

## First Record of Ghost Pipefish, *Solenostomus cyanopterus* (Solenostomidae: Gasterosteiformes) from Korea

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**A single female specimen (73.6 mm SL) of ghost pipefish, *Solenostomus cyanopterus* Bleeker, belonging to the family Solenostomidae (new Korean name: Yu-ryeong-sil-go-gi-gwa), was observed and collected in the water off Yeongdeok, East Sea of Korea. Unlike to syngnathids, solenostomids are characterized by having the brood pouch formed by pelvic fins in female and dorsal fin spines present. This species is characterized by having the deep snout, and short, deep caudal peduncle, but no cirri and striped markings. In the water, the species swims slowly head downward in pairs and looks like a drifting pieces of algae or fallen leaf. We describe this species as new to Korean fish fauna and propose its new Korean name, "Yu-ryeong-sil-go-gi".**

**Key words :** *Solenostomus cyanopterus*, Solenostomidae, ghost pipefish, first record

The ghost pipefishes inhabit sandy bottoms near rocky, coral reef, and seaweed beds of shallow tropical waters in the Indo-West Pacific. They are characterized by having a body covered with bony plates, pelvic fin present, dorsal fin spines present, and brood pouch formed by pelvic fins in female (Orr and Fritzsche, 1993; Senou, 2002). The family revised by Orr and Fritzsche (1993) and Senou (1994) in the Indo-Pacific and Japan, respectively. Thereafter, Orr *et al.* (2002) described one additional new species and provided a revised key of ghost pipefishes.

The family Solenostomidae comprises a single genus and five species worldwide: *Solenostomus cyanopterus* Bleeker, 1854, *S. leptosoma* Tanaka, 1908, *S. paradoxus* (Pallas, 1770), *S. armatus* Weber, 1913, and *S. halimeda* Orr, Fritzsche and Ranall, 2002 (Orr and Fritzsche, 1993; Orr *et al.*, 2002). Of these, the first three species have been recognized in Japan (Senou, 2002).

This species described briefly from the Hawssoon port of southern Jeju Island based on underwater photograph (Park and Choi, 2001), it has not been recorded on the basis of the specimen in Korea until now.

In October 2002, we observed a pair of ghost pipefish identified as *Solenostomus cyanopterus* in the water, subsequently, collected a single female specimen at 23 m depth on sandy bottom off coastal waters of Yeongdeok, East Sea of Korea. Accordingly, it is herein described as new to the Korean fish fauna. Brief descriptions and comparisons are provided.

### Materials and Methods

Measurement methods and terminology of body plates followed Orr and Fritzsche (1993) and Nakabo (2002). Vertebrae were counted from radiographs prepared by soft X-ray (Hitex Co., Japan), and second dorsal, pectoral, and anal fin rays were counted by stereomicroscope after partial

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dissection. The examined specimen is deposited in the National Fisheries Research and Development Institute (NFRDI) of Korea.

**Family Solenostomidae Lacepède, 1803**  
(New Korean name: Yu-ryeong-sil-go-gi-gwa)

Fishes of the family Solenostomidae live in tropical Indo-West Pacific; body compressed with large star-shaped bony plates; snout long; two separate dorsal fins, the first with five long spines; unlike to syngnathids, brood pouch formed by large pelvic fins in female; dorsal fin spines and pelvic fin present; a single genus, *Solenostomus*, with about five species (Orr *et al.*, 2002; Nelson, 2006).

**Genus Solenostomus Lacepède, 1803**  
(New Korean name: Yu-ryeong-sil-go-gi-sok)

*Solenostomus* Lacepède, 1803: 360 (Type species: *Fistularia paradoxa* Pallas 1770, =*Solenostomus paradoxus*).

