

Taxonomy of the Black Coral Family Antipathidae (Anthozoa: Antipatharia) from Korea

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ABSTRACT

Six species, four genera belonging to two families of antipatharians have been reported in Korea. In the present study, the major specimens were collected from the coastal areas of Jeju Island from 2005 to 2006, and the other ones which have been deposited in the Natural History Museum and the Department of Life Science, Ewha Womans University during the period from 1965 to 2004 were reexamined. As a result of this work, two species, *Cirripathes spiralis* and *Stichopathes filiformis*, are newly recorded to Korean antipatharian fauna.

Key words: taxonomy, Antipathidae, Antipatharia, Anthozoa, Korea

INTRODUCTION

The classification of black corals has been complicated for many years by the description of numerous species from incomplete specimens and by the lack of a clearly defined taxonomic hierarchy at the genus and family levels. The major taxonomic revision grouped all species into a single family Antipathidae (Pesch 1914). However, the revisionary works of Opresko (2001, 2002, 2003b, 2004, 2006) offered the current classification including 235 species, 40 genera, seven subfamilies and seven families. The families are mainly separated on the basis of internal and external characteristics of the polyps and the shape, arrangement and development of the axial spines.

On the Korean antipatharians, Kamita and Sato (1941) recorded only one species, *Antipathes japonica*, and Song (1987) added two species, *A. lata* and *Cirripathes anguina*. In addition, three species *Antipathes densa*, *A. grandiflora* and *A. dubia* were reported in an earlier paper (Moon and Song, 2005).

In the present study, two species within the family Antipathidae are turned out to be new to Korean fauna. They were described with figures including the colonial external features and microscopic skeletal features. Also, a key to the species of family Antipathidae is presented.

MATERIALS AND METHODS

For the taxonomic study of antipatharians, specimens were collected from the rocky areas of Jeju Island by SCUBA

diving during the period from 2003 to 2006. They were initially preserved in 4-5% seawater buffered formalin after anesthetization with menthol and then transferred to 70% ethanol, and deposited in the Natural History Museum and the Department of Life Sciences, Ewha Womans University.

The specimens were identified on the basis of morphological characters under the light and stereo microscopes. Their examination was especially focused on the growth form and branching mode of corallums, the size and arrangement of polyps and spines on the axis. Especially, the distance between spines was measured between the centers of the bases of adjacent spines of the same longitudinal row, and also the height of a single spine was measured from the apex to the center of base.

SYSTEMATIC ACCOUNTS

Phylum Cnidaria Hatschek, 1888
Class Anthozoa Ehrenberg, 1834
Order Antipatharia Milne Edwards and Haime, 1857
Family Antipathidae Ehrenberg, 1834

Diagnosis. Corallum branched or unbranched, spine triangular, laterally compressed, smooth or papillose, and subequal in size, shape and density around circumference of axis. Polyps 1 mm or greater in transverse diameter with long tentacles ending in a narrow tip (two or more times of transverse diameter).

Key to the genera of family Antipathidae

1. Colony unbranched 2
Colony branched *Antipathes*

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- 2. (1) Polyps arranged in a single row *Stichopathes*
- Polyps arranged in multi-serial row *Cirripathes*

Genus *Cirripathes* Biainville, 1834

Diagnosis. Corallum unbranched, polyps arranged in several irregular rows, tentacle with rounded apex.

Key to the species of genus *Cirripathes*

- 1. Colony irregularly twisted, without spiral-coils
..... *Cirripathes anguina*
- Colony sinistrorse spiral-coils *Cirripathes spiralis*

***Cirripathes anguina* (Dana, 1846)**

Antipathes anguina Dana, 1846, p. 576.

Cirripathes anguina: Brook, 1889, p. 84; Silberfeld, 1909b, p. 10; Pax, 1932, p. 407; Zou and Zhou, 1984, p. 101; Song, 1987, p. 65, pl. 1, figs. 1-6; Uchida and Soyama, 2001, p. 133.

