

## **Four Species of the Shallow-water Comantulids (Echinodermata, Crinoidea) from Geomundo Island; New Records in Korea**

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### **ABSTRACTS**

The crinoids collected at the subtidal zone in Geomundo Island were identified. Four species belonging to the family Comasteridae, order Comantulida turned out to be new to the Korean fauna. They are *Comantheria intermedia*, *Comanthus japonicus*, *C. solaster* and *C. parvicirrus* which are redescribed on the morphological characteristic with illustrations. The class Crinoidea is new to Korean fauna.

Key words: Taxonomy, Comasteridae, Comantulida, Crinoidea, Korea

### **INTRODUCTION**

Crinoidea is one of the five major classes composing Echinodermata and commonly known as sea lily and feather star. The crinoids are radially symmetrical echinoderms having theca and arms and mostly attached to the oral surface directed upward (Shin and Rho, 1996). About 6,000 extinct species have been described and there are only about 600 modern species belonging to about 150 genera and about 30 families of the Articulata. Nevertheless, they are found abundant locally and as many as 10,000 feather stars were taken once in a single haul of the R.V. Albatross's nets (Meglitsch and Schram, 1991).

Articulata including both extinct and all living crinoids have arms branched and bearing pinnules and they are placed within five orders. Of which feather stars belonging to the order Comantulida are stalked at juveniles but break free and move about on the bottom as adults. They are among

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the most beautifully colored animals in sea. Many crinoids are deep-water forms, but feather stars may inhabit shallow waters, especially in the Indo-Pacific and West-Indian-Caribbean regions, where the largest numbers of species are found. And Comasteridae including 19 genera and about 90 species inhabit in all warm seas, chiefly in shallow water (Pratt, 1985).

A.H. Clark (1931) published the monograph of Comantulida collected by Albatross including some of the species which were collected from the Korea Strait. But actually the collection was made in Japanese water and not in Korean water. Only one species was recorded in the list of animals in Korea published by the Korean Society of the Systematic Zoology (1997) but any previous taxonomic description was not found. Therefore no systematic description about the fauna of Korean crinoids has been recorded yet. This prompted me to investigate crinoids intensively. The author report primarily the systematic information about four comantulid species among Crinoidea.

The crinoid specimens used in this work were collected by scuba diving at the subtidal zone of Geomundo Island (34° 02'N, 127° 17'E). After the animals were captured, they were photographed in the sea water and were preserved in 70% methyl alcohol. The important morphological parts of specimen were photographed using stereomicroscope and microscope. The morphological terms of comantulid external features and the systematic scheme on the identified crinoids followed those of A.H. Clark (1931).

In the present study I report four species identified as *Comantheria intermedia* (A.H. Clark, 1916), *Coanthus japonicus* (Müller, 1841), *Coanthus solaster* (A.H. Clark, 1907), and *Coanthus parvicirrus* (Müller, 1841) belonging to the family Comasteridae, the order Comantulida. These species turned out to be new to the Korean fauna and their morphological characteristics are redescribed.

## SYSTEMATIC ACCOUNTS

Phylum Echinodermata Klein, 1734 극피동물문  
 Class Crinoidea Müller, 1821 바다나리강  
 Subclass Articulata A.H. Clark, 1908 관절아강  
 Order Comantulida A.H. Clark, 1908 바다나리목  
 Family Comasteridae A.H. Clark, 1908 깃갯고사리과

Key to the genus of family Comasteridae in Korea

1. Arms always very numerous. Some IIIBr series consisting of only two ossicles ..... *Comantheria*  
 Arms numerous or as few as 20. When IIIBr series present, some of four ossicles present .....  
 ..... *Coanthus*

Genus *Comantheria* A.H. Clark, 1909 털깃갯고사리속 (신칭)

### 1. *Comantheria intermedia* A.H. Clark, 1916 가는발깃갯고사리 (신칭) (Fig. 1A-G)

*Comantheria intermedia* A.H. Clark, 1916, p. 105; 1931, p. 508, pl. 60, figs. 169, 171, 172, pl. 65, fig. 182; Utinomi and Kogo, 1965, p. 268, text-fig. 4; 1968, p. 48; Liao and Clark,



**Fig. 1.** *Comantheria intermedia*. A, ventral view; B, dorsal view; C, D, centrodorsal, cirri and proximal part of arms; E, cirrus; F, G, proximal pinnules. Scale bars = 3 cm (A, B), 2 mm (C-G).

