Invertebrate Fauna of Korea

Volume 4, Number 1

Cnidaria: Hydrozoa: Thecatae

Thecates

Flora and Fauna of Korea

National Institute of Biological Resources
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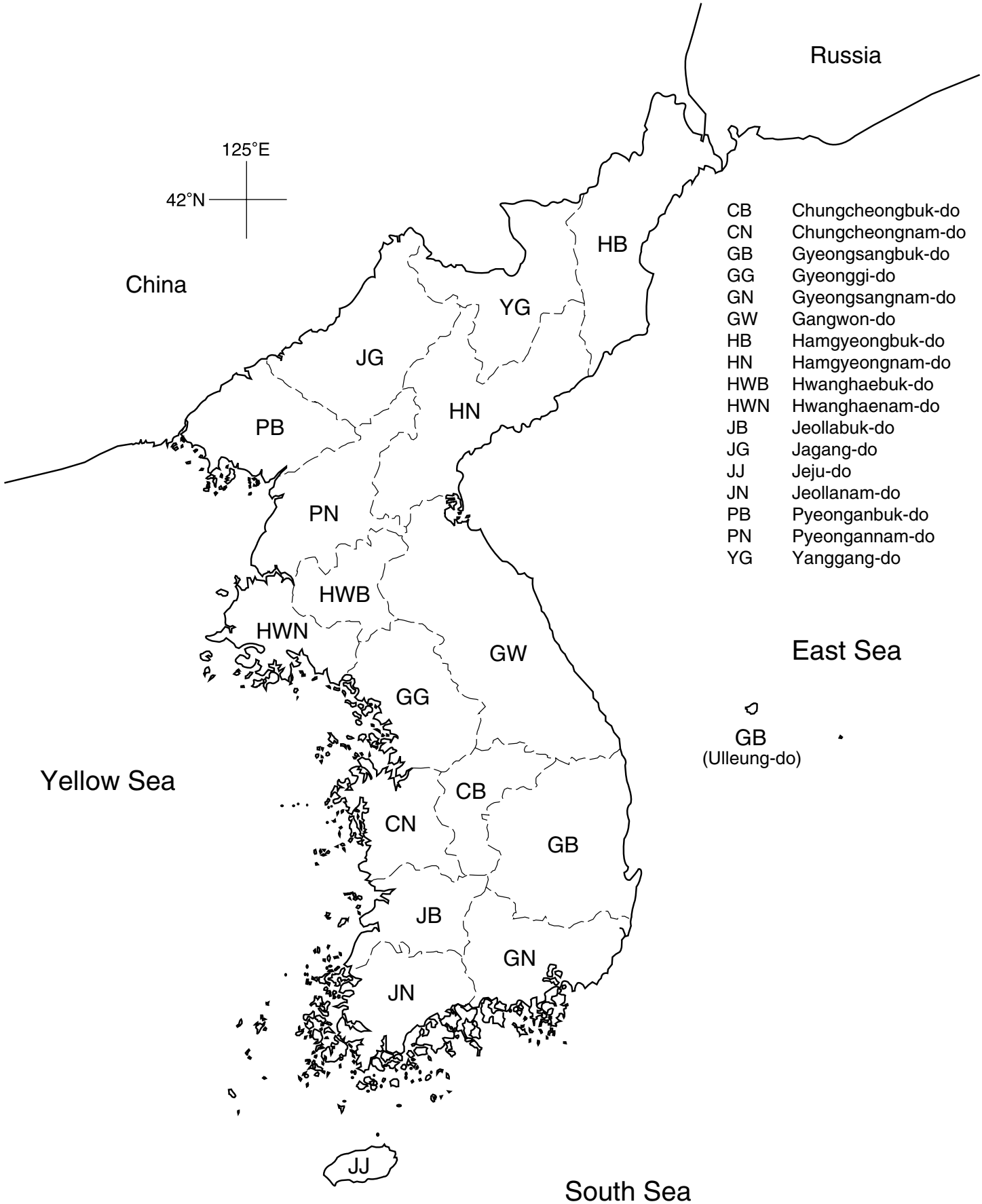
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JJ Jeju-do
JN Jeollanam-do
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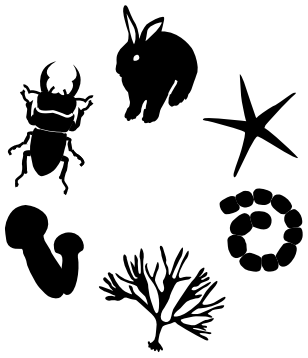

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The Flora and Fauna of Korea logo was designed to represent six major target groups of the project including vertebrates, invertebrates, insects, algae, fungi, and bacteria. The book cover and the logo were designed by Jee-Yeon Koo.

Preface

In the wake of the Convention on Biological Diversity (CBD), which recognized national sovereignty over indigenous biological and genetic resources when adopted in 1992, countries around the world have been putting their best foot forward in unearthing raw biological materials reckoned as one of the crucial resources upon which national competitiveness depends to a great extent in the 21st century. Being well aware of the priority of securing and managing biological resources, the National Institute of Biological Resources (NIBR) under the Korean Ministry of Environment decided to issue *the Flora and Fauna of Korea* in an attempt to attain systematic management and comprehensive conservation of biological resources at the national level.

Endowed with diverse landscapes involving a wide range of topographic conditions, Korea is acclaimed as one of the nations with high levels of biological diversity. Purporting to establish a thorough record on national indigenous species, the NIBR embarked on the publication of *the Flora and Fauna of Korea* in Korean and English detailing those species inhabiting the Korean peninsula in 2006. Our dedication to research during the past three years led by a group of professionals in the field of systematics finally came to fruition with issuance of the first of a kind monograph for Korean animals, fungi and algae encompassing approximately 1,037 species in 158 families belonging to 9 phyla.

It is my firm belief that this very first national *the Flora and Fauna of Korea* is indeed the culmination of our persevering scientific research efforts aimed at deepening our understanding on native species and acutely identifying Korean biota. It will not only serve as an important initiative for sustainable biodiversity conservation but also a catalyst for rational and far-sighted use of biological resources.

I would like to extend my utmost gratitude to the team of over 29 professors and associated experts headed by Prof. Sook Shin of Sahmyook University for their unsparing efforts in producing this groundbreaking work. I earnestly hope that on-going publication of *the Flora and Fauna of Korea* initiated by the Ministry of Environment will significantly contribute to unveiling all Korean native species estimated up to 100,000 and expanding wise utilization of beneficial indigenous resources.

Chong-chun Kim, Ph. D.
President
NIBR

Contents

List of Taxa

- Phylum Cnidaria Hatschek, 1888
  - Class Hydrozoa Huxley, 1856
    - Order Thecatae Fleming, 1828
      - Family Campanulinidae Hincks, 1868
        - Genus *Calycella* Allman, 1864
          - *Calycella syringa* (Linné, 1767)
        - Genus *Modeeria* Forbes, 1848
          - *Modeeria rotunda* (Quoy and Gaimard, 1827)
      - Family Haleciidae Hincks, 1868
        - Genus *Halecium* Oken, 1815
          - *Halecium beanii* (Johnston, 1838)
          - *Halecium magellanicum* (Hartlaub, 1905)
          - *Halecium pusillum* (M. Sars, 1857)
          - *Halecium tenellum* Hincks, 1861
        - Genus *Hydrodendron* Hincks, 1874
          - *Hydrodendron armata* (Totton, 1930)
          - *Hydrodendron caciniformis* (Ritchie, 1907)
          - *Hydrodendron gardineri* (Jarvis, 1922)
          - *Hydrodendron leloupi* Hirohito, 1983
      - Family Hebellidae Fraser, 1912
        - Genus *Hebella* Allman, 1888
          - *Hebella scandens contorta* Marktanner-Turneretscher, 1890
        - Genus *Scandia* Fraser, 1912
          - *Scandia neglecta* (Stechow, 1913)
      - Family Lafoeidae Hincks, 1868
        - Genus *Acryptolaria* Norman, 1875
          - *Acryptolaria conferta* (Allman, 1877)
        - Genus *Filellum* Hincks, 1868
          - *Filellum serratum* (Clarke, 1879)
        - Genus *Grammaria* Stimpson, 1854
          - *Grammaria abietina* (M. Sars, 1850)
        - Genus *Lafoea* Lamouroux, 1821
          - *Lafoea dumosa* (Fleming, 1828)
        - Genus *Zygophylax* Quelch, 1885
          - *Zygophylax biarmata* Billard, 1905
      - Family Campanulariidae Johnston, 1836
        - Genus *Campanularia* Lamarck, 1816
          - *Campanularia caliculata* Hincks, 1853
          - *Campanularia crenata* (Hartlaub, 1901)
          - *Campanularia groenlandica* Levinsen, 1893

Campanularia platycarpa (Bale, 1914)
Genus *Clytia* Lamouroux, 1812
Clytia gracilis (M. Sars, 1851)
Genus *Obelia* Peron and Lesueur, 1809
Obelia bicuspidata (Clarke, 1875)
Obelia dichotoma (Linnaeus, 1758)
Obelia flexuosa (Hincks, 1861)
Obelia geniculata (Linnaeus, 1758)
Genus *Rhizocaulus* Stechow, 1919
Rhizocaulus verticillatus (Linnaeus, 1758)

Family Sertulariidae Hincks, 1868
Subfamily Sertomminae Stechow, 1920
Genus *Diphasia* L. Agassiz, 1862
Diphasia palmata Nutting, 1905
Genus *Dynamena* Lamouroux, 1812
Dynamena crisioides (Lamouroux, 1824)
Dynamena quadridentata (Ellis and Solander, 1786)
Genus *Salacia* Lamouroux, 1816
Salacia desmoides (Torrey, 1902)
Subfamily Sertularinae Stechow, 1920
Genus *Abietinaria* Kirchenpauer, 1884
Abietinaria filicula (Ellis and Solander, 1786)
Genus *Amphisbetia* L. Agassiz, 1862
Amphisbetia pacifica Stechow, 1931
Genus *Sertularella* Gray, 1848
Sertularella areyi Nutting, 1904
Sertularella diaphana (Allman, 1885)
Sertularella distans (Allman, 1877)
Sertularella gayi (Lamouroux, 1827)
Sertularella gigantea Mereschkowsky, 1878
Sertularella gotoi Stechow, 1913
Sertularella levigata Stechow, 1931
Sertularella mirabilis Jäderholm, 1896
Sertularella miurensis Stechow, 1921
Sertularella obtusa Stechow, 1931
Sertularella quinquelaminata Stechow, 1931
Sertularella sinensis Jäderholm, 1896
Sertularella tenella Alder, 1856
Sertularella tongensis Stechow, 1919
Genus *Sertularia* Linnaeus, 1758
Sertularia dalmasi (Versluys, 1899)
Sertularia hattorii Leloup, 1940
Sertularia turbinata (Lamouroux, 1816)
Genus *Symplectoscyphus* Marktanner-Turneretscher, 1890
Symplectoscyphus hozawai Stechow, 1931

Genus *Thuiaria* Fleming, 1828
Thuiaria argentea (Ellis and Solander, 1786)
Thuiaria articulata (Pallas, 1766)
Thuiaria cornigera Kudelin, 1914

Family Plumulariidae L. Agassiz, 1862
Subfamily Halopterinae Millard, 1962
Genus *Antennella* Allman, 1877
Antennella africana Broch, 1914
Antennella integerrima (Jäderholm, 1896)
Antennella secundaria (Gmelin, 1789)
Genus *Halopteris* Allman, 1877
Halopteris constricta Totton, 1930
Genus *Monotaechas* Allman, 1877
Monostaechas quadridens (McCrady, 1858)
Subfamily Kirchenpaueriinae Stechow, 1921
Genus *Pycnotheca* Stechow, 1919
Pycnotheca mirabilis (Allman, 1883)
Subfamily Plumulariinae Kuhn, 1913
Genus *Dentitheca* Stechow, 1919
Dentitheca hertwigi (Stechow, 1907)
Genus *Nemertesia* Lamouroux, 1812
Nemertesia antennina (Linnaeus, 1758)
Nemertesia ciliata Bale, 1914
Genus *Plumularia* Lamarck, 1815
Plumularia filicaulis japonica Jädeholm, 1919
Plumularia obliqua (Johnston, 1847)
Plumularia setacea (Linnaeus, 1758)
Plumularia spinulosa Bale, 1882
Plumularia spiralis Billard, 1911
Plumularia undulata Yamada, 1950
Subfamily Aglaopheniinae Stechow, 1911
Genus *Aglaophenia* Lamouroux, 1812
Aglaophenia pluma (Linnaeus, 1758)
Aglaophenia suensonii Jäderholm, 1896
Aglaophenia whiteleggei Bale, 1888
Genus *Gymnangium* Hincks, 1874
Gymnangium hians (Busk, 1852)
Genus *Haliaria* Stechow, 1921
Haliaria vegae (Jäderholm, 1903)
Genus *Lytocarpus* Allman, 1883
Lytocarpus philippinus (Kirchenpauer, 1872)
Genus *Machrorhynchia* Kirchenpauer, 1872
Macrorhynchia phoenicea (Busk, 1852)
Genus *Thecocarpus* Nutting, 1900
Thecocarpus niger Nutting, 1906

Introduction

The hydroids belong to the class Hydrozoa of the phylum Cnidaria. Most of them are marine and widely distributed in the coasts and deep waters of the temperate and tropical oceans. Their life cycle consists of asexual polyp and sexual medusa stages. However the name hydroids refer to the polyp stage which are attached on algae, shells, rocks and other invertebrates or other hard substratums, and live together with algae and other invertebrates. About 2700 hydroid species were known worldly.

The early taxonomic studies on the hydroids in Korean waters, include in 1941, the Japanese Kamita and Sato preliminary report on four species without their descriptions in the J. Chosen Nat. Hist. Soc. as the title "marine fauna at Jinsen(Incheon) Bay, Corea". And then in all 152 species/subspecies of 19 families in three orders so far were reported in Korean waters by Rho (1967, 1969), Rho and Chang(1972, 1974), Rho and Park(1979, 1980, 1983, 1984, 1986), Park and Rho(1986), Park(1988, 1990, 1991, 1992, 1993, 1995, 1997, 1998a, 1998b, 1999, 2007, 2009).

This monograph deals with 77 species/subspecies of 39 genera in families with the keys of families, genera and species of Korea. The orders of seven families and subfamilies are from Millard (1975) and Hirohito(1995) and genera and species are arranged in alphabetical sequence within the families.

Materials and Methods

The specimens used for this monograph were collected from the islands and coasts of the Korean Pennisula during years from 1970 to 2008. They were deposited in the Department of Life Science, College of Natural Sciences, The University of Suwon. Among them up to date the unidentified specimens were identified on the basis of the morphological characters. The fresh specimens which were recently collected, or preserved ones collected at long times ago were used for photographs. The permanent specimens of them were prepared for light microscope photographs (Nikon Microscope ECLIPSE 80i) and parts of small colonies were photographed under the stereomicroscope (Nikon SMG-U), and the large complete colonies were photographed with a Canon EOS 300D camera.

Methods for Staining and Preparation of Permanent Specimens

1. Prepare the following apparatus: slide and cover glasses, scissors, light microscope, borax, acetic acid, distilled water, alcohol, xylene, canada balsam, alcohol lamp, filter paper.
2. Boil the mixture of 4 g borax, 2 g carmine, 100 ml distilled water, and than cool it.
3. Pour 100 ml absolute alcohol to solution 2 and filter this solution with filter paper.
4. Titrate three or four drops of acetic acid to solution 3 (stock sol.).
5. Dilute two times of stock sol. with 80% alcohol, and stain the specimens in this solution until pink.
6. Titrate one or two drops of acetic acid to 50–70% alcohol and transfer the above stained specimens to former alcohol solution for 20–30 minutes.
7. Dehydrate in 80% alcohol for several changes of solution.
8. Dehydrate in 90% alcohol for 20–30 minutes.
9. Dehydrate in 100% alcohol for 30–60 minutes.
10. Clear the dehydrated stained specimens in xylen.
11. Mount the stained clear specimens in Canada balsam.

Taxonomic Notes

Phylum Cnidaria Hatschek, 1888

Ja-po-dong-mul-mun (자포동물문)

A body radial symmetry or biradial symmetry, two germ layer animal. The life cycle consists sessile polyp stage and free swimming medusa stage. They have cnidae. Reproduction is sexual and asexual, zygote developed into planula larva.

Class Hydrozoa Huxley, 1856

Hi-deu-ra-chung-gang (히드라충강)

Most marine, formed colony. The life cycle consists sessile polyp stage and free swimming medusa stage. Polyp consists hydrorhiza, hydrocaulus and hydranth. This class divided into Thecatae and Athecatae. Medusa bell or umbrella-shaped, mostly small and with velum.

Order Thecatae Fleming, 1828

Keop-hi-deu-ra-chung-mok (컵히드라충목)

Hydranth with a hydrotheca and a whorl of filiform tentacles. Gonophores in gonotheca, in the form of fixed sporosacs or free medusa. Medusae usually flat or hemispherical. Gonads developed on radial canals but sometimes on stomach. Umbrella margin with statocysts or ocelli.

Key to the families of order Thecatae

1. Hydrotheca with or without marginal teeth ····· 2
− Hydrotheca without marginal teeth ····· 3
2. Hydrotheca with operculum ····· Sertulariidae
− Hydrotheca without operculum ····· 4
3. Nemaththeca absent ····· Hebellidae
− Nematotheca present or absent ····· 5
4. Nematotheca present ····· Plumulariidae
− Nematotheca absent ····· Campanulariidae
5. Hydrotheca shallow saucer- or basin shaped ····· Haleciidae
− Hydrotheca tubular shaped ····· 6
6. Hydrotheca with operculum ····· Campanulinidae
− Hydrotheca without operculum ····· Lafoeidae

Family Campanulinidae Hincks, 1868

Ja-geun-jong-hi-deu-ra-gwa (작은종히드라과)

Colony small, stolonial or sympodially branched stems. Hydrotheca deep cylindrical and without marginal teeth, with a conical or roof-shaped operculum of covering segments which may or may not be sharply demarcated from margin, with or without a diaphragm (Fig. 1). Hydranth slender and extensile, completely retractable into hydrotheca, with conical hypostome. Nematophores present or absent. Gonophores in the form of fixed sporosacs or free medusa.

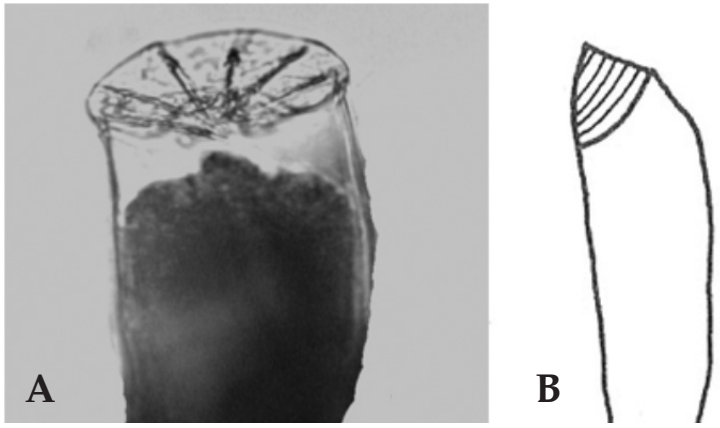

Fig. 1. Opercular type of hydrotheca. A. *Calycella syringa*, operculum consists of four more segments; B. *Modeeria rotunda*, operculum consists with two pleated membraines which meet one another like a gable of a roof.

Genera 15 (2 in Korea), species 63 (2 in Korea).

Key to the genera of family Campanulinidae

1. Operculum consists with two pleated membraines which meet one another like a gable of a roof ····· *Modeeria*
− Operculum consists of four more segments ····· *Calycella*

Genus *Calycella* Allman, 1864

Yeon-tong-hi-deu-ra-sok (연통히드라속)

Calicella Hincks, 1861.

Colony stolonial, Hydrotheca pedicellate and free, deep and tubular. Margin crenulate. Operculum

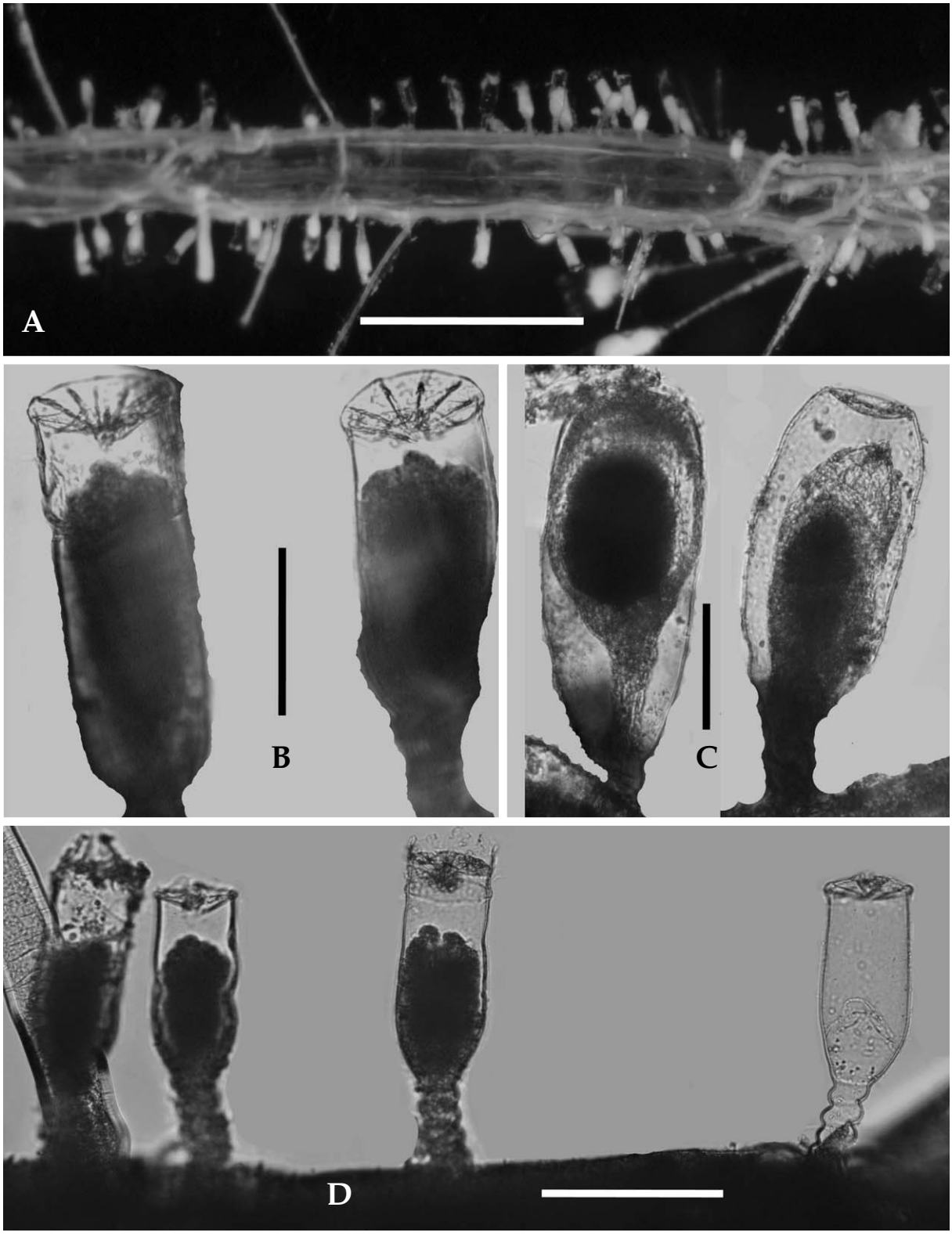

Fig. 2. *Calycella syringa*. A. colony; B, D. hydrothecae; C. gonothecae. Scales: A=1 mm, B, C=100 μm, D=200 μm.

of many covering segments, which do not quite meet in the centre, and which are clearly demarcated from the hydrothecal wall by a sharp and sometimes raised edge. No nematothecae. Gonophores in the form of fixed sporosacs.

Type species: *Sertularia syringa* Linné, 1767.

Species 4 (1 in Korea).

1. *Calycella syringa* (Linné, 1767) (Fig. 2)

Yeon-tong-hi-deu-ra (연통히드라)

Sertularia syringe Linné, 1767, p. 1311 (not seen).

Calycella syringa: Nutting, 1901, p. 355, fig. 47; Billard, 1904, p. 165; Bedot, 1910, p. 249; 1911, p. 219; 1912, p. 261; 1916, p. 59; 1918, p. 79; 1925, p. 107; Kramp, 1911, p. 384, pl. 24, figs. 7–14; Stechow, 1912, p. 357; 1913b, p. 125, 1919, p. 76; 1923a, p. 9; Leloup, 1933, p. 6; 1937b, p. 26; 1938, p. 2; 1940, p. 8; 1947, p. 19; 1960, p. 220; Hummelinck, 1936, p. 49; 1954, p. 160; Vervoort, 1946, p. 340; 1949, p. 149; 1972, p. 36; Yamada, 1950, p. 9; 1959, p. 45; Hamond, 1957, p. 308; Hirohito, 1969, p. 12; Rho and Park, 1980, p. 22, pl. 4, figs. 5–8; Park, 1992, p. 286.

Colony small, creeping on other hydroids, not branched. Hydrotheca arising from stolon, cylindrical, about 3–5 times as long as wide, with short annulated pedicel, without teeth, operculum of 6–10 triangular flaps which are retracted into the hydrotheca or protruded. Gonotheca arising from stolon, ovoid, with short annulated pedicel, which were found in April.

The measurements of the specimen from Mipo.are as follows (μm).

Hydrotheca, total length	234–350
maximum diameter	29–73
Hydrothecal pedicel, length	44–102
maximum diameter	29–73
Gonotheca, total length	248–292
maximum diameter	146–175
Colony, length	500–800

Distribution: Cosmopolitan.
Korea: GW, GN.
Specimen examined: GW: (Jumunjin: 26.vi.1988), GN: (Mipo: 18.iv.1978).
Ecology: This species is attached on other hydroids inhabiting the subtidal zone.