Cirrhopathes anguina: Utinomi, 1958, p. 181, fig. 3; Opresko, 1974, p. 8; Grigg and Opresko, 1977, p. 249, fig. 4; Zou and Zhou, 1984, p. 101.

Cirripathes propingua: Brook, 1889, p. 82, pl. 10, figs. 9-13, pl. 12, fig. 14, pl. 14, fig. 7.

Cirripathes densiflora: Silberfeld, 1909a, p. 762; 1909b, p. 10; Carlgren, 1940, p. 15.

Cirripathes (Eucirripathes) anguina: Pesch, 1914, p. 146, figs. 203-205, pl. 8, figs. 3-4, 7.

Cirrhopathes anguinus: Bayer, 1959, p. 229.

Cirrhopathes sieboldi: Brook, 1889, p. 9; Opresko, 1974, p. 14.

Cirripathes flagellum: Brook, 1889, p. 87, pl. 12, fig. 13; Opresko, 1974, p. 19.

Cirripathes gardineri: Opresko, 1974, p. 23.

Cirrhopathes propingua: Opresko, 1974, p. 19.

Previous record. Jeju Is. (Wimi) (Song, 1987).

Material examined. 1 ind. Munseom, 4 Dec. 2003 (D.B. Ko); 1 ind., 10 Apr. 2004 (D.B. Ko), 30 m deep; 1 ind., 11 Apr. 2004 (S.J. Hwang), 20 m deep; 1 ind., 23 Apr. 2005 (H.W. Moon), 40 m deep.

Remarks. In comparison with Pesch's diagnosis (Pesch, 1914), our specimens have the differences of polypar spines and abpolypar's in size, and with *C. anguina* from Korea (Song, 1987), they are similar to each other in most of features except for the size of polyps 3-4 mm in transverse diameter.

Distribution. Korea (Jeju Is.), Japan (Uruga Channel), Pacific Ocean (Fiji, Anchorage, Billiton, Cape Moresby), Atlan-

tic Ocean (Ambon, N. Guinea), Indian Ocean (Red Sea, Seychelles, Ceylon), Nilanda, Suvadiva Atoll.

^{1*}*Cirripathes spiralis* (Linnaeus, 1758) (Fig. 1A-F)

Gorgonia spiralis Linnaeus, 1758

Cirripathes spiralis: Brook, 1889, p. 85, pl. 7, fig. 10; Silberfeld, 1909b, p. 18; Pax, 1932, p. 407; Opresko, 1972, p. 961.

Cirripathes (Eucirripathes) spiralis: Pesch, 1914, p. 158, figs. 216-241.

Cirrhopathes spiralis: Utinomi, 1958, p. 181, text-fig. 3; 1965, p. 299, text-fig. 462; Bayer, 1959, p. 229; Opresko, 1974, p. 14.

Material examined. 1 ind. Munseom, 26 Nov. 2005 (H.W. Moon), 30 m deep; 1 ind. Gapado, 4 Jan. 2006 (H.W. Moon), 30 m deep.

Description. Colonies about 50 cm high or less and 3.0 × 2.0 cm in diameter at basal part of stem, unbranched and sinistrorse spiral-coils from base to top which 2.5-3.0 cm in diameter. Stem straight, about 2.5 cm long and 0.3 cm in diameter, usually gradually tapering towards top which about 0.2 mm in diameter.

Spines large, conical to cylindrical with blunt apex, arranged in 12-14 longitudinal rows. Spines unequal on opposite sides of axis. Larger spines about 0.60-0.70 × 0.27-0.30 mm, arranged on polyp-bearing side of axis, and project very far through coenenchyma. Smaller spines triangular, about 0.24-0.29 × 0.20-0.25 mm, slightly distalwards. Most spines inserted at right angles with axis, irregularly distributed and very crowded on some parts. Mutual distance between adjacent spines in one row about 0.60-0.75 mm.

