

## **New Record of Two Echinoids (Echinodermata, Echinoidea) in Korea**

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### **ABSTRACT**

Some echinoids were collected at about 20m depth of the sea in Moseulpo of Jeju-do Island. Among them two species, *Diadema setosum* (Leske, 1778) and *Toxopneustes pileolus* (Lamarck, 1816), turned out to be new to the Korean fauna. They were redescribed on the morphological characteristics with illustrations. The order Diadematoida is new to Korea. Fourteen echinoids species so far have been reported from the sea around Jeju Island in Korea.

Key words: taxonomy, echinoids, Jeju Island, Korea

### **INTRODUCTION**

The echinoids are one of the five major classes composing Echinodermata and are free-living echinoderms commonly known as sea urchins, heart urchins, and sand dollars. Their skeletal plates are fused as a solid test with movable spines and ambulacral grooves are closed. Echinoids occur in all seas being most numerous in the neighborhood of the coast, although many deep-sea forms occur. Echinoids play an important role in marine ecosystem as benthos and is mainly distributed in the neritic ocean and particularly abundant in the Indo-Pacific Ocean. Many of the common littoral Indo-Pacific echinoids extend northeastward into southern Japan by Kuroshio Current. About 950 species have been reported from all over the world up to the present (Shigei, 1986).

Since the first report by Sladen (1879) on echinoids, 26 species have so far been reported in Korea. Among them 12 species of echinoids have been reported in the sea around Jeju Island (Shin and Rho, 1996): Rho and Kim (1966) reported three species, Rho (1971) reported seven species distributed in the sea around Jeju Island, and Rho and Shin (1981) recorded 12 species

adding two more species.

The echinoid specimens used in this work were collected by scuba diving at about 20 m depth of the sea in Moseulpo of Jeju Island. The specimens were preserved in 75% methyl alcohol and the important morphological taxonomic characters were photographed using a stereomicroscope and a phase-microscope. They were identified as *Diadema setosum* (Leske, 1778) in the family Diadematidae of the order Diadematoida and *Toxopneustes pileolus* (Lamarck, 1816) in the family Toxopneustidae of the order Echinoida. Both species are new to the Korean fauna. The systematic scheme on the identified echinoids was adopted from that of Shigei (1986).

### Systematic Account

Phylum Echinodermata Klein, 1734 극피동물문

Class Echinoidea Leske, 1778 해담강

Order Diadematoida Duncan, 1889 왕관성게목 (신칭)

Family Diadematidae Gray, 1855 왕관성게과 (신칭)

Genus *Diadema* Humphreys, 1797 왕관성게속 (신칭)

Type species: *Echinometra setosa* Leske, 1778

***Diadema setosum* (Leske, 1778) 가시왕관성게 (신칭) (Fig. 1A-G)**

*Echinometra setosa* Leske, 1778, p. 35(100), pls. 37(1-2), 46(1), 51(1-2).

*Diadema lamarcki* L. Agassiz and Desor, 1846, p. 349.

*Diadema setosum* A. Agassiz, 1872, p. 103, pls. 2b, 2c, 4a, 6a; Tokunaga, 1905, pl. 5; Clark, 1925, p. 43; Ohshima, 1947, p. 590, fig. 1707; Utinomi, 1954, p. 345; 1975, p. 228, pl. 173; Chang *et al.*, 1964, p. 82; Nishiyama, 1968, p. 331; Shigei, 1970, p. 56; 1973a, p. 10; 1973b, p. 36; Clark and Rowe, 1971, p. 140, pl. 24; Liao, 1978, p. 111, pl. 1; Shigei, 1981, p. 199; 1986, p. 45, pl. 10, 69, 70; Saba *et al.*, 1982, p. 33, pl. 25.

*Diadema saxatile* Moretensen, 1904, p. 49, pls. 3, 4, 5; Majiere, 1904, p. 49, pl. 14; Döderlein, 1906, p. 166, fig. 30g; Koehler, 1927, p. 47.