Genus *Modeeria* Forbes, 1846

Ja-geun-jong-hi-deu-ra-sok (작은종히드라속)

Tiaranna Hartlaub, 1914.

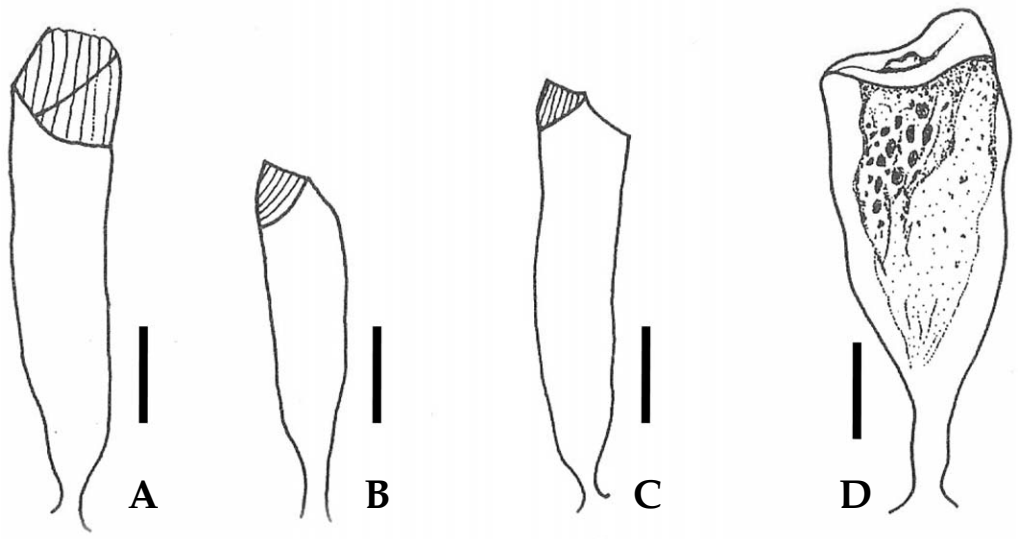

Fig. 3. *Modeeria rotunda*. A–C. hydrothecae; D. gonotheca (cited from Park, 1988). Scales: A–C=500 μm, D=400 μm.

Colony stolonial. Hydrotheca pedicellate, deep and tubular, with margin produced on two sides. Operculum of two longitudinally pleated membranes seated in embayment of margin and meeting one another like a gable. No diaphragm and no nematotheca. Gonotheca similar to hydrotheca.

Type species: *Dianaea rotunda* Quoy and Gaimard, 1827.

Species 2 (1 in Korea).

2. *Modeeria rotunda* (Quoy and Gaimard, 1827) (Fig. 3)

Dung-geun-ja-geun-jong-hi-deu-ra (둥근작은종히드라)

Dianaea rotunda Quoy and Gaimard, 1827, p. 181, pl. 6A, figs. 1, 2 (not seen).
Stegopoma fastigiatum: Stechow, 1914, p. 135, fig. 9; Totton, 1930, p. 155, fig. 11; Fraser, 1944, p. 178, pl. 32, fig. 153a–c; Ralph, 1957, p. 850, text-fig. 8n–o.
Modeeria rotunda: Millard, 1975, p. 137, fig. 45A; Park, 1988, p. 61, figs. 5, 6; Park, 1992, p. 286.

Colony epizootic on other hydroids (*Corhiza* sp.). Hydrorhiza stolonial, giving rise to solitary, pedicellate hydrothecae and gonothecae. Hydrotheca with smooth pedicel, variable in size, tube-shaped, operculum consisted of two plicated membranes, like a gable of roof. Gonotheca arising from stolon, resemble hydrotheca, with short and smooth pedicel.

The measurements of the specimen from Ulleungdo Island (Dodong) are as follows (μm).

Hydrotheca, total length	460–1060
diameter at margin	250–330
length of pedicel	240–390

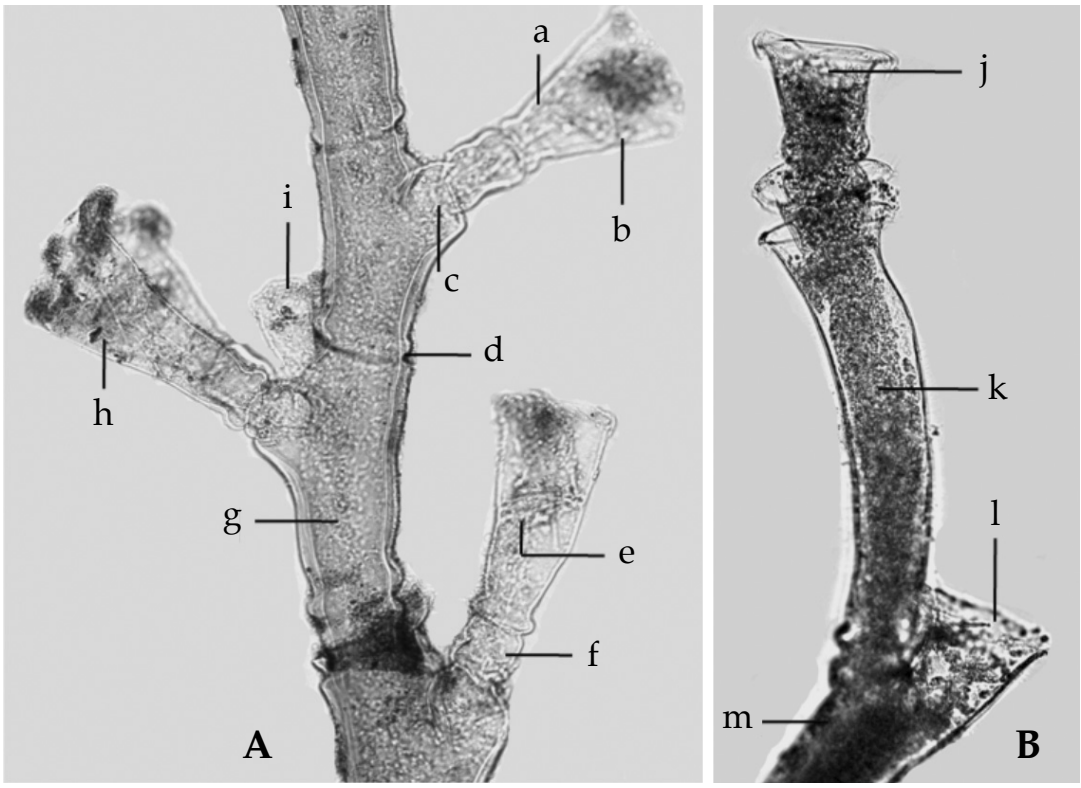

Fig. 4. Structure of Haleciidae. A. *Hydrodendron leloupi* (a. adcauline wall; b. hydrotheca; c. apophysis; d. node; e. diaphragm; f. hydrothecal pedicel; g. internode; h. abcauline wall; i. nematotheca); B. *Haleciun tenellum* (j. diaphragm; k. 2nd hydrotheca; l. first hydrotheca; m. hydrothecal pedicel).

diameter of pedicel ····· l90–180

Distribution: Korea, Japan, Straits of Gibraltar (type locality), Shetland Is., Chatham, Trondheim, off North Carolina, Dry Tortugas, Marthas Vinyard, George Bay, Three Kings Is., Cook Strait, South Africa (from Natal to Moçambique).

Korea: GB.

Specimen examined: GB: (Ullungdo Dodong: 25.vii.1976).

Ecology: This species is attached on other hydroids inhabiting in the subtidal zone.

Remarks: The size of the hydrothecae and length of their pedicel are variable.

Family Haleciidae Hincks, 1868

Mu-nui-hi-deu-ra-gwa (무늬히드라과)

Hydrotheca shallow saucer- or basin-shaped, radially symmetrical, without teeth, operculum and with diaphragm. Hydranth very large and usually not completely retractable into hydrotheca, with

conical hypostome and one circle of filiform tentacles (Fig. 4). Nematophore present or absent. Gonophore in the form of fixed sporosacs, or rarely free medusa.

Genera 13 (2 in Korea), species 179 (10 in Korea).

Key to the genera of family Haleciidae

1. Without nematotheca ····· *Halecium*
– With nematotheca ····· *Hydrodendron*

Genus *Halecium* Oken, 1815

Mu-nui-hi-deu-ra-sok (무늬히드라속)

Colony with sympodial growth. Stem and branch divided into internodes, each internode bearing a hydrotheca. Hydrotheca arranged in alternate, sessile or pedicellate, shallow basin- or saucer-shaped, with delicate diaphragm generally, a ring of refringent nodules above it and regeneration common, resulting in tiers of secondary hydrothecae growing from within the primary hydrotheca. Hydranth large. Nematotheca absent. Gonotheca solitary, male and female dissimilar and on separate colonies.

Type species: *Sertularia halecina* Linnaeus, 1758.

Species 104 (6 in Korea).

Key to the species of genus *Halecium*

1. Stem very slender ····· *H. tenellum*
– Stem not slender ····· 2
2. Stem and branch annulated throughout ····· *H. pusillum*
– Stem and branch without annulations ····· 3
3. Hydrotheca cup shaped ····· *H. magellanicum*
– Hydrotheca saucer shaped ····· *H. beanii*

3. *Halecium beanii* (Johnston, 1838) (Fig. 5)

Dung-geun-mu-nui-hi-deu-ra (둥근무늬히드라)

Thoa beanii Johnston, 1838, p. 120, pl. 7, figs. 1, 2 (not seen).

Halecium beani: Fraser, 1944, p. 186, pl. 7, fig. 160; Naumov, 1960 (tanslated in 1969), p. 483, fig. 336A; Park, 1991, p. 544; 1993, p. 286; 1995, p. 265.

Halecium beanii: Hincks, 1868, p. 224; Ralph, 1958, p. 332, fig. 10b, e–k; Vervoort, 1959, p. 224, fig. 6; 1964, p. 103, fig. 3; 1972, p. 30, figs. 6, 7; Millard, 1975, p. 144, fig. 47A–E; Park, 1990, p. 76, fig. 3A–C; Park, 1995, p. 10.

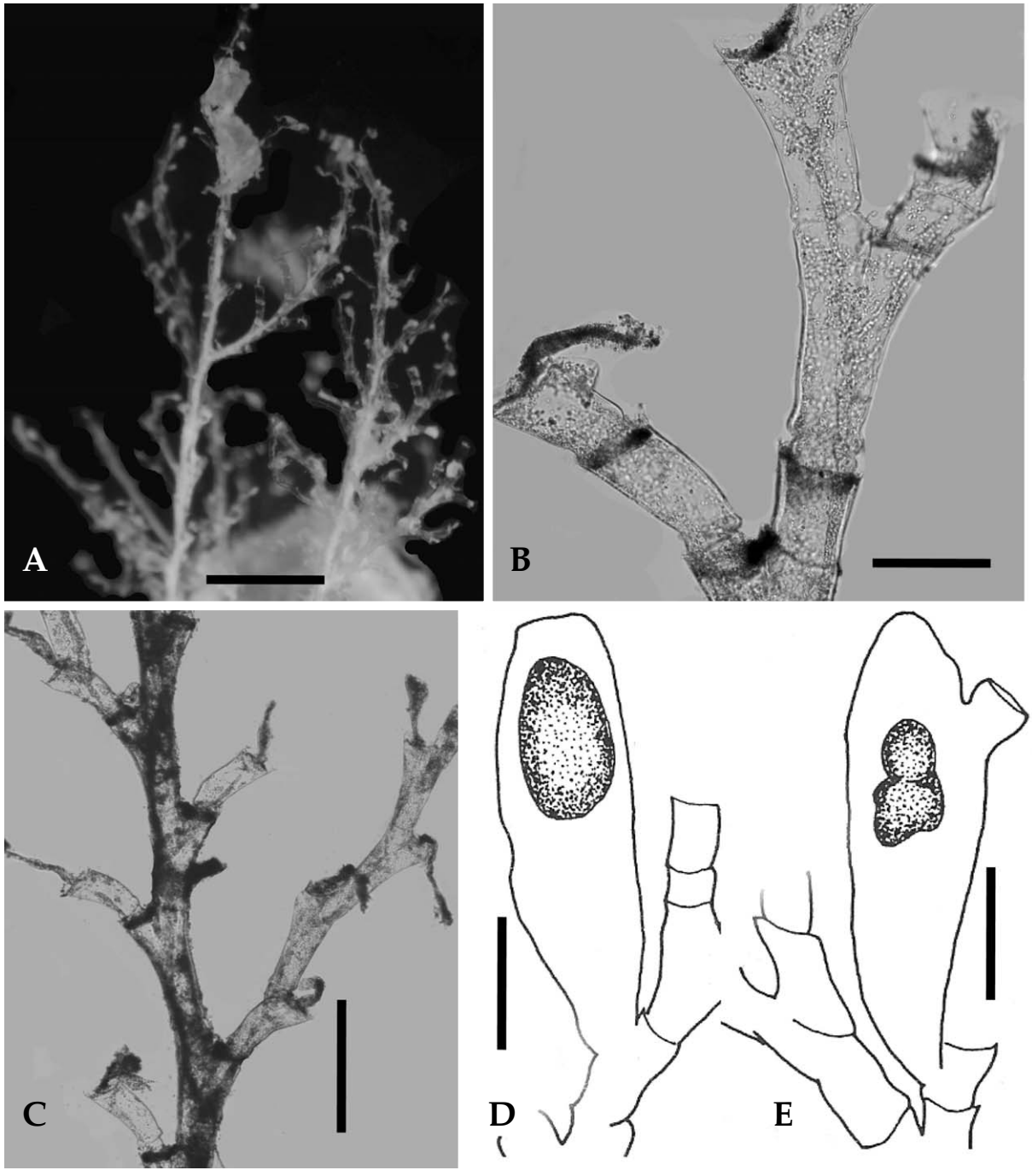

Fig. 5. *Halecium beanii*. A. colony; B, C. parts of colony; D. male gonotheca (cited from Park, 1990); E. female gonotheca (cited from Park, 1990). Scales: A=1 mm, B=200 μm, C=500 μm, D, E=400 μm.

Colony shrub-shaped, attending 5–25 mm in height. Stem stiff and fascicled at base, but distal part monosiphonic, branching irregularly or in roughly alternate manner, divided into internodes in variable size, each internode giving rising to a hydrotheca from an apophysis at distal end. Branches

arising from below or with in hydrothecae, similar to stem. Primary hydrotheca sessile and secondary hydrothecae pedicellate. Pedicel commonly with a constriction above the origin, gibbous above this, then narrowed and then widening gradually to distal end. Hydrotheca of third or fourth order of the same structure as the secondary ones. Hydrotheca shallow, widening to margin, which is not everted, diaphragm delicate, with a ring of nodules above it. Gonotheca arising from the branches, elongate. Female gonotheca with an aperture at end of small tube, but male one without aperture and small tube.

The measurements of the specimen from Seogwipo are as follows (μm).

Hydrotheca, total length ····· 18–36
diameter of mouth ····· 127–145
length of pedicel ····· 127–220
diameter of proximal ····· l90–110
Stem, length of internode ····· 360–400
diameter of node ····· 110
Gonotheca, total length ····· 1400–1500
maximum diameter ····· 400–430
Colony, total length ····· 5–25 mm

Distribution: Cosmopolitan. Type locality: near Scarborough, England. But the species predominates in sub-Arctic, sub-Antarctic and temperate waters.

Korea: GN, JN, JJ.

Specimen examined: GN: (Mipo: 15.vii.1974), JN: (Jindo: 23.vii.1994), JJ: (Seogwipo: 13.vii.1979); (Hoenggando: 9.viii.1969).

Ecology: This species is attached on other hydroids inhabiting in the subtidal zone.

Remarks: *Halecium beanii* is similar to *Halecium halecium* (Linnaeus, 1758) reported by Millard (1975) in trophosome structure, but it is distinguished from latter by the female gonotheca bearing a terminal aperture on the adcauline side. This species attached on algae inhabiting in the subtidal zone.

4. *Halecium magellanicum* (Hartlaub, 1905) (Fig. 6)

Ma-jel-lan-mu-nui-hi-deu-ra (마젤란무늬히드라)

Plumularia magellanicum Hartlaub, 1905, p. 684, figs. N, D.
Halecium magellanicum: Linko, 1911, p. 15, fig. 2; Yamada, 1950, p. 6, pl. 1, figs. 3, 4; 1959, p. 34; Park, 1995, p. 10, fig. 1A–D.

Colony small, below 10 mm in height, arising from rather thick stolon creeping on sea weed or *Mytilus* shells. Stem not fascicled, with one to three annulations in proximal, divided into regular internodes, each of which bears a short branch or hydrotheca on distal end, sometimes giving off secondary branches on distal end of hydrothecal pedicel. Hydrotheca cup-shaped. Gonangium from hydrorhiza and stem, with corrugation on gonothecal wall, truncated distal end, and with short smooth pedicel.

The measurements of the specimen from Jeopdo are as follows (μm).

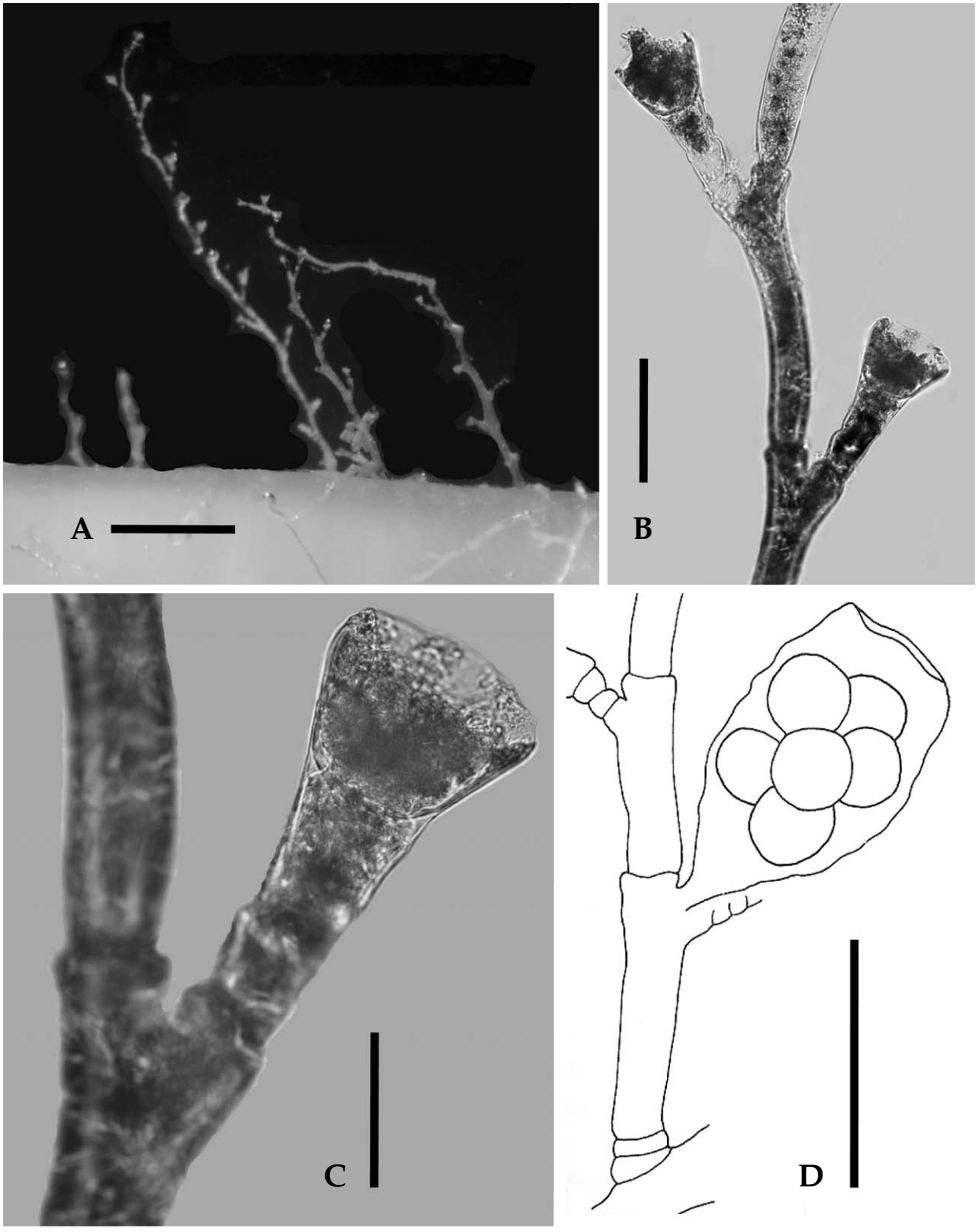

Fig. 6. *Halecium magellanicum*. A. colony; B. part of colony; C. hydrotheca; D. gonotheca (cited from Park, 1995). Scales: A=1 mm, B=200 μm, C=100 μm, D=500 μm.

Stem, length of internode ····· 310–400
diameter ····· 90–100
Hydrotheca, length ····· 80–110
diameter of margin ····· 130–150
diameter of base ····· 70
length of pedicel ····· 90–110
Gonotheca, length ····· 620–630
diameter of margin ····· 160–170

Distribution: Korea, North polar regions of the world and Japan (Akkeshi Bay).
Korea: JN.
Specimen examined: JN: (Jindo Jeopdo: 23.vii.1994).
Ecology: This species attached on algae inhabiting in the subtidal zone.
Remarks: Branches are variable in length and structure. Some ones consist of one short segment and the others several segments which are irregular in length.

5. *Halecium pusillum* (M. Sars, 1857) (Fig. 7)

Ja-geun-mu-nui-hi-deu-ra (작은무늬히드라)

Eudendrium pusillum M. Sars, 1857, p. 154, figs. 14–16.
Halecium pusillum: Stechow, 1919, p. 36, fig. F; Gili et al., 1984, p. 413, fig. 113; Gili and Garcia, 1985, p. 39, fig. 2D, H; Park, 1990, p. 76, fig. D–F; 1992, p. 286; 1993, p. 265.

Colony very small, below 10 mm in height, arising from hydrorhiza creeping on algae. Main stem monosiphonic, giving rise to branches irregularly, divided into irregular internodes, each internode with several annulations at base. Hydrotheca sessile, secondary hydrotheca movable, pedicellate, diaphragm delicate, with commonly a row of nodules above it. Gonotheca very large compared with hydrotheca, elongate oval-shaped, with short pedicel, arising from hydrothecal pedicel.

The measurements of the specimen from Seogwipo are as follows (μm).

Stem, length of internode ····· 500–650
maximum diameter ····· 75–95
Hydrotheca, length ····· 30
diameter of margin ····· 120–140
diameter of base ····· 60–80
length of pedicel ····· 170–230
Gonotheca, length ····· 480
maximum diameter ····· 150

Distribution: Korea, Villefranche bei Nizza, Monaco harbour, Ajaccio, Corsica, d'Ecdoume bei Marseille, Majorque, Medes Islands.
Korea: JJ.
Specimen examined: JJ: (Seogwipo: 15.iv.1975).
Ecology: This species attached on corallines in coastal waters.

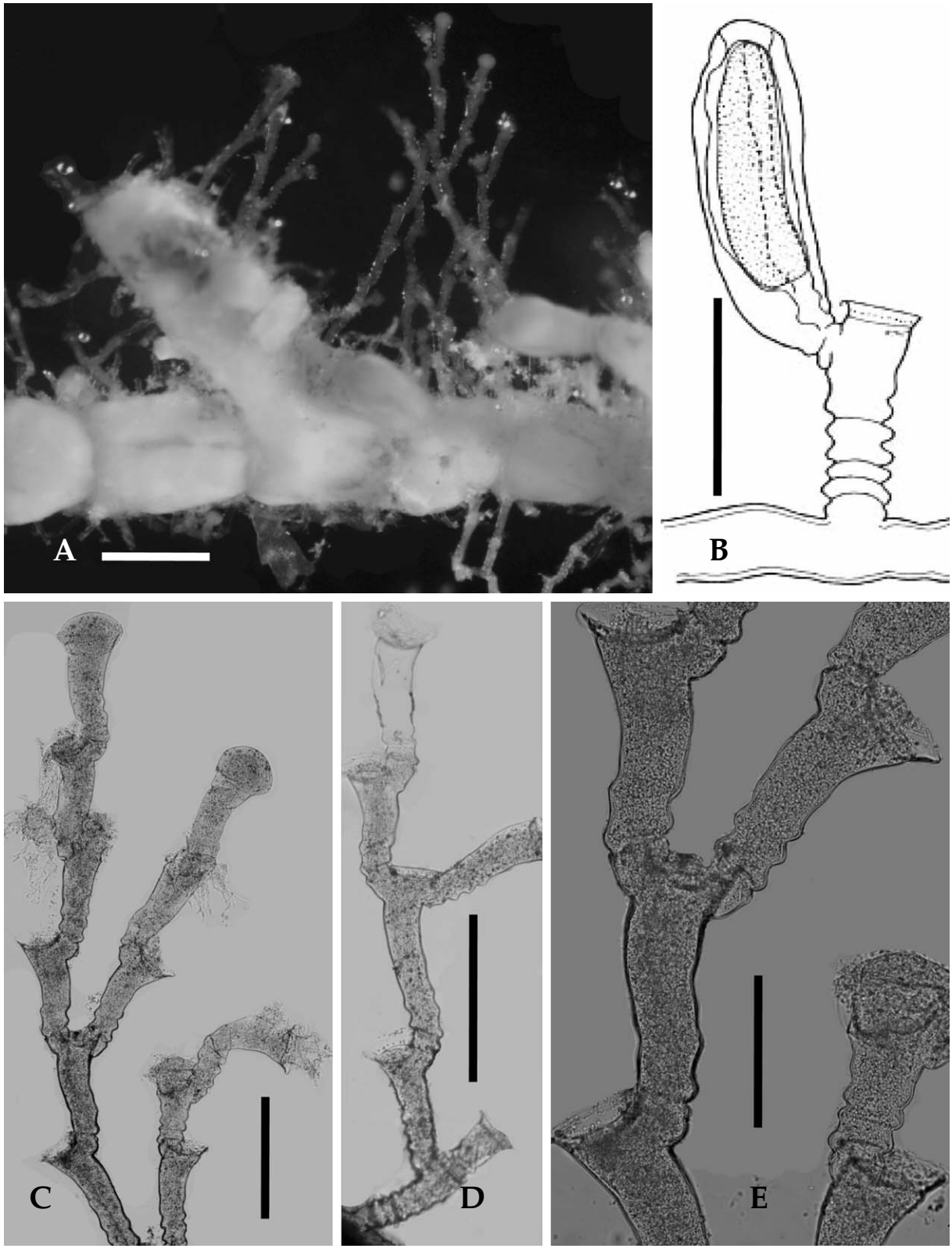

Fig. 7. *Halecium pusillum*. A. colony; B. gonotheca (cited from Hirohito, 1995); C–E. parts of colony. Scales: A=1 mm, B=250 μm, C, D=500 μm, E=200 μm.

