

New Records of Two Phanerozoan Asteroids (Echinodermata, Stelleroidea) in Korea

Sook Shin

(Department of Biology, Sahmyook University, Seoul 139-742, Korea)

ABSTRACTS

Some asteroids were collected at a depth of 30 m in Chejudo Island. Of which two species were identified as *Luidia maculata* Müller et Troschel, 1842 and *Linckia laevigata* Linné, 1758. These species are turned out to be new to the Korean fauna and redescribed on the morphological characteristics with illustrations. Eighteen species of asteroids are reported to be distributed in the Chejudo Island of Korea.

Key words: Taxonomy, Asteroidea, Chejudo Island, Korea

INTRODUCTION

Phanerozoia is one of the three major orders composing Asteroidea. Asteroids play an important role in marine ecosystem as benthos and is mainly distributed in the neritic ocean and particularly abundant in the North Pacific Ocean. More than 1,600 species have been reported from the all over the world up to the present time.

Since the first report by Sladen (1879) on asteroids 48 species have so far been reported in South Korea. Among them 16 species of asteroids have been reported in the Chejudo Island (Shin and Rho, 1996): Rho and Kim (1966), and Rho and Shin (1980) reported 15 species of Asteroids distributed in Chejudo Island. And then Sim and Kim (1992) recorded 14 species in their list of Asteroids distributed in Chejudo Island including *Astropecten polyacanthus* Müller et Troschel, 1842. But *A. polyacanthus* is turned out to be *Craspidaster hesperus* (Müller et Troschel, 1840). In addition *Ctenopleura fisheri* Hayashi, 1957 previously reported in references was not recorded. Their misreport was due to errors in the citation of our references. In 1992 Shin reported 16 species by adding one more species to 15 species reported in 1980.

The asteroid specimens used in this work were collected by scuba diving and by using the fishing nets at a depth of 30 m in Moseulpo and Seogwipo of Chejudo Island. All samples were preserved in 75% methyl alcohol and the important morphological parts of specimen were photographed using stereomicroscope. The systematic scheme on the identified asteroids was adopted from that of Fell (1962, 1984).

In the present study we report two species were identified as *Luidia maculata* Müller et Troschel, 1842 belonging to Luidiidae, Paxillosida and *Linckia laevigata* Linné, 1758 belonging to Ophidiasteridae, Valvatida. These species are turned out to be new to the Korean fauna and their morphological characteristics were redescribed.

SYSTEMATIC ACCOUNT

Phylum Echinodermata Klein, 1734 극피동물문
 Class Stellerioidea Larmarck, 1816 불가사리강
 Subclass Asteroidea De Blainville, 1930 불가사리아강
 Order Phanerozonia Sladen, 1899 현대목

Key to the suborders of order Phanerozonia in Korea

1. Boundary of animal formed by inferomarginal plate and Superomarginal plates wanting Paxillosida
 Boundary of animal formed by 2 sets of inferomarginal plates and Superomarginal plates generally more prominent Valvatida

Suborder Paxillosida Perrier, 1884 소주아목
 Family Luidiidae Verrill 검은띠불가사리과
 Genus *Luidia* Forbes, 1839 검은띠불가사리속
 Type species: *Luidia fragilissima* Forbes, 1839

***Luidia maculata* Müller et Troschel, 1842** 반점검은띠불가사리 (신칭) (fig. 1: 1-6)

Luidia maculata Müller et Troschel, 1842, p. 77; Döderlein, 1902, p. 330; 1920, p. 216; Mortensen, 1933, p. 238; H.L. Clark, 1938, p. 72; 1946, p. 71; Hayashi, 1938b, p. 276; 1973, p. 48; A.M. Clark and Courtman-Stock, 1976, p. 45; A.M. Clark, 1987, p. 243.

Material examined. Moseulpo (on sandy sediment at 30 m sea depth), 8 Feb. 1999, 1 individual, by Scuba diving.

Description. R = 28 cm, r = 4 cm R = 7 r. Eight arms.

