

A Newly Recorded Sea Cucumber (Holothuroidea: Aspidochirotida: Synallactidae) from East Sea, Korea

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ABSTRACT

Five sea cucumbers were collected from Gisamun and Gonghyeonjin of Gangwon-do, in the East Sea, Korea from 27 December 2009 to 14 November 2012. These specimens were classified as *Synallactes nozawai* Mitsukuri, 1912 belonging to the family Synallactidae of order Aspidochirotida based on morphological characteristics. The family, genus and species are recorded for the first time from Korea. The distinct morphological characteristics of this species are as follows: body flexible, with thin gelatinous body wall; presence of numerous tubercles along dorsal ambulacra table of body wall consisted of three- or four-armed disk and a spire-form pillar. This species usually inhabits the deep sea and is distributed in the Northwest Pacific from northern Japan to Bering Sea.

Keywords: *Synallactes nozawai*, sea cucumber, taxonomy, morphology, East Sea, Korea

INTRODUCTION

Species of the family Synallactidae comprising mainly deep-sea forms are cosmopolitan (Solís-Marín, 2005). Approximately seventeen genera of this family recognized at the present time (Paulay and Hansson, 2013). According to Deichmann (1930), genus *Synallactes* is very closely related to genus *Bathyplores*. *Synallactes* is a cosmopolitan genus containing more than twenty-six species (Paulay and Hansson, 2013). Six species of *Synallactes*: *S. chuni*, *S. discoidalis*, *S. gilbert*, *S. multivesiculatus*, *S. nozowai* and *S. sagamiensis* have been reported in Japan (Augustin, 1908; Mitsukuri, 1912; Ohshima, 1915). In this study, *S. nozowai* is reported for the first time in Korean fauna. To date, five species of order Aspidochirotida including this species have been recorded in Korea (Shin, 2013).

Specimens were preserved in above 95% ethyl alcohol, and their important morphological characteristics were photographed using digital camera (D7000; Nikon, Tokyo, Japan), stereo- and light-microscopy (Nikon SMZ1000, Eclipse 80i), and scanning electron microscopy (JSM-6510; JEOL, Tokyo,

Japan). The specimens were identified on the basis of morphological characteristics, and described with photographs. Key between genus *Synallactes* and genus *Bathyplores* which resemble each other was suggested. Specimens were deposited in the Marine Echinoderm Resource Bank of Korea (MERBK), Sahmyook University, Seoul, Korea.

SYSTEMATIC ACCOUNTS

Class Holothuroidea de Blainville, 1830
Order Aspidochirotida Grube, 1840

Key to the families of order Aspidochirotida in Korea

1. Tentacle ampullae present 2
– Tentacle ampullae absent Synallactidae
2. One gonad bundle located on left side of dorsal mesentery Holothuriidae
– Two gonad bundles located on left and right sides of dorsal mesentery Stichopodidae