***Solenostomus cyanopterus* Bleeker, 1854**  
(New Korean name: Yu-ryeong-sil-go-gi)  
(Fig. 1; Table 1)

*Solenostomus cyanopterus* Bleeker, 1854: 507

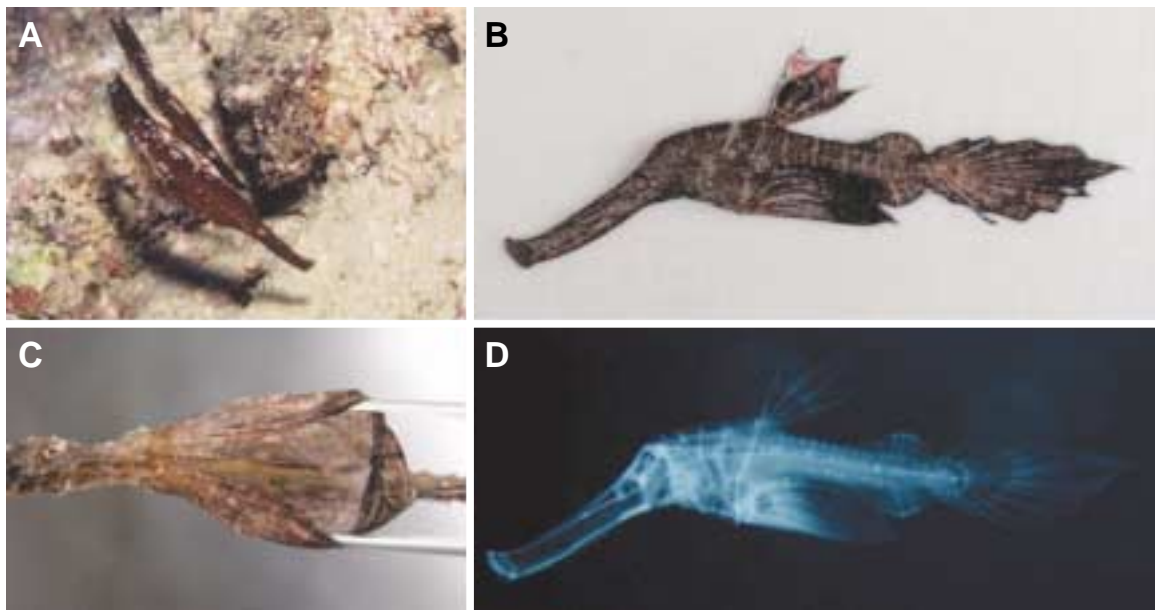
(type locality: Wahi, Ceram, Indonesia); Jordan and Snyder, 1901: 4, pl. 3 (Japan); Fishelson, 1966: 95, figs. 1~3 (Red Sea); Araga in Masuda *et al.*, 1984: 85, pls. 75-J, K (Japan); Myers, 1991: 81, pl. 19E (Micronesia); Kuitert, 1996: 72 (Australia); Randall and Lim, 2000: 603 (listed, South China Sea); Senou in Nakabo, 2002: 519 (key, description, Japan); Orr *et al.*, 2002: 100, figs. 12, 13 (Indo-Pacific); Allen *et al.*, 2003: 424 (Tropical Pacific); Myers and Donaldson, 2003: 613 (listed, Mariana Islands); Randall, 2005: 103 (South Pacific).

*Solenostomus paegnius* Jordan and Thompson, 1914: 235 (type locality: Misaki, Japan); Araga, 1967: 2, fig. 1 (Tanabe Bay, Japan); Shen *et al.*, 1993: 225, pl. 52-7 (Taiwan).

**Material examined.** NFRDI 20071022-01, 1 specimen, female, 76.3 mm in standard length (SL), 129° 25'E, 36° 32'N, off coastal waters of Gyomuyeok-ri, Byeonggok-myeon, Yeongdeok-gun, East Sea of Korea, 23 m depth, 22°C, 5 October 2002, by bare hand, collected by H.S. Yim.

**Description.** Meristic and morphometric characters are shown in Table 1.

Body compressed, depth greatest between origin of first dorsal fin and pelvic fin, very slender between first and second dorsal fin; head elongated; snout long, tubular, and oriented to down-



**Fig. 1.** *Solenostomus cyanopterus* Bleeker, NFRDI 20071022-01, female, 76.3 mm SL, 129° 25'E, 36° 32'N, off coastal waters of Gyomuyeok-ri, Byeonggok-myeon, Yeongdeok-gun, Korea. (A) Underwater photograph; (B) Lateral view; (C) Ventral view of brood pouch; (D) X-ray photograph.

**Table 1.** Comparison of meristic and morphometric characters of *Solenostomus cyanopterus*

	Present study	Orr <i>et al.</i> (2002)
Number of specimens	1	52
Total length (mm)	85.9	–
Standard length (mm)	76.3	30.6 ~ 109.0
Counts		
Dorsal fin rays	V-20	V-18 ~ 22
Pectoral fin rays	27	25 ~ 28
Pelvic fin rays	I, 6	–
Anal fin rays	20	17 ~ 21
Caudal fin rays	16	–
Total body plates	30	27 ~ 35
Total trunk plates	11	10 ~ 14
Complete trunk rings	5	4 ~ 8
Total tail plates	15	12 ~ 17
Complete tail rings	6	5 ~ 9
Caudal peduncle plates	7	5 ~ 10
Vertebrae	19+14	19+13 ~ 14 <sup>a</sup>
Measurements (% of SL)		
Body depth	22.3	13.8 ~ 48.4
Body width	6.4	–
Head length	47.7	39.8 ~ 50.5
Snout length	33.3	21.4 ~ 34.3
Snout depth	7.2	3.6 ~ 11.7
Eye diameter	3.9	2.8 ~ 7.5
Upper jaw length	3.9	–
Postorbital length	10.0	–
Interorbital width	2.8	–
Pre-first dorsal length	68.2	–
Pre-second dorsal length	92.9	–
Prepectoral length	47.4	–
Preal anal length	91.7	–
Length of first dorsal fin base	3.7	–
Length of second dorsal fin base	8.8	–
Length of longest dorsal fin spine	24.1	18.5 ~ 31.2
Length of longest dorsal fin ray	1.8	–
Length of anal fin base	8.9	–
Length of longest anal fin ray	2.0	–
Pectoral fin length	3.4	–
Pelvic fin length	34.2	16.9 ~ 38.9
Caudal peduncle depth	7.1	3.2 ~ 10.4
Caudal peduncle length	5.6	1.4 ~ 17.3
Caudal fin length	44.7	30.3 ~ 44.9