Actinal side perfectly flat, but abactinal side somewhat convex and covered with paxillae. Paxillae comparatively large and very closed set. Large paxillae bear about 15-20 central granules and 30-40 peripheral spinelets. The more or less roundish-polygonal in the disk and rectangular in the arms. On the arms the paxille arranged in longitudinal rows. In the distal parts of the arms, however, these rows become more or less irregular.

Madreporite comparatively small, situated close to the margin of the disk between two of the arms, and completely hidden from view by the crowns of the surrounding paxillae. Superomarginal

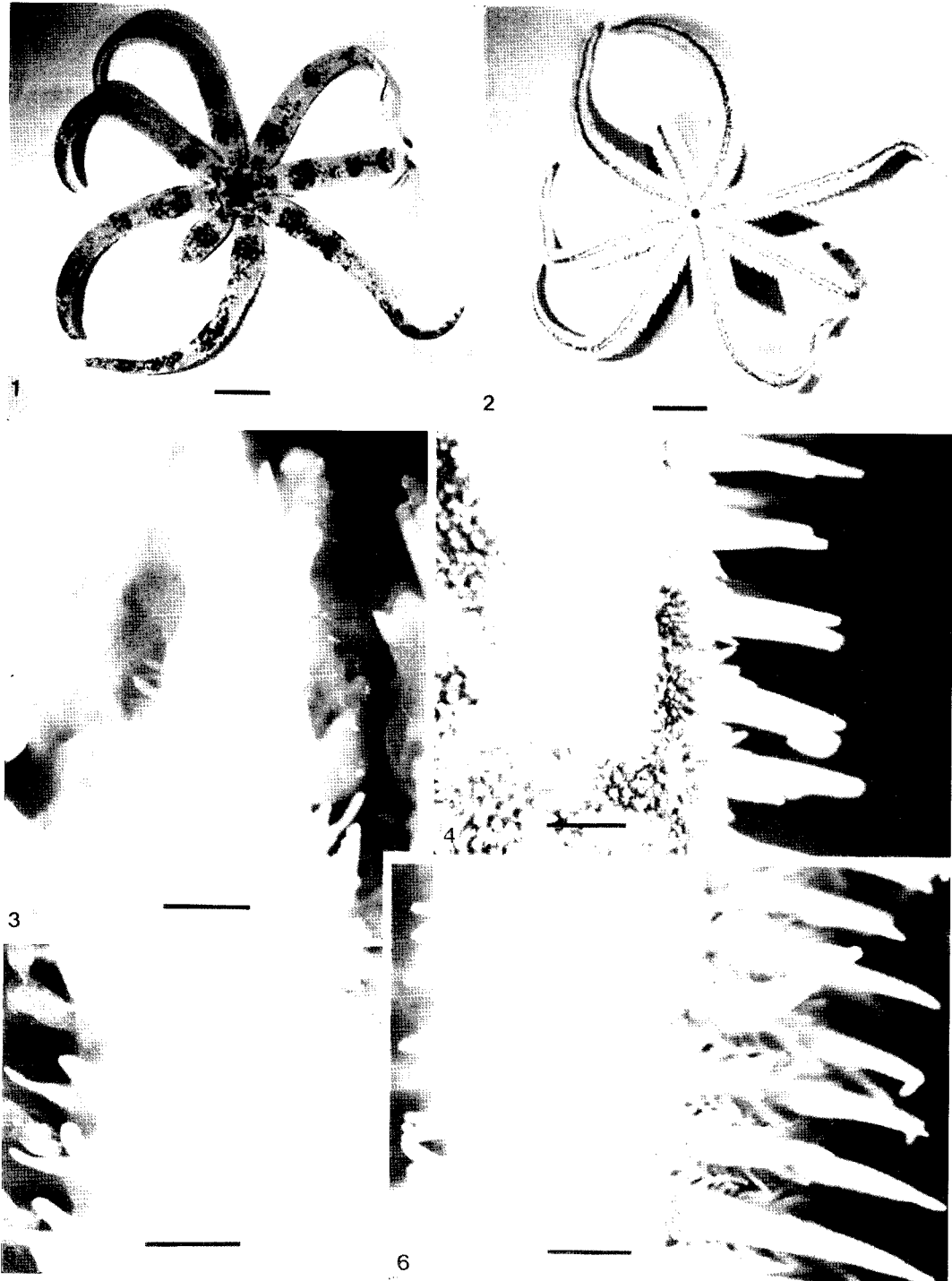


Fig. 1. *Luidia maculata* Müller et Troschel, 1842. 1, abactinal side; 2, actinal side; 3, mouth plate; 4, paxillae and inferomarginal spines on actinal side; 5, 6, adambulacal spines and inferomarginal spines on abactinal side. Scale size, 1, 2 = 5 cm; 3-6 = 2 mm.