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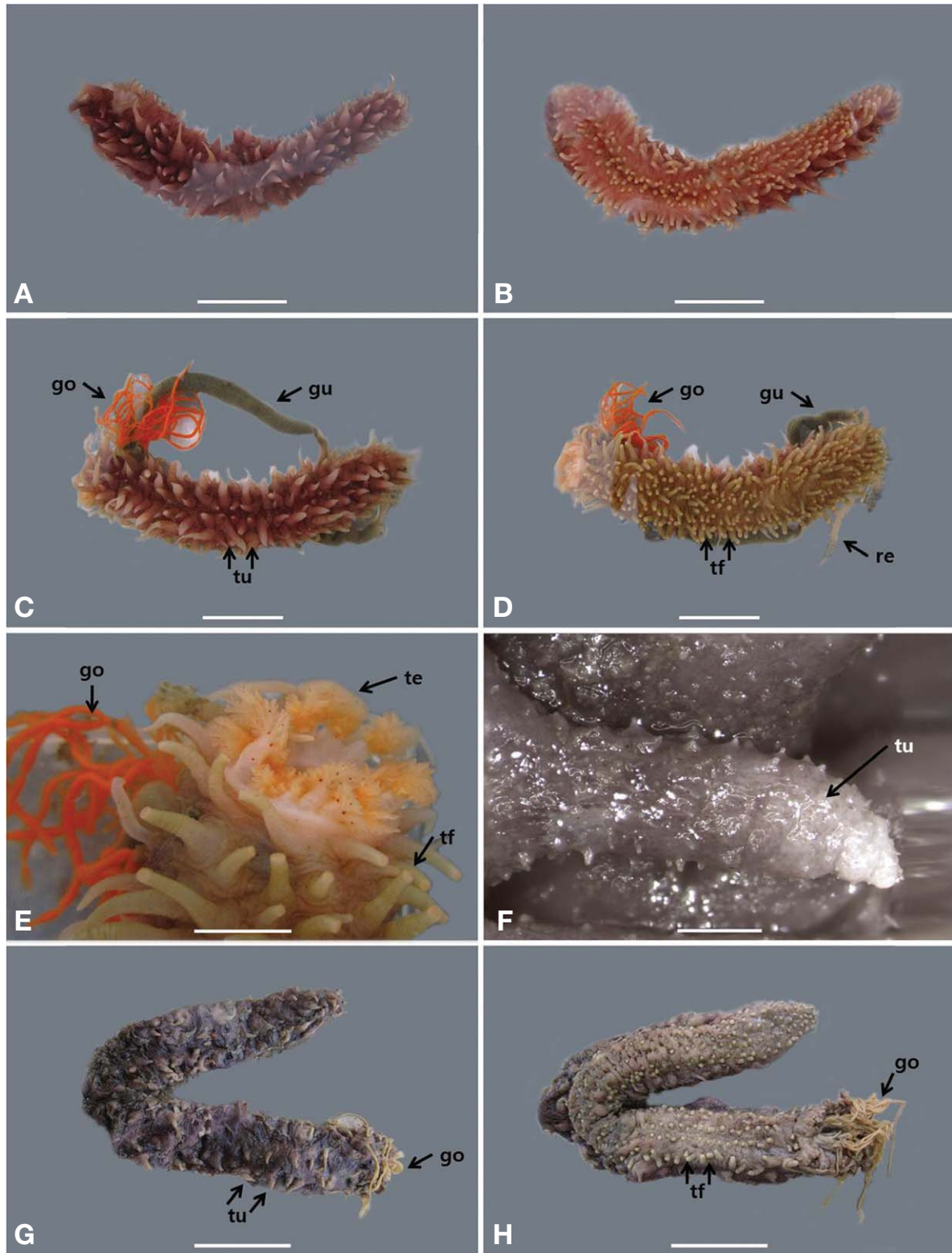


Fig. 1. *Synallactes nozowai*. A–E, Specimens in life; F–H, Specimens in alcohol. A, G, Dorsal side; B, H, Ventral side; C, Dorsal side with extruded gonads and gut; D, Ventral side with extruded gonads and gut; E, Tentacles, tube feet and gonads; F, Dorsal tubercle with small warts. go, gonad; gu, gut; re, respiratory tree; te, tentacle; tf, tube feet; tu, tubercle. Scale bars: A–D, G, H=3 cm, E=2 cm, F=1 mm.