1995, p. 17.

*Oxycomanthus intermedia* Rowe *et al.*, 1986, p. 248.

*Oxycomanthus intermedius* Kogo, 1998, p. 40, fig. 31.

**Material examined.** 1 individual, Geomundo Island (on rocky sediment at 20 m depth), 18 July 2001, by scuba diving; 1 individual, (15 cm depth), 17 Sept. 2001, by scuba diving.

**Diagnosis.** The centrodorsal is discoidal and bears 41 cirri, of which only 14 are well developed. Large ones are slender, usually 12 mm in length, and are composed of 17 segments. There are 36 arms.

**Description.** Centrodorsal discoidal, 4.2 mm in diameter and 1.0 mm high. Polar area slightly concave with a central pit and 3.5 mm across. Cirrus sockets arranged in two and a partial three irregular rows. Cirri with somewhat blunt claws and 41 including 14 larger ones, 8 smaller ones and 18 cirrus sockets estimated, rudimental ones. Large cirrus 12 mm long and 17 segments. Longest segments in the proximal portion about one-third again as long as broad and the distal segments from about the eleventh onward about twice as broad as long; the transition from the one type to the other rather abrupt. Distal 11 segments each with a dorsal spine. Arms stout proximally, presumably 36 in number and reaching to 100 mm long, 2.3 mm wide at first syzygy. Brachials smooth proximally and rugose appearance in middle arms with everted, spinous distal margins. Middle and distal brachials excessively short. Division series broad and smooth. Radials more or less concealed; IBr series 2, IBr<sub>1</sub> excessively short, 4 times as broad as long; IBr<sub>2</sub> triangular, about twice as broad as long; II Br series always 4(3+4); III Br series 4(3+4), sometimes 2; IV Br series 4(3+4). Syzygial pairs occurring at 3-4, 11+12..., and at intervals of 4 muscular articulations. Proximal pinnules with large segments at base; P<sub>0</sub> 45 segments with 9 teeth, 12.0 mm; P<sub>1</sub> 47, 10 teeth, 13.0 mm long; P<sub>2</sub> 33, 7 teeth, 10.0 mm; P<sub>3</sub> 29, 5 teeth, 9.0 mm; P<sub>4</sub> 15 without tooth, 8.0 mm; P<sub>m</sub> 15, 8.0 mm.

**Colour.** When it is alive, the color of a body is brown. The area around disk looks bright and some part between the brown arms is embedded with yellowish brown arm. Since the base of arm shows a bright color, the bright orange ring appears to surround the disk.

**Remarks.** This species is new to Korea.

**Distribution.** Korea (Korea Strait); From Southern Japan (as north as Sagami Bay) to China (Amoy).

Genus *Comanthus* A.H. Clark, 1908 갯고사리속 (신칭)