plates small, exactly like the paxillae, and therefore will not be treated of separately. (fig. 1: 4)

Inferomarginals comparatively large plates forming the lateral margin of the arms, lying between the adambulacral and superomarginal plates, mostly occupied in two-third of ventral side of arm, and with four large conspicuous spines making a single transverse series among themselves and with the large spines of the adambulacrals. These large spines of the inferomarginals separated from one another by smaller spines (fig. 1: 6).

The adambulacral plates broad, each adambulacral being in a line with the inferomarginal plate just outside it, and with a hardly noticeable furrow in the armature between the two series of plates. The armature of the adambulacral plate consists of a transverse series of three large spines on the inner half of the plate, a number (10-15) of small spines on the outer half, and one or occasionally two, elongated, tricuspid large pedicellariae, situated at the outer end of the series of large spines. (fig. 1: 5) The first adambulacral spine smaller than the other two and somewhat flattened and curved; the second spine the largest of the three and also slightly curved and flattened; the third spine only slightly smaller than the second and nearly straight and round. The rest of the actinal surface of the adambulacral plate covered with small spines, which may be found also on the proximal side of the third adambulacral spine.

Ventrolateral plates very small and inconspicuous and a single series of plates extends more than half of the arms between the adambulacral and the inferomarginal plates. Each ventrolateral plates bears some 10-15 sharp, slender straight spines, one or two of which usually larger than the others.

Mouth plates narrow and elongated. Each plate has two ridges, the main one on the actinal surface, and a secondary one on the mouth side, parallel with the ambulacral furrow. On the main ridge ten or a few more large spines forming a somewhat irregular series, of which one or two at or near the mouth end may conspicuously larger than the others. (fig. 1: 3) The secondary ridge bears some seven to ten spines similar in form and size to the smaller spines of the main ridge; one of them at the mouth end may conspicuously larger than the rest.

Remarks. Arms are 8 in number. The black portions of body color form only small scattered patches in the general orange brown surface and the relative distribution of the two patches are entirely irregular.

Distribution. Korea (Chejudo Island); Southern coast of Japan; South China Sea; Indo-West Pacific Ocean; Red Sea.

Suborder Valvatida Perrier, 1884 소주아목

Family Ophidiasteridae Verrill, 1870 뱀불가사리과(신칭)

Genus *Linckia* Nardo, 1834 린키아 속(신칭)

Type species: *Linckia typus* Nardo, 1834 = *Asterias laevigata* Linné, 1758

***Linckia laevigata* (Linné, 1758) 푸른불가사리 (신칭) (fig. 2: 1-8)**

Asterias laevigata Linné, 1758, p. 662.

Linckia laevigata: H.L. Clark, 1908, p. 282; 1921, p. 64, pl. 9, figs. 1, 2, pl. 26, fig. 1; 1946, p. 117; Fisher, 1919, p. 400; Djakonov, 1930, p. 248; Engel, 1938, p. 15; Hayashi, 1938a, p. 210; 1939, p. 434, pl. 3, fig. 4; 1973, p. 68; A.M. Clark and Rowe, 1971, p. 36; Marsh, 1974, p. 86; Liao, 1980, p. 62; A.M. Clark, 1990, p. 338.