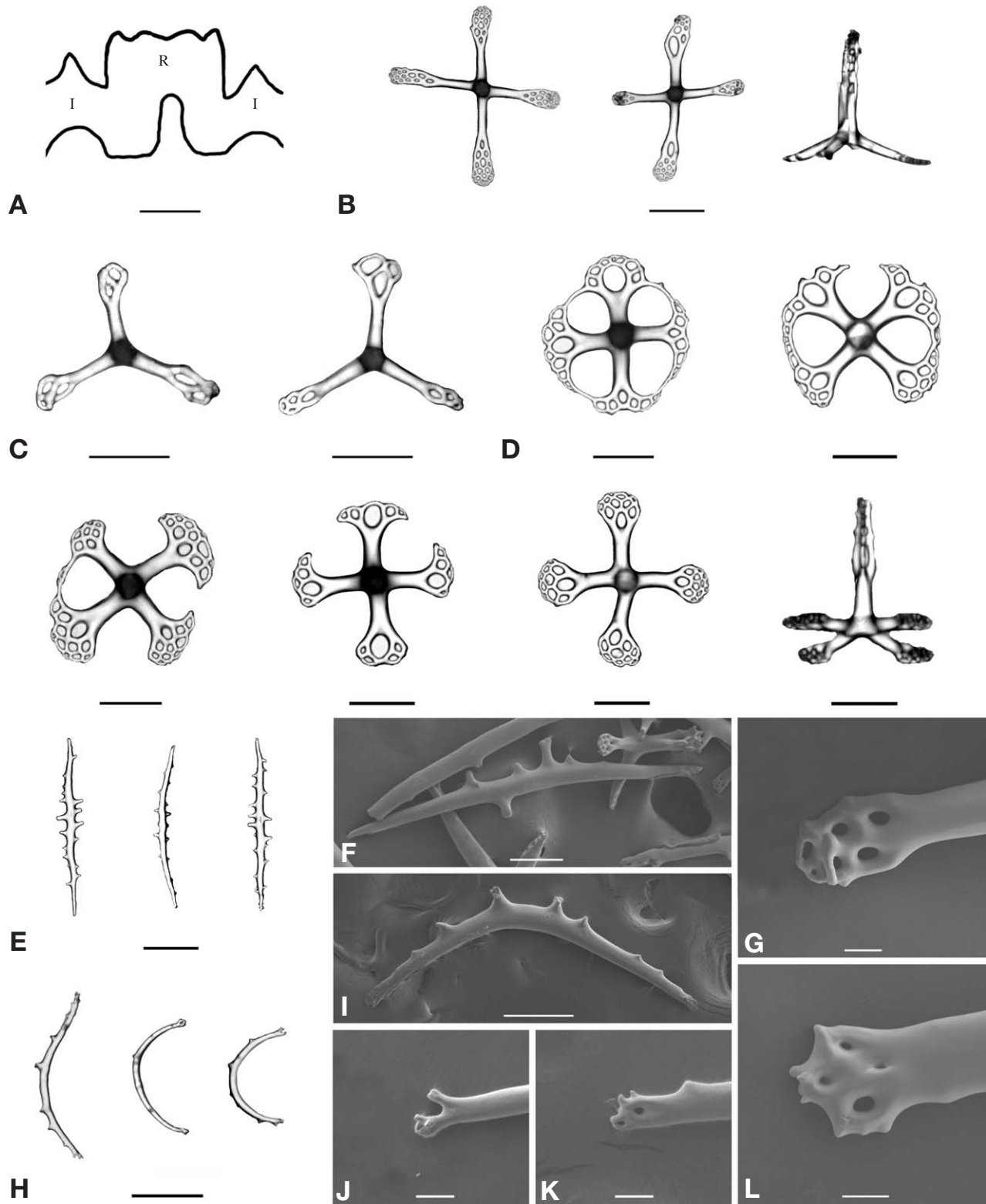


Fig. 2. *Synallactes nozowai*. A, Calcareous ring; B, Table with four-armed disk from dorsal body wall; C, Table with three-armed disk from dorsal body wall; D, Table with four-armed disk from ventral body wall; E, F, Rods of tube feet; G, End of rod of tube feet; H, I, Curved rods of tentacle; J-L, End of curved rod of tentacle. I, interradial; R, radial. Scale bars: A=2 mm, B=200 μ m, C-F, H, I=100 μ m, G, J-L=25 μ m.

¹*Family Synallactidae Ludwig, 1894

Synallactinae Ludwig, 1894: 8; Mitsukuri, 1912: 3.
Synallactidae: Ohshima, 1915: 221; Deichmann, 1930: 85;
Pawson, 1965: 15; Cherbonnier and Féral, 1981: 358; Rowe
and Gates, 1995: 328; Paulay and Hansson, 2013: 123185.