Polyps irregular in size and shape, arranged in several longitudinal rows, but all of them arranged on distal outward side of coil. Polyps mostly about 1.1-2.0 mm in transverse diameter with 9-10 polyps/cm, and interpolypar space 1.2-1.5 mm. Small polyps about 0.5 mm in transverse diameter, irregularly distributed between larger ones. Tentacles in preserved specimens, 1.5-2.0 mm in length, more slender at tip of axis and blunt at distal apex. Oral cone 0.90-1.00 mm in diameter, raised about 0.50-0.70 mm and covered by lateral tentacles.

Coloration. Axis dark brown, base storm gray and polyps dull orange.

Habitat. This species inhabits on the flat rocky area, below 20°, at 30 m deep.

Remarks. In comparison with Pesch's diagnosis (Pesch, 1914), our specimens have larger spines, 0.24-0.70 mm long.

Distribution. Korea (Jeju Is.), Atlantic Ocean (Norway, Barbados, Cuba, Ireland, Martinique, Montserrat, Saint

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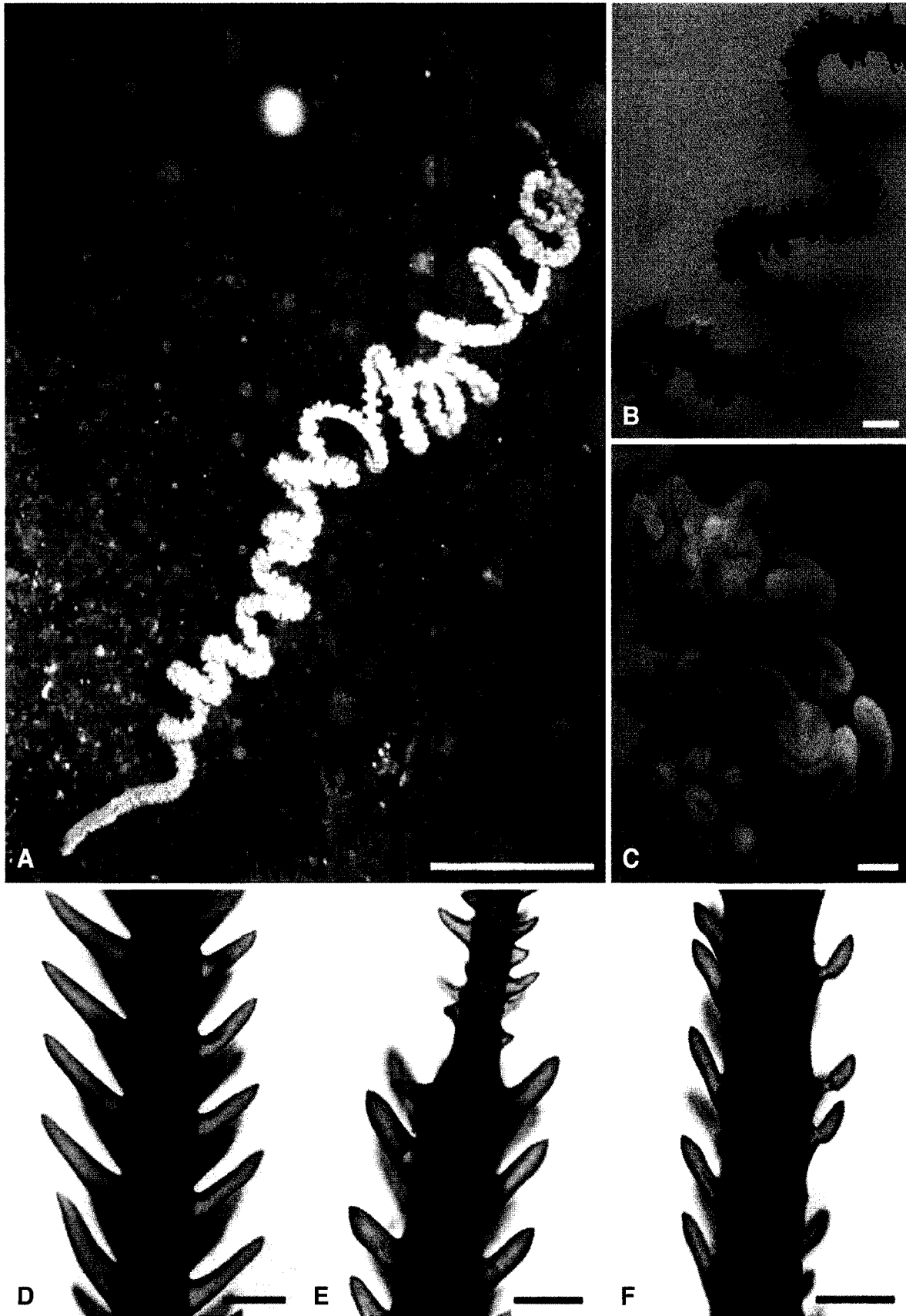