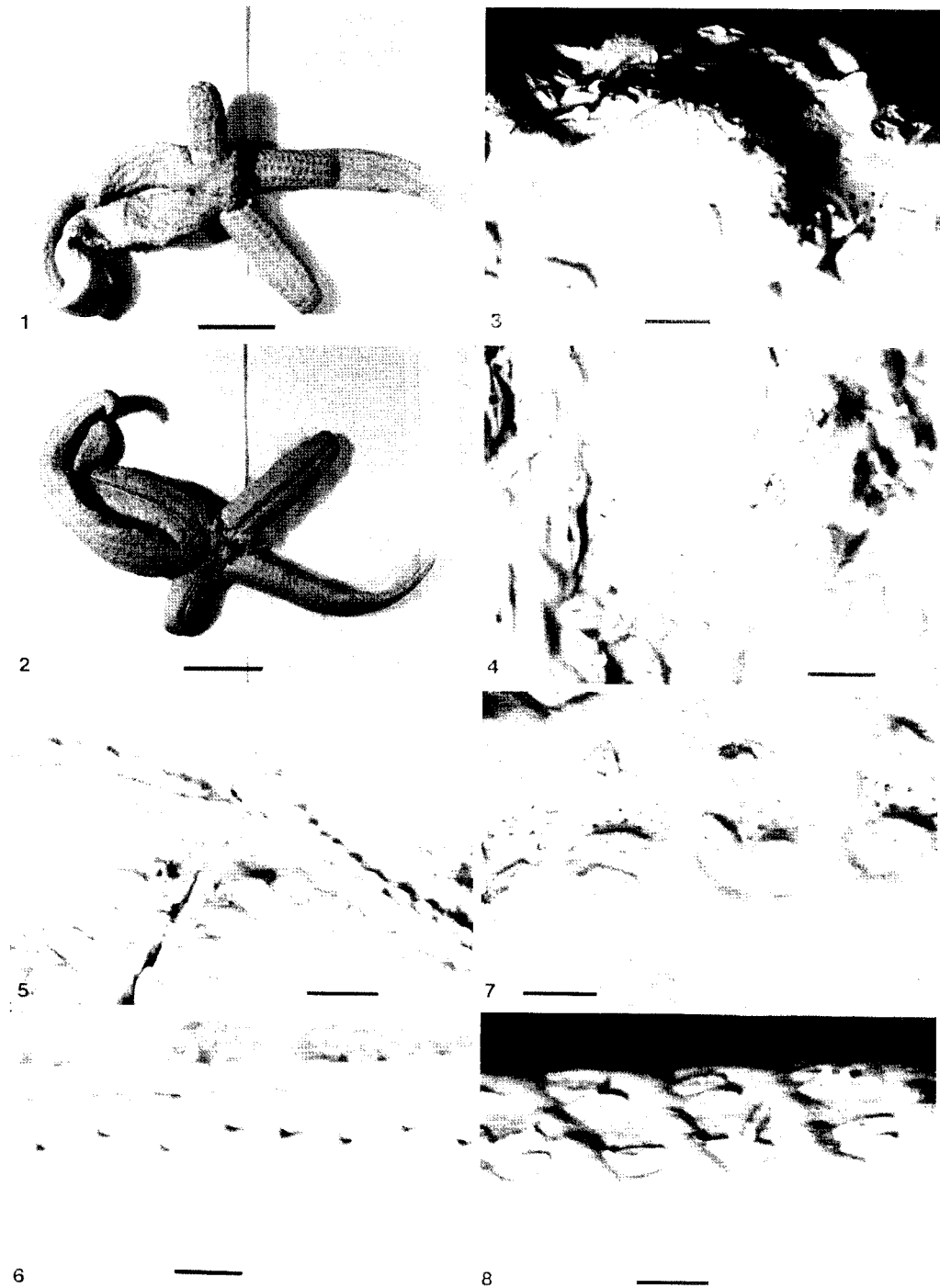


Fig. 2. *Linckia laevigata* Linné, 1758. 1, abactinal side; 2, actinal side; 3, madreporite and pedicellariae on abactinal side; 4, anal plates and pedicellariae on abactinal plate; 5, mouth part; 6, adambulacral spines on abactinal side; 7, entrenched pedicellariae and papulae on abactinal side; 8, erected pedicellariae. Scale size, 1, 2 = 5 cm; 3-8 = 1 mm.

Ophidiaster laevigata Müller and Troschel, 1842, p. 30.

Linckia Laevigata Hayasaka, 1949, p. 16, pl. III, Fig. 1.

Material examined. Seogwipo (on rocky sediment at 30 m sea depth), 18 Aug. 1989, 1 individual, by Fishing net.