Tentacle ampullae absent. Stone canal usually connected with body wall, sometimes opening outwards through body wall. Respiratory trees usually not connected with a mirabile net. No Cuvierian organ. Tables, rods and very rarely buttons present.

Type genus: *Synallactes* Ludwig, 1894.

Genera 17 (1 in Korea).

Key to the genera of family Synallactidae

1. Table with four-armed disk and a long pillar
..... *Bathyploetes*
– Table with three- or four-armed disk and a short or no pillar
..... *Synallactes*

²*Genus *Synallactes* Ludwig, 1894

Synallactes Ludwig, 1894: 21; Mitsukuri, 1912: 11; Ohshima, 1915: 221; Mortensen, 1927: 378; Deichmann, 1930: 106; Cherbonnier, 1952: 473; Solís-Marín, 2005: 570; Massin and Hendrickx, 2010: 600; Paulay and Hansson, 2013: 123471.

Body cylindrical or subcylindrical form. Tentacles 18–20 in number. Small tubercles on dorsal surface distinctly arranged in rows. Each ventro-lateral radius with tube feet arranged in one or more rows. Mid-ventral radius with tube feet arranged in distinct rows. Gonads subdivided into two tufts. Table consisted of a three- or four-armed disk, and a terminally divided or perforated, or both pillar.

Type species: *Synallactes alexandri* Ludwig, 1894.

Species 26 (1 in Korea).

³**Synallactes nozowai* Mitsukuri, 1912
(Figs. 1A–H, 2A–K)

Synallactes nozowai Mitsukuri, 1912: 23; Ohshima, 1915: 221; Paulay and Hansson, 2013: 529034.

Material examined. 1 specimen, Gisamun, 27 Dec 2009, at 140 m depth by trawl; 1 specimen, Gisamun, 25 Dec 2010, at 170 m depth by trawl; 1 specimen, Gonghyeonjin, 16 Oct 2011, at 180 m depth by trawl; 2 specimens, Gonghyeonjin, 14 Nov 2012, at 160 m depth by trawl.

Description. Body elongated, cylindrical, with slightly flattened ventral side, and distinctly divided into ventral and dor-

sal portions. Body wall thin, flexible, and a little translucent (Fig. 1A–D). Mouth bent toward ventral side, and surrounded by a circle of small tubercles. Tentacles 18 in number (Fig. 1D, E). Anus terminal, and subdorsal (Fig. 1D). Each of two dorsal ambulacra composed of a narrow double row of conical tubercles, which carry a number of microscopic whitish warts (Fig. 1F), which also present on dorsal interambulacra, and scantily on ventral surface. Tube feet on ventral side arranged in three longitudinal rows, each row forming a zig-zag (Fig. 1B, D, H). Calcareous ring remarkably thick, simple, with no differences between dorsal and ventral sides, and a radial plate with deep median furrow (Fig. 2A). Ossicles of body wall include table consisting of a three- (tri-radiate) or four-armed (cross-shaped or quad-radiate) disk and a spire-form pillar: each end of arm enlarged and flattened, with irregular sized holes; each pillar terminally divided, with several cross beams, and with irregularly serrated edges on tip (Fig. 2B–D). Table usually four-armed (Fig. 2B, D) or very rarely three-armed (Fig. 2C). Rod of tube feet has irregular thorns (Fig. 2E, F), and perforated flat ends (Fig. 2G). Curved rod of tentacle also irregularly thorned (Fig. 2H, I), with perforated flat ends whose holes fewer than those of tube feet (Fig. 2J–L).

Size. Bodies in contracted states are 9.2–13.7 cm in length and 2.0–3.8 cm in width.

Color. Color of body in life is light reddish brown on the dorsal side (Fig. 1A, C), and light brown on the ventral side (Fig. 1B, C). Gonads are scarlet (Fig. 1C–E).

Distribution. Korea (East Sea), Japan (Hokkaido), Sakhalin, Bering Sea.

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