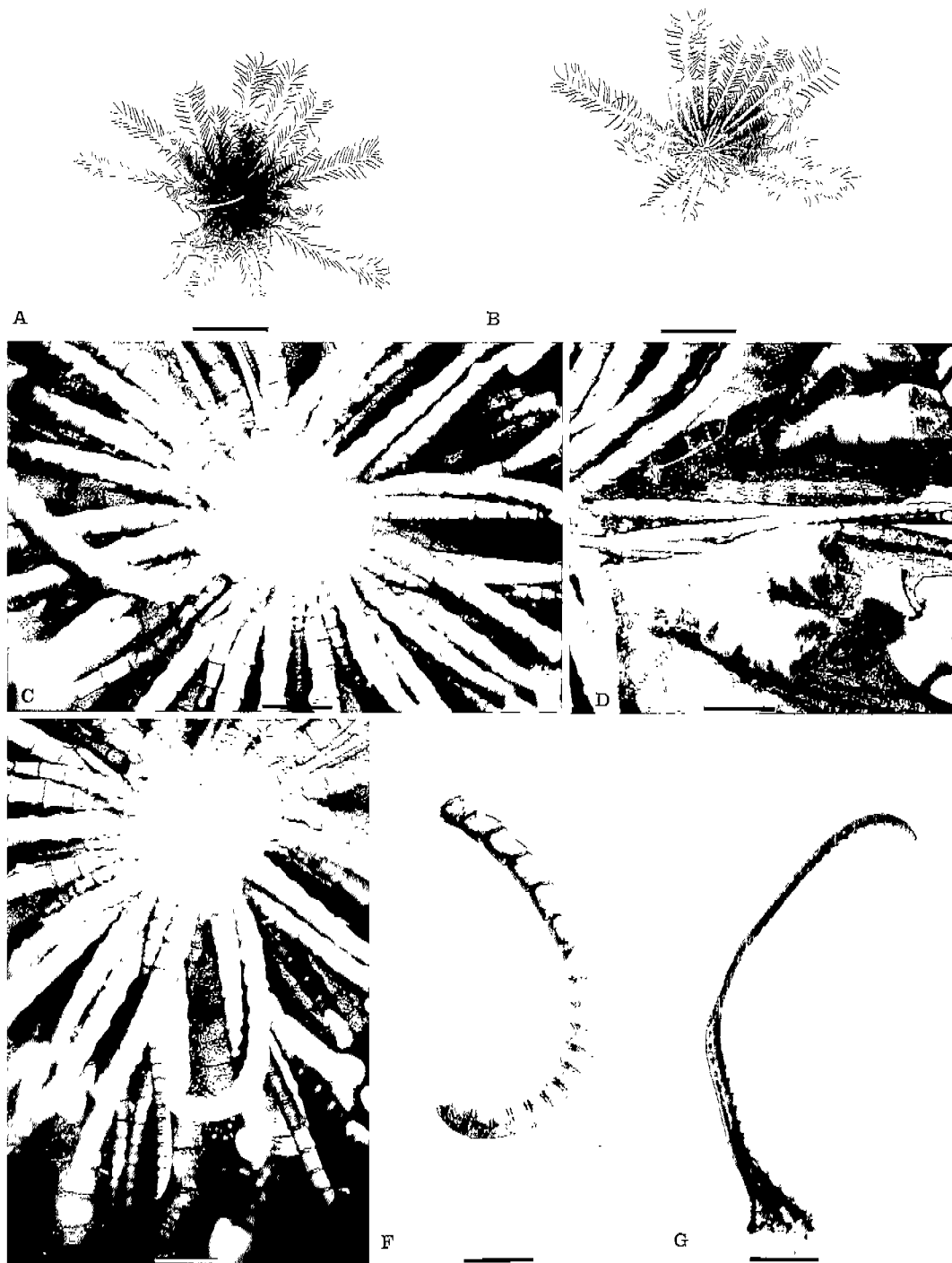
Key to the species of genus *Comanthus* in Korea

1. Cirri large and their distal segments markedly shorter than the proximal ones ..... 2  
     Cirri small and their distal segments slightly shorter than the proximal ones ..... *parvicirrus*
2. Cirri relatively large and numerous, >40 ..... *japonicus*  
     Cirri rather short and slender, >25 ..... *solaster*

**2. *Comanthus japonicus* (Müller, 1841) 일본갯고사리 (신칭) (Fig. 2A-G)**

*Alecto japonica* Müller, 1841, p. 186.

*Comanthus japonica*: A.H. Clark, 1931, p. 564, pl. 71, fig. 195, pl. 72, figs. 196-198, pl. 73, fig. 201, pl. 82, figs. 226, 227; Gislén, 1922, p. 43.



**Fig. 2.** *Comanthus japonicus*. A, ventral view; B, dorsal view; C, D, E, centrodorsal, cirri and proximal part of arms; F, cirrus; G, a proximal pinnule. Scale bars = 3 cm (A, B), 2 mm (C-G).