*Centrechinus setosus* H. L. Clark, 1921, p. 146, pl. 17; 1923, p. 372.

*Aspidodiadema annulatum* Koehler, 1927, p. 47.

**Material examined.** Moseulpo (20 m deep), 26 Dec. 1999, 1 individual, by Scuba diving.

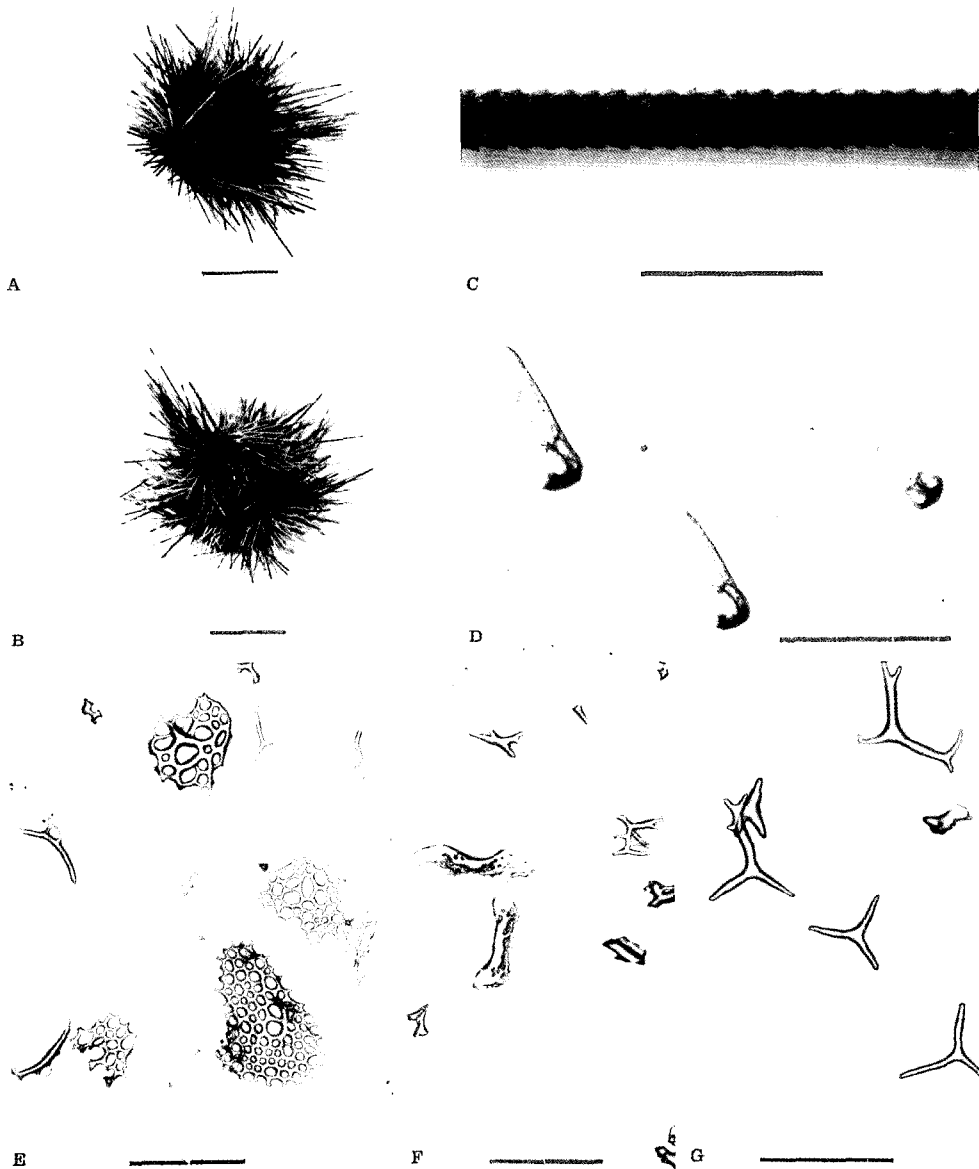
**Description.** Horizontal diameter 6.7 cm. Vertical diameter 2.7 cm. Longest spine 8.9 cm.