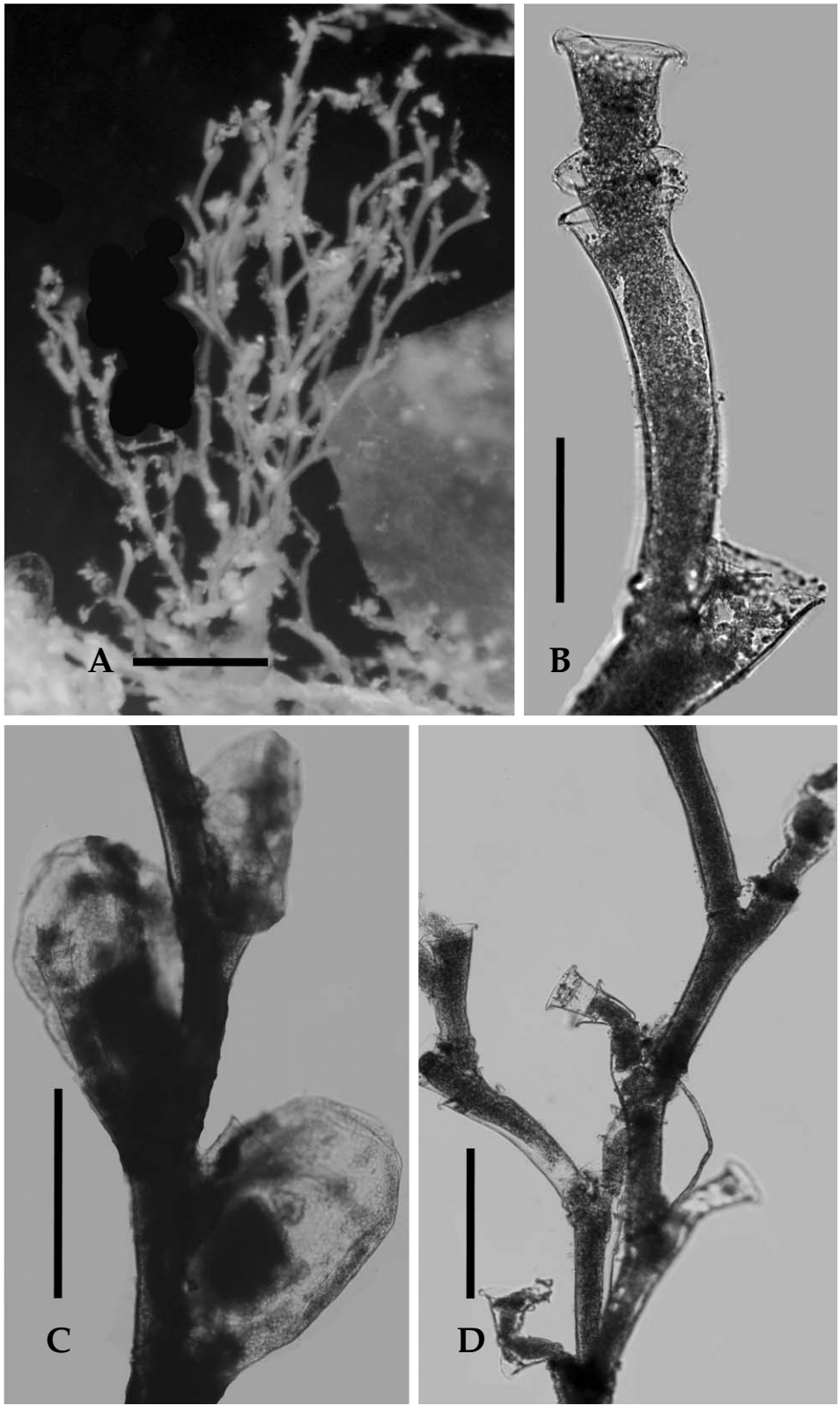

Fig. 8. *Halecium tenellum*. A. colony; B. hydrothecae; C. gonothecae; D. part of colony. Scales: A=1 mm, B=100 μm, C, D=500 μm.

Remarks: The small colony, large gonotheca and the distinct annulations of the proximal part of each internode are characteristics in this species.

6. *Halecium tenellum* Hincks, 1861 (Fig. 8)

Ga-neun-mu-nui-hi-deu-ra (가는무늬히드라)

Halecium tenellum Hincks, 1861, p. 252, pl. 6, figs. 1–4; 1868, p. 226, tab. 45, fig. 1; Stechow, 1919, p. 41, figs. J, K; 1923b, p. 5; Leloup, 1934, p. 7; 1935, p. 9; 1937a, p. 96; 1937b, p. 17, fig. 8; 1940, p. 7; 1947, p. 27, fig. 18; 1960, p. 220; Hamond, 1957, p. 307, fig. 14; Yamada, 1959, p. 5; Vervoort, 1959, p. 229, fig. 8; Rho and Chang, 1974, p. 136, pl. 1, figs. 1–4; Park, 1991, p. 544; 1993, p. 265; 1995, p. 11.

Colony very fine, monosiphonic, arising from creeping stolon, attaining 3–8 mm in height. Stem unfascicled, divided into irregular internodes, strongly bent in zig-zag fashion. Each internode with an annular constriction basally. Hydrotheca rather shallow. Gonotheca only arising from stolon, compressed, broad and round in shape, and with a very short stalk.

The measurements of the specimen from Seogwipo are as follows (μm).

Stem, length of internode	600–820
diameter of node	56–65
Hydrotheca, length	35–40
diameter at margin	140–170
Male gonotheca, maximum length	767
maximum diameter	398
Colony, length	3–8 mm

Distribution: Cosmopolitan.

Korea: JN, CN, JJ.

Specimen examined: JN: (Jindo: 23.vii.1994), CN: (Anmyeondo: 25.xii.1973), JJ: (Seogwipo: 25.xii. 1971); (Munseom: 1.vi.1993); (Daepo: 9.vii.1996).

Ecology: This species attached on algae inhabiting in waters about 60 m deep. Gonothecae have been observed in December.

Genus *Hydrodendron* Hincks, 1874

Na-mu-mu-nui-hi-deu-ra-sok (나무무늬히드라속)

Ophiodes Hincks, 1866.
Diplocyathus Allan, 1888.
Phylactotheca Stechow, 1913.
Ophiodissa Stechow, 1919.

Colony stolonial growth. Stem erect, divided into regular internodes. Each internode bearing a apophysis for hydrotheca near distal end. Hydrotheca pedicellate, basin or cup shaped, with delicate diaphragm, and usually a ring of refringent nodules above it. Nematophore present, enclosed in one chambered nematotheca. Gonotheca solitary or rarely aggregated into coppinia.

Type species: *Halecium gorgonoide* G.O Sars, 1874.

Species 26 (4 in Korea).

Key to the species of genus *Hydrodendron*

1. Hydrotheca sessile, gonotheca aggregated into coppinia ····· *H. armata*
– Hydrotheca pedicellate, gonotheca not aggregated into coppinia ····· 2
2. Hydrotheca funnel shaped ····· *H. gardineri*
– Hydrotheca basin shaped ····· *H. caciniformis*

7. *Hydrodendron armata* (Totton, 1930) (Fig. 9)

A-reu-ma-ta-mu-nui-hi-deu-ra (아르마타무늬히드라)

Ophiodissa armata Totton, 1930, p.143, fig. 2a.

Hydrodendron armata: Ralph, 1958, p. 341, figs. 13d–I, 14b–d; Rho and Park, 1983, p. 42, pl. 2, figs. 4, 5, pl. 3, figs. 1, 2; Park, 1990, p. 77; 1991, p. 544; 1992, p. 286; 1993, p. 265.

Colony comparatively large, stem polysiphonic, branched irregularly. Branches branched irregularly, polysiphonic. Hydrocladia arising from branchlets alternately to right and left side. Hydrocladium divided into regular internodes, monosiphonic, with hydrotheca alternating to right and left side on distal end of each internode. Hydrotheca sessile, pocket-shaped, sloped obliquely, margin smooth, without hydrothecal pedicel, all adcauline wall adhering. Nematotheca arising on proximal part of each internode, opposite hydrotheca, scattered in scapus, relatively small, sometimes not visable for destruction, saucer-shaped. Gonangiae aggregated into scapus on stem and branches, with a process straight upward or slightly backward. But gonangiae of Ralph (1958) bear a sharply backward process; this is considered as a geographical difference.

The measurements of the specimen from Seogwipo are as follows (μm).

Hydrocladium, length of internode	510–620
maximum diameter	340
Hydrotheca, total length	220–320
diameter at aperture	200–230
Gonotheca, total length (excepting process)	700–880
maximum diameter	490–510
Colony, length	85–190 mm

Distribution: Korea, New Zealand, Antarctic.

Korea: GN, JB, JJ.

Specimen examined: GN: (Tongyeong: 13.viii.2008), JB: (Eocheongdo: 25.vii.1981), JJ: (Seogwipo: 18.x.1973).

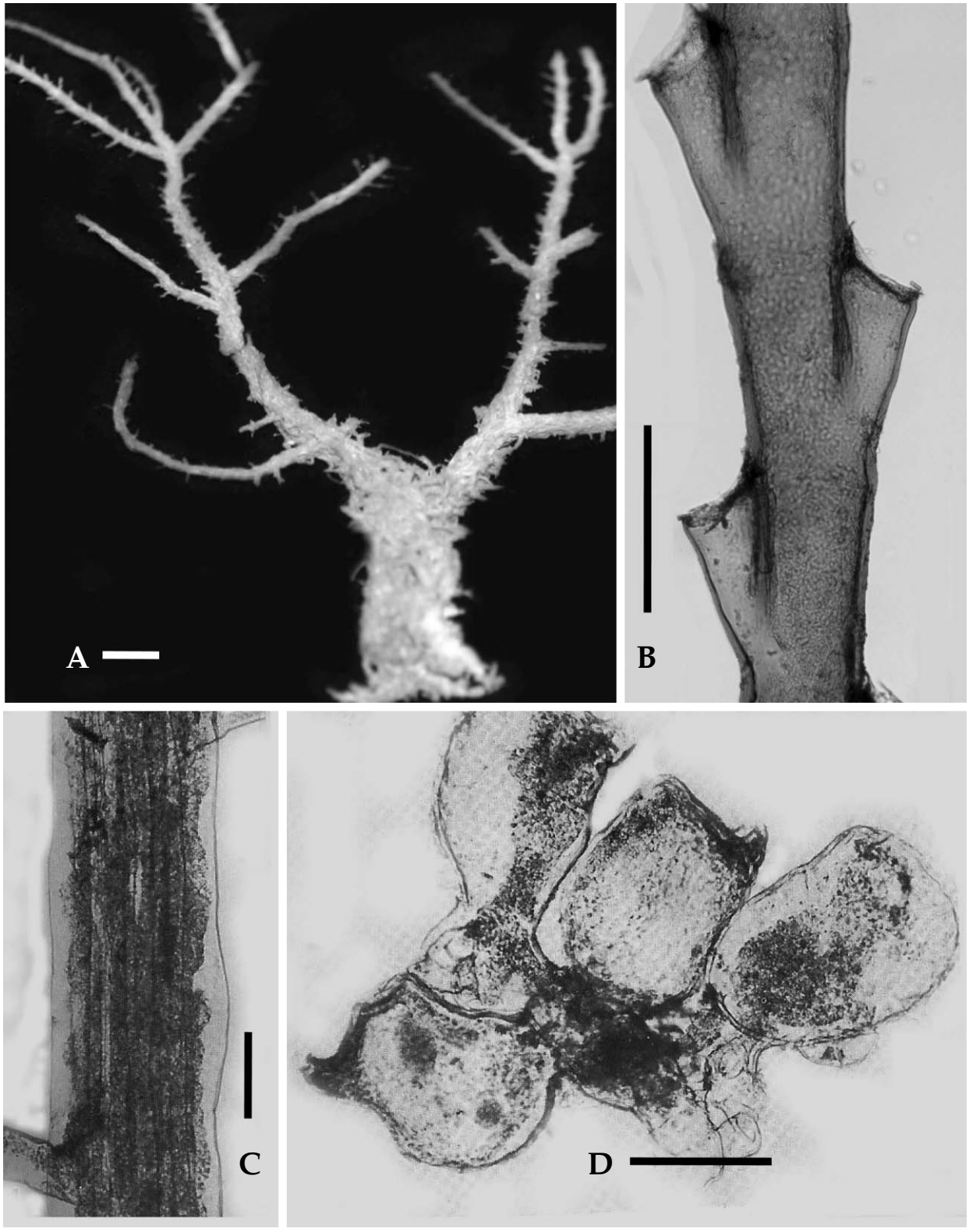

Fig. 9. *Hydrodendron armata*. A. colony; B. hydrothecae; C. polysiphonic stem; D. gonothecae (cited from Rho and Park, 1983). Scales: A=10 mm, B=500 μm, C=200 μm, D=300 μm.

Ecology: This species attached on hard substratums in waters 20–30 m deep.
Remarks: This species was originally described by Totton (1930) as *Ophiodissa armata*. The specimen of Totton from New Zealand without gonangiae but our sample with excellent gonangiae.

8. *Hydrodendron caciniformis* (Ritchie, 1907) (Fig. 10)

Ja-geun-na-mu-mu-nui-hi-deu-ra (작은나무무늬히드라)

Ophiodes caciniformi Ritchie, 1907, p. 500, pl. 23, figs. 11, 12, pl. 24, fig. 2, pl. A, fig. 5; Bedot, 1925, p. 313; Vervoort, 1959, p. 218, figs. 1, 2.
Ophiodissa caciniformis: Stechow, 1925, p. 139.
Diplocyathus caciniformis: Leloup, 1935, p. 10.
Hydrodendron caciniformis: Hirohito, 1974, p. 9, fig. 3; Rho and Park, 1980, p. 16, pl. 1, figs. 1–4; Park, 1991, p. 544; 1992, p. 287; 1993, p. 265.

Colony attached on algae, irregularly branched. Monosiphonic stem divided into regular internodes. Hydrothecae arranged alternately to left and right sides at distal region of each internode, saucer-shaped. Hydranth not retractile into hydrotheca. Gonotheca arising from stolon, oblong-shaped, with several transverse furrows, truncated above, which were found in July.

The measurements of the specimen from Seogwipo are as follows (μm).

Stem, internode length	339–409
internode diameter	102
Hydrotheca, total length	58
diameter at aperture	103–175
Gonotheca, total length	657–715
maximum diameter	307–311
Colony, length	4–6 mm

Distribution: Korea, Japan, Mediterranean, West Indies, Cape Verde Islands, False Bay, South Africa, New Zealand.
Korea: JN, JJ.
Specimen examined: JN: (Bogildo: 23.vii.1981); (Geomundo: 17.vii.1977), JJ: (Seogwipo: 30.xi.1978).
Ecology: This species attached on algae inhabiting in the coastal waters.

9. *Hydrodendron gardineri* (Jarvis, 1922) (Fig. 11)

Ga-deu-neo-mu-nui-hi-deu-ra (가드너무늬히드라)

Halecium gardineri Jarvis, 1922, p. 334, pl. 24, fig. 1; Millard and Bouillon, 1973, p. 23, fig. 4.
Hydrodendron gardineri: Millard, 1975 p. 162, fig. 53A–D; Park, 1991, p. 544, fig. 4A–D; 1992, p. 287; 1993, p. 266; 1995, p. 11.

Colony stiff, shrub-shaped, reaching less than 100 mm in height. Stem and main branch fascicled,

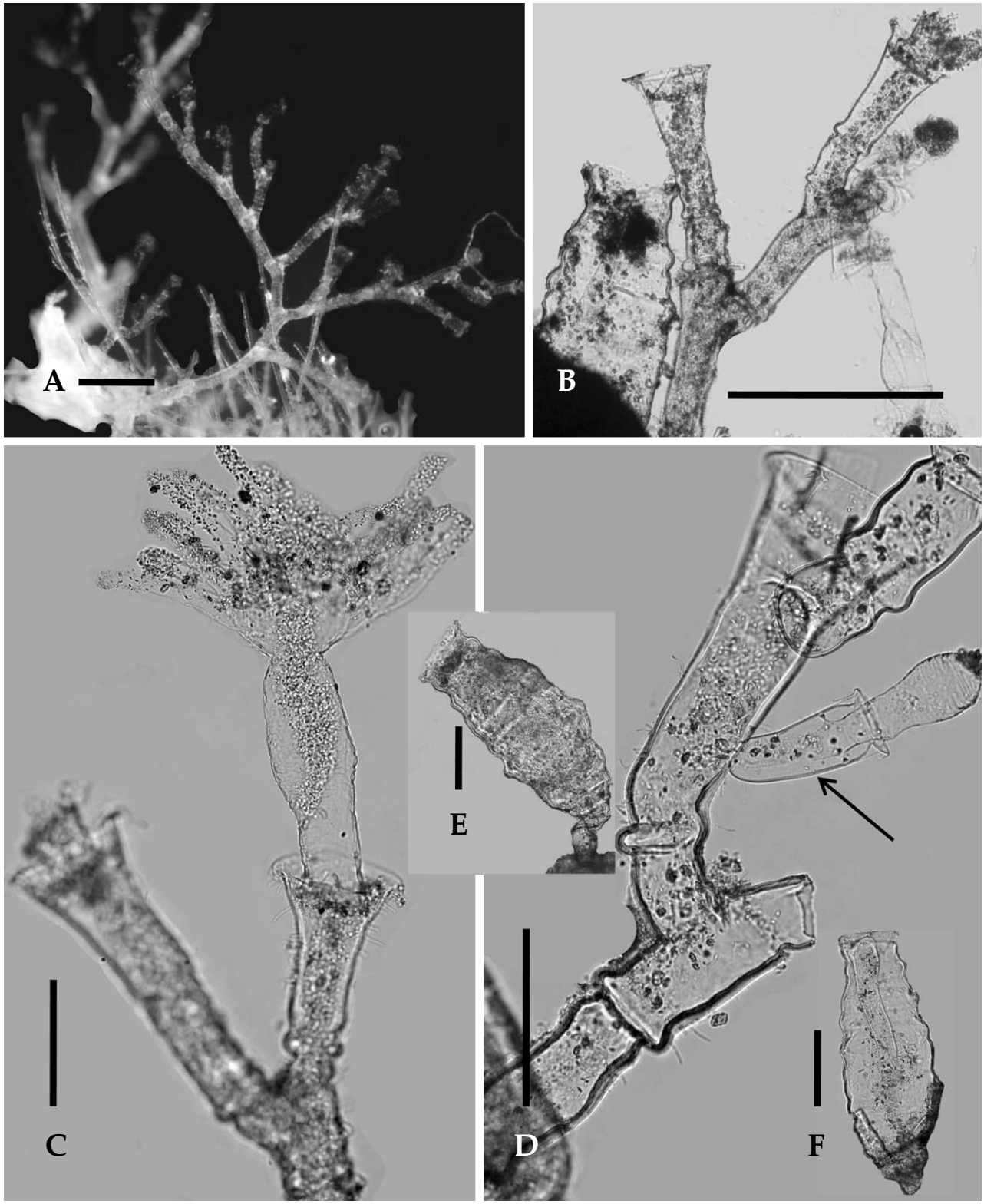

Fig. 10. *Hydrodendron carciniformis*. A. colony; B. part of colony; C. hydrothecae; D. nematotheca (arrow) and hydrotheca; E, F. gonothecae. Scales: A=1 mm, B=500 μm, C–F=200 μm.

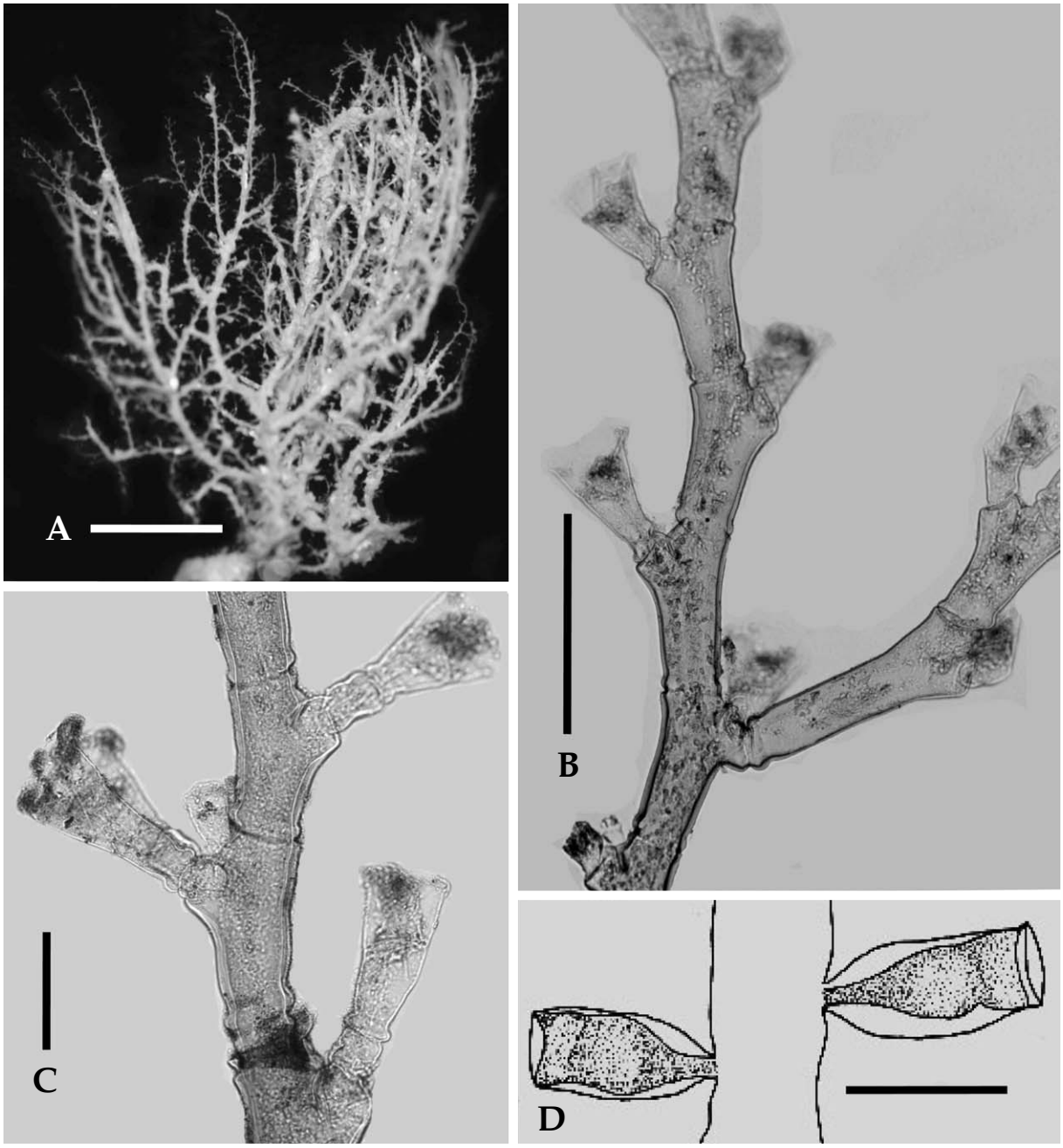

Fig. 11. *Hydrodendron leloupi*. A. whole colony; B. hydrothecae and nematotheca; C. part of colony; D. Gonothecae (cited from Park, 1991). Scales: A=10 mm, B=500 μm, C=200 μm, D=300 μm.

giving off branches irregularly at nearly right angles, each branch tending to fuse with other adjacent branches. Monosiphonic branch divided into regular internodes, each internode bearing a hydrotheca from an apophysis at about two-third of length, two rows of hydrothecae in one plane. Hydrotheca also arising from polysiphonic stem and branch, pedicellate, usually regenerated between apophysis and hydrothecal pedicel resulting in additional nodes or corrugations, pedicel

longer than hydrotheca. Hydrotheca widening to margin which usually everted. Intrathecal diaphragm oblique, sloping downward to adcauline edge. Nematotheca usually irregular in occurence, sessile, goblet-shaped, margin everted. Gonotheca born on polysiphonic stem and branch, cylindrical, with truncated distal end and short pedicel, much larger than hydrotheca.

The measurements of the specimen from Seogwipo are as follows (μm).

Stem, internode length ····· 145
diameter at node ····· 51–62
Hydrotheca, total length ····· 136
diameter at aperture ····· 67–73
Gonotheca, total length ····· 522–667
diameter at mouth ····· 240–280
Colony, length ····· 20–45 mm

Distribution: Korea, Chaos Archipelage (Salomon) (type locality), South Africa (Moçambique, Inhaca to Inhambane).

Korea: JJ.

Specimen examined: JJ: (Seogwipo: 4.xii.1975).

Ecology: This species attached on hard substratums in waters about 20–30 m deep.