*Comanthus japonicus*: Gislén, 1927, p. 13; Liao and Clark, 1995, p. 21, fig. 9.

*Comanthus (Cenolia) japonica*: Utinomi and Kogo, 1965, p. 263, pl. 12, fig. 2; 968, p. 49.

*Oxycomanthus japonica* Rowe *et al.*, 1986, p. 248.

*Oxycomanthus japonicus* Kogo, 1998, p. 45, fig. 35.

**Material examined.** 1 individual, Geomundo Island (on rocky sediment at 20 m sea depth), 19 July 2001, by scuba diving.

**Diagnosis.** The centrodorsal is large with the dorsal pole concave. Cirri are numerous, 40 in number, large and stout, with 19-20 segments of which the terminal 9 segments are twice wider in width than in length and distal half segments bear dorsally as a subterminal dorsal spine. Arms are 26 in number and 95 mm in length. The division series are narrow and very strongly convex dorsally and are widely separated laterally.

**Description.** Centrodorsal moderately thick, discoidal, 7.0 mm in diameter and 1.5 mm high. Polar area slightly concave without dorsal pit and 4.0 mm across. Cirrus sockets closely crowded arranged in two or three irregular marginal rows. Cirri 40 in number, 12.0 mm long, moderately stout, well rounded in cross section in the proximal half but laterally compressed in the distal half; First two segments shorter than long; third-fourth as long as broad; fifth-seventh nearly twice as long as broad. Seventh or eighth usually a well-marked transition segment. Transition and following segments with the dorsal portion of the distal edge somewhat thickened, this soon becoming a small subterminal tubercle. Distal 12 segments each with a minuate dorsal spine. Terminal claw rather stout. Division series broad, rounded dorsally and laterally, and widely separated laterally. Radials perfectly concealed; IBr series 2, IBr<sub>1</sub> excessively short; IBr<sub>2</sub> about twice as broad as long; II Br, III Br, IV Br series usually 4 (3+4). Articulations of division series not constricted. Arms presumably 26 in number and 90 mm in length at first syzygy. Brachials oblong, rounded dorsally in proximal arm, twice as broad as exterior length and beyond sixth coming to wedge-shaped with everted, spinous distal ends. Syzygial pairs occurring at 3+4, 14+15, 21+22... and at intervals of 4 muscular articulations in distal arm. Pinnules excessively long, combs short, composed of a few segments up to twelve. Teeth not confluent. P<sub>D</sub> 47 with 12 teeth, 20.0 mm long; P<sub>p</sub> 43, 12 teeth, 16.0 mm; P<sub>1</sub> 42, 10 teeth, 12.0 mm; P<sub>2</sub> 20, 7 teeth 8.0 mm; P<sub>3</sub> 21, 2 teeth, 4.0 mm; P<sub>m</sub> 22, 10.0 mm; P<sub>d</sub> very slender, up to 7.0 mm. Disk 24-25 mm in diameter. Mouth marginal and anal tube slightly subcentral.

**Color.** When it is alive, the color of a whole body is dark violet brown but the dorsal arms have a lighter yellowish brown median line.

