

Echinodermata from Chindo Island, Korea

Sook Shin

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

ABSTRACT

Twenty-two species of Echinodermata collected from 11 localities in Chindo Island, Korea in September, 1990 and July, 1994 are recorded. One asteroids, *Luidia quinaria*, five ophiuroids such as *Astrocladus coniferus coniferus*, *A.c. dofleini*, *Ophiactis affinis*, *Stegophiura sladeni*, *Amphipholis* sp., four echinoids such as *Temnopleurus toreumaticus*, *T. hardwicki*, *Hemicentrotus pulcherrimus*, *Anthocardaris crassispina* and two holothuroids such as *Protankyra bidentata*, *Stichopus japonicus* are unrecorded species by this time in Chindo Is. One asteroid species, *Asterina minor* is newly recorded in Korean water and its taxonomic characteristics are redescribed.

Key words: Systematics, Echinodermata, Chindo Island, Korea

INTRODUCTION

Echinoderm fauna of Chindo Island located in the south-west part of Korea has not been studied extensively up to this date. In case of the asteroid fauna Rho and Shin (1980) reported one species collected from Chöpto and Shin (1992a) reported four species from Chukrim, Hönbokdong, Gulp'o and Kahag, and so four asteroid species were reported. In case of the ophiuroid species Matsumoto (1911) reported one species and Shin (1992b) reported three species from Chukrim, Gulp'o and Kahag. And Won (1993) reported one holothuroid species from Chöpto. But no echinoid species and crinoid species were recorded from Chindo Island.

Fortunately, Echinodermata specimens including the other marine animals were collected by the taxonomists attending the workshop organized by the Korean Society of Systematic Zoology during the period from July 22 to 26, 1994 in Chindo Island. Also in September, 1990, various species of echinoderms were already collected by the author from several places in Chindo Is. On the basis of

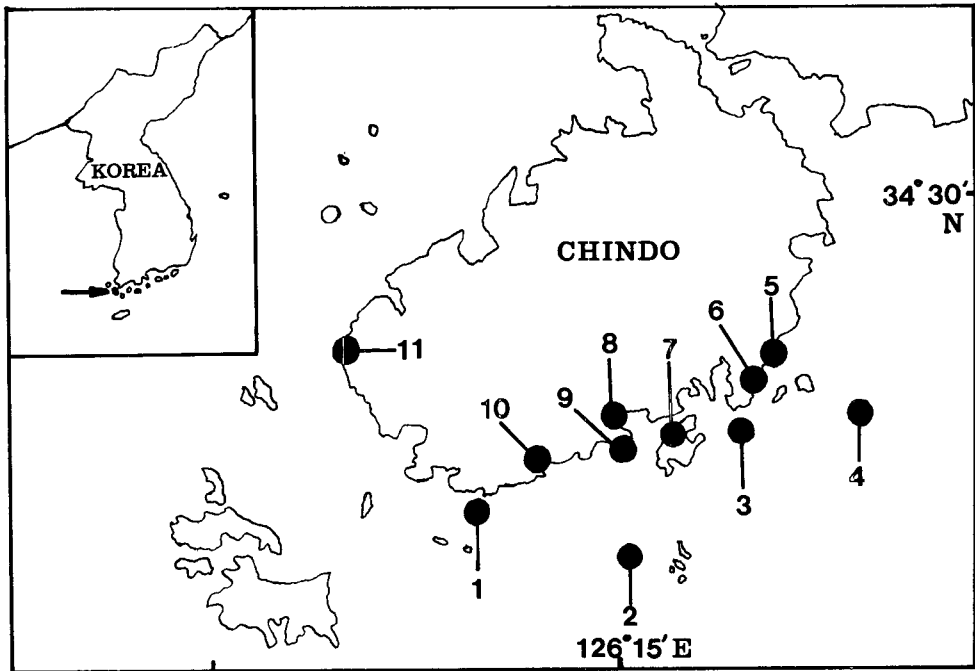


Fig. 1. A map showing the localities where the materials were collected. 1: St. 1, 34°19' N, 126°10' E. 2: St. 2, 34°21' N, 126°16' E. 3: St. 3, 34°23' N, 126°20' E. 4: St. 4, 34°23' N, 126°23' E. 5: Hoedong, 회동. 6: Kump'o, 군포. 7: Chöpto, 집도. 8: Chukrim, 죽림. 9: Hönbokdong, 현복동. 10: Gulp'o, 굴포. 11: Kahag, 가학.