Remarks: Specimens of Millard (1975) from South Africa are short (4 mm) and have a monosiphonic stem. But our specimens are tall, about 50 mm long and shrub-shaped. However the hydrotheca, nematotheca and other characters are identical with those of South Africa.

10. *Hydrodendron leloupi* Hirohito, 1983 (Fig. 12)

Rel-lu-peu-mu-nui-hi-deu-ra (렐루프무늬히드라)

Hydrodendron leloupi Hirohito, 1983, p. 13, fig. 2; 1995, p. 34, fig. 9d–j, pl. 2, fig. D; Park, 2007, p. 52, fig. 2A–E.

Colony forming a network in varying from loosely to densely formed. Stem and branches polysiphonic, and monosiphonic terminally and entangled each other and anastomosing to make network. Monosiphonic branches give rise to branchlets. Branchlets arranged irregularly. Monosiphonic stem, branches and branchlets divided into regular internodes, but in polysiphonic portion, internodes indistinct. Each internode give rise to a hydrotheca and a nematotheca. Hydrotheca arising from all parts of colony, funnel-shaped, widening upwards gradually. Margin slightly flared or everted outward, with 1–2 annulated pedicels. Nematotheca occurred on apophysis, bell-shaped, slightly widening upwards, without pedicel and with whip-like nematophore. According to Hirohito (1995), gonotheca arising from hydrorhiza or basal portion of colony. With growth these become cylindrical, mouth widens, and margin more or less invaginate.

The measurements of the specimen from Munseom are as follows (μm).

Stem, internode length ····· 300
diameter at node ····· 130–160
Hydrotheca, total length ····· 230–260
diameter at aperture ····· 200

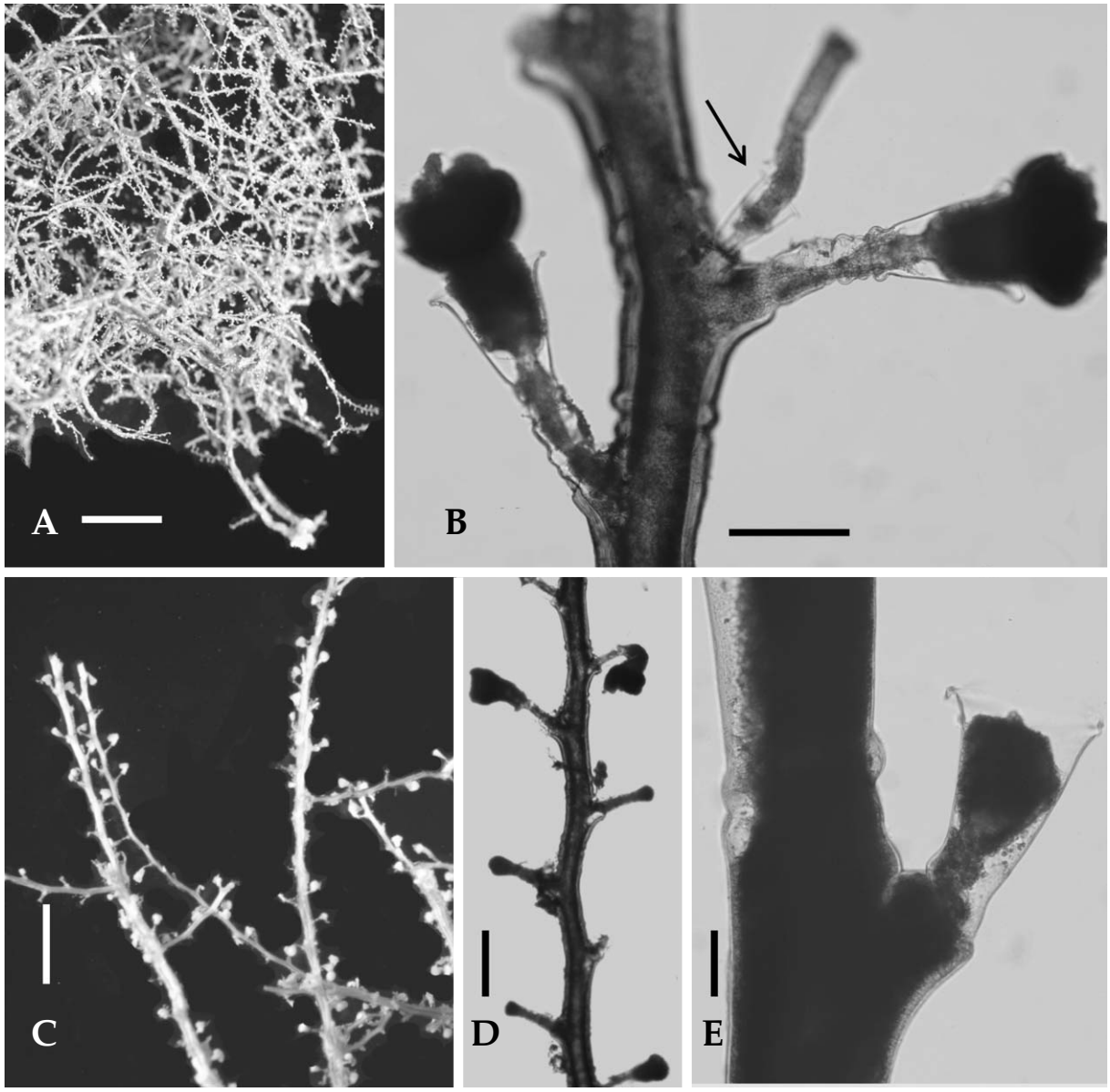

Fig. 12. *Hydrodendron leloupi*. A. whole colony; B. hydrothecae and nematotheca (arrow); C. part of colony; D. branch with hydrothecae; E. enlarged hydrotheca. Scales: A=10 mm, B, E=200 μm, C= 100 μm, D=500 μm.

diameter at base ····· 57–60
Colony, length ····· 100 mm

Distribution: Korea, Japan.
Korea: JJ.
Specimen examined: JJ: (Munseom: 12.i.2006).
Ecology: This species attached on hard substratums in waters about 10 m deep.

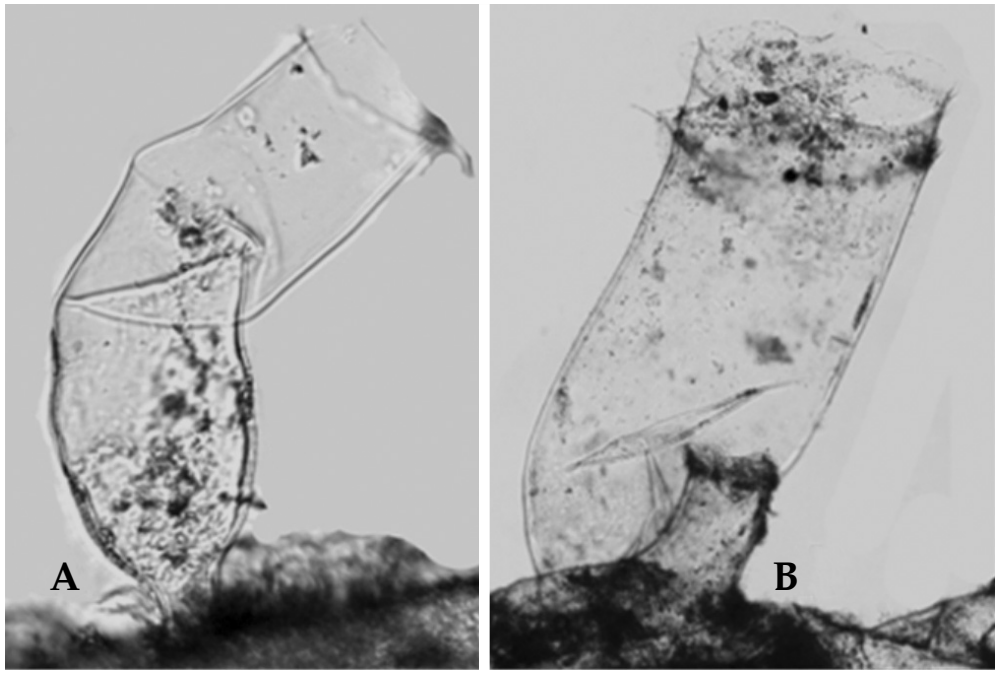

Fig. 13. Types of hydrotheca of Hebellidae. A. constructed hydrotheca; B. smooth hydrotheca.

Remarks: This species is similar to *Phylactotheca pacifica* Stechow, 1913 in the shape of hydrotheca, but it is distinguished from latter by the specific network of colony, polysiphonic stem and branches.

Family Hebellidae Fraser, 1912

Teol-hi-deu-ra-gwa (털히드라과)

Colony stolonial growth. Hydrotheca deep bell or cylinder shaped, with short pedicel (Fig. 13). Intrathecal diaphragm present, operculum present or absent. Hydranth with dome shaped or conical hypostome. Gonotheca with short pedicel.

Genera 6 (2 in Korea), species 50 (3 in Korea).

Key to the genera of family Hebellidae

1. Hydrotheca curved ····· *Hebella*
– Hydrotheca straight ····· *Scadia*

Genus *Hebella* Allman, 1888

Teol-hi-deu-ra-sok (털히드라속)

Hebellopsis Hadzi, 1913.

Colony stolonial growth. Hydrotheca stalked, deep bell- or cylinder-shaped, usually with annular perisarcal thickening around base, with or without true diaphragm. Gonotheca arising singly producing free medusa from hydrorhiza. Intrathecal diaphragm present, operculum present or absent. Hydranth with dome-shaped or conical hypostome. Gonotheca with short pedicel. Nematophores absent.

Type species: *Hebella striata* Allman, 1888.

Species 21 (2 in Korea).

11. *Hebella scandens contorta* Marktanner-Turneretscher, 1890 (Fig. 14)

Kko-in-teol-hi-deu-ra (꼬인털히드라)

Hebella contorta Marktanner-Turneretscher, 1890, p. 215, pl. 3, fig. 17a, b.
Hebella calcalata: Stechow, 1913b, p. 105, fig. 79; Leloup, 1937b, p. 4, fig. 17.
Hebellopsis contorta: Stechow and Müller, 1923, p. 464, fig. 5.
Hebella spiralis: Nutting, 1927, p. 208, figs. 4–6.
Hebella scandens contorta: Vervoort, 1959, p. 239, fig. 14; Rho and Chang, 1972, p. 100, pl. 2, figs. 6–9; Park, 1990, p. 77; 1992, p. 286; 1993, p. 264.

Colony small, stolonial growth, arising from stolon creeping on other hydrods. Hydrotheca with short pedicel, cylindrical constricted in middle portion, bent slightly to one side, margin round and smooth, everted and usually oblique. Reduplication of margin common. Pedicel smooth or corrugated. Gonotheca arising from stolon, widening gradually to wide margin, much larger than hydrotheca, cylinder shaped, irregularly corrugated, with operculum of four valves, pedicel short and smooth. Gonothecae developed in August.

The measurements of the specimen from Anmyeondo are as follows (μm).

Hydrotheca, total length	584–643
maximum diameter	190–220
diameter of margin	220–280
Gonotheca, total length	715
maximum diameter	410
Colony, length	20–30 mm

Distribution: Korea, Japan, Philippine, East Indes, West Africa.

Korea: CN, GG, JJ.

Specimen examined: CN: (Anmyeondo: 10.viii.1973), GG: (Deokjeokdo: 19.x.1985), JJ: (Seogwipo: 5.viii.1970).

Ecology: This species attached on other hydroids in the subtidal zone.

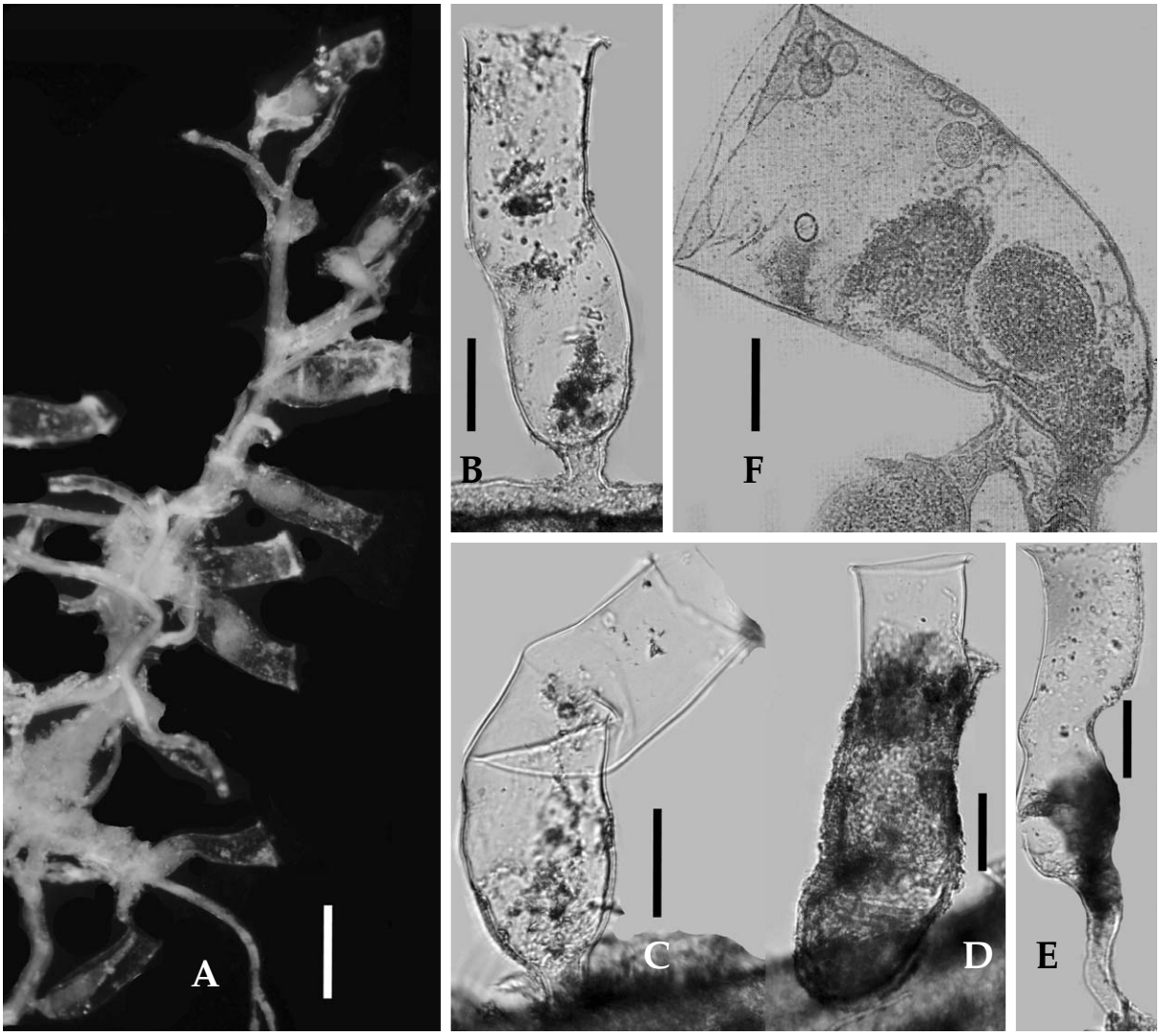

Fig. 14. *Hebella scandens contorta*. A. colony; B–E. hydrothecae; F. gonotheca (cited from Rho and Chang, 1972). Scales: A=1 mm, B–F=200 μm.

Genus *Scandia* Fraser, 1912

Gi-neun-teol-hi-deu-ra-sok (기는털히드라속)

Colony stolonial. Hydrotheca stalked, arising from creeping hydrorhiza, deep campanulate, distinctly demarcated from pedicel, with an annular thickening around base. Gonotheca solitary, oblong ovate, with short pedicel. Nematophore absent.

Type species: *Campanularia mutabilis* Ritchie, 1907.

Species 7 (1 in Korea).

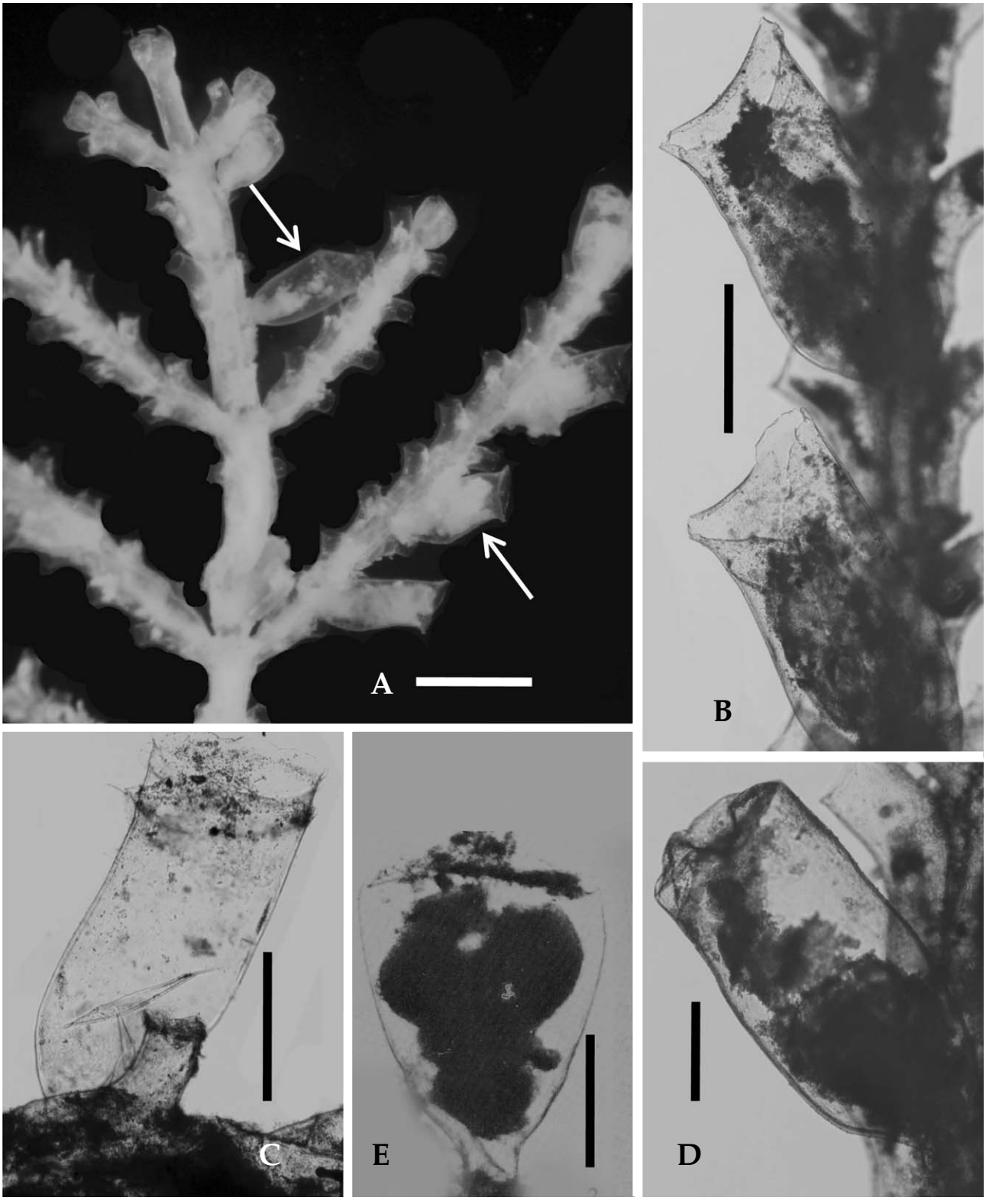

Fig. 15. *Scandia neglecta*. A. colony on other hydroids (arrows indicate *S. neglecta*); B–D, hydrothecae; E. gonotheca (cited from Rho and Park, 1980). Scales: A=1 mm, B, C, E=500 μm, D=250 μm.

12. *Scandia neglecta* (Stechow, 1913) (Fig. 15)

Gi-neun-teol-hi-deu-ra (기는털히드라)

Hebella neglecta Stechow, 1913a, p. 139; 1913b, p. 108, fig. 83; 1923b, p. 138; Jäderholm, 1919, p. 10, pl. 2, fig. 5.
Scandia neglecta: Fraser, 1936, p. 50, pl. I, fig. 3a–c; Rho and Park, 1980, p. 23, pl. 5, figs. 1–3; Park, 1990, p. 77; 1992, p. 286; 1993, p. 265.

Colony creeping on other hydroids, not branched. Hydrotheca arising from stolon, with short pedicels, large, urceolate, margin forming an angle about 30° with axis. Gonotheca arising from stolon, with short pedicels, truncated above, which were found in November.

The measurements of the specimen from Mipo are as follows (μm).

Hydrotheca, total length ····· 1577–1825
maximum diameter ····· 701–774
Hydrothecal pedicel, length ····· 526–818
maximum diameter ····· 146
Gonotheca, total length ····· 876
maximum diameter ····· 759–803
Colony, length ····· 1100–2600

Distribution: Korea, Japan, India.

Korea: GN, JN, JJ.

Specimen examined: GN: (Mipo: 5.ix.1976; 28.iv.1978); (Nohwado: 20.viii.1981), JN: (Hongdo: 7.vii.1978), JJ: (Seogwipo: 4.x.1974).

Ecology: This species attached on other hydroids, *Synthecium* in waters 20 m deep.

Family Lafoeidae Hincks, 1868

Ba-wi-bu-chi-hi-deu-ra-gwa (바위붙이히드라과)

Colony erect, polysiphonic but monosiphonic terminally. Hydrotheca arising from all around stem and branches, campanulate or cylindrical, stalked or sessile, without operculum, untoothed margin, and with or without diaphragm (Fig. 16). Nematophore present or absent. Gonothecae aggregated into coppinia. Gonophore in form of fixed sporosac.

Type genus: *Lafoea* Lamouroux, 1821.

Genera 16 (6 in Korea), species 184 (7 in Korea).

Key to the genera of family Lafoeidae

1. Hydrotheca pedicellate ····· 2
– Hydrotheca sessile ····· 3
2. Nematotheca present ····· *Zygophyax*
– Nematotheca absent ····· *Lafoea*

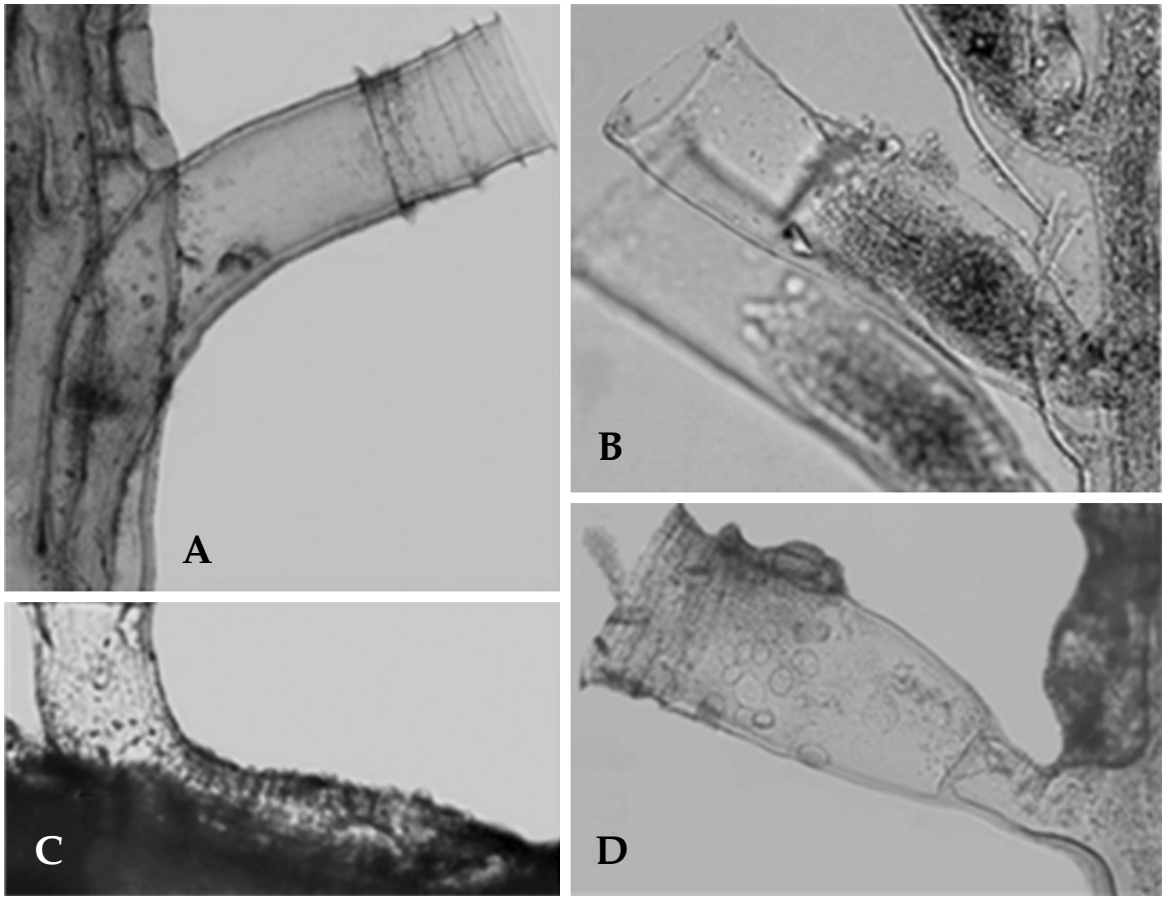

Fig. 16. Types of hydrothecae of Lafoeidae. A–C. sessile types; D. pedicellate.

3. Hydrotheca with longitudinal rows ····· *Filellum*
– Hydrotheca without longitudinal rows ····· 4
4. Stem and branch completely polysiphonic ····· *Grammaria*
– Stem and branch monosiphonic in distal end ····· *Acryptolaria*

Genus *Acryptolaria* Norman, 1875

Da-bal-hi-deu-ra-sok (다발히드라속)

Scapus Norman, 1875.
Oswaldaria Stechow, 1923.