**Remarks.** This species is new to Korea.

**Distribution.** Korea (Korea Strait); From Southern Japan (as north as Sagami bay) to China (Amoy).

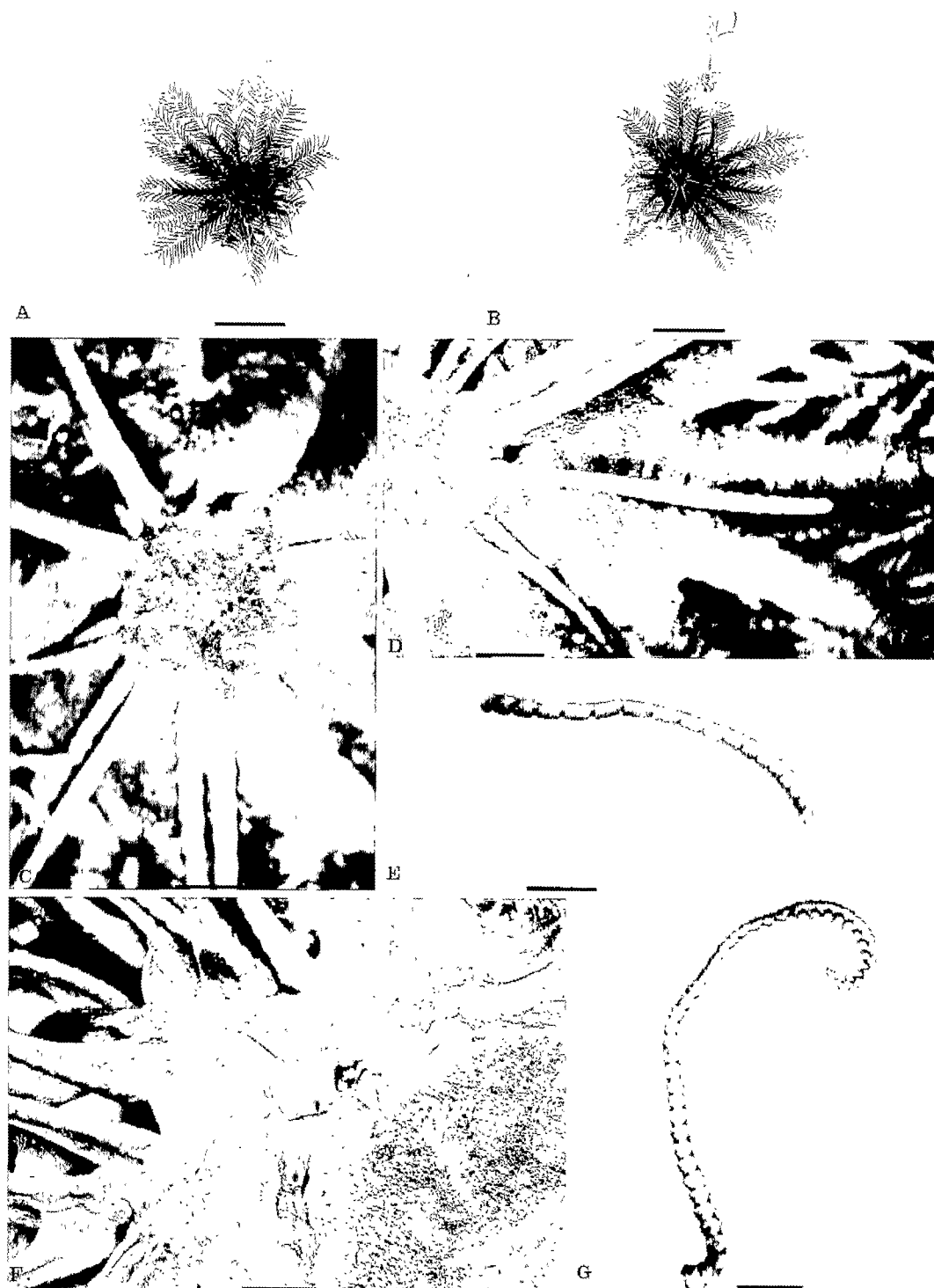
### 3. *Comanthus solaster* A.H. Clark, 1907 햇남깃갯고사리 (신칭) (Fig. 3A-G)

*Comanthus solaster* A.H. Clark, 1907, p. 153; 1931, p. 576, pl. 20, fig. 51; Liao and Clark, 1995, p. 24.

*Comanthus (Cenolia) solaster*: Utinomi and Kogo, 1968, p. 53.

*Oxycomanthus solaster* Rowe *et al.*, 1986, pp. 248; Kogo, 1998, p. 47, fig. 36.

**Material examined.** 1 individual, Geomundo Island (on rocky sediment at 20 m sea depth), 19



**Fig. 3.** *Comanthus solaster*. A, ventral view; B, dorsal view; C, D, centrodorsal cirri and proximal p arms; E, cirrus; F, peristome; G, a proximal pinnule. Scale bars = 3 cm (A, B), 2 mm (C-G).