Fig. 1. *Cirripathes spiralis*. A, corallum; B, middle part of colony showing arrangement of polyps; C, close-up view of polyps; D, spines at basal part; E, spines at middle part; F, spines at distal part. Scale bars=5 cm (A), 5 mm (B), 0.5 mm (C-F).

Vincent, Grenada), Pacific Ocean (China, Indonesia, Japan, Malaysia, Moluccas, Maldives, Philippines, United States), Indian Ocean (Mauritius, Mozambique, Pakistan, Sri Lanka).

Genus ¹**Stichopathes* Brook, 1889

Diagnosis. Corallum unbranched, stem long and flexible sometimes spirally curved. Polyps arranged in a single row on one side of stem only with long fingerlike tentacles, sometimes larger polyps and smaller ones alternately arranged.

²**Stichopathes filiformis* (Gray, 1868) (Fig. 2A-F)

Cirripathes filiformis Gray, 1868, p. 444, fig. 1.

Stichopathes filiformis: Silberfeld, 1909b, p. 15, fig. 1; Pesch, 1914, p. 109; Pax, 1932, p. 407; Opresko, 1974, p. 23.

Stichopathes? filiformis: Brook, 1889, p. 93, pl. 12, figs. 23-24.

Material examined. 1 ind. Munseom, 27 Nov. 2005 (S.J. Suh), 35 m deep.

Description. Colony whip-like and unbranched, about 59 cm high and 0.2 × 0.2 cm in diameter at basal part of stem. Stem slender, filiform and slightly curved, 1.5 mm in diameter, usually subequal thickness over its entire length, except for near top about 0.8-1.0 mm in diameter. Spines large and conical with smooth surface, arranged in 6-8 longitudinal rows. On upper part of axis 0.9 mm in diameter, polypar spines about 0.40-0.50 × 0.22 mm and abpolypar spines about 0.30 × 0.12 mm, slightly larger on polypar side of axis, but similar in shape. Most of spines inserted at right angles with axis, and mutual distance between adjacent spines in one row about 0.6-1.0 mm.

Polyps, two types, arranged in a single row on one side of axis, usually 10-11 polyps/cm. Larger polyps usually 1.0 mm in diameter with enlarged thick tentacles, and smaller polyps about 0.3-0.5 mm in diameter. Both types arranged in alternate regularly, with interpolypar distance of 1.0-1.2 mm, and similar in shape and structure. Tentacles radiate and enlarged more than axis diameter. On larger polyps usually 1.5-2.2 mm in length and on smaller ones about 1.0 mm in length, more slender at distal apex. Oral cone large and prominent, mostly 0.60-0.70 mm in diameter, raised about 0.55-0.70 mm.

Coloration. Axis and base dark brown and polyps transparent ivory.

Habitat. The colony inhabits on flat sand area at 35 m deep.

Remarks. In comparison with diagnosis of *Stichopathes filiformis* (see Pesch, 1914), our specimen is very similar to each other in an arrangement of polyps, but the mutual dis-

tance of spines more increased up to 1.0 mm at distal part.

Distribution. Korea (Jejudo Is.), Atlantic Ocean (St. Helena), Pacific Ocean (Australia).

Genus *Antipathes* Pallas, 1766

Diagnosis. Corallum sparsely to densely branched, bushy or flabellate, rarely monopodial. Branchlet of various length, arranged irregularly or bilaterally, rarely pinnulate. Spines usually triangular to conical in lateral view, smooth or papillose, often laterally compressed, sometimes with knobs or multiple forking at apex. Polyps about 1-3 mm in diameter, sometimes longer sagittal axis than along transverse axis.

