

〈Original article〉

## A Newly Recorded Sea Star, Genus *Diplopteraster* (Asteroidea: Velatida: Pterasteridae), from Korea Strait

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**Abstract** - Asteroid specimens of the genus *Diplopteraster* were collected by trawling nets at a depth of 93 m on 05 November 2016 from the Korea Strait (33°41'N, 127°26'E). The specimens were identified as *Diplopteraster multipes* (M. Sars, 1866), which belongs to the family Pterasteridae, order Velatida. This species is similar to other *Diplopteraster* species in its pentagonal stellate shape, but is distinguished by having each paxilla composed of a protruded spine, more than eight spiracles, and regularly reticulated muscular bands. It is not commonly found in shallow water. This is the first report of the genus *Diplopteraster* and *D. multipes* in Korea.

**Key words** : Sea star, *Diplopteraster*, Korea Strait, newly recorded, Pterasteridae

### INTRODUCTION

The family Pterasteridae Perrier, 1875 of order Velatida Perrier, 1884 contains eight genera, of which the genus *Diplopteraster* Verrill, 1880 comprises seven species including *D. clarki* (Bernasconi, 1937), *D. hurleyi* (McKnight, 1973), *D. multipes* (M. Sars, 1866), *D. otagoensis* (McKnight, 2006), *D. peregrinator* (Sladen, 1882), *D. semireticulatus* (Sladen, 1882), and *D. verrucosus* (Sladen, 1882) (Mah, 2016). *Diplopteraster* can be distinguished from other genera in this family by its two alternating arrangements of adambulacral spines united by a web skin, enlarged central paxillar spines surrounded by peripheral spines, and webbed oral spines of each jaw (Clark and Downey 1992). *D. multipes* is usually similar in pentagonal stellate body shape to almost every other species of genus *Diplopteraster*, but is distinguished by having protruded spines, and by not being commonly found in shallow water (Lambert 2000). *D. multipes* shares a very close similarity to *D. verrucosus* (Fisher 1911). The key taxonomic difference from other *Diplopteraster* species is the number of spiracles in the supradorsal

membrane, of which *D. multipes* has more than eight, while *D. verrucosus* has four or five, and *D. peregrinator* has two or three. It also differs from other *Diplopteraster* species by having a regularly reticulated and distinct muscle band (Fisher 1911), which is slightly visible (as in *D. hurleyi*), and closely reticulated (as in *D. otagoensis*) (McKnight 2006). Fisher (1911) recorded *D. multipes* from the Arctic Ocean to San Diego, California at 150 to 1170 meters and from North Atlantic at 140 to 1060 meters. It is reported in the Atlantic, from the Arctic to Chesapeake Bay, southwest of Ireland, and off the coast of South Africa at 91 to 1225 meters by Clark and Downey (1992). Lambert (2000) found this species in Puget Sound at 57 to 1171 meters. This peculiar species is also distributed in the North Pacific, specifically in Japan at 923 to 1093 meters (Hayashi 1940), in Okhotsk Sea, and near the Aleutian Islands at depths of 90 to 1170 meters (D'yakonov 1968). *D. multipes* is known for its worldwide distribution.

### MATERIALS AND METHODS

Asteroid specimens were collected by trawling nets on 05 November 2016 from the Korea Strait (33°41'N, 127°26'E).

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The collected specimens were preserved in 95% ethanol, and their morphological characteristics such as size of disk, dorsal spines, arrangement of adambulacral and oral spines were observed. Morphological features of the specimen were photographed using a digital camera (Nikon D7000, Nikon Co., Tokyo, Japan) and stereomicroscope (Nikon SMZ1000). The identification of the specimen was mainly based on the descriptions of Hayashi (1940), Clark and Downey (1992), and Lambert (2000).

## SYSTEMATIC ACCOUNTS

Class Asteroidea de Blainville, 1830

Order Velatida Perrier, 1884

Family Pterasteridae Perrier, 1875

Genus *Diplopteraster* Verrill, 1880

### Key to the Korean genera of family Pterasteridae

1. Muscle band of supradorsal membrane irregularly reticulated and not distinct (Fig. 2A), not alternating adambulacral plates (Fig. 2B) ..... *Pteraster*
2. Muscle band of supradorsal membrane regularly reticulated and distinct (Fig. 1D), alternating adambulacral plates (Fig. 1G) ..... *Diplopteraster*

### *Diplopteraster multipes* (M. Sars, 1866)

복방석불가사리 (신칭) (Fig. 1A-H)

*Pteraster multipes* M. Sars, 1866, p. 200.

*Retaster multipes* Sladen, 1889, p. 477.