specimens collected from Chindo Island in both occasions aforementioned the systematic and distributional study of Echinodermata were performed.

MATERIALS AND METHODS

The echinoderm specimens used for this study were collected from six localities in Chindo Island (St. 1: 34°19' N, 126°10' E, St. 2: 34°21' N, 126°16' E, St. 3: 34°23' N, 126°20' E, St. 4: 34°23' N, 126°23' E, Kump'o, Hoedong) from July 23 to 25, 1994 and from other five localities (Chöpto, Chukrim, Hönbokdong, Gulp'o and Kahag) from September 19 to 21, 1990 (Fig. 1).

All specimens fixed and preserved in 75% methyl alcohol are deposited in the Department of Biology, Korean Sahmyook University, Korea. These specimens were identified on the basis of their morphological characteristics and for more detailed observation research microscope and stereomicroscope were used. The species identified in this study and reported previously (Rho and Shin, 1980; Shin, 1992a, 1992b; Won, 1993) are also included in the list of species. A brief description for the species newly reported in the Korean fauna are presented with the plate.

RESULTS

The echinoderms identified turned out to be 22 species belonging to 18 genera, 15 families, 8 orders and 3 classes and they are as follows: Asterozoa (6 species, 4 genera, 4 families and 2 orders), Ophiurozoa (9 species, 7 genera, 5 families and 2 orders), Echinozoa (4 species, 3 genera, 3 families and 1 order) and Holothurozoa (3 species, 3 genera, 3 families and 3 orders). Of which one asteroid species, *Asterina minor* (Asterisk *) is newly recorded in Korean fauna.

The species previously recorded from Chindo Island (**) are four asteroids such as *Asterina batheri*, *A. pectinifera*, *Henricia nipponica* and *Crossaster papposus*, four ophiuroids such as *Amphiura vadicola*, *Aphiura sinicola*, *Ophiotrix exigua* and *Ophioplocus japonicus*, and one holothuroid, *Pseudocnus* sp. The species newly recorded in Chindo Island as presented in the systematic list (***) are two asteroid species, *Luidia quinaria* and *Asterina minor*; five ophiuroid species, *Astrocladus coniferus coniferus*, *A. c. dofleini*, *Ophiactis affinis*, *Amphipholis* sp. and *Stegophiura sladeni*; four echinoid species, *Temnopleurus toreumaticus*, *T. hardwicki*, *Hemicentrotus pulcherrimus* and *Anthocardis crassispina* and two holothuroid species, *Protankyra bidentata* and *Stichopus japonicus*. And so 13 species are added to the Echinoderm fauna of Chindo Island. Including 9 previously known species, the total 22 species are listed.