Colony erect. Stem polysiphonic and branched. Branch arranged in alternate or subalternate and give rise to hydrocladium. Hydrocladium similar to branch. Hydrotheca arising from stem, branch and hydrocladium, arranged in alternate, tubular shaped, partly adnate, without diaphragm.

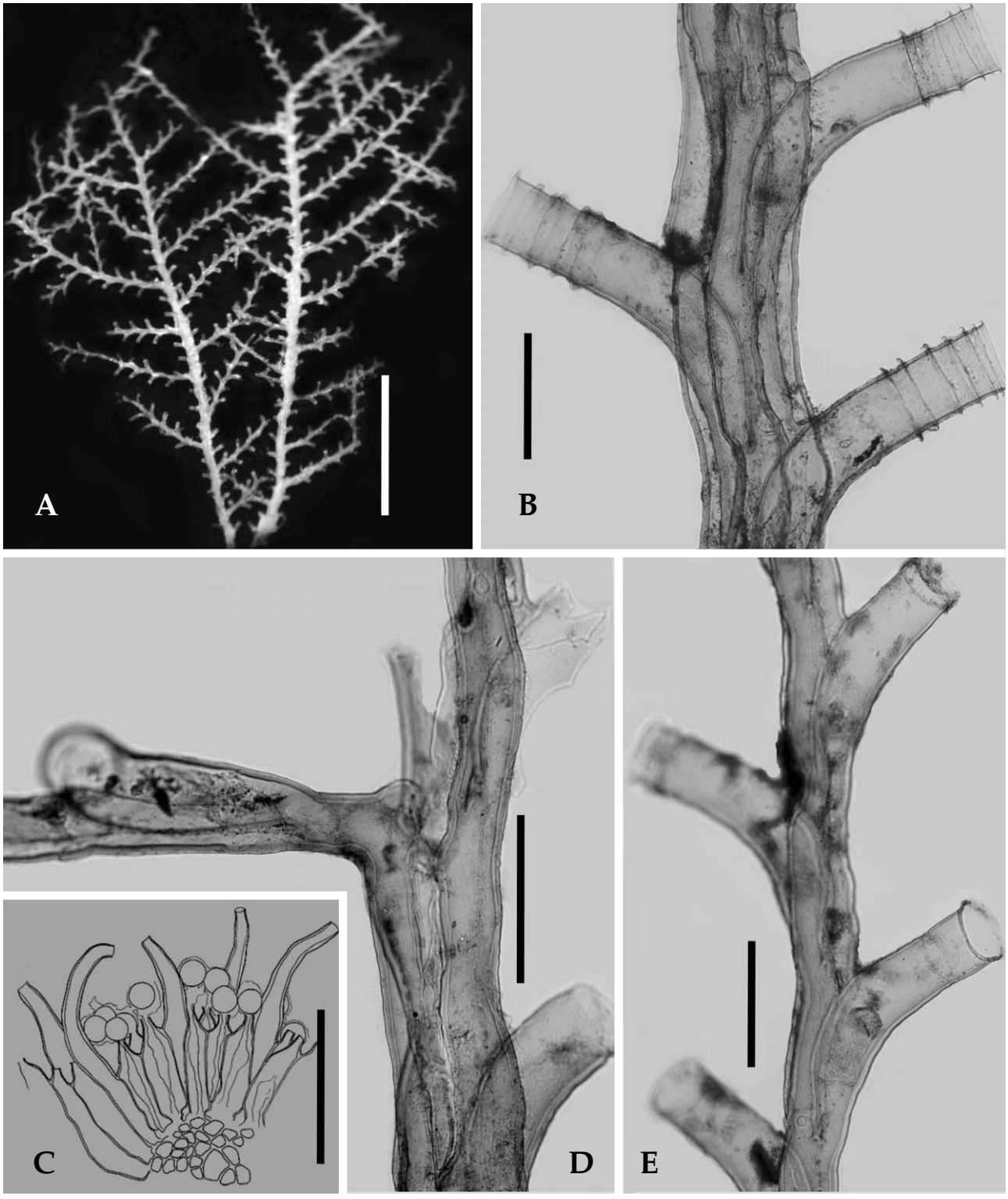

Fig. 17. *Acryptolaria conferta australis*. A. colony; B. polysiphonic stem and hydrothecae; C. coppinia (cited from Hirohito, 1995); D. branching pattern; E. monosiphonic branch with hydrothecae. Scales: A=10 mm, B–E=500 μm.

Nematotheca absent. Gonothecae aggregated to coppinia.
Type species: *Acryptolaria andersoni* Totton, 1930.

Species 20 (1 in Korea).

13. *Acryptolaria conferta* (Allman, 1877) (Fig. 17)

Ho-ju-da-bal-hi-deu-ra (호주다발히드라)

Cryptolaria conferta Allman, 1877, p. 17, pl. 12, figs. 6–10.
Acryptolaria conferta australis: Jäderholm, 1919. p. 7, pl. 2, fig. 1; Totton, 1930, p. 163, text-fig. 19c–e; Ralph, 1958, p. 315, fig. 4a–g; Park, 1991, p. 545, fig. 5A–D; 1992, p. 287; 1993, p. 266; Yamada, 1959, p. 49.
Acryptolaria conferta: Millard, 1964, p. 260; 1973, p. 28, fig. 4C; 1975, p. 169, fig. 56A–F.

Colony erect, attaining about 50 mm long, fascicled, giving rise to branches, hydrocladia and hydrothecae. Stem, branch and hydrocladia not divided into internodes. Hydrotheca tubular, curved smoothly outward, intersection of adcauline wall of hydrotheca commonly extending below level of emergence of free portion of previous hydrotheca, about half to two-third of adcauline wall adnated, more or less narrowing toward base, margin smooth and round, and slightly everted.

The measurements of the specimen from Seogwipo are as follows (μm).

Hydrotheca, length of adcauline	680–1170
length of abcauline	670–1040
diameter at aperture	240–280
Gonotheca, total length	270–350
maximum diameter	70–110
Colony, length	34–40 mm

Distribution: Korea, Japan, Australia, New Zealand.
Korea: JJ.
Specimen examined: JJ: (Seogwipo: 27.xii.1971).
Ecology: This species attached on hard substratum in waters about 20–30 m deep.

Genus *Filellum* Hincks, 1868

Sil-hi-deu-ra-sok (실히드라속)

Reticularia Wyville Thompson, 1853.

Colony stolonial, arising from hydrorhiza. Hydrotheca tubular, partly adnate to hydrorhiza and remainder free, without diaphragm. Nematotheca absent. Gonothecae aggregated to coppinia which protected with modified hydrothecae. Gonophores in from of fixed sporosacs.

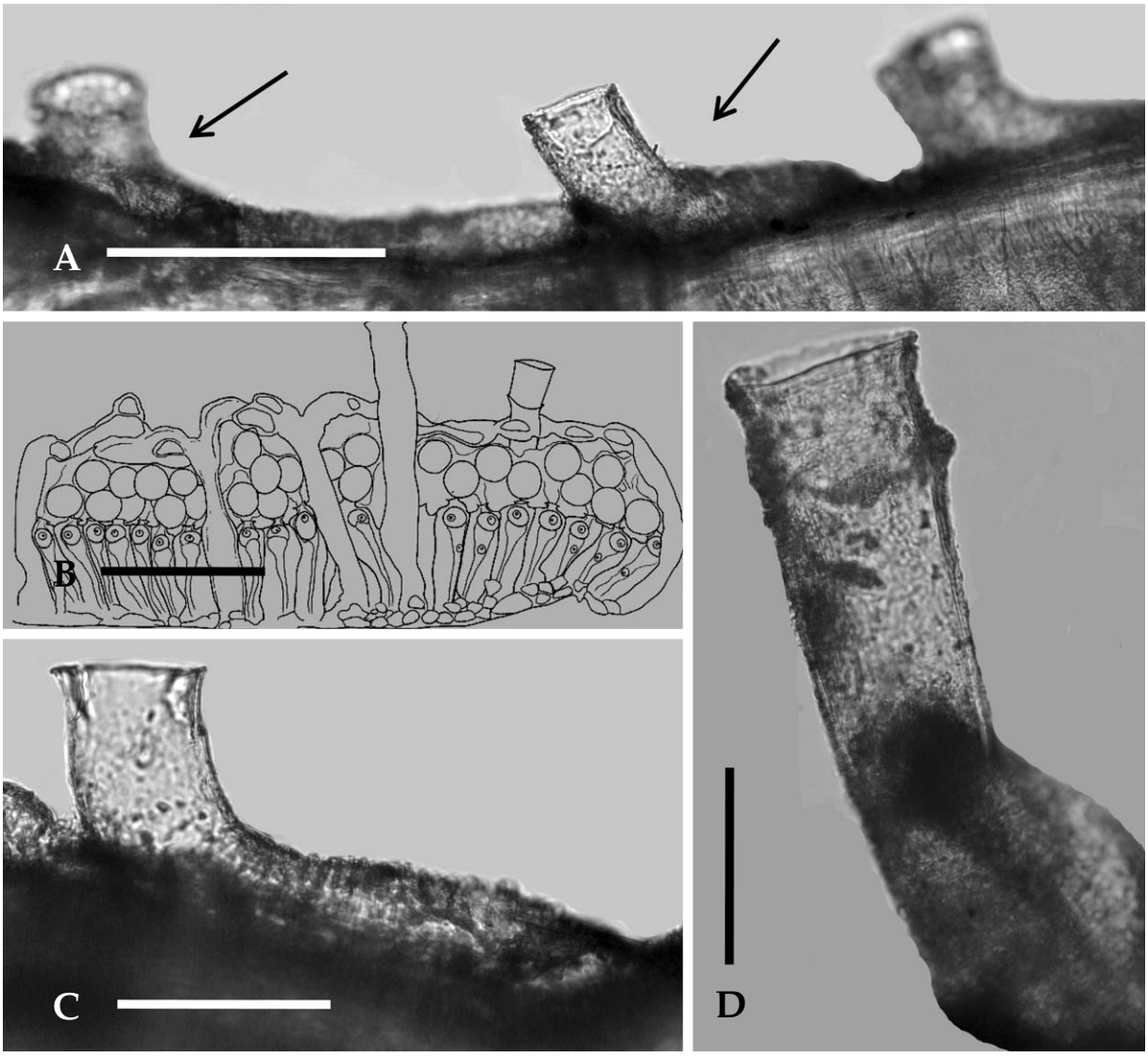

Fig. 18. *Filellum serratum*. A. colony (arrows); B. coppinia (cited from Hirohito, 1995); C, D. hydrothecae. Scales: A=200 μm, B–D=500 μm.

Type species: *Campanularia serpens* Hassal, 1848.

Species 12 (1 in Korea).

14. *Filellum serratum* (Clarke, 1879) (Fig. 18)

Tom-ni-sil-hi-deu-ra (톱니실히드라)

Lafoea serrata Clarke, 1879, p. 242, pl. 4, fig. 25.

Filellum serratum: Stechow, 1913b, p. 111, fig. 85; Leloup, 1938, p. 11; 1937, p. 31; 1940, p. 15; Millard, 1967, p. 793, fig. 2D; Vervoort, 1972, p. 51, fig. 14a, b; Rho and Chang, 1974, p. 137, pl. 2, figs. 3, 4; Park, 1990, p. 78; 1992, p. 287; 1993, p. 266; 1995, p. 11.

Colony attached on other hydroids. Hydrotheca tubular, with basally adnate to hydrorhiza or substratum, one half of total length of hydrotheca slightly swollen, and with transversal striations,

The measurements of the specimen from Anmyeondo are as follows (μm).

Hydrotheca, length of free part	200–300
length of adnate part	310–370
diameter at margin	170–190
Colony, length	700

Distribution: Korea, Japan, New Zealand, Philippines, Indo-China, East and West Indies, Red Sea, Mediterranean Sea.

Korea: GN, JN, JB, CN, GG, JJ.

Specimen examined: GN: (Mipo: 11.v.1974), JN: (Manjaedo: 23.viii.1998); (Jindo: 23.vii.1994); (Yeosu: 8.viii.1973), JB: (Gyeokpo-ri: 7.viii.1975), CN: (Anmyeondo: 10.viii.1973), GG: (Jakyakdo: 14.x.1973), JJ: (Sangchujado: 22.vii.1990); (Seogwipo: 6.ii.1971); (Munseom: 30.vi.1993).

Ecology: This species attached on other hydroids in waters about 20–30 m deep.

Remarks: This species reported by Millard (1967) from South-West Indian Ocean. She said "this colonies differ greatly in dimensions, they have been included in the same species". The Korean specimens are almost agreed with her descriptions. The adnate parts of specimens from Seogwipo are much shorter than those of Anmyeondo.

Genus *Grammaria* Stimpson, 1854

Na-mu-hi-deu-ra-sok (나무히드라속)

Stem polysiphonic and branched. Hydrotheca tubular, curved outwardly, margin smooth, without diaphragm and operculum. Nematotheca absent. Gonothecae aggregated to coppinia.

Type species: *Grammaria robusta* Stimpson, 1854.

Species 11 (1 in Korea).

15. *Grammaria abietina* (M. Sars, 1850) (Fig. 19)

Jeon-na-mu-hi-deu-ra (전나무히드라)

Campanularia abietina M. Sars, 1850, p. 139 (not seen).

Grammaria abietina: Fraser, 1944, p. 217, pl. 44, fig. 200; Yamada, 1955, p. 124, fig. 1D; Naumov, 1960, p. 306, fig. 174; Calder, 1970, p. 1523, pl. 5, fig. 1; Cornelius, 1975, p. 382, fig. 3; Park, 1991, p. 545, fig. 6A–C.

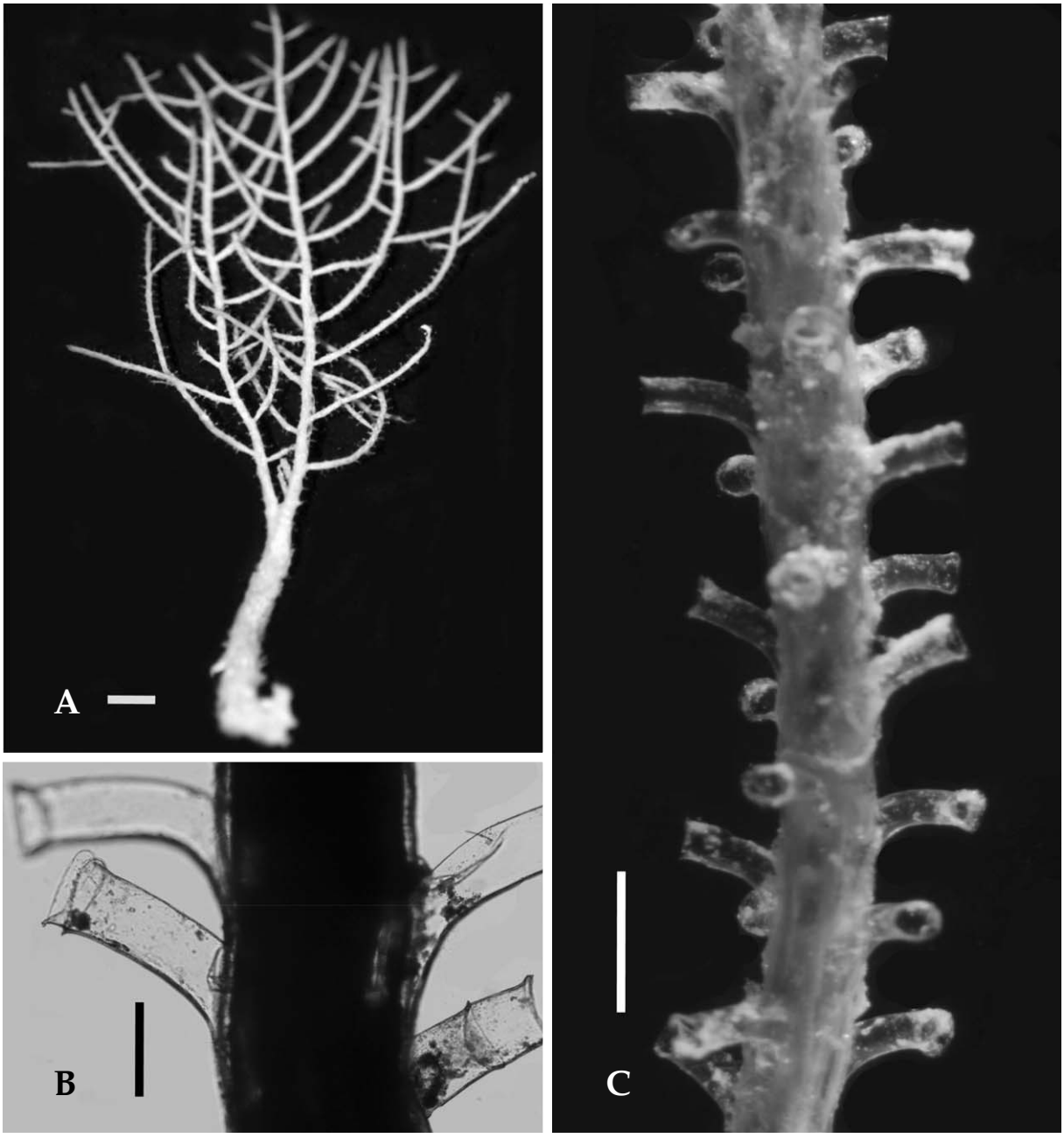

Fig. 19. *Grammaria abietina*. A. colony; B, C. parts of colony showing hydrothecae. Scales: A=10 mm, B=200 μm, C=500 μm.

Colony more or less large, 155 mm in height, very stout. Stem and branch polysiphonic throughout, branched irregularly. Branches constricted at base and tapering near base, resembling main stem in all features. Hydrotheca tubular, arranged in six longitudinal rows on branches, large portion of hydrotheca free, free portion being directed outward, margin circular, vertical with axis in some specimens, flaring slightly, often renovated.

The measurements of the specimen from Sokcho are as follows (μm).

Hydrotheca, length of free portion	700–850
length of adnate portion	430–650
diameter at margin	150–190
Colony, length	155 mm

Distribution: Korea, Japan, Great Britain to northern France, northern Atlantic, west, east Greenland, Iceland, Faeroes, Jan Mayen Island, all Russian northern seas (except Chukchi Sea), Bering Sea to Vancouver region, Okhotsk.

Korea: GW.

Specimen examined: GW: (Sokcho: 3.x.1990).

Ecology: This species attached on hard substratum in waters about 10–20 m deep.

Remarks: The degree of outward-curving and the length of hydrothecae are variable.

Genus *Lafoea* Lamouroux, 1821

Ba-wi-bu-chi-hi-deu-ra-sok (바위붙이히드라속)

Colony erect. Stem polysiphonic and branched. Hydrotheca arising from all surfaces of stem and branches. Hydrotheca tubular or deep campanular shaped, usually asymmetrical, free from stem not distinctly demarcated from pedicel, without diaphragm or annular perisarcal thickening, but with a ring of refringent dot markings on base of hydranth. Nematotheca absent. Gonothecae aggregated to coppinia. Gonophores in form of fixed sporosacs.

Type species: *Sertularia dumosa* Fleming, 1820.

Species 19 (2 in Korea).

16. *Lafoea dumosa* (Fleming, 1828) (Fig. 20)

Ga-si-deom-bul-ba-wi-bu-chi-hi-deu-ra (가시덤불바위붙이히드라)

Sertularia dumosa Fleming, 1820, p. 83 (not seen).

Lafoea dumosa: Hincks, 1868, p. 200, pl. 41, figs. 1, 1a; Stechow, 1919, p. 30, fig. A1; 1923b, p. 10; Totton, 1930, p. 158, fig. 14; Fraser, 1944, p. 221, pl. 45, fig. 205; Vervoort, 1945, p. 197, figs. 83a, 84; Yamada, 1959, p. 50; Naumov, 1960, p. 276, figs. 21, 4V, pl. 1, fig. 1; Hirihito, 1995, p. 126, fig. 36a–c, pl. 8, fig. A; Schuchert, 2000, p. 413; 2001, p. 67, figs. 54, 55, p. 157, fig. 16; Galea, 2007, p. 49, fig. 11A–E; Park, 2009, p. 83, fig. 2A–D.

Colony large and erect, straggly, almost without main trunk loosely and irregularly branched, polysiphonic component tubes parallel, each bearing hydrotheca at irregular intervals. Hydrotheca long tubular, margin without teeth, tapering below, sometimes asymmetrically, without pedicel, so that sessile type, diaphragm and operculum lacking. Gonothecae aggregated to coppinia.

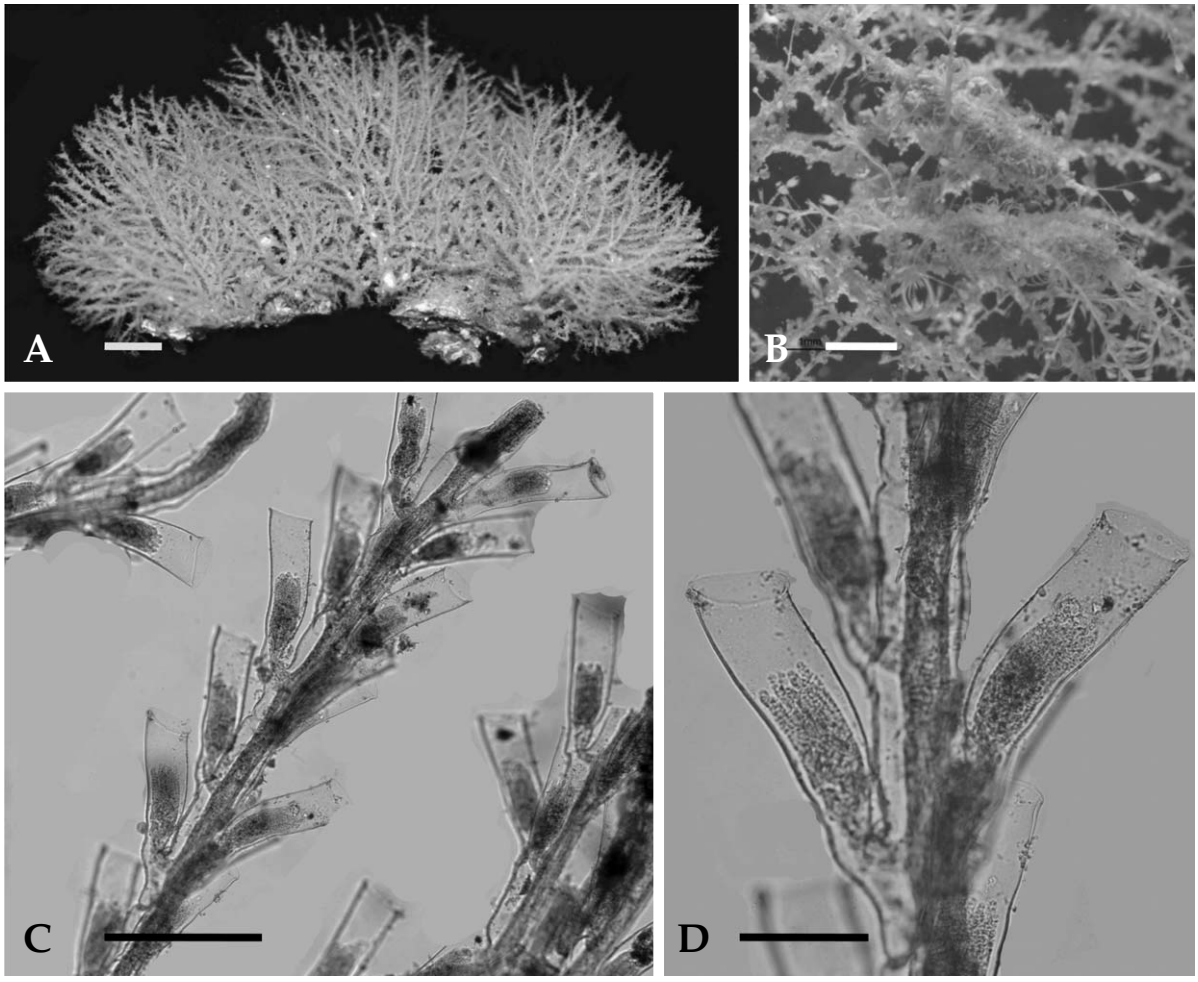

Fig. 20. *Lafoea dumosa*. A. whole colony; B. coppinia; C. parts of branches with hydrothecae; D. hydrothecae. Scales: A=10 mm, B=2 mm, C=500 μm, D=200 μm.

The measurements of the specimen from Nagokkkochdongsan are as follows (μm).

Hydrotheca, length of adcauline wall ····· 460
length of abcauline wall ····· 490–550
diameter at margin ····· 164
Colony, length ····· 33–55 mm

Distribution: Near cosmopolitan.
Korea: GB.
Specimen examined: GB: (Uljin Nakkokkkochdongsan: 10.i.2008).
Ecology: This species attached on hard substratum in waters 20–25 m deep.
Remarks: This species is similar to *L. fruticosa* (see Vervoort, 1945) in the shape of colony, hydrotheca and coppinia. But this species is distinguished from latter by lacking the hydrothecal pedicel.

Genus *Zygophylax* Quelch, 1885

Du-gwan-jeol-hi-deu-ra-sok (두관절히드라속)

Lictorella Allman, 1888.
Brucella Ritchie, 1907.

Colony erect. Stem monosiphonic or polysiphonic, branched or unbranched. When polysiphonic, branches arising from axial tube and usually subalternate. Stem and branch give rise to hydrocladia, which often not distinguishable from branches. Hydrothecae arising from stem, branch and hydrocladia alternately in two rows and from axial tube when fascicled. Hydrotheca pedicellate. Nematotheca usually present. Gonothecae aggregated to coppinia. Gonophores in form of fixed sporosacs.

Type species: *Zygophylax profunda* Quelch, 1885.

Species 54 (1 in Korea).