*Diplopteraster multipes*: Fisher, 1911, p. 371, pl. 107, figs. 1, 2; Clark, 1923, p. 300; Hayashi, 1940, p. 199, pl. 12, fig. 1, pl. 13, fig. 1; Clark, 1952, p. 198; D'yakonov, 1968, p. 67; Clark and Courtman-Stock, 1976, p. 82, fig. 68; Clark and Downey, 1992, p. 311, pl. 75G; Lambert, 2000, p. 92, fig. 71; Mah, 2016, 124128.

**Material examined.** Two specimens, Korea Strait (33°41'N, 127°26'E), 05 November 2016, Bae and Kim, at 93 m depth by trawling nets.

**Description.** Body plump, pentagonal, stellate shape. Arms five in number, broad, and short ( $R/r = 1.4$ ), with dorsally recurved arm tips (Fig. 1A, B). Dorsal surface tough, bearing central spine of each paxilla surrounded by peripheral

spines and protruded through supradorsal membrane. Paxilla slender, surrounded by more than eight spiracles, with reticulated visible muscular bands (Fig. 1C, D). Osculum surrounded and covered with numerous stubby spines (Fig. 1E). Oral plate bearing four to six slender spines (Fig. 1F). Slender sub-oral spines located behind and longer than oral spines, with two series of spines connected with a common membrane. Ventrolateral spines long, slender, and arranged perpendicularly in adambulacral groove. Adambulacral plates alternate from three to four and four to five spines, webbed together into a comb (Fig. 1G). Tube feet strong, forming sucking discs (Fig. 1H).

**Size.**  $R = 21$  mm,  $r = 15$  mm,  $R/r = 1.4$ .

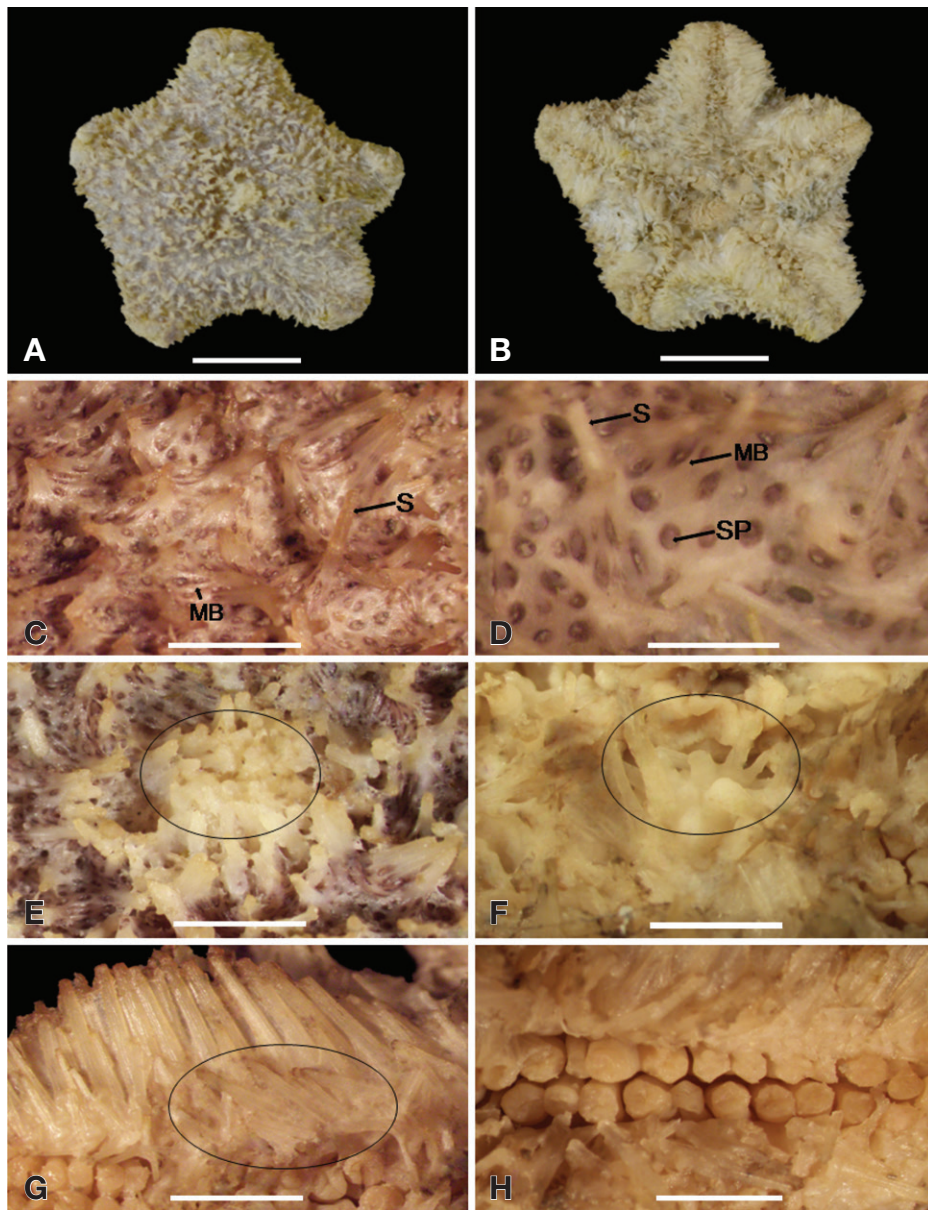
**Color.** Yellowish brown in life.