Phylum Echinodermata Klein, 1734 극피동물문

Subphylum Asterozoa 불가사리아문

Class Stelleriozoa Lamarck, 1816 불가사리아강

Subclass Asterozoa de Blainville, 1830, 불가사리아강

Order Platyasterida Spencer, 1951 편평불가사리목

Family Luidiidae Verrill, 1839 검은띠불가사리과

Genus *Luidia* Forbes, 1839 검은띠불가사리속

***1. *Luidia quinaria* von Martens, 1865 검은띠불가사리

Order Spinulosa Perrier, 1894 유극불가사리목

Family Asterinidae Gray, 1840 별불가사리과

Genus *Asterina* Nardo, 1834 별불가사리속

**2. *Asterina minor* Hayashi, 1974 작은별불가사리 (신칭)

**3. *Asterina batheri* Goto, 1914 볼록별불가사리

**4. *Asterina pectinifera* Müller et Troschel, 1842 별불가사리

Family Echiniasteridae Verrill, 1867 애기불가사리과

Genus *Henricia* Gray, 1840 애기불가사리속

**5. *Henricia nipponica* Uchida, 1928 애기불가사리

Family Solasteridae Forbes, 1839 햇님불가사리과

Genus *Crossaster* Müller et Troschel, 1840 주름불가사리속

**6. *Crossaster papposus* (Linné, 1767) 주름불가사리

Subclass Ophiurozoa Gray, 1840 거미불가사리아강

Order Phrynophiurida Matsumoto, 1915 혁거미불가사리목

- Suborder Euryalina 만거미불가사리아목
 Family Gorgonocephalidae Ljungman, 1867 삼천발이과
 Genus *Astrocladus* Verrill, 1899 가지거미불가사리속
- ***7. *Astrocladus coniferus coniferus* Döderlein, 1902 흑가지거미불가사리
- ***8. *Astrocladus coniferus dofleini* (Döderlein, 1910) 도플라인흑가지거미불가사리
 Order Myophiurida Matsumoto, 1915 폐거미불가사리목
 Suborder Gnathophiurina Matsumoto, 1915 악거미불가사리아목
 Family Ophiactidae Matsumoto, 1915 뱀이거미불가사리과
 Genus *Ophiactis* L tken, 1856 뱀이거미불가사리속
- ***9. *Ophiactis affinis* Duncan, 1879 유사뱀이거미불가사리
 Family Amphiuridae Ljungman, 1867 양편거미불가사리과
 Genus *Amphipholis* Verrill, 1899 양편거미불가사리속
- ***10. *Amphipholis* sp.
 Genus *Amphiura* Forbes, 1842 턱뱀거미불가사리속
- **11. *Amphiura vadicola* Matsumoto, 1915 연안거미불가사리
- **12. *Aphiura sinicola* (Matsumoto, 1941) 긴팔거미불가사리
 Family Ophiotrichidae Ljungman, 1867 가시거미불가사리과
 Genus *Ophiothrix* Müller et Troschel, 1840 가시거미불가사리속
- **13. *Ophiothrix exigua* (Lyman, 1874) 짧은가시거미불가사리
 Order Chilophiurina Matsumoto, 1915 순거미불가사리아목
 Family Ophiuridae Lyman, 1865 빗살거미불가사리과
 Subfamily Opholepidinae Mastsumoto, 1915 비늘거미불가사리아과
 Genus *Ophioplocus* Lyman, 1861 곱슬거미불가사리속
- **14. *Ophioplocus japonicus* H.L. Clark, 1911 왜곱슬거미불가사리
 Subfamily Ophiurinae Lyman, 1865 빗살거미불가사리아과
 Genus *Stegophiura* Matsumoto, 1915 지붕거미불가사리속
- ***15. *Stegophiura sladeni* (Duncan, 1879) 슬라덴지붕거미불가사리
 Subphylum Echinozoa 성계아문
 Class Echinoidea Leske, 1778 성계강
 Subclass Regularia Latreille, 1825 정형성계아강
 Order Echinoida Claus, 1876 공치성계목
 Family Temnopleuridae A. Agassiz, 1872 분지성계과
 Genus *Temnopleurus* L. Agassiz, 1841 분지성계속
- ***16. *Temnopleurus toreumaticus* (Leske, 1778) 분지성계
- ***17. *Temnopleurus hardwicki* (Gray, 1855) 하드윅분지성계
 Family Strongylocentrotidae Gregory, 1897 둥근성계과
 Genus *Hemicentrotus* Mortensen, 1942 말뚱성계속
- ***18. *Hemicentrotus pulcherrimus* (A. Agassiz, 1863) 말뚱성계
 Family Echinometridae Gray, 1855 만두성계과
 Genus *Anthocidaris* Lütken, 1864 보라성계속
- ***19. *Anthocidaris crassispina* (A. Agassiz, 1863) 보라성계
 Class Holothuroidea de Balinville, 1834 해삼강