July 2001, by scuba diving; 1 individual, (15 cm depth), 17, Sept. 2001, by scuba diving.

**Diagnosis.** The longest cirri have 18 segments and are 12.0 mm in length and the arms which are broad at the base and rapidly tapering are usually about 20 with cirrus sockets in number, and from 70.0 to 83.0 mm in length.

**Description.** Centrodorsal a little pentagonal shape, 6.0 mm in diameter and 2.0 mm high. Polar area flat with a small dorsal pit and 5.2 mm across. Cirrus sockets arranged in a single or partly two marginal rows. Cirri straight, 20 with rudimentals and up to 12.0 mm long. First two segments shorter than long; third as long as broad; fourth-ninth, longest segments, longer than broad; distal segments each with a short spine, shorter than broad. Eighth or ninth transitional segment. Division series more or less flattened dorsally, rather broad and separated from neighboring series. Radials perfectly concealed by centrodorsal plate. IBr series 2. IBr<sub>1</sub> excessively short, four times as broad as long; IBr<sub>2</sub> low pentagonal, twice as broad as long or even broader; IIBr series 4 (3+4); No IIIBr series present. Articulations of division series not constricted. Arms 20 in number, from 70.0 up to 83 mm long, comparatively stout, especially in the basal portion. First two brachials rather large and about twice as broad as long exteriorly. Next brachials oblong and short wedge-shaped in the distal half of the arm. From about the fourth onward the brachials have rather prominent distal edges. Syzygial pairs occurring between brachials 3+4, sometimes 10+11, 20+21.... and distally at intervals of 4 or 5, usually 4 muscular articulations in distal arm. Proximal pinnule segments provided with produced dorsal crests and dorsal spine composed of 10-14 small and well separated teeth. P<sub>D</sub> 52 segments with 15 teeth, 22.0 mm long; P<sub>1</sub> 46, 12 teeth, 17.5 mm; P<sub>2</sub> 35, 10 teeth, 12.6 mm; P<sub>3</sub> 28, 8 teeth, 7.5 mm; P<sub>4</sub> 23, 7 teeth, 9.0 mm P<sub>m</sub> 20, 9.0 mm; P<sub>d</sub> 22, slender, up to 11.0 mm. Disk 22.0-23.0 mm in diameter and bears few scattered calcareous granules around anal area. Mouth situated marginal and anal tube very large and centrally situated.

**Color.** Disk is dark brown and arm is pale brown when it is alive. The color in alcohol is dark purple with the disk, cirri, and pinnules brownish yellow and the arms with a lighter yellowish brown median line.

**Remarks.** Because of the highly characteristic appearance of the specimen such as the shape of centrodorsal and cirri, it can not be confused with any other species of *Comanthus*. This species is new to Korea.

**Distribution.** Korea (Korea Strait); From Southern Japan (as north as Tokyo Bay) to Taiwan Strait.

#### 4. *Comanthus parvicirrus* (Müller, 1841) 작은발깃갯고사리 (신칭) (Fig. 4A-G)

*Aceto parvicirra* Müller, 1841, p. 185.

*Actinometra parvicirra*: H.L. Clark, 1921, p. 5.

*Comanthus parvicirra*: A.H. Clark, 1931, p. 631, pl. 25, fig. 88, pl. 65, fig. 184, pl. 73, fig. 200, pl. 78, figs. 209, 210, pl. 79, figs. 211-214, pl. 80, figs. 215-218, pl. 81, fig. 221; H.L. Clark, 1938, p. 26.

*Comanthus (Vania) parvicirra*: A.H. Clark, 1918, p. 54; Gislén, 1922, p. 50, figs. 41-45.

*Comanthus tipica*: Gislén, 1922, pp. 50, 54.

*Comanthus (Vania) parvicirra comasteripinna*: Gislén, 1922, p. 4.

*Comanthus parvicirra comasteripinna*: Gislén, 1922, p. 50, figs. 41-44.



