록종, 독도