Subclass Dendrochirotea Grube, 1840 수수아강
 Order Dendrochirotida Grube, 1840 수수목
 Family Cucumariidae Ludwig, 1894 광삼과
 Subfamily Cucumariidae Ludwig, 1894 광삼아과
 Genus *Pseudocnus* Panning, 1949 수도크누스속

****20. *Pseudocnus* sp.**

Subclass Apodacea Brandt, 1835 무족아강
 Order Apodida Brandt, 1835 무족목
 Family Synaptidae Burmeister, 1837 닻해삼과
 Genus *Protankyra* Ostergren, 1898 가시닻해삼속

*****21. *Protankyra bidentata* (Woodward and Barrett) 가시닻해삼**

Subclass Aspidochirotea Grube, 1840 순수아강
 Order Aspidochirotea Grube, 1840 순수목
 Family Stichopodidae Haeckel, 1896 돌기해삼과
 Genus *Stichopus* Brandt, 1835 돌기해삼속

*****22. *Stichopus japonicus* Selenka, 1867 돌기해삼**

Description of Species

1. *Luidia quinaria* von Martens, 1865 검은띠불가사리

Material examined. St. 1, 23 July 1994, 1 specimen (J.G. Jae).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (Korea Strait, Yellow Sea), Japan and Indo-Pacific Ocean.

2. *Asterina minor* Hayashi, 1974 작은별불가사리(신칭) (Figs. 1-4)

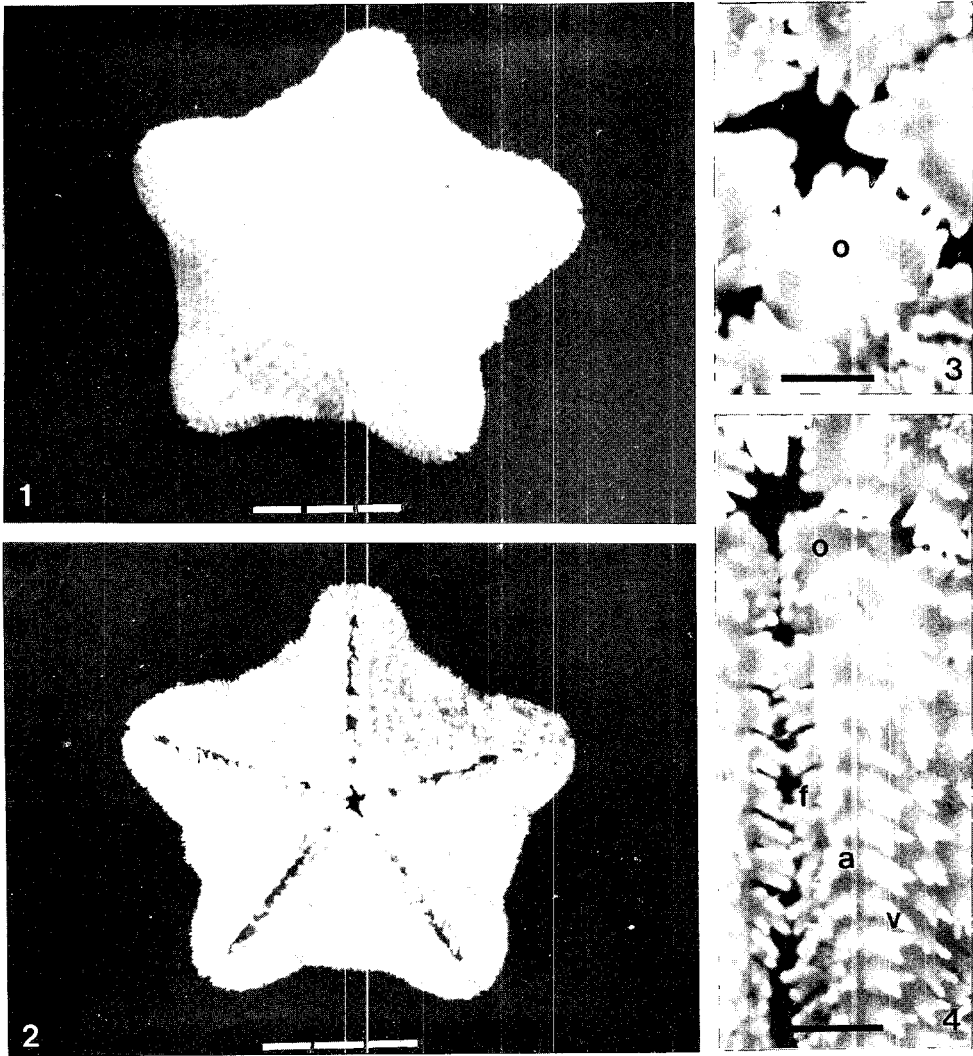
Asterina minor Hayashi, 1974, p. 42, text-fig. 1.