<sup>a</sup>Data from Orr and Fritsche (1993)

ward obliquely; depth of snout deeper than eye diameter; interorbital space concave; mouth small, oriented vertically; teeth absent; two dorsal fins well separated, first dorsal fin spines weak and elongated; first dorsal fin inserted a little poste-

rior to pelvic fin; second dorsal fin located opposite anal fin, both on a raised base; pectoral and anal fins very small and rounded; pelvic fins large, the upper margin of fin fused to body surface and the lower margin fused to each other, forming a brood pouch; lateral line absent; scales absent; caudal peduncle very short; caudal fin long and rounded; body surface covered with star-shaped bony plates, anterior plate bigger than posterior one.

**Color of fresh specimen.** Body overall reddish black, with a large number of rounded violet spots; first dorsal fin dark red, with two large black blotches on the membrane between the first and the third spines; upper margin of first dorsal fin light scarlet; pelvic and caudal fins more darker than body, with the bigger violet spots; second dorsal and anal fins translucent. Body color is highly variable, ranging from light-color to dark-color phase (Fishelson, 1966; Araga, 1984). The coloration of present specimen corresponds to dark-color phase, however, that of specimen at Hwasoon port, Jeju Island is light-color phase, light green body with reddish fins (Park and Choi, 2001).

**Sexual dimorphism.** This species displays remarkable sexual dimorphism in having a brood pouch formed by the modified pelvic fins in female (Fig. 1B). However, pelvic fins of male are separated from the ventral part of body. Furthermore, The male is slender and smaller than the female in body form (Fishelson, 1966). The pouch of present specimen showed no eggs (Fig. 1C).

**Distribution.** Known from Indo-West Pacific: Korea (off Yeongdeok, present study), Japan (Senou, 2002), Taiwan (Shen *et al.*, 1993), South China Sea (Randall and Lim, 2000), Micronesia (Myers, 1991), Indonesia (Bleeker, 1854), Tropical Pacific (Allen *et al.*, 2003), South Pacific (Randall, 2005), and Red Sea (Fishelson, 1966). The occurrence of *S. cyanopterus* at Yeongdeok, East Sea of Korea is the northernmost record of the species.

**Ecological notes.** This specimen is found over sandy bottom near rocks in pairs, swimming slowly head downward close to each other. This species has a perfectly camouflage and looks like the drifting pieces of algae, such as *Undaria pinnatifida*, or fallen leaf (Fig. 1A).

**Remarks.** This species is a unique in both morphology and reproduction. Meristic and morphometric characters of the present specimen agree well with the descriptions given by Orr *et al.* (2002)

(Table 1). Among three species from Japan, *Solenostomus cyanopterus* is easily distinguished from *S. paradoxus* by having no slender simple cirri and striped markings. The former differs from *S. leptosoma* in having 25~27 pectoral fin rays (vs. 22~24 in the latter), deep snout (vs. narrow), and short caudal peduncle (vs. long) (Senou, 2002).

Since Jordan and Thompson (1914) described *S. paegnius* as a new species on the basis of one specimen from Misaki, Araga (1967) reported one additional specimen of that species from Tanabe Bay, Japan. However, Orr and Fritzsche (1993) revealed *S. paegnius* as a junior synonym of *S. cyanopterus*, as a result of reexamination of the holotype.

Fishelson (1966) investigated an embryonic and larval development of *S. cyanopterus* in aquarium, as a result, he revealed a brood pouch keeping ca. 350 eggs and larvae in various developmental stages. Ten days after mating the first larvae were expelled with the water flow through the pouch, the fertilized eggs are 0.5~0.75 mm in diameter and the newly hatched larvae are 11.5~12.5 mm in total length (Fishelson, 1966).

The new Korean name follows its English name, ghost pipefish.

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한국산 큰가시고기목, Solenostomidae과 어류 1 미기록종,  
*Solenostomus cyanopterus*

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큰가시고기목, Solenostomidae (국명신청: 유령실고기과)에 속하는 *Solenostomus cyanopterus* 암컷 1개체 (표준체장 73.6 mm)가 경북 영덕연안의 수중에서 처음 채집되었다. 다른 실고기류와는 달리, 유령실고기류는 암컷의 배지느러미가 융합되어 변형된 육아낭을 가지고 등지느러미에 구조를 가지는 특징이 있다. 본종은 주둥이의 폭이 넓고 꼬리자루가 짧고 폭이 넓으며, 피질돌기와 줄무늬가 없는 것이 특징이다. 또한 수중에서 관찰한 바로는, 암수 짝을 지어 머리를 아래로 하여 마치 떠다니는 해조류나 낙엽같이 느리게 유영하였다. 본종의 신한국명을 “유령실고기”라고 명명하였다.