17. *Zygophylax biarmata* Billard, 1905 (Fig. 21)

Du-gwan-jeol-hi-deu-ra (두관절히드라)

Zygophylax biarmata Billard, 1905, p. 97, fig. 2; Stechow, 1913b, p. 114, fig. 88; 1923b, p. 10; 1925, p. 447; Leloup, 1938, p. 9, fig. 6; 1940, p. 11, pl. 1, fig. 6A, B; Rho and Chang, 1974, p. 139, pl. 4, figs. 1–3; Park, 1990, p. 78; 1992, p. 287; 1993, p. 266.

Colony 50 mm in height. Stem polysiphonic, with sub-opposite side branches. Stem consists of two or three hydrothecae between right and left branches in main stem. Hydrotheca attached to hydrocaulus and side branches by moderately long pedicel with one nematotheca. Hydrotheca 2–4 renovations, circular aperture, slightly everted margin, and with a very distinct peridermal ring at aperture, cup-shaped, and with circular aperture, margin slightly everted.

The measurements of the specimen from Seogwipo are as follows (μm).

Stem, diameter at base	740
Hydrotheca, length of aperture including renovations	630–720
diameter at aperture	295–315
length of pedicel	110–150
Nematotheca, length	250–260
diameter at aperture	65–80
Colony, length	50 mm

Distribution: Korea, Japan, Northwest-Africa.
Korea: GN, JJ.
Specimen examined: GN: (Bijindo: 10.vii.1996), JJ: (Munseom: 21.iv.2008); (Seogwipo: 19.x.1973).
Ecology: This species attached on hard substratum in waters 20–25 m deep.

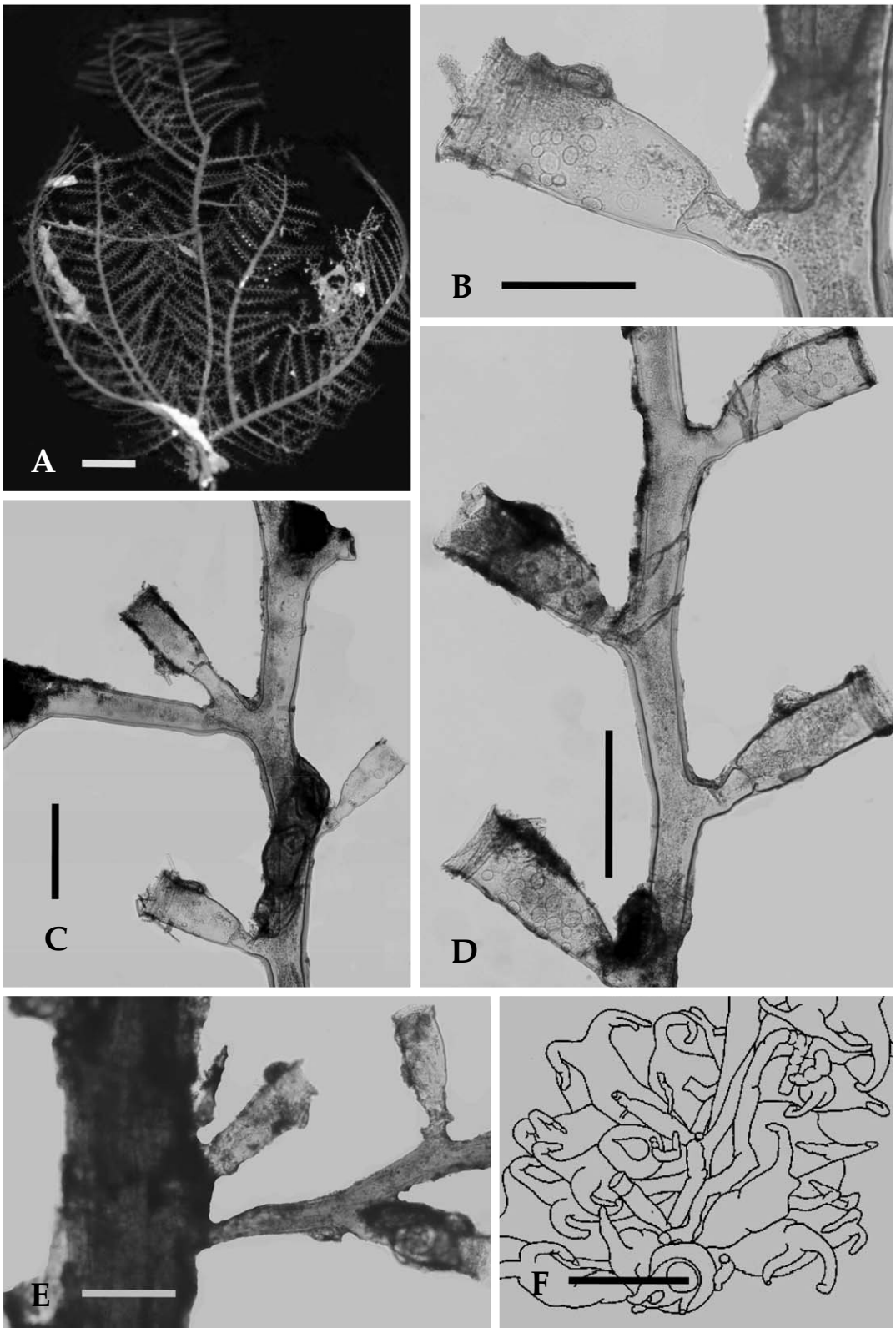

Fig. 21. *Zygophylax biarmata*. A. colony; B. hydrotheca; C. branching pattern; D. part of colony; E. polysiphonic stem; F. coppinia. Scales: A=10 mm, B=1200 μm, C–F=1500 μm.

Family Campanulariidae Johnston, 1836

Jong-hi-deu-ra-gwa (종히드라과)

Eucopidae Gegenbauer, 1856.

Colony sympodial. Hydrotheca campanulate or cup shaped, radially or bilaterally symmetrical and into which hydranth completely or not completely withdrawn. Hydrotheca pedicellate, without operculum, with toothed or untoothed margin. Hydrotheca divided into small proximal and large distal regions by diaphragm or annular thickening of perisarcal wall (Fig. 22). Hypostome trumpet shaped, with one circle of filiform tentacles. Nematotheca absent. Gonophores in form of fixed sporosacs or free medusae.

Genera 190 (4 in Korea), species 290 (16 in Korea).

Key to the genera of family Campanulariidae

1. Colony stolonial ····· 2
− Colony erect ····· 3
2. With a spherule at base of hyrotheca ····· *Campanularia*
− With annulated pedicel ····· *Clytia*
3. Stem monosiphonic or polysiphonic ····· *Obelia*
− Stem polysiphonic ····· *Rhizocaulus*

Genus *Campanularia* Lamarck, 1816

Jong-hi-deu-ra-sok (종히드라속)

Orthopyxis L. Agassiz, 1862.
Eucopella von Ledenfelt, 1883.
Agastra Hartlaub, 1897.

Colony stolonial. Hydrothecal pedicel unbranched, with one terminal spherule. Hydrotheca campanulate or funnel shaped, radially symmetrical with or without teeth. Annular peridermal thickening present inside base of hydrotheca. Hydranth completely retractable into hydrotheca. Gonotheca arising from hydrorhiza. Gonophores in form of fixed sporosacs or free medusae.
Type species: *Sertularia volubilis* Linnaeus, 1758.

Species 83 (5 in Korea).

Key to the species of genus *Campanularia*

1. Hydrothecal teeth absent ····· 2
− Hydrothecal teeth present ····· 3

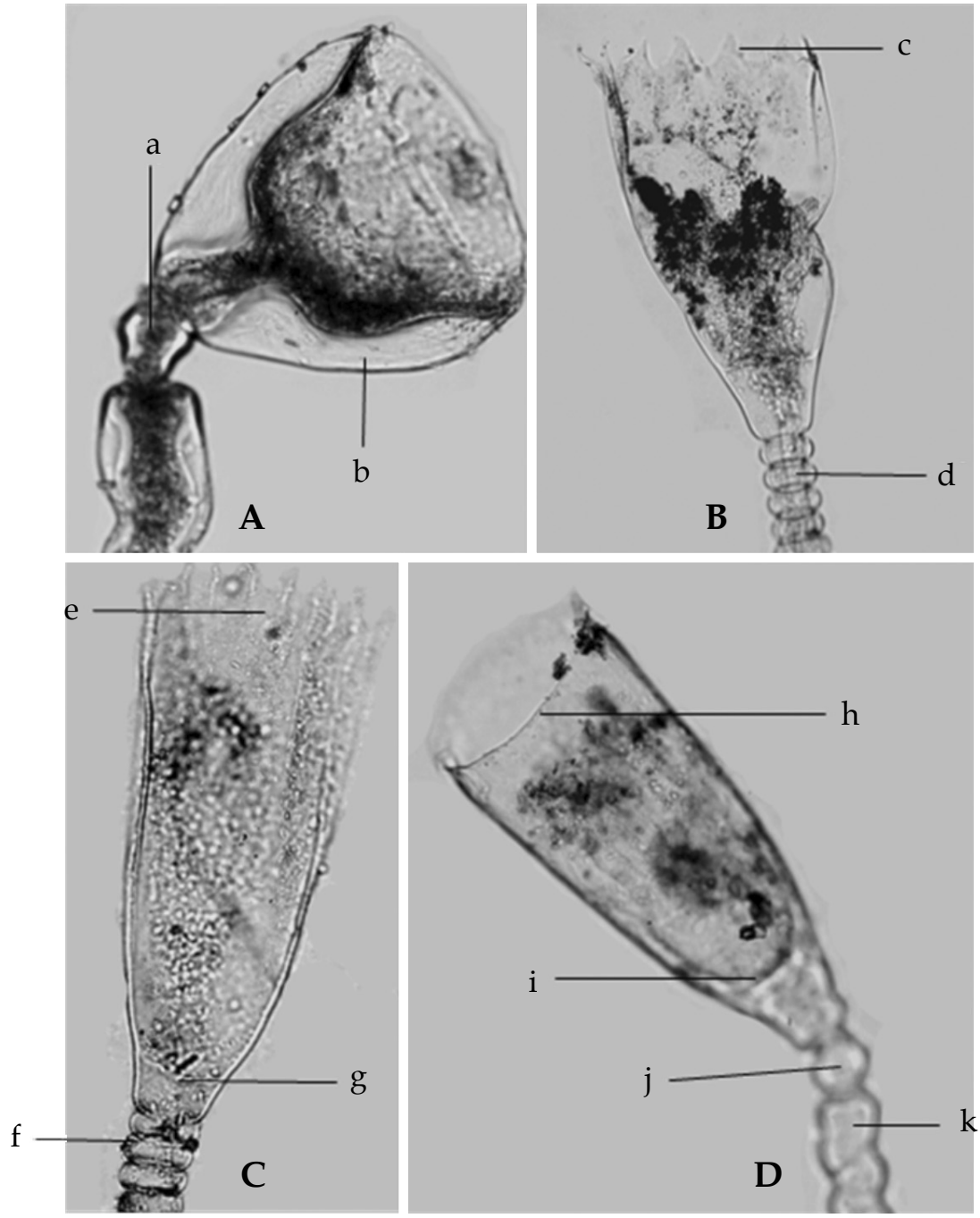

Fig. 22. Types and structure of hydrothecae of Campanulariidae. A. *Campanularia caliculata* (a. spherule; b. periderm); B. *Clytia gracilis* (c. tooth of hydrotheca; d. annulation); C. *Obelis bicuspidata* (e. bicuspidate tooth; f. annulation; g. diaphragm); D. *Campanularia platycarpa* (h. smooth margin; i. diaphragm; j. spherule; k. annulation).

2. Hydrotheca deep campanulate and periderm thick ····· *C. caliculata*
− Hydrotheca campanulate and periderm thin ····· *C. platycarpa*

3. Hydrotheca with longitudinal rows ····· *C. groenlandica*
− Hydrotheca without longitudinal rows ····· *C. crenata*

18. *Campanularia caliculata* Hincks, 1853 (Fig. 23)

Sat-dae-hi-deu-ra (삿대히드라)

Campanularia caliculata Hincks, 1853, p. 178, pl. 5, fig. B; 1868, p. 164, pl. 31, fig. 2; Hirohito, 1995, p. 48, fig. 14a–e.
Campanularia integra: Stechow, 1913b, 73, figs. 30–36.
Orthopyxis caliculata: Stechow, 1923b, p. 7; Yamada, 1958, p. 54; 1959, p. 38; 1965, p. 361; Ito and Inoue, 1962, p. 449, pl. 8, figs. 78, 79.
Eucopella caliculata: Bedot, 1925, p. 180; Rho and Park, 1980, p. 18, pl. 2, figs. 1, 2; Park, 1990, p. 78; 1992, p. 288; 1993, p. 268.

Colony stolonial, attached on algae, not branched. Hydrotheca bowl-shaped, without marginal teeth, with pedicels arising from stolon. Gonotheca arising from stolon with short pedicels, cup-shaped, truncated above, which were found in August.

The measurements of the specimen from Naksan are as follows (μm).

Hydrotheca, total length ····· 336–555
maximum diameter ····· 292–467
Hydrothecal pedicel, length ····· 584–1192
maximum diameter ····· 102–131
Gonotheca, total length ····· 584
maximum diameter ····· 463
Colony, length ····· 1000–1400

Distribution: Korea, Japan, Pacific coast of North America, Arctic, Ajaccio (Corsica), Mediterranean, Cape Verde Islands.

Korea: GW, GN, CN, GG, JJ.

Specimen examined: GW: (Imwon: 30.vi.1989); (Naksan: 14.viii.1973), GN: (Haeundae: 1.vii.1967); (Mipo: 14.vii.1974), CN: (Anmyeondo: 8.viii.1733), GG: (Deokjeokdo: 4.vi.1978), JJ: (Munseom, Supseom: 2.vii.1993).

Ecology: This species inhabits waters from the coast to the subtidal zone.

19. *Campanularia crenata* (Hartlaub, 1901) (Fig. 24)

Ju-geok-hi-deu-ra (주걱히드라)

Eucopella crenata Hartlaub, 1901, p. 364, pl. 22, figs. 27–31, 33–35; Billard, 1906a, p. 71; 1906b, 2; 1907, p. 170, fig. 3; Hirohito, 1969, p. 7, fig. 7; Rho and Park, 1980, pl. 1, figs. 8, 9; Park, 1990, p. 79; 1992, p. 298; 1995, p. 11.
Orthopyxis crenata: Nutting, 1915, p. 67, pl. 16, figs. 3–5; Leloup, 1973, p. 7.

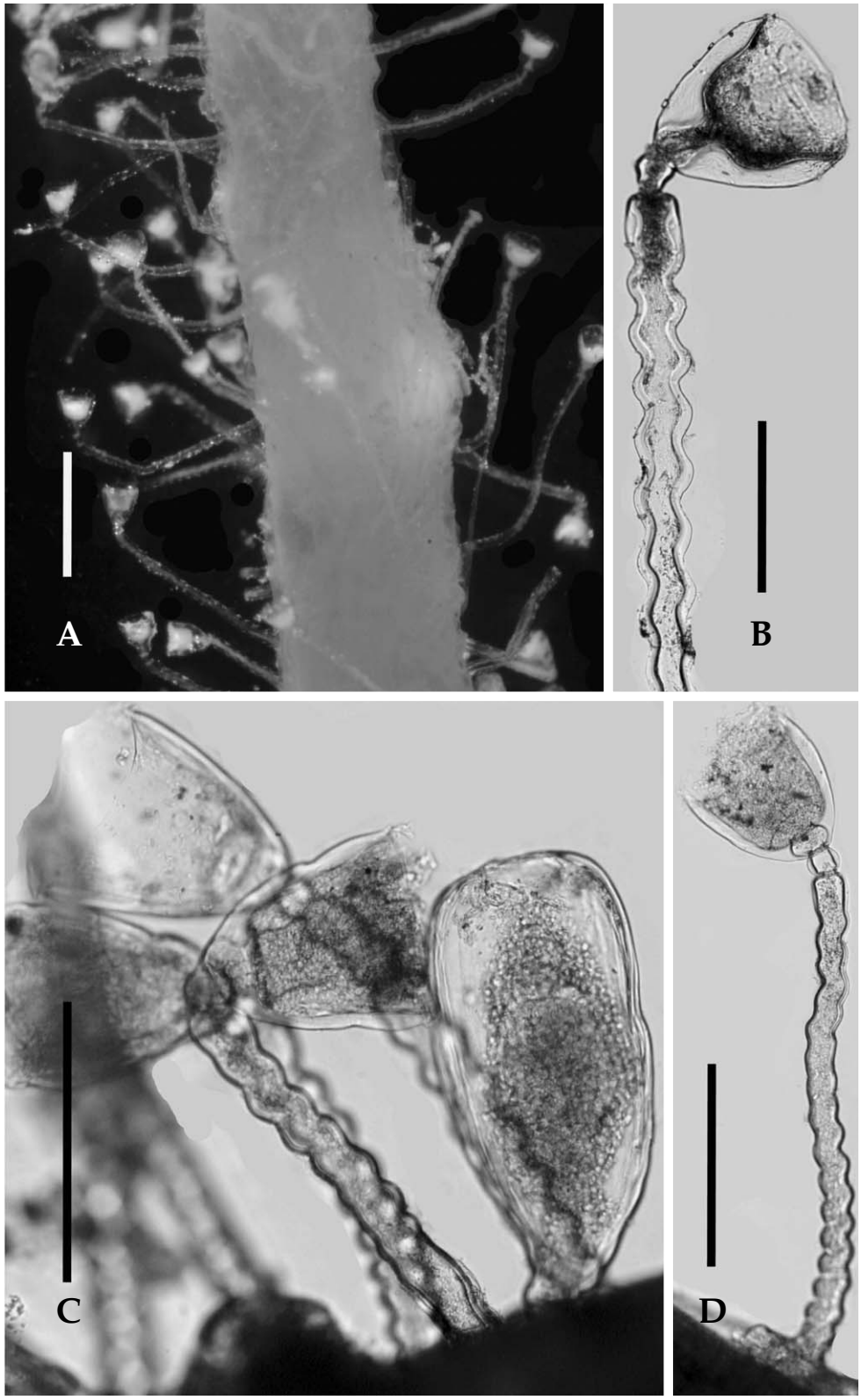

Fig. 23. *Campanularia caliculata*. A. colony; B, D. hydrothecae; C. gonotheca and hydrothecae. Scales: A=1 mm, B-D=500 μm.

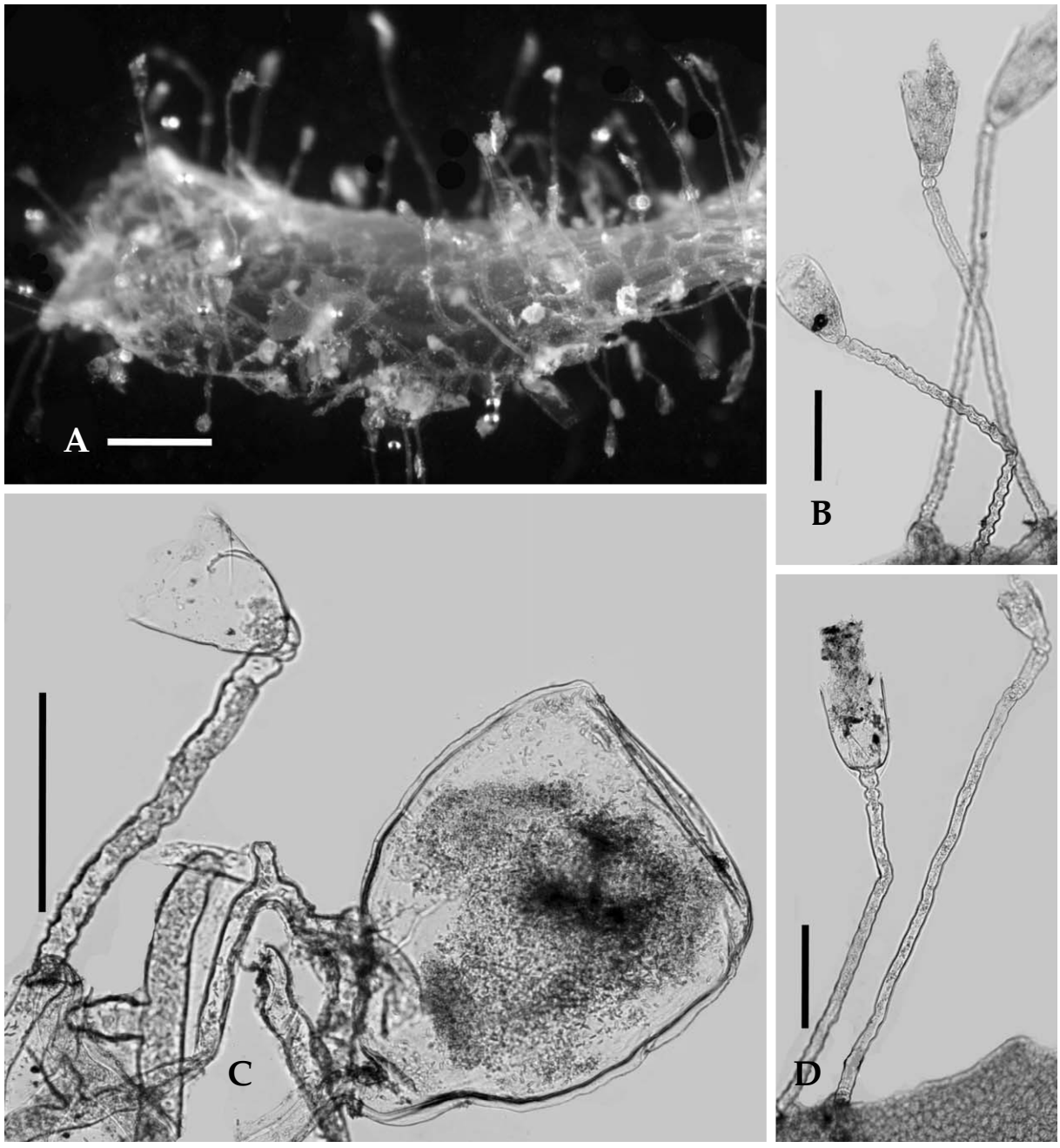

Fig. 24. *Campanularia crenata*. A. colony; B, D. hydrothecae; C. gonotheca and hydrotheca. Scales: A=1 mm, B–D=500 μm.

Campanularia crenata: Millard and Bouillon, 1973, p. 47, fig. 6B–F; Millard, 1975, p. 204, fig. 68A–F.

Colony attached on algae, not branched. Hydrotheca bell-shaped, with about 12 low and blunt marginal teeth and pedicels arising from stolon. Gonotheca large, cup-shaped, more or less compressed, with a pair of low processes from upper sides in general, and pedicel arising from stolon,

which were found in December.

The measurements of the specimen from Seongsanpo are as follows (μm).

Hydrotheca, total length ····· 555–613
maximum diameter ····· 423–463
Hydrothecal pedicel, length ····· 2262–3212
maximum diameter ····· 98–100
Gonotheca, total length ····· 818–905
maximum diameter ····· 715–788
Colony, length ····· 2800–3800

Distribution: Korea, Japan, Magellanes, Tocopilla.

Korea: GN, JN, JJ.

Specimen examined: GN: (Mipo: 14.vii.1974), JN: (Geomundo: 17.vii.1977); (Jindo Jeopdo: 23.vii. 1994); (Daeheuksando: 4.vii.1978), JJ: (Wimi-ri: 8.vii.1972); (Seogwipo: 13.vii.1979); (Seongsanpo: 1.xii. 1978).

Ecology: This species attached on algae in waters from coast to subtidal zone.

20. *Campanularia groenlandica* Levinsen, 1893 (Fig. 25)

Geu-ril-lan-deu-jong-hi-deu-ra (그린란드종히드라)

Campanularia groenlandica Levinsen, 1893, p. 168, pl. 5, figs. 10–12 (not seen); Stechow, 1913b, p. 76, figs. 37–41; 1923b, p. 6, no. 54; Nutting, 1915, p. 38, pl. 3, figs. 1, 2; Fraser, 1944, p. 120, pl. 21, fig. 91; Yamada, 1958, p. 54; 1959, p. 37; Naumov, 1960, p. 253, fig. 139; Park, 1993, p. 266, fig. 3A–D.

Colony small, arising from stolons winding over the surface of other hydroids. Pedicel wavy in irregular on their upper part but not distinctly annulated and even smooth on their basal part, however a distinct spherule immediately above pedicel origin. Hydrotheca large, variable in shape, campanulate or cylindrical, with longitudinal ribs in wall and rounded marginal teeth. Gonotheca arising from hydrorhiza, oblong ovate, with short pedicel.

The measurements of the specimen from Munseom are as follows (μm).

Hydrothecal pedicel, total length ····· 700–1600
diameter ····· 50–60
Hydrotheca, total length ····· 550–740
diameter at middle portion ····· 260–370

Distribution: Korea, White, Barents, Kara, Laptev and Bering Seas, seas of Okhotsk and Japan, coasts of Norway to Trondheim Fjord, northern coast of Iceland, western coast of Greenland, coast of Alaska, Pacific and Atlantic coasts of North America.

Korea: JJ.

Specimen examined: JJ: (Munseom: 1.xii.2006; 1.vii.1993).

Ecology: This speies attached on algae or other hydroids in waters from the coast to 20 m deep.

Remarks: The hydrothecae are variable in shape and the wave patterns of pedicels. The pedicels of Nutting (1915), Fraser (1944) and Naumov (1960) were waved distinctly throughout.