Description. R = 220 mm r = 16 mm R = 13.7 r. Five arms.

Disk small, slightly convex. Arms elongate, cylindrical, and tapering slightly towards the rather obtuse tip. Interbranchial area subacute. (fig. 2: 1, 2)

Madreporite rather large, subcircular, and situated near the margin of the disk. (fig. 2: 3) The striations fine and more or less regularly centrifugal. The primary apical plates on the disk distinctly discernible. The anal aperture excentric in position, and closed by a few small valve-like plates (fig. 2: 6).

Abactinal and marginal plates, regularly arranged in seven longitudinal series, small and slightly convex, and united by well-defined, slightly raised dissepiments. but the whole so uniform and crowded that it is almost impossible to distinguish the separated plates. The plates and dissepiments covered with rounded granules, those on the median region of the plates usually larger. The papular areas, very regular and subcircular or slightly oval in outline, and form six longitudinal series. (fig. 2: 7) They slightly depressed, which gives great prominence to the plates and dissepiments, and covered with small rounded granules, smaller than those on the plates; in each papular areas about 20-30 papule. Small entrenched pedicellariae of the characteristic figure, frequent near the margin of the plates adjacent to a papular area, but much variation as to the number of pedicellariae present. (fig. 2: 7, 8)

Adambulacral furrow spines almost closed, two to each plate, and these form as continuous series along the furrow. They short, obtuse, compressed laterally, and separated by vertical series of several granules. The rows of these spines forming a narrow but very distinct axial line of each of the arms. Behind these a robust fusiform adambulacral spine, which forms an outer series. In the interspaces between these spines small miliary granules present, which extend up to the furrow series.

Entrenched pedicellariae similar to those on the abactinal area present on the actinal intermediate plates immediately behind the large outer spines on the adambulacral plates. (fig. 2: 6)

Remarks. This sea star is notable among for its conspicuous blue color when lying exposed to the sun without shelter. Colour in alcohol, a light brownish grey on the abactinal surface, and with a number of the papular areas with a much darker shade of brown, the papular areas generally being darker than the plates and dissepiments.

Distribution. Korea (Chejudo Island); Japan (Ryukyu); Taiwan; Hong Kong; Hawaii; Indo-West Pacific Ocean.

REFERENCES

- Clark, A. M., 1987. An index of names of recent Asteroidea - Part 1: Paxillosida and Notomyotida. pp. 225-347.
- Clark, A. M., 1990. An index of names of recent Asteroidea - Part 2 : Valvatida. pp. 187-366.