**Habitat.** Muddy and sandy areas.

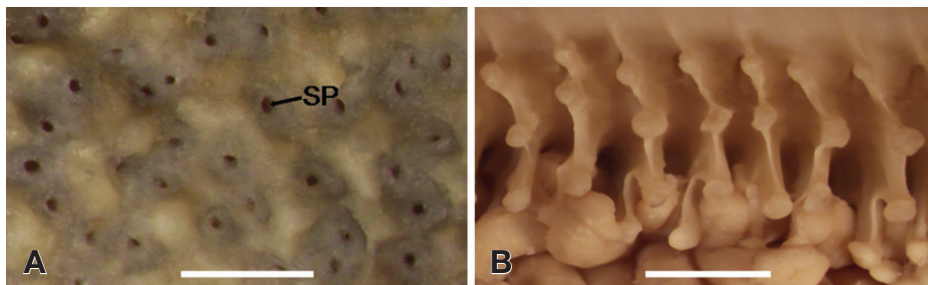
**Distribution.** Korea (Korea Strait), Pacific (Suruga, Japan to Puget Sound - San Diego, California), Okhotsk Sea, Aleutian Islands, Bering Sea, Arctic, Atlantic (Chesapeake Bay to southwest of Ireland), Barents Sea, Argentina, South Africa.

**Deposition.** Collected specimens deposited in the Marine Echinoderm Resource Bank of Korea (MERBK), Sahmyook University, Seoul, Korea.

**Remarks.** This species was originally described as *Pteraster multipes* (M. Sars, 1866) and revised to *Diplopteraster multipes* by Verrill (1880). Some *Pteraster* species such as *P. militaris* and *P. tessellatus* which were reported in Korea (Shin and Rho 1996; Shin and Kim 2016) were commonly found in shallow water, but *D. multipes* was usually collected from deep waters (Fisher 1911; Hayashi 1940; D'yakonov 1968; Clark and Downey 1992; Lambert 2000). *D. multipes* possesses muscle bands that are not present in *P. militaris* and *P. tessellatus*. The shape of *D. multipes* resembles that of almost every other *Diplopteraster* species with respect to the presence of protruding spines through its supradorsal membrane. Some specific key characters of *P. tessellatus* such as supradorsal membrane (Fig. 2A) and the arrangement of the adambulacral spines (Fig. 2B) were compared to our *D. multipes* specimen. The key characteristics of *D. multipes* were the presence of muscle bands (Fig. 1C, D) in the supradorsal membrane, the number of spiracles located in this membrane (Fig. 1D), and the number of alternating adambulacral spines (Fig. 1G). The other descriptions of important characters of our specimen are in accord with those



**Fig. 1.** *Diplopteraster multipes*. A. dorsal view; B. ventral view; C, D. supradorsal membrane: dorsal spine (S), muscle band (MB), spiracles (SP); E. osculum covered with spines (circle); F. oral spines (circle); G. adambulacral spines (circle); H. tube feet. Scale bars: A, B = 1 cm; C-H = 1 mm.



**Fig. 2.** *Pteraster tessellatus*. A. supradorsal membrane: spiracles (SP); B. adambulacral spines. Scale bars: A, B = 1 mm.

of Fisher (1911), Clark and Downey (1992), and Lambert (2000), except for the number of tube feet rows. Our specimen possessed two rows of tube feet (Fig. 1H), whereas other species of the genus *Diplopteraster* generally possess four rows. According to Mcknight (2006), tube feet of the genus *Diplopteraster* were usually arranged in four rows, at least in adult specimens. Therefore, our specimen seems to be still young. This study represents the first report of the genus *Diplopteraster* and *Diplopteraster multipes* in Korean fauna.

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