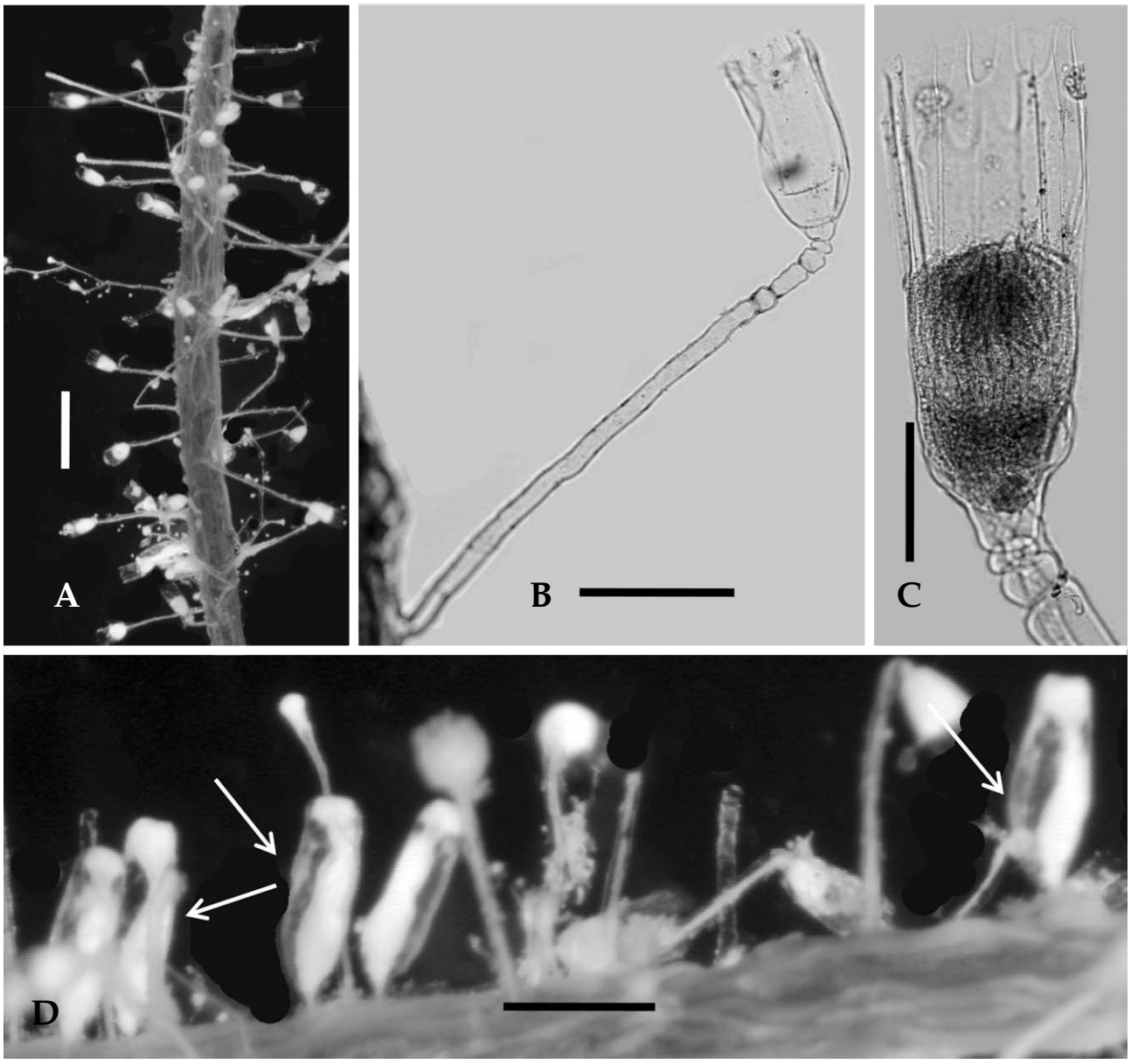

Fig. 25. *Campanularia groenlandica*. A. colony; B. hydrotheca and its pedicel; C. enlarged hydrotheca; D. part of colony with gonothecae (arrows). Scales: A=1 mm, B, D=500 μm, C=200 μm.

21. *Campanularia platycarpa* (Bale, 1914) (Fig. 26)

Ip-neol-beun-jong-hi-deu-ra (입넓은종히드라)

Orthopyxis platycarpa Bale, 1914, p. 79, pl. 11, fig. 3; pl. 12, fig. 3; Stechow and Uchida, 1931, p. 548, text-fig. 2, pl. 15, fig. 2; Yamada, 1950, p. 7; Utinomi, 1962, p. 5, pl. 3, fig. 3; Rho, 1967, p. 344, fig. 3; Park, 1990, p. 79; 1992, p. 287; 1993, p. 268.

Campanularia orthocarpa: Hirohito, 1995, p. 56, fig. 16e–g.

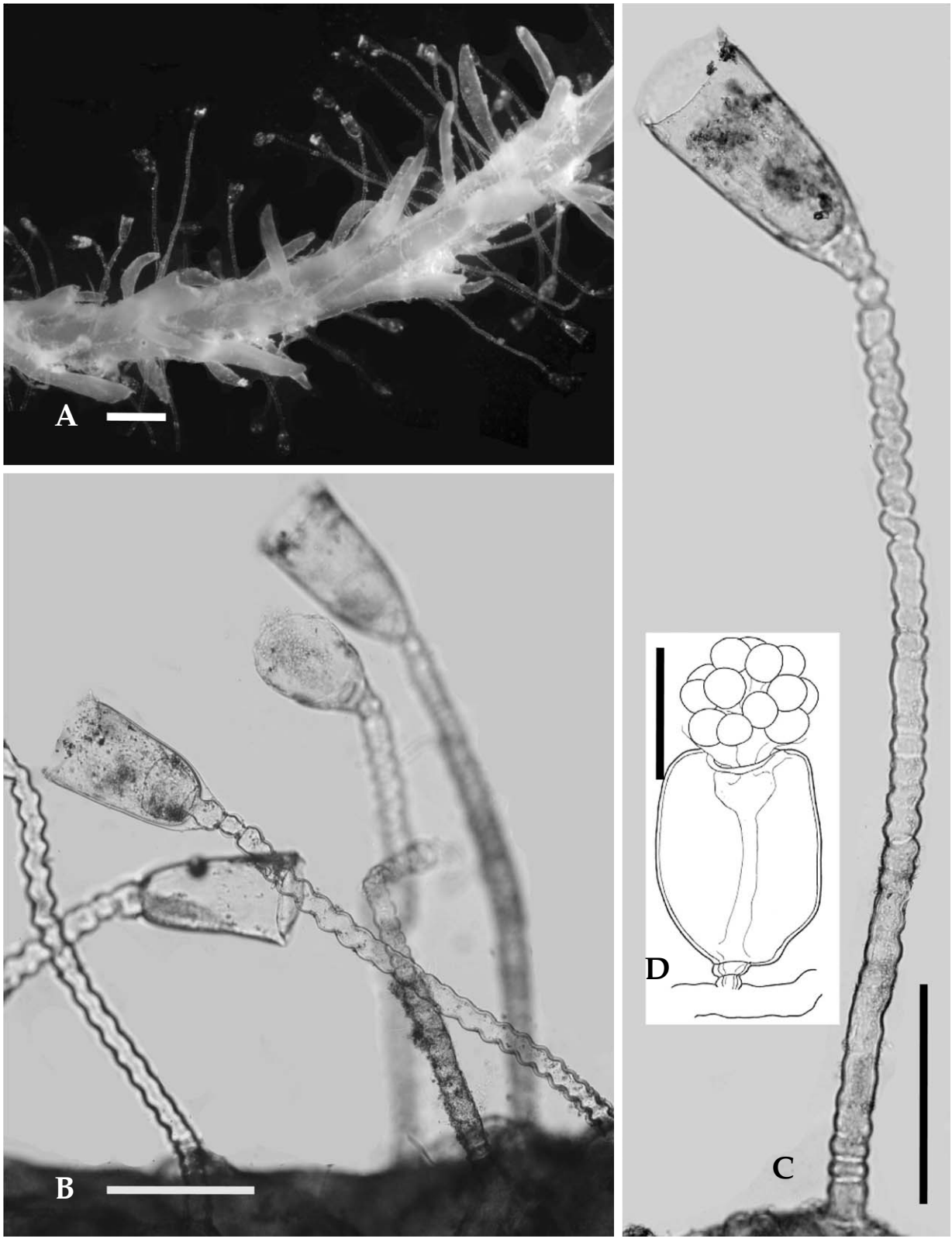

Fig. 26. *Campanularia platycarpa*. A. colony; B, C. hydrothecae and hydrothecal pedicels; D. female gonotheca (cited from Hirohito, 1995). Scales: A=1 mm, B–D=500 μm.

Campanularia platycarpa: Naumov, 1960, p. 257, fig. 154; Hirohito, 1995, p. 56, fig. 16e–g.

Colony stolonial. Hydrothecal pedicel arising from hydrorhiza, waved throughout, unbranched, with a spherule at distal end, and periderm thick. Hydrotheca large, deep campanulate, divided into low small room and upper large room by diaphragm, periderm thick, without teeth. Gonotheca arising from hydrorhiza, with short pedicel of one or two annulations, flat ovate, margin truncate and may form a brooding chamber at distal end.

The measurements of the specimen from Imwon are as follows (μm).

Hydrotheca, total length	470–570
diameter at margin	280–290
length of pedicel	1700–2160
maximum diameter	80–90
Gonotheca, total length	800
maximum diameter	650
Colony, length	2170–2730

Distribution: Korea, Japan, Australia.

Korea: GW, GB, GN, JN, CN, JJ.

Specimen examined: GW: (Imwon: 30.vi.1989); (Naksan: 14.viii.1973); (Sokcho: 16.viii.1973); (Jumunjin: 26.v.1985), GB: (Jukbyeon: 30.vii.1989), GN: (Haeundae: 11.vii.1967), JN: (Daeheuksando: 20.vii.1966), CN: (Amyeondo: 8.viii.1973), JJ: (Seogwipo: 10.vii.1972).

Ecology: This species attached on algae in waters from coast to subtidal zone.

Genus *Clytia* Lamouroux, 1812

Bit-hi-deu-ra-sok (빛히드라속)

Phialidium Leuckart, 1856.
Eucalix Stechow, 1921.
Pseudoclytia Mayer, 1900.

Colony small and stolonial, but sometimes sympodial and branched. Hydrotheca deep campanulate or funnel shaped, radially symmetrical and usually with teeth on margin. Diaphragm present, variable thickness, but always distinctly demarcated from hydrothecal wall. Gonophores in form of free medusae.

Type species: *Medusa haemisphaerica* Linnaeus, 1867=*Sertularia volubilis* Ellis and Solander, 1786.

Species 92 (3 in Korea).

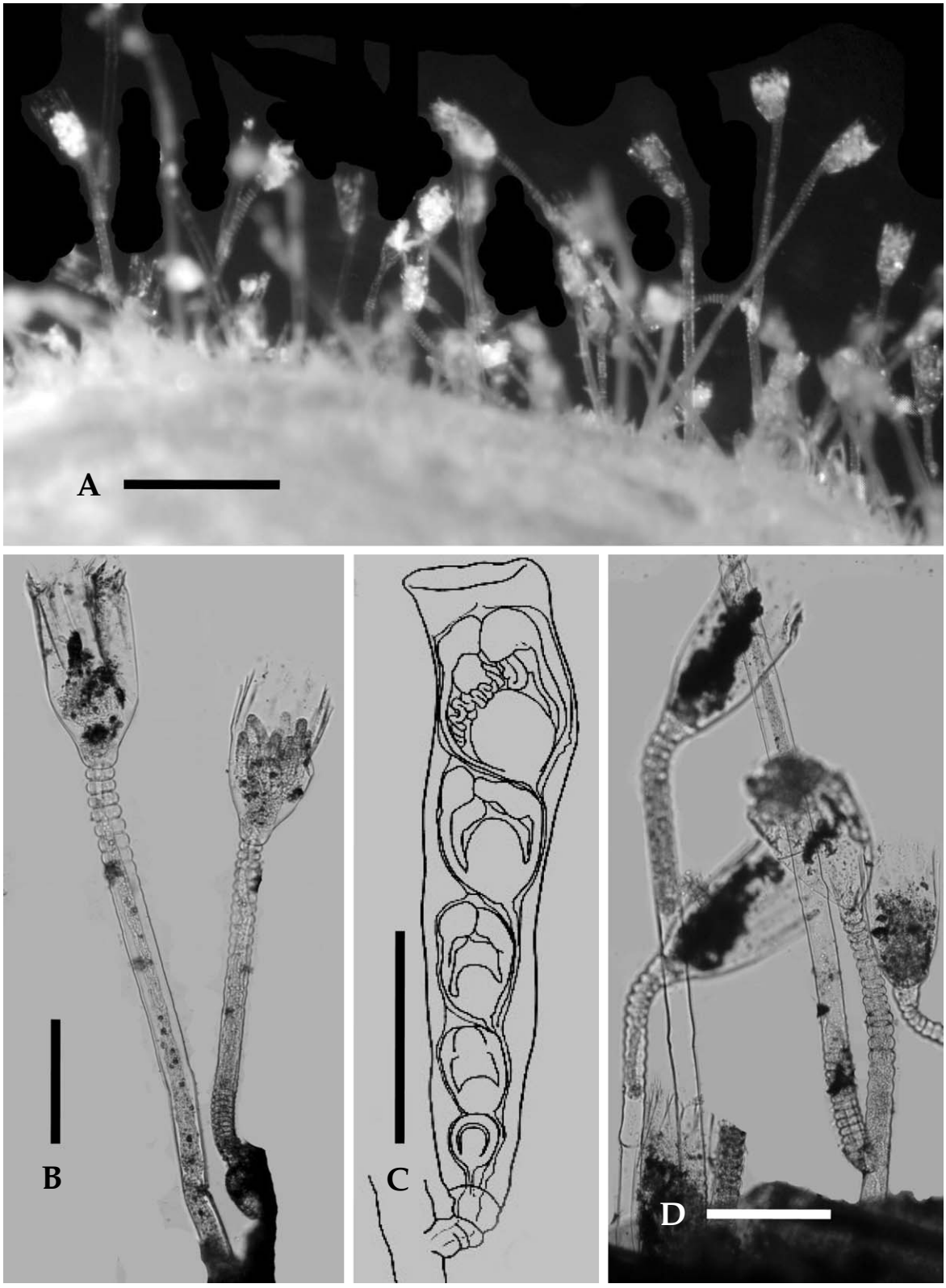

Fig. 27. *Clytia gracilis*. A. colony; B, D. hydrothecae and hydrothecal pedicels; C. gonotheca (cited from Hirohito, 1995). Scales: A=1 mm, B, D=200 μm, C=250 μm.

22. *Clytia gracilis* (M. Sars, 1851) (Fig. 27)

Bit-hi-deu-ra (빛히드라)

Laomedea gracilis M. Sars, 1851, p. 138 (not seen); Leloup, 1933, p. 8; 1937b, p. 23, fig. 14; 1940, p. 21; 1947, p. 26, fig. 15.
Gonothyrea gracilis: Bedot, 1910, p. 300; 1912, p. 293; 1916, p. 107; 1918, p. 135; 1925, p. 195; Kudelin, 1914, p. 467; Nutting, 1915, p. 70, pl. 17, fig. 3.
Clytia gracilis: Stechow, 1923a, p. 7; 1923b, p. 111; 1923c, p. 461; 1923d, p. 105; 1925, p. 431, figs. 9, 10; Yamada, 1959, p. 40; Rho and Park, 1980, p. 19, pl. 2, figs. 5, 6.

Colony attached on bryozoans, rarely branched. Hydrotheca deep campanulate, with 12-14 long and pointed marginal teeth, about three times as long as wide. Gonotheca arising from hydrothecal pedicel and stolon, oblong-shaped, truncated above, which were found in July.

The measurements of the specimen from Daeheuksando are as follows (μm).

Hydrotheca, total length	730
maximum diameter	463
Hydrothecal pedicel, length	1752–2555
maximum diameter	73
Gonotheca, total length	934–1416
maximum diameter	234–277
Colony, length	2500–3300

Distribution: Cosmopolitan.
Korea: GW, GN, JN.
Specimen examined: GW: (Sokcho: 3.x.1990), GN: (Mipo: 10.v.1974), JN: (Daeheuksando: 1.vii. 1978); (Yeosu: 8.vii.1973).
Ecology: This species attached on brown seaweeds.
Remarks: This species is similar to *C. edwardsi* and *C. johnstoni* (see Rho and Park, 1980) in the shape and length of colony, and the shape of hydrotheca, but distinguished from them by the shape of gonothecae. The author observed the three types of gonothecae from the same colony. The differences of the shape of gonothecae are considered as morphological differences during growth.

Genus *Obelia* Peron and Lesueur, 1809

Hok-hi-deu-ra-sok (혹히드라속)

Stem erect, fascicled or unfascicled, branched or unbranched, divided into regular internodes, each internode bearing a hydrotheca at distal end. Hydratheca campanulate, radial symmetrical, margin with or without teeth. Diaphragm distinctly demarcated from thecal wall. Gonophores in form of free medusa.

Type species: *Sertularia geniculata* Linnaeus, 1758.

Species 27 (5 in Korea).

Key to the species of genus *Obelia*

1. Stem fascicled ····· 2
− Stem unfascicled ····· *O. bicuspidata*
2. Periderm thick ····· *O. geniculata*
− Periderm thin ····· 3
3. Hydrotheca arranged in dichotomous ····· *O. dichotoma*
− Hydrotheca arranged in alternate ····· *O. flexuosa*

23. *Obelia bicuspidata* Clarke, 1875 (Fig. 28)

Ssang-ppyo-jok-hok-hi-deu-ra (쌍뾰족혹히드라)

Obelia bicuspidata Clark, 1875, p. 58, pl. 9, fig. 1; Bedot, 1918, p. 195; 1925, p. 299; Fraser, 1937, p. 83; Millard, 1958, p. 174; Millard and Bouillon, 1973, p. 6; Wedler, 1975, p. 340; Park, 1990, p. 79; 1992, p. 288; 1993, p. 268; 1995, p. 11; Hirohito, 1995, p. 71, fig. 21a, b, pl. 5, fig. A.

Laomedea bicuspidata: Hummelinck, 1936, p. 53, figs. 8a–1, r, s, v; 1954, p. 161; Leloup, 1937b, p. 20; 1938, p. 2; Vervoort, 1946, p. 344, fig. 10a, b; Hamond, 1957, p. 312.

Colony length variable, from 17 mm to 118 mm. Though young colony very small, external features identical with old colony. Colony attached on shells of bivalves. Stem fascicled in proximal portion, divided into regular internodes, branched alternately to right and left side, with 6–7 annulations on base of each internode. Hydrocladia not fascicled, divided into regular internodes, with 4–5 annulations on proximal portion of each internode. Hydrotheca arising from distal portion of each internode of hydrocladia, comparatively large, long cylinder-shaped, with pedicel consisting of 6–14 annulations, terminated with about 10 pairs sharp teeth, with usually longitudinal strips on external surface of hydrotheca. Gonotheca elongate, widening to broad distal end, with terminal aperture, but no neck, with annulated pedicel.

The measurements of the specimen from Jagyakdo are as follows (μm).

Hydrocaulus, length of internode ····· 84–92
maximum diameter (nonfascicled portion) ····· 12–13
Hydrocladia, length of internode ····· 46–60
maximum diameter ····· 8–10
Hydrotheca, total length (including teeth) ····· 46–50
diameter at margin ····· 23–33
diameter at base ····· 6
Colony, length ····· 17–118 mm

Distribution: Cosmopolitan.

Korea: GN, JN, JB, CN, GG, JJ.

Specimen examined: GN: (Mipo: 29.xii.1974); (Samcheonpo: 20.vii.1984), JN: (Daeheuksando: 22. vii.1982), JB: (Eocheongdo: 31.v.1969); (Gomso: 6.viii.1975); (Jindo: 23.vii.1994), CN: (Daecheon: 2.vii. 1984), GG: (Jagyakdo: 4.v.1996).

Ecology: This species attaches to rock and shells in waters about 20 m deep.

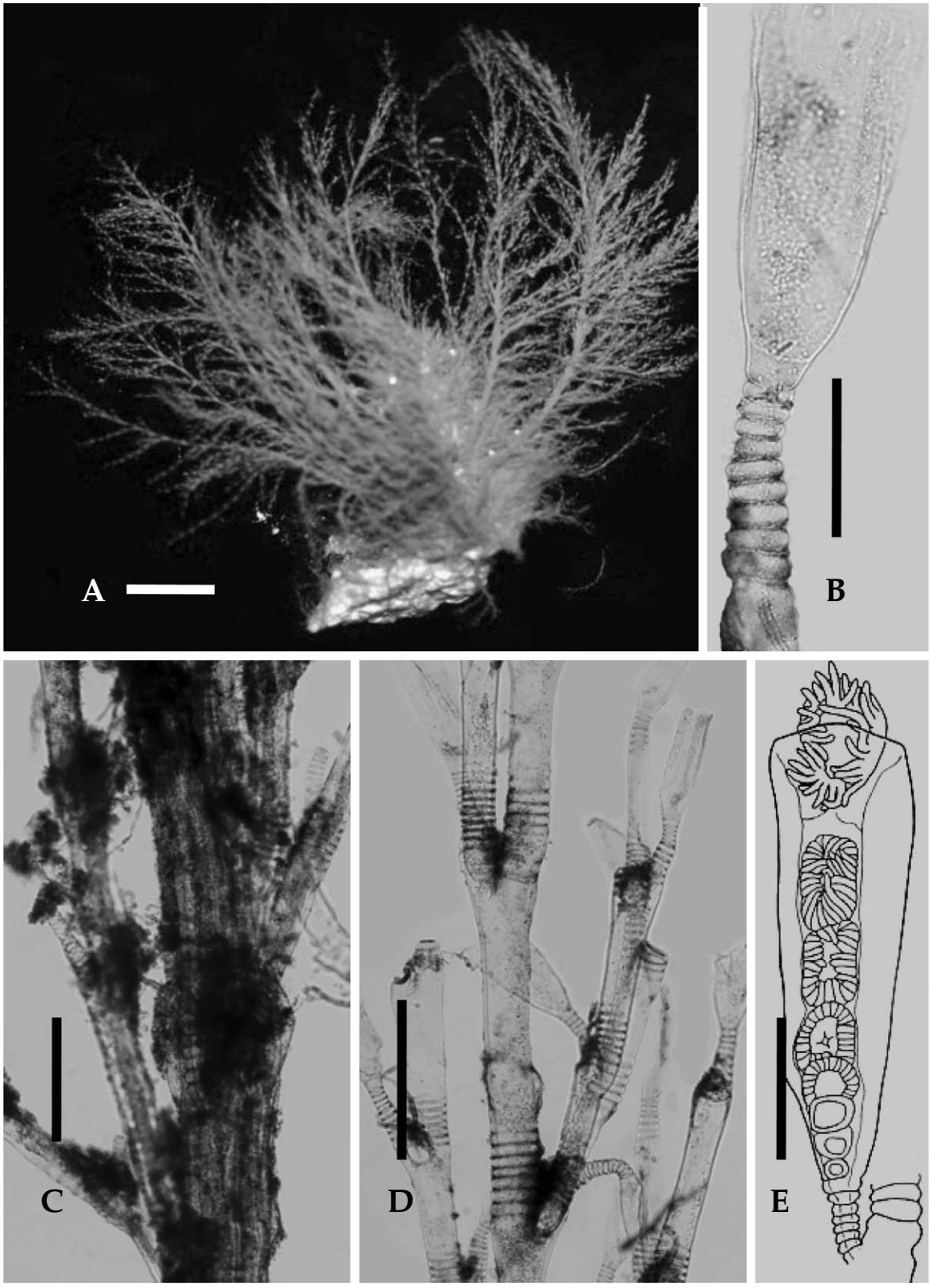

Fig. 28. *Obelia bicuspidata*. A. colonies; B. hydrotheca; C. polysiphonic stem; D. monosiphonic stem and branches; E. gonotheca (cited from Hirohito, 1995). Scales: A=10 mm, B=200 μm, C–E=500 μm.

24. *Obelia dichotoma* (Linnaeus, 1758) (Figs. 29, 30)

Gal-lae-hok-hi-deu-ra (갈래혹히드라)

Sertularia dichotoma Linnaeus, 1758 (not seen).

Laomedea dichotoma: Allman, 1859, p. 137; Stechow, 1923b, p. 117; 1925, p. 521; Leloup, 1933, p. 21; 1934, p. 8; 1937b, p. 22; 1938, p. 5; 1947, p. 25, fig. 13; 1960, p. 222; Hummelinck, 1936, p. 52; 1954, p. 161; Vervoort, 1946, p. 344; 1949, p. 158; 1959, p. 315; Hamond, 1957, p. 312.

Obelia dichotoma: Nutting, 1901, 350, fig. 37; 1915, p. 80, pl. 20, fig. 7; Billard, 1906b, p. 1; 1907, p. 169; Bedot, 1910, p. 334; 1912, p. 356; 1916, p. 160; 1918, p. 196; 1925, p. 304; Stechow, 1912, p. 356; 1913b, p. 130; 1919, p. 49; 1929, p. 152; Yamada, 1950, p. 8, pl. 1, fig. 6; 1959, p. 41; Hirohito, 1969, p. 8; 1995, p. 74, fig. 21d–k; Rho and Park, 1980, p. 20, pl. 3, figs. 1–3; Park, 1992, p. 288.

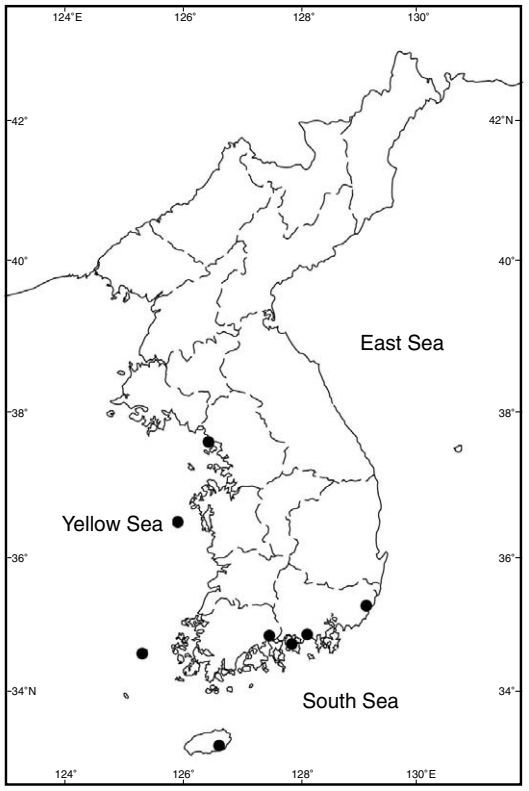

Fig. 29. Distribution of *Obelia dichotoma*.