Test: Test fragile, medium to rather large in size, and hemispherical. Apical system conspicuously depressed. Ambulacra distinctly raised aborally. Interambulacra correspondingly sunken, particularly on adapical part. Oral side scarcely flattened, not sunken towards peristome. Circumference round.

Ambulacra: Width about 1/3.5 that of interambulacra. Pore-zones slightly widened aborally; Pore-pairs arranged in arcs of three. Primary tubercles large, perforate, distinctly crenulate, and contiguous throughout leaving no spaces for secondary tubercles between them. A small but fairly conspicuous tubercle at admedian edge of each plate.

Interambulacra: Primary tubercles very large, perforate and crenulate usually forming three vertical series in each column, with broad naked median areas adapically.

Apical system about one fifth diameter of test and pentagonal in outline. Genitals and oculars



**Fig. 1.** *Diadema setosum*. A, dorsal side; B, ventral side; C, spine; D, two valves of tridentate pedicellariae and one valve of triphyllyous pedicellaria; E-G, rosettes and spicules of tube feet. Scale bars = 1 cm (A-C), 0.1 mm (D-G).

often accompanied with a separate plate on inner side of plates. Genital plates without no spines and tubercles. Periproct large and naked except peripheral part bearing small scale-like plates; central part rises as a very conspicuous cone, on top of which anal opening. Peristome less than half of horizontal diameter Buccal membrane densely covered with elongate plates.

Primary spines very long and slender, distinctly verticillate, shaft being hollow. Ambulacral spines and secondary spines not distinctly different from primary ones, only shorter and thinner.

Tridentate pedicellariae with long, very slender straight valves meeting only at point. Triphyllous pedicellariae claviform type.

Colour: Purplish black in general but some of spines banded with purple and white, or uniformly white in alcohol. On top of anal cone, a very conspicuous, bright, and dark orange ring rounding anal opening.

**Remarks.** A dark orange ring is around the anal opening which is long extended outward in this specimen; no blue ring is on the apical system and no blue line is along the interambulacral midline. The order Diadematoidea is new to Korea.

**Distribution.** Korea (Jejudo Island), Japan (as north as Sagami bay and Sado Island), widely distributed over the Indo-West Pacific Ocean.

Order Echinoida Claus, 1876 성계목

Family Toxopneustidae Troschel, 1872 주발성계과

Genus *Toxopneustes* L. Agassiz, 1841 주발성계속 (신칭)

Type species: *Echinus pileolus* Lamarck, 1816

***Toxopneustes pileolus* (Lamarck, 1816) 주발성계 (신칭) (Fig. 2A-M)**

*Echinus pileolus* Lamack, 1816, p. 45

*Boletia pileolus* L. Agassiz and Desor, 1846, p. 362.

*Toxopneustes pileolus* A. Agassiz, 1872, p. 167, pl. 38; 1881, p. 117; Döderlein, 1885, p. 98; Yoshiwara, 1900, p. 385; Mortensen, 1904, p. 120; Majiere, 1904, p. 92, pl. 17; Tokunaga, 1906, pl. 12; Clark, 1908, p. 305; 1912, p. 283; 1925, p. 123; Ohshima, 1947, p. 587, fig. 1700; Koehler, 1927, p. 108; Mortensen, 1940, p. 48; 1942, p. 473, pls. 26, 27, 28, 29, 30, 31, 33, 54, 55; Utinomi, 1954, p. 348; 1975, p. 329, p. 174; Chang *et al.*, 1964, p. 88; Nishiyama, 1968, p. 349; Shigei, 1970, p. 56; 1973a, p. 16; 1973b, p. 36; 1974, p. 307; Clark and Rowe, 1971, p. 142, pl. 24; Liao, 1978, p. 114; Shigei, 1981, p. 200; 1986, p. 82, pl. 19, figs. 1-3; pl. 77, figs. 1-4; Saba *et al.*, 1982, p. 35, pls. 27, 28.