- Clark, A. M. and J. Courtman-Stock, 1976. The Echinoderms of Southern Africa. Bull. Brit. Mus. (Nat. Hist.) Zool., pp. 279-311.
- Clark, A. M. and F. W. E. Rowe, 1971. Monograph of Shallow-Water Indo-West Pacific Echinoderms. Trustees Brit. Mus. (Nat. Hist.) London, vii+238, 100 figs., 31 pls.
- Clark, H. L., 1908. Some Japanese and East Indian Echinoderms. Bull. Mus. Comp. Zool. Harvard., **51**: 277-311.
- Clark, H. L., 1921. The Echinoderm Fauna of Torres Strait Its Composition and its origin. Carnegie Inst. Wash., pp. 104-223, 38 pls.
- Clark, H. L., 1938. Echinoderms from Australia. Mem. Mus. comp. Zool. Harv., 55: VIII + 596, 63 figs., 28 pls.
- Clark, H. L., 1946. The Echinoderm fauna of Australia Its Composition and Its Origin. Carnegie Inst. Wash., 567 pp.
- Döderlein, L., 1902. Japanische Seesterne. Zool. Anz., **25**: 326-336.
- Döderlein, L., 1920. Die Asteriden der Siboga-Expedition II. Die Gattung *Luidia* und Ihre Stammesgeschichte. Siboga Exped. Monogr., 46b.
- Djakonov, A. M., 1930. Echiniden, Ophiuriden und Asteriden, gesammelt von Prof. P. J. Schmidt bei den Riu-Kiu-Inseln im Jahre 1926-1927. Zool. Jahrb., **59**: 233-252.
- Engel, H., 1938. Asteries et Ophiures Resultats Scientifiques du Voyage aux Indes Orientales Neerlandaises. Mem. Rov. D'Hest. Nat. Bely., **3**(18): 1-2.
- Fell, H. B. 1962. The phylogeny of sea-stars. Roy. Soc. London, Philos. Trans. ser. B, **246**(735): 381-435.
- Fell, H. B. 1984. Echinodermata. In, Synopsis and classification of living organisms, McGrew-Hill, II. pp.785-818.
- Fisher, W. K. 1919. Starfishes of the Philippine Seas and adjacent waters. Bull. U. S. Nat. Mus., **100**(3): 1-712.
- Hayasaka, I., 1949. On Some Starfishes from Taiwan. Bull. Oceanogr. Inst. Taiwan, (5): 11-19, 3pls
- Hayashi, R., 1938a. Sea-Stars of the Ryukyu Islands. Bull. Biogeograph. Soc. Japan, **8**:192-222.
- Hayashi, R., 1938b. Sea-Stars in the vicinity of the Seto Narine Biological Laboratory. Bull. Biogeogr. Soc. Japan, **8**: 271-292, 3pls.
- Hayashi, R., 1939. Sea-Stars of the Caroline Islands. Palao trop. biol. Stn Stud., **3**: 417-446.
- Hayashi, R., 1973. The seastars of Sagami Bay. Biol. Lab. Imp. Hous., 114pp, 18 pls.
- Liao, Y., 1980. The Echinoderms of Xisha Islands, IV. Asteroidea. Stud. Mar. Sin., (17): 153-171, 4 pls.
- Linné, C., 1758, Systema Naturae, ed. 10, p. 662 (cited from Clark, H. L., 1946).
- Marsh, L. M., 1974. Shallow-water Asterozoans of southeastern Polynesia. 1. Asteroidea. Micronesica, **10**(1): 65-104, 8 figs, 4 tables.
- Mortensen, Th., 1933. a. Echinoderms of South Africa (Asteroidea and Ophiuroidea). Vidensk. Meddr dansk naturh. Foren., **93**: 215-400, 91 figs., 12 pls.
- Müller, J. et. F. H. Troschel, 1842. System der Asteriden Braunschweig, pp. 1-134 (cited from Sladen, W. P., 1878).
- Rho, B. J. and H. S. Kim, 1966. Studies on the Echinodermata (Echinoidea, Asteroidea and Ophiuroidea) from Korea. Collect. Thes. Writ. Commen. Dr. Emma Kim's Forty Years Teac. Ewha Womans Univ., Seoul, Korea, 273-293, 9 pls.
- Rho, B. J. and S. Shin, 1980. A systematic study on the echinoderms in Korea 4. Asteroids. J. Kor. Res. Inst.

- Liv., Ewha Womans Univ., **26**: 65-104, 12pls.
- Shin, S., 1992. A Systematic study on the Asteroidea in Korea 1. Species from the South Sea. Kor. Jour Syst Zool., **8**(2): 243-258.
- Shin, S. and B. J. Rho, 1996. Illustrated Encyclopedia of Fauna and Flora of Korea Vol. 36 Echinodermata. The ministry of education, 780 pp.
- Sim. C. J. and Y. H. Kim, 1992. Sponge and Echinoderm Fauna of Cheju Island. pp. 93-116.
- Sladen, W. P., 1879. On the Asteroidea and Echinoidea of the Korean Seas. Jour. Linn. Soc. London, **14**: 424-445, pl. 8.

RECEIVED: 7 November 1999

ACCEPTED: 12 January 2000

한국산 현대목(극피동물문, 불가사리강)의 2미기록종

신 숙

(삼육대학교 생물학과)

요 약

제주도의 서귀포와 모슬포의 수심 30 m 지점에서 채집된 불가사리류를 동정 분류한 결과, 현대목에 속하는 반점검은띠불가사리 (*Luidia maculata* Müller et Troschel, 1842)와 푸른불가사리 (*Linckia laevigata* Linné, 1758)가 한국 미기록종으로 밝혀져 보고한다. 제주도 해역에 분포하는 불가사리류는 18종이 된다.