Key to the species of genus *Antipathes*

1. Branches anastomose *Antipathes dubia*
Branches not anastomose 2
2. (1) Corallum one plane *A. densa*
Corallum multi-planes *A. grandiflora*

***Antipathes densa* Silberfeld, 1909**

Antipathes densa Silberfeld, 1909a, p. 761; 1909b, p. 23, figs. 1, 3; Pax, 1932, p. 407; Utinomi, 1958, p. 181, fig. 7; 1965, p. 300, text-fig. 467; Opresko, 1974, p. 47; Okutani, 1999, p. 46, text-fig. 2; Uchida and Soyama, 2001, p. 131, text-figs. 1, 2; Moon and Song, 2005, p. 251, figs. 1-3.

Antipathes densa: Utinomi, 1976, p. 27, pl. 14, fig. 3.

Previous record. Jejudo Is. (Munseom, Seogwipo) (Moon and Song, 2005).

Material examined. 1 ind. Seogwipo, 27 Aug. 2005 (S.H. Kim); 1 ind. Munseom, 25 May 2006 (S.H. Kim), 24 m deep; 1 ind. Seopseom, 14 Jun. 2006 (H.W. Moon), 25 m deep.

Distribution. Korea (Jejudo Is., 20-40 m deep), Japan (Uruga Canal, Sagami Bay, Kii Peninsula 100-300 m deep).

***Antipathes grandiflora* Silberfeld, 1909**

Antipathes grandiflora Silberfeld, 1909a, p. 76; 1909b, p. 26, pl. 2, fig. 5; Pesch, 1914, p. 75; Opresko, 1974, p. 46; Okutani, 1999, p. 46, text-fig. 4; Uchida and Soyama, 2001, p. 132, text-fig. 2; Opresko, 2003a, p. 487, fig. 3; Moon and Song, 2005, p. 264, figs. 4-6.

Euantipathes dichotoma: Pesch, 1914, p. 52, figs. 29-61.

Antipathes dichotoma grandiflora: Pax, 1932, p. 420.

Previous record. Jejudo Is. (Seogwipo) (Moon and Song, 2005).

Material examined. 2 inds. Gapado, 4 Jan. 2006 (H.W.