Material examined. Chukrim, 20 Sep. 1990, 2 specimens (S. Shin).

Description. R = 5.5 - 7.0 mm, R = 4.2 - 5.0 mm, R = 1.4 - 1.5r. Body subpentagonal shape and arms very short and five in number. Disc large, convex at dorsal side and interbrachial margin concaved. Papulae absent in interbrachial areas. Abactinal area composed of imbricating plates strongly concaved for a papula and arranged in somewhat regular series. Papulae absent in interbrachial area. Central ring composed of long concaved plates on abactinal side, distinctive but not prominent. Small roundish plates and small papulae located inside of central ring. Radial plates larger than the dorsolateral plate and interbrachial plates small. Anus present near center of disk. Abactinal spines paxilliform, slender and 10 to 15 for a plate. Marginal plates reduced. Ventrolateral plates slightly swollen, arranged in regular series and gradually decreased in size outward and each have usually three but sometimes two subequal spines arranged in a series. Adambulacral plates slightly wider than long and each have four webbed furrow spines, the middle ones somewhat larger than the laterals. Subambulacral spines three in number and arranged in a series parallel to the furrow spines. Mouth plate with five or six oral spines and four suboral spines.

Remarks. This species is newly reported from Korean fauna.

Distribution. Korea (Korea Strait, Yellow Sea) and Japan.



Figs. 1-4. *Asterina minor* Hayashi, 1974: 1, abactinal view; 2, actinal view (scale size: 0.1 mm); 3, oral plate (o) and oral spines of ventral side (scale size: 50 μ m); 4, oral plate (o), subambulacral spines (f), ambulacral spines (a) and ventrolateral spines (v) of ventral side (scale size: 100 μ m).

3. *Asterina batheri* Goto, 1914 불록별불가사리

Material examined. Hönbokdong (Shin, 1992b).

Remarks. This species was previously recorded from Chindo Island.

Distribution. Korea (Korea Strait, Cheju Island) and Japan.

4. *Asterina pectinifera* Müller et Troschel, 1842 별불가사리

Material examined. Chōpto (Rho and Shin, 1980); Hönbokdong (Shin, 1992b); Chukrim (Shin, 1992b); Kahag (Shin, 1992b); Gulp'o (Shin, 1992b); St. 3, 23 July 1994, 4 specimens (J.G. Jae); Kulp'o, 25 July 1994, 8 specimens (S. Shin).

Remarks. This species was previously recorded from five localities of Chindo Island and is the commonest echinoderm species collected 7 localities of total 11 localities in Chindo Is. Actually this asteroid species is widely distributed in the Korean waters.

Distribution. Korea (East Sea, Korea Strait, Cheju Island, Yellow Sea), Japan and Sakhalin and Vladivostok.