Colony attached below rocks in tide pools, dichotomous branched irregularly. Hydrocaulus divided into regular internodes. There are three annulations at the base of each internode. Hydrotheca deeply campanulate, with marginal wave or smooth. Gonotheca arising from between the hydrocaulus and hydrothecal pedicel, oblong, with short and annulated pedicel and short collar at distal end; found in July.

The measurements of the specimen from Daeheuksando are as follows (μm).

Hydrocaulus, length of internode ····· 715–832
maximum diameter of internode ····· 117–131
Hydrotheca, total length ····· 292–365
maximum diameter ····· 161–389
Gonotheca, total length ····· 672–759
maximum diameter ····· 277–394
Colony, length ····· 10–20 mm

Distribution: Korea, Japan, Indo-China, North Atlantic.

Korea: GN, JN, CN, GG, JJ.

Specimen examined: GN: (Namhaedo: 7.vi.1974); (Mipo: 28.iv.1978); (Samcheonpo: 20.vii.1984), JN: (Yeosu: 20.vii.1978); (Daeheuksando: 4.vii.1978), CN: (Oeyeondo: 26.vi.2007), GG: (Jagyakdo: 14.x.1973), JJ: (Seogwipo: 12.iv.1975).

Ecology: This species attached on algae and hard substratum in waters coast to subtidal zone.

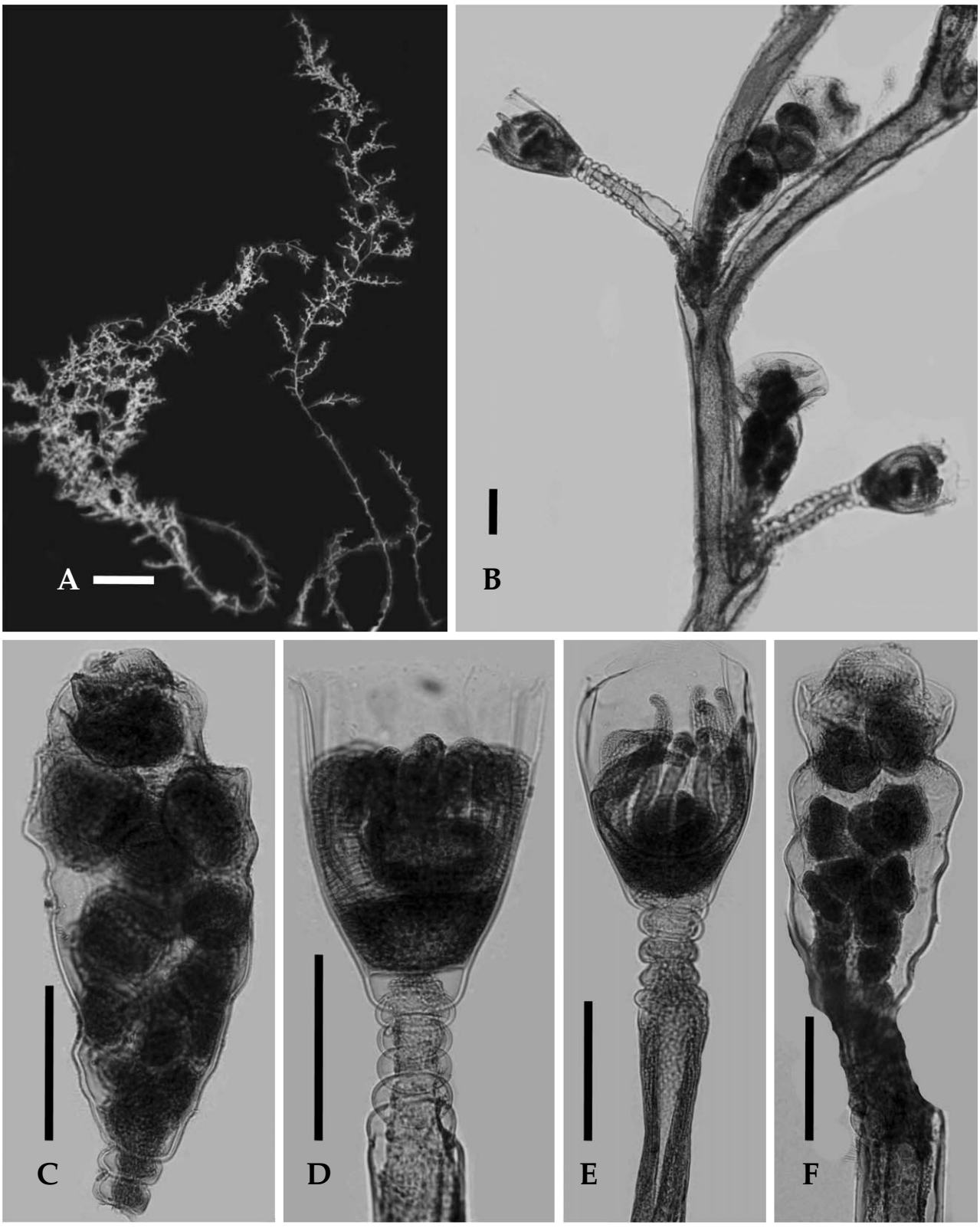

Fig. 30. *Obelia dichotoma*. A. colonies; B. part of colony; C, F. gonothecae; D, E. hydrothecae. Scales: A=10 mm, B–F=200 μm.

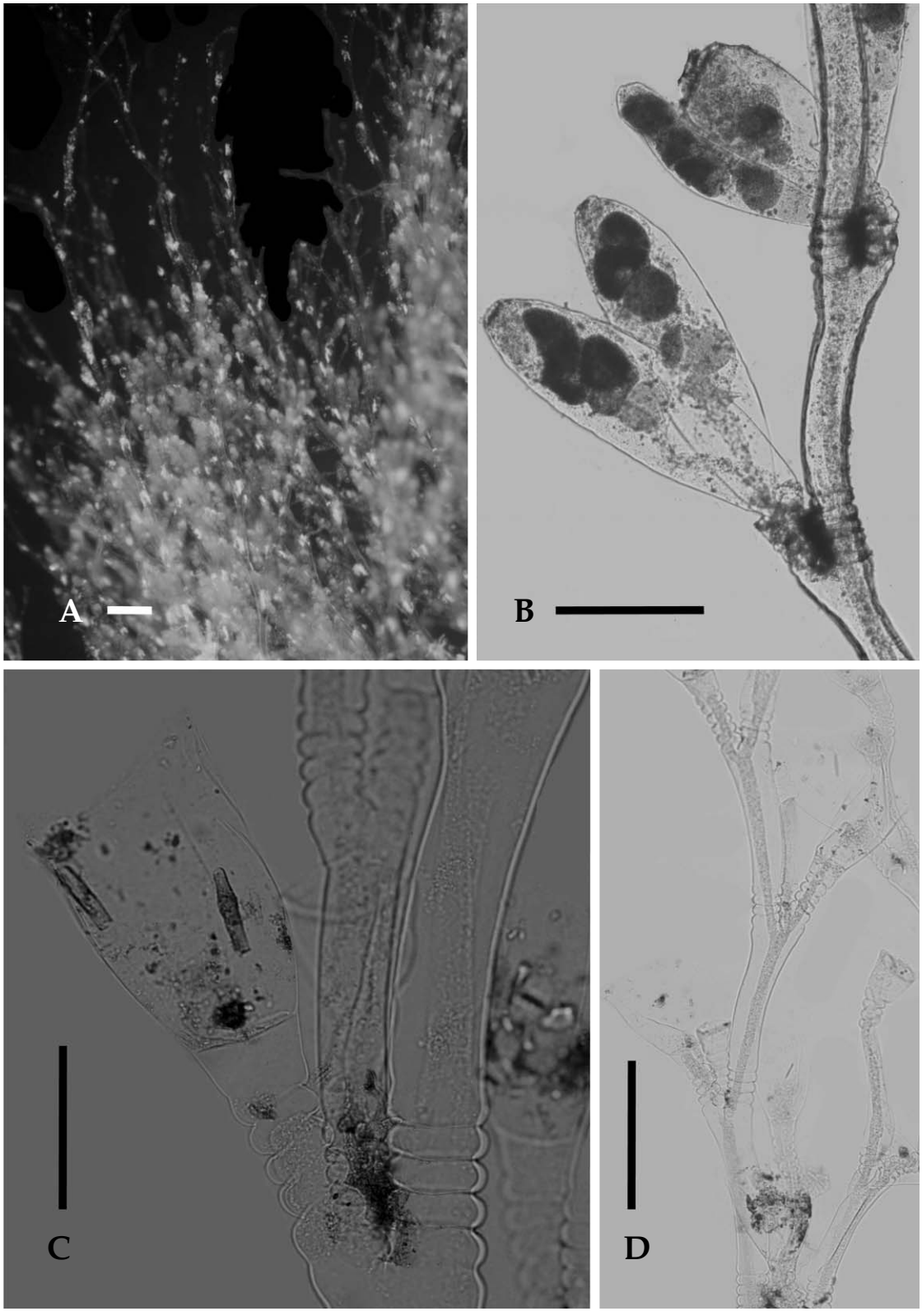

Fig. 31. *Obelia flexuosa*. A. colony; B. gonothecae; C. hydrotheca; D. part of colony. Scales: A=1 mm, B, D=500 μm, C=200 μm.

25. *Obelia flexuosa* (Hincks, 1861) (Fig. 31)

Gul-gok-hi-deu-ra (굴곡혹히드라)

Laomedea flexuosa Hincks, 1861, p. 260.
Campanularia flexuosa: Hincks, 1868, p. 168; Nutting, 1915, p. 45, pl. 7, figs. 1–6.
Obelia flexuosa: Naumov, 1960, p. 266, fig. 154; Park, 1995, p. 12, fig. 1E–H.

Colony small. Stem not fascicled, slightly flexuous, sometimes branched, and divided into regular internodes. Each internode annulated on proximal ends, 5–8 annuli and with a distal apophysis alternately, which bears hydrotheca. Hydrotheca typically funnel-shaped and margin smooth, distinct intrathecal diaphragm, hydrothecal pedicel annulated throughout or usually middle part of pedicel smooth.

The measurements of the specimen from Jindo are as follows (μm).

Hydrotheca, total length	310–330
diameter at margin	190–280
Hydrothecal pedicel, total length	270–300
diameter at distal	60
diameter at middle	90–100
diameter at proximal	70
Gonotheca, total length	70–110
maximum diameter	210–300
Gonothecal pedicel, total length	120–220
maximum diameter	60–70
Colony, length	below than 10 mm

Distribution: Korea, Japan, New England coast (America), British Islands, Norway, Iceland, Denmark, Helgoland, France, Mediterranean, Morocco, Baltic, Barents and White Seas.

Korea: GW, GG.

Specimen examined: GW: (Yongho-ri: 28.vi.1989), GG: (Jagyakdo: 18.iii.1995).

Ecology: This species attached on shells and axon of dead coral in waters coastal to subtidal zone.

Remarks: The number of annulations on the base of each internode of stem, hydrothecal pedicel and gonothecal pedicel are variable.

26. *Obelia geniculata* Linnaeus, 1758 (Fig. 32, 33)

Hok-hi-deu-ra (혹히드라)

Sertularia geniculata Linnaeus, 1758, p. 812 (not seen).
Obelia geniculata: Stechow, 1913b, p. 70, text-figs. 26, 27; 1923b, p. 7; 1925, p. 53, text-fig. 129; Yamada, 1958, p. 51; 1965, p. 41; 1959, p. 365; Ito and Inoue, 1962, p. 85, pl. 8, fig. 67; Rho, 1967, p. 2, fig. 1; 1969, p. 164, text-figs. 3, 4; Kim and Rho, 1971, p. 10; Rho and Chang, 1972, p. 101; Park, 1990, p. 79; 1992, p. 288; 1993, p. 268; Hirohito, 1995, p. 76, fig. 2a, b.

Colony attached on brown algae. Stem monosiphonic, unbranched, divided into regular inter-

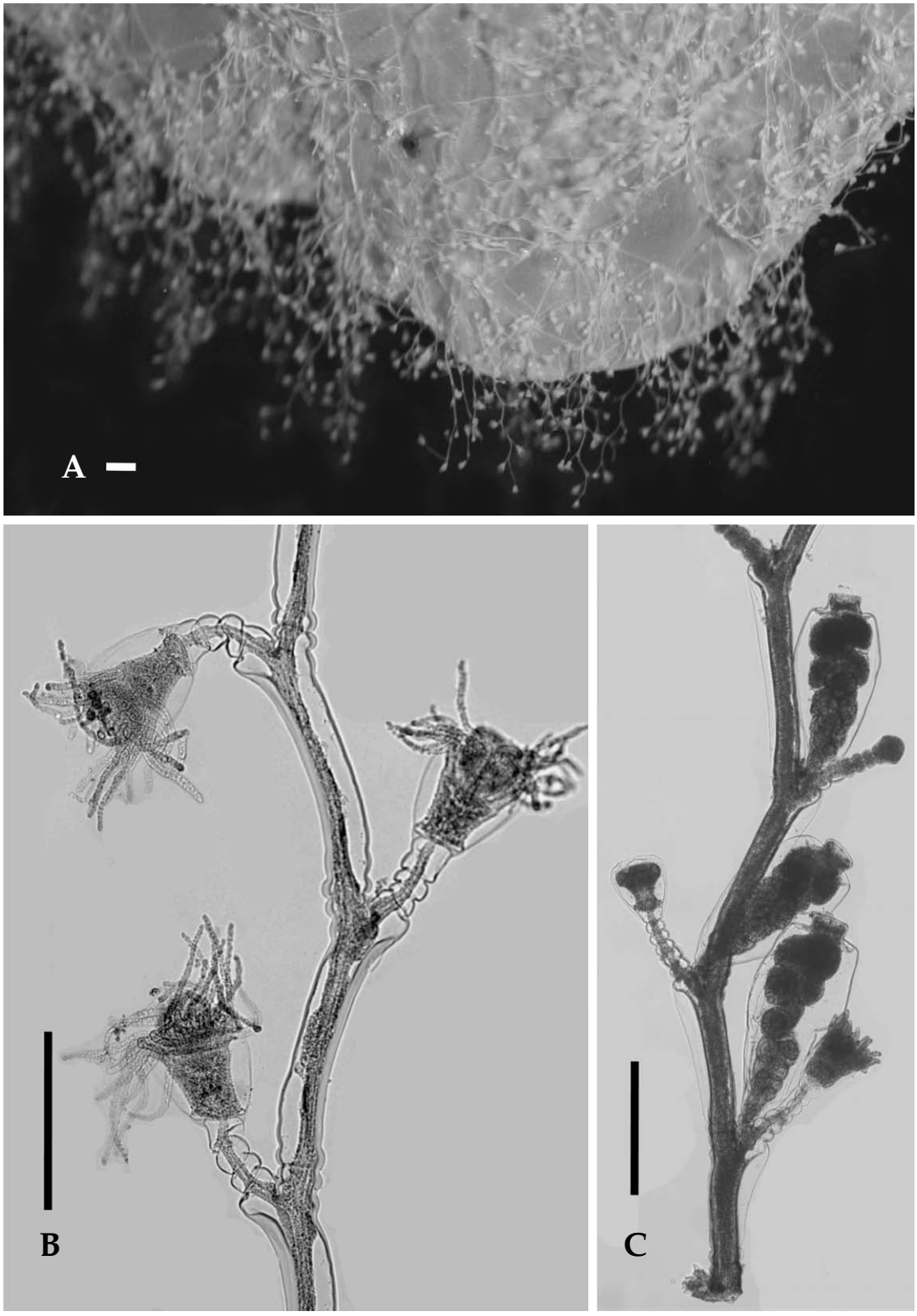

Fig. 32. *Obelia geniculata*. A. colony; B. hydrothecae; C. gonothecae and hydrothecae. Scales: A=1 mm, B, C=500 μm.

nodes, each internode bearing a hydrotheca alternately at distal end, curved alternately making zig-zag pattern. With one or two annulations at proximal end of each internode. Periderm of stem very thick. Hydrotheca campanulate, diaphragm distinct, dividing a small lower room from a large upper room, margin smooth. Hydrothecal pedicel completely annulated, usually shorter than hydrotheca. Gonotheca arising from hydrorhiza or stem, oblong ovate, wall smooth, with terminal aperture on short tubular neck. Gonothecal pedicel short, with one or two annulations.

The measurements of the specimen from Gollido are as follows (μm).

Stem, length of internode ····· 420–640
maximum diameter ····· 150
Hydrotheca, total length ····· 210–300
diameter at margin ····· 150–210
Gonotheca, total length ····· 760–850
maximum diameter ····· 240–390
Colony, length ····· 10 mm

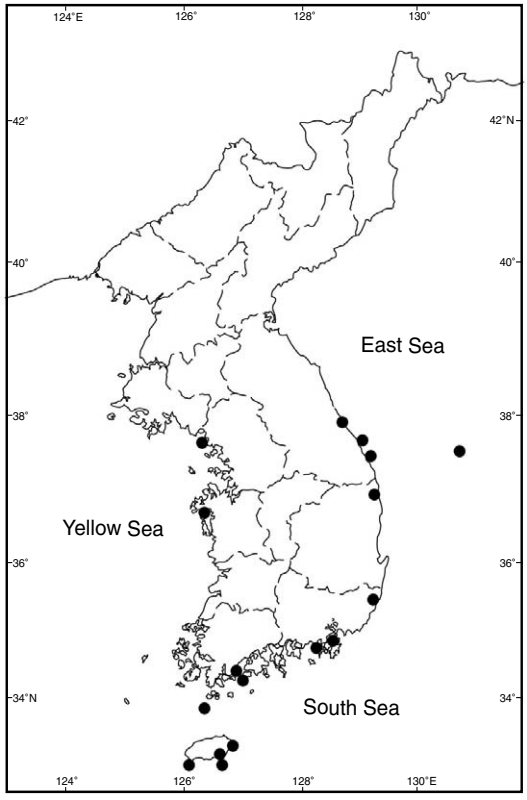

Fig. 33. Distribution of *Obelia geniculata.*

Distribution: Cosmopolitan.

Korea: GW, GB, GN, JN, CN, GG, JJ.

Specimen examined: GW: (Jumunjin: 26.v.1986); (Jangho, Imwon: 30.vi.1989), GB: (Jukbyeon: 30.vi. 1989); (Ulleungdo: 16.vii.1976), GN: (Gonrido: 4.vii.2001); (Haeundae: 12.vi.1967); (Gujora: 20.vii. 1970), JN: (Dolsan: 22.v.1967); (Yeosu: 8.viii.1974), CN: (Biin: 20.vii.1971), GG: (Yeongjongdo: 30.iii. 1968), JJ: (Sasudo: 8.viii.1969); (Seogwipo: 14.vii.1973); (Wimi-ri: 8.vii.1971); (Gapado: 15.vi.1986); (Munseom: 30.vi.1993).

Ecology: This species attaches on brown algae in waters coastal to subtidal zone.

Remarks: The periderm is very thick.

Genus *Rhizocaulus* Stechow, 1919

Ppu-ri-hi-deu-ra-sok (뿌리히드라속)

Stem fascicled. Hydrothecal pedicels arranged in verticillate or spiral pattern. Diaphragm absent. With a spherule at base of hydrotheca.

Type species: *Sertularia verticillata* Linnaeus, 1758.

Species 2 (2 in Korea).

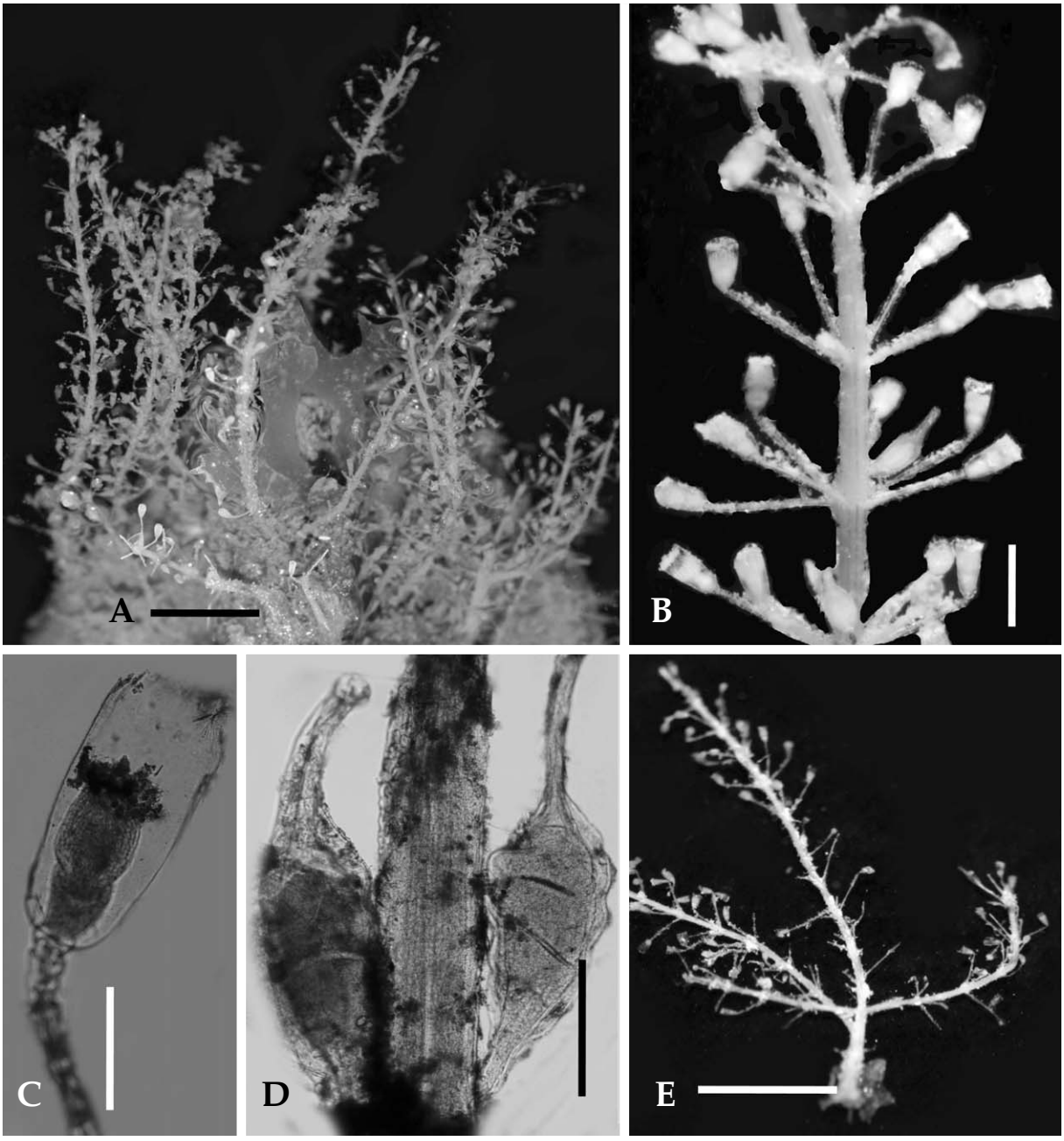

Fig. 34. *Rhizocaulus verticillatus*. A. colonies; B. verticils of hydrothecal pedicels; C. hydrotheca; D. gonothecae; E. branching colony. Scales: A, E=10 mm, B=1 mm, C, D=500 μm.

27. ***Rhizocaulus verticillatus*** (Linnaeus, 1758) (Fig. 34)

Yun-saeng-ppu-ri-hi-deu-ra (윤생뿌리히드라)

Sertularia verticillata Linnaeus, 1758, p. 1310 (not seen).
Campanularia verticillata: Hincks, 1868, p. 167, pl. 32, figs. 1, 1a.

Rhizocaulus verticillatus: Stechow, 1919, p. 852; Cornelius, 1982, p. 67, fig. 7; Park, 2009, p. 83, fig. 3A–E.
Verticillina verticillata: Naumov, 1960, p. 291, fig. 159.

Stem erect, composed of many parallel tubes, each bearing long straight smooth hydrothecal pedicels arranged in verticils of 4–6 in number at regular intervals, unbranched but sometimes branched irregularly. Hydrotheca bell-shaped, rather large and deep, with 10–16 blunt teeth. Hydrothecal pedicel more or less annulated at top and bottom. Gonotheca bottle–shaped, with smooth, narrow and long neck and very short stalk its base.

The measurements of the specimen from Nagokkkochdongsan are as follows (μm).

Hydrothecal pedicel, length ····· 1000–1500
  maximum diameter ····· 90–100
Hydrotheca, total length ····· 250–350
  meter at margin ····· 350
Gonotheca, total length ····· 1200
  maximum diameter ····· 300
Colony, length ····· 30–50 mm

Distribution: Korea, Japan, Norway, Denmark and Sweden, Barents Sea, Greenland, Roscoff (NW France), Britain, Netherlands, Belgium.

Korea: GW, GB, GN, JN, JB, JJ.

Specimen examined: GW: (Jangho: 7.viii.1983), GB: (Uljin Nagokkkotdongsan: 10.i.2008); (Ulleungdo: 24.vii.1976), GN: (Mipo: 28.vi.1978), JN: (Jindo: 23.vii.1994), JB: (Eocheongdo: 31.v.1969), GG: (Jagyakdo: 2.xi.1978).

Ecology: This species attaches on shells or hard substratums in waters 20–25 m deep.

Remarks: This species species is similar to R. chinensis (see Park, 1979) in the polysiphonic main stem and unbranched hydrothecal pedicel. But it is distinguished from the latter with semivertthe icillate arrangement of hydrothecal pedicels and lacks the neck of the gonotheca.

Family Sertulariidae Hincks, 1