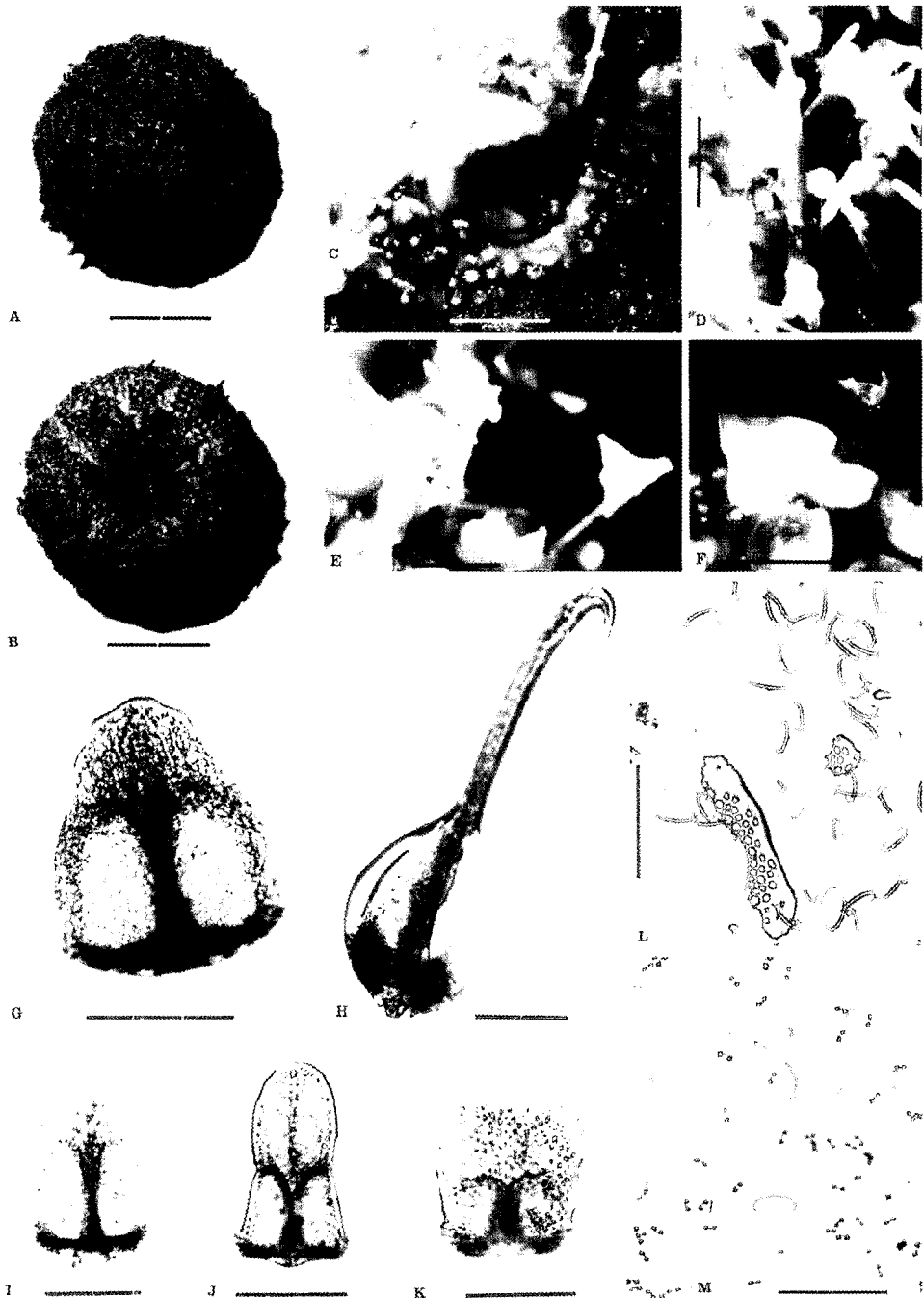
*Toxopneustes chlorachanthus* Clark, 1912, p. 283, pl. 93; 1925, p. 122.