5. *Henricia nipponica* Uchida, 1928 애기불가사리

Material examined. Gulp'o (Shin, 1992b); Hönbokdong (Shin, 1992b); Chukrim (Shin, 1992b); Hoedong, 25 July 1994, 2 specimens (S. Shin).

Remarks. This species was previously recorded and is also common species collected from 4 localities among total 11 localities in Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Cheju Island) and Japan.

6. *Crossaster papposus* (Linné, 1767) 주름불가사리

Material examined. Hönbokdong (Shin, 1992b); St. 2, July 23, 1994 (J.G. Jae).

Remarks. This species was previously recorded from Chindo Island and also widely distributed in the northern hemisphere.

Distribution. Korea (East Sea, Korea Strait), Japan, Okhotsk, North Pacific Ocean, Arctic Ocean and North Atlantic Ocean.

7. *Astrocladus coniferus coniferus* Döderlein, 1902 흑가지거미불가사리

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Cheju Island), Japan (Southern Honshu, Kyushu), Peter the Great Bay, East China Sea, Philippines and Indo-Pacific Ocean.

8. *Astrocladus coniferus dofleini* Döderlein, 1910 도플라인흑가지거미불가사리

Material examined. St. 2, 23 July 1994, 1 specimen (J.G. Jae).

Remarks. This species is newly recorded from Chindo Island.

Distribution. Korea (Korea Strait, Cheju Island), Japan (Southern Honshu, Kyushu), Peter the Great Bay, Philippines and Vladivostok

9. *Ophiactis affinis* Duncan, 1879 유사뱀이거미불가사리

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (Korea Strait, Cheju Island, Yellow Sea), Japan (Kyushu), China, Philippine Sea, Malaysian water, Banda Sea and Indo-Pacific Ocean.

10. *Amphipholis* sp

Material examined. St. 3, 23 July 1994, 2 specimens (J.G. Jae); St. 4, 23 July 1994, 9 specimens (J.G. Jae).

Remarks. The present specimens were collected mainly from the mud bottom and this species is

newly reported from Chindo Island.

Distribution. Korea (Korea Strait, Yellow Sea).

11. *Amphiura vadicola* Matsumoto, 1915 연안거미불가사리

Material examined. Chindo (Matsumoto, 1911); St. 3, 23 July 1994, 1 specimen (J.G. Jae).

Remarks. The present specimens were collected mainly from the mud bottom and this species was previously recorded from Chindo Island.

Distribution. Korea (Korea Strait, Yellow Sea), Japan and Indo-Pacific Ocean.

12. *Amphiura sinicola* (Matsumoto, 1941) 긴팔거미불가사리

Material examined. Kahag (Shin, 1992a).

Remarks. This species was previously recorded from Chindo Island.

Distribution. Korea (Korea Strait, Yellow Sea) and Japan.

13. *Ophiothrix exigua* (Lyman, 1874) 짧은가시거미불가사리

Material examined. Chukrim (Shin, 1992a); Kahag (Shin, 1992a); Gulp'o (Shin, 1992a); Hönbokdong, 21 Sep. 1990, 6 specimens (S. Shin); St. 2, 23 July 1994, 4 specimens (J.G. Jae); Hoedong, 25 July 1994, 9 specimens (S. Shin).

Remarks. This species was previously recorded from four localities in Chindo Island and is the commonest ophiuroid collected from 6 localities of total 11 localities in Chindo Is. Actually this species is widely distributed in the Korean waters

Distribution. Korea (East Sea, Korea Strait, Cheju Island, Yellow Sea), Japan, China, Hong Kong, Amboina and Indo-West Pacific Ocean.

14. *Ophioplocus japonicus* H.L. Clark, 1911 왜곱슬거미불가사리

Material examined. Chukrim (Shin, 1992a).

Remarks. This species was previously recorded from Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Cheju Island) and Japan (Honshu, Kyushu).

15. *Stegophiura sladeni* (Duncan, 1879, 1879) 슬라덴거미불가사리

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (Korea Strait), Japan and Indo-West Pacific Ocean.