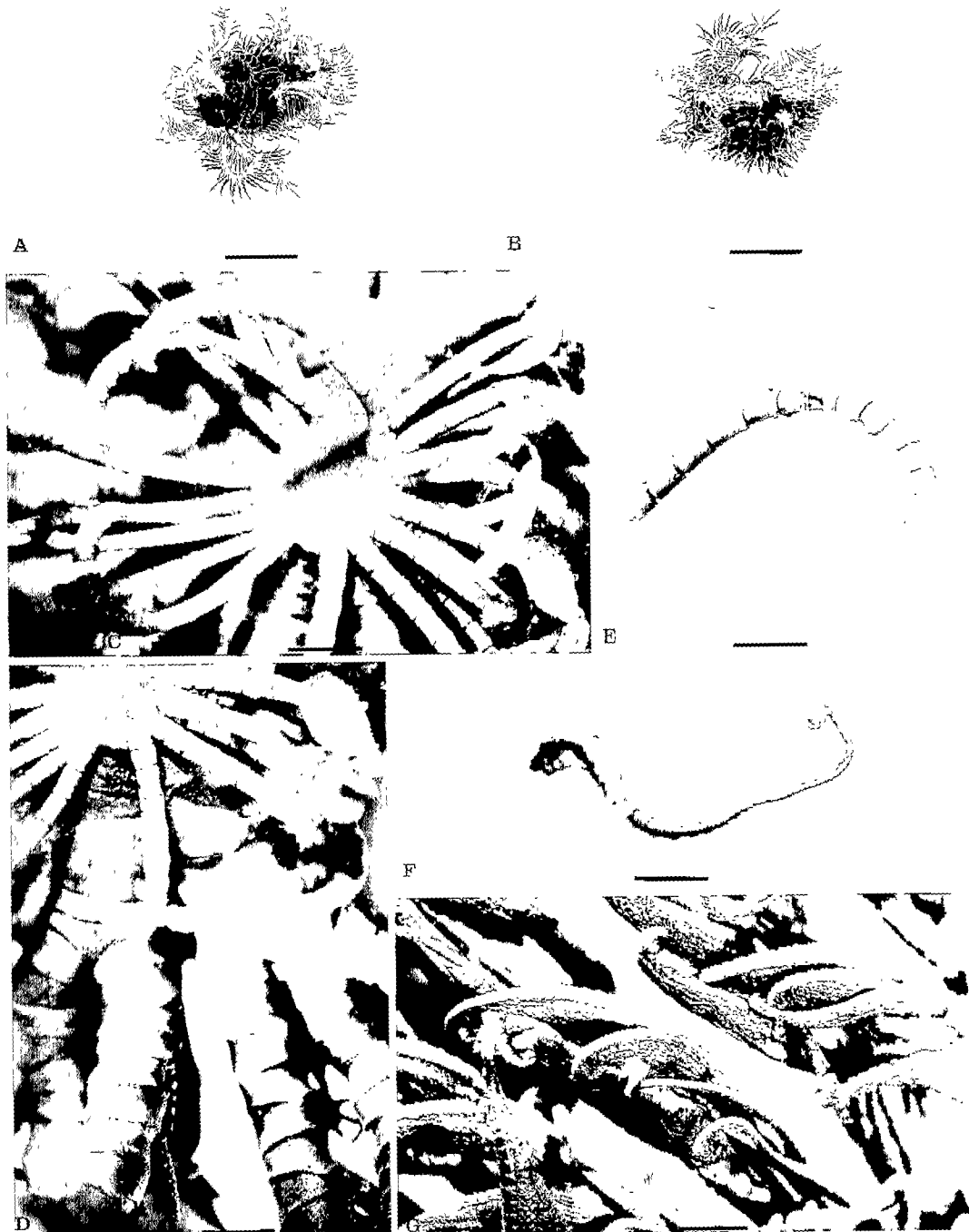


Fig. 4. *Comanthus parvicirrus*. A, ventral view; B, dorsal view; C, D, centrodorsal, cirri and proximal part of arms; E, cirrus; F, G, proximal pinnules. Scale bars = 3 cm (A, B), 2 mm (C-G).