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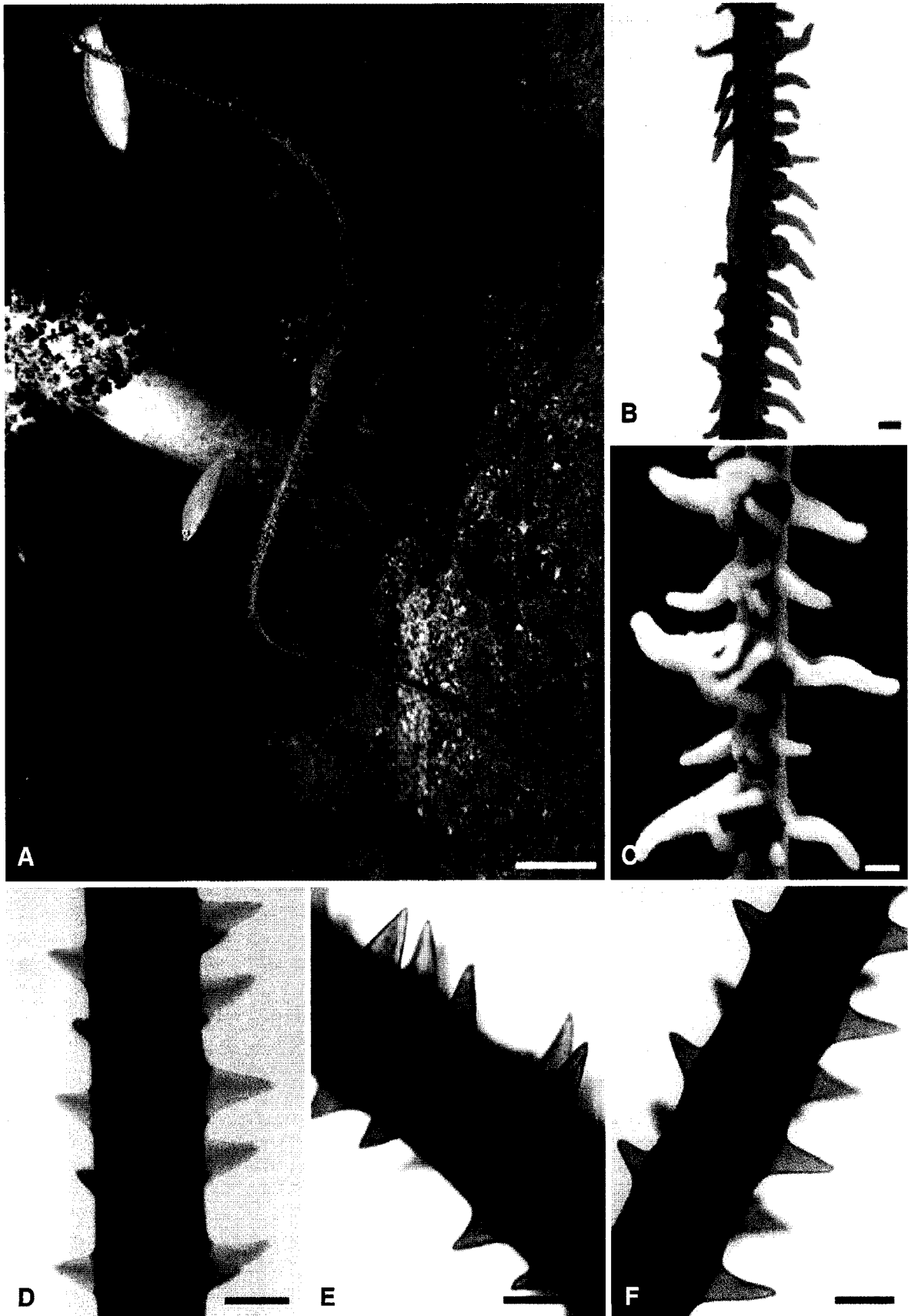


Fig. 2. *Stichopathes filiformis*. A, corallum; B, middle part of colony showing arrangement of polyps; C, close-up view of polyps; D, spines at basal part; E, spines at middle part; F, spines at distal part. Scale bars=5 cm (A), 5 mm (B), 0.5 mm (C-F).

Moon) 30-34 m deep; 1 ind. Seopseom, 14 Jun. 2006 (H.W. Moon) 30 m deep.

Remarks. In comparison with *A. grandiflora* from Seogwipo (Moon and Song, 2005), the specimens for this work occur in various colors ranging from reddish orange to golden maize.

Distribution. Korea (Jejudo Is. 30-40 m deep), Japan (Uraga Canal 75 m deep).

Antipathes dubia Brook, 1889

Tylopathes ?dubia Brook, 1889, p. 138, pl. 11, fig. 15.

Antipathes dubia: Silberfeld, 1909b, p. 8; 1932, p. 421, text-figs. 7, 8; Utinomi, 1958, p. 181, fig. 6; 1965, p. 300, text-fig. 465; Opresko, 1974, p. 48; Moon and Song, 2005, p. 268, figs. 7-9.

Antipathes dubius: Utinomi, 1976, p. 27, pl. 14, fig. 2.

Previous record. Jejudo Is. (Munseom) (Moon and Song, 2005).

Material examined. 1 ind. Munseom, 21 Apr. 2006 (H.W. Moon), 27 m deep.

Distribution. Korea (Jejudo Is. 27-38 m), Japan (Sagami Bay, Kii Peninsula 40-100 m deep, Inoshima Is.).

ACKNOWLEDGEMENTS

This work was supported by the Korea Research Foundation Grant (KRF-2005-070-C00124).

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Received June 16, 2008
Accepted July 4, 2008