**Material examined.** Moseulpo (20 m sea deep), 8 July 1999, 1 individual, by Scuba diving.

**Description.** Horizontal diameter 91 mm. Vertical diameter 38 mm. Longest spine 12 mm. Test large, low hemispherical, and sunken towards peristome.

Ambulacra: Width a little more than three third that of interambulacra. Pore-zones scarcely sunken, rather broad, but less than half that of interporiferous zone. Pore-arcs low; pore-pairs form though not very regular, three longitudinal series. Primary tubercles of about same size as interambulacral ones; they set on every second plate, forming regular vertical series. Plates without a primary tubercle usually carry a large tubercle on admedian side; these tubercles alternate with primary tubercles, forming a regular series parallel to primary one from oral side to about midway to apical system. Plates with a primary tubercle may carry an additional large tubercle. Plates otherwise covered more or less densely with small tubercles.

Interambulacra: Secondary tubercles reach same size as primary ones, forming a conspicuous horizontal series on each plate and also form more or less regular vertical series. Primary series



**Fig. 2.** *Toxopneustes pileolus*. A, dorsal side; B, ventral side; C, apical system; D, spine; E, F, flower-like appearance of globiferous pedicellariae; G, a valve of large tridentate pedicellaria; H, a valve of globiferous pedicellaria; I, a valve of small tridentate pedicellaria; J, a valve of ophiocephalous pedicellaria; K, a valve of triphyllous pedicellaria; L, one rosette and spicules of tube feet; M, dumbbell-shaped spicules in the skin of globiferous pedicellaria. Scale bars = 1 cm (A, B), 1 mm (C, D), 3 mm (E, F), 0.1 mm (G-M).

alone reach to apical system. Plates otherwise covered densely with small tubercles.

Apical system: Anal opening near Ocular I and Genital 5. Genital plates carry one or two large tubercles and a varying number of small tubercles. Peristome large, about two fifth diameter of test. Buccal plates adjoining close together, carrying a great number of ophiocephalous pedicellariae and a few spines, which cluster rounding mouth. Gill-slits very deep and sharp with a prominent longitudinal ridge admedianly.

Spines of aboral side short of which tip being not sharply pointed. Those of oral side somewhat longer and may be slightly flattened and widened distally.

Pedicellariae: Globiferous pedicellariae very large and prominent, showing a flower-like appearance; skin between valves full of dumbbell-shaped spicules, forming a conspicuous white border along edge of valves; small stalk-glands present close under head. Larger forms of globiferous pedicellariae often occur. Tridentate pedicellariae scarce; valves rather slender, meeting only distally with edges irregularly serrated. Small forms of tridentate pedicellariae with simple, spoon-shaped valves sometimes occur on buccal membrane. Ophiocephalous pedicellariae with almost squarish valves. Triphyllous pedicellariae with valves widened distally.

Colour: Spines usually reddish and olive-greenish with white tip. Ground colour of denuded test usually olive-greenish with pinkish tubercles. Poriferous zones more or less yellowish-white. Oral side much lighter.

**Remarks.** This species represents the typical characteristics of the genus *Toxopneustes* which is the flower-like appearance of large globiferous pedicellariae. And also no purely black ring is on the spines and horizontal sutures of the coronal plates is not conspicuous. The genus *Toxopneustes* is new to Korea.

**Distribution.** Korea (Jejudo Island); southern coast of Japan; widely distributed over Indo-West Pacific Ocean.

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## 한국산 성게류 (극피동물문, 해담강)의 2미기록종

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## 요 약

제주도 모슬포 해안의 수심 약 20 m 지점에서 채집된 성게류를 동정 분류한 결과, 왕관성게목의 가시왕관성게 (*Diadema setosum*)와 성게목의 주발성게 (*Toxopneustes pileolus*)가 한국 미기록종으로 밝혀져 보고한다. 왕관성게목 (*Diadematoida*)은 우리나라에서 처음으로 보고된다. 이로써 제주도 해역에 분포하는 성게류는 12종이 된다.