*Comanthus (Comanthus) parvicirra*: Utinomi and Kogo 1965, p. 263, pl. 12, fig. 3; 1968, p. 49, fig. 1, p. 47.

*Comanthus parvicirrus*: A.M. Clark, 1972, p. 77; Gibbs *et al.*, 1976, p. 109; A.M. Clark, 1980, p. 486; Liao, 1983, p. 264; Rowe *et al.*, 1986, p. 211, fig. 5; Liao and Clark, 1995, p. 21, fig. 10, pl. 2, fig. 1.

*Oxycomanthus parvicirrus* Kogo, 1998, p. 33, fig. 27.

**Material examined.** 2 individuals, Geomundo Island (on rocky sediment at 20 m sea depth), 20 July 2001, by scuba diving; 1 individual, (15 cm depth), 17, Sept. 2001, by scuba diving.

**Diagnosis.** The arms are 22 in number, all rather short and almost equal in length. The cirri are 24 in number and are irregularly distributed about the periphery of a thin subcircular centrodorsal. The longest cirri usually consist of 13-14 segments.

**Description.** Centrodorsal thin discoidal, 3.5 mm in diameter and 0.3 mm high. Polar area flat and 2.5 mm across. Cirrus sockets arranged in a single row and partly two. Cirri small, with 13-14 segments, 24 in number and 11.0 mm long. Proximal segments broader than long; fifth-seventh, longest segments, slightly longer than broad; succeeding almost as long as broad. Distal eight segments each with a minute dorsal spine. Terminal claw blunt. Radials oblong and 6 times as broad as long; IBr series 2, IBr<sub>1</sub> short, about four times as broad as long, in lateral contact; IBr<sub>2</sub> low pentagonal, twice as broad as long; IIBr series usually 4 (3+4) and partially 2 (1+2); IIIBr series all 4 (3+4); IVBr series 4 (3+4). Arms 22 in number and 90 mm long at first syzygy. Brachials in proximal arm smooth and succeeding provided with everted ridges, and spinous. Syzygial pairs occurring at 3+4, 12+13, 17+18... and at intervals of 4 muscular articulations in distal arm. Proximal pinnules arising at division series excessively long with characteristically coiled distal part. Combs sometimes extending to P<sub>m</sub>, with confluent teeth. P<sub>D</sub> 52 segments with 5 teeth, 18.5 mm long; P<sub>p</sub> 33, 5 teeth, 16.5 mm; P<sub>1</sub> 29, 4 teeth 8.0 mm; P<sub>2</sub> 19, without tooth, 7.0 mm; P<sub>3</sub> 17, without tooth 7.5 mm; P<sub>m</sub> 18, 9.0 mm; P<sub>d</sub> excessively slender, 19, up to 9.0 mm. Disk naked, comparatively large and 15.0-17.0 mm in diameter.

**Color.** When it is alive, the color of body is light brown in life but much reddish brown at the dorsal median lines of arm and dark brown in the disk. After preservation in alcohol and drying, only a faint central dark line along each arm remains.

**Remarks.** This species is new to Korea.

**Distribution.** Korea (Korea Strait); From Southern Japan to China; widely distributed in the Indo-West Pacific Ocean (to Australia and Madagascar).

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## 거문도 연안 갯고사리류 (극피동물문, 바다나리강)의 4한국미기록종

신    숙  
(삼육대학교 생명과학과)

## 요    약

거문도 해안의 조하대에서 채집된 갯고사리류를 동정 분류한 결과, 바다나리목 (Comantulida), 갯갯고사리과 (Comasteridae)의 가는발갯갯고사리 (*Comantheria intermedia*), 일본갯갯고사리 (*Comanthus japonicus*), 햇넘갯갯고사리 (*C. solaster*), 그리고 작은발갯갯고사리 (*C. parvicirrus*)가 한국 미기록종으로 밝혀져 보고한다. 갯고사리류는 우리나라에서 처음으로 보고된다.