16. *Temnopleurus toreumaticus* (Leske, 1778) 분지성게

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Yellow Sea), Japan (Tokyo Bay-Bingo, Kagoshima Bay, Ryukyu Islands), Taiwan and Indo-West Pacific (East Africa-Australia).

17. *Temnopleurus hardwicki* (Gray, 1885) 하드윅분지성게

Material examined. Hönbokdong, 21 Sep. 1990, 2 specimens (S. Shin); St. 2, 23 July 1994, 6

specimens (J.G. Jae); St. 1, 23 July 1994, 2 specimens (J.G. Jae); Kulp'o, 25 July 1994, 1 specimen (S. Shin); Hoedong, 25 July 1994, 2 specimens (S. Shin).

Remarks. This species is first recorded from Chindo Island and is the commonest echinoid species collected 5 localities of total 11 localities in Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Yellow Sea), Japan (Hakodate Bay, Mutsu Bay, Sendai Bay, Tokyo Bay, Kobe), Kamtchaka, China, Philippines and Arafura Sea.

18. *Hemicentrotus pulcherrimus* (A. Agassiz, 1863) 말뚝성게

Material examined. Gulp'o, 19 Sep. 1990, 3 specimens (S. Shin); Chukrim, 20 Sep. 1990, 6 specimens (S. Shin).

Remarks. This species is widely distributed in the Korean waters but first reported from Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Cheju Island, Yellow Sea), Japan (Hokkaido-Kagoshima Bay) and China.

19. *Anthocidaris crassispina* (A. Agassiz, 1863) 보라성게

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (East Sea, Korea Strait, Cheju Island), Japan (Onahama Bay-Kyushu, Ogasawara Island), Taiwan and Hong Kong.

20. *Pseudocnus* sp.

Material examined. Chöpto (Won, 1993).

Remarks. This species was previously recorded from Chindo Island.

Distribution. Korea (Korea Strait).

21. *Protankyra bidentata* (Woodward and Barrett) 가시달해삼

Material examined. Gulp'o, 19 Sep. 1990, 1 specimen (S. Shin).

Remarks. The present specimens were collected mainly from the mud bottom and this species is first recorded from Chindo Island.

Distribution. Korea (Korea Strait), Japan, China and Philippines.

22. *Stichopus japonicus* Selenka, 1867 돌기해삼

Material examined. Hönbokdong, 21 Sep. 1990, 1 specimen (S. Shin).

Remarks. This species is first recorded from Chindo Island.

Distribution. Korea (Korea Strait), Japan, Hong Kong, Sakhalin and Vladivostok.

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진도의 극피동물

신 숙

(삼육대학교 생물학과)

요 약

1990년 9월 18일부터 22일까지 죽림, 헌복동, 굴포, 가학, 접도와 1994년 7월 23일부터 25일까지 34° 19' -23' N, 126° 10' -23' E의 St. 1, St. 2, St. 3, St. 4 와 군포, 회동 등, 진도의 11개 지역에서 채집되어 동정된 극피동물은 3강 8목 15과 18속 22종으로서 불가사리류가 2목 4과 4속 6종, 거미불가사리류가 2목 5과 7속 9종, 성게류가 1목 3과 3속 4종, 해삼류가 3목 3과 3속 3종이었다. 이중 *Asterina minor*는 한국 미기록종으로 밝혀졌으며, 불가사리 1종, *Luidia quinaria*와 *Astrocladus coniferus coniferus*, *A. c. dofleini*, *Ophiactis affinis*, *Stegophiura sladeni*, *Amphipholis* sp. 등 5종의 거미불가사리류, *Temnopleurus toreumaticus*, *T. hardwicki*, *Hemicentrotus pulcherrimus*, *Anthocidaris crassispinata* 등 4종의 성게류, *Protankyra bidentata*, *Stichopus japonicus* 등 2종의 해삼류는 진도에서 처음 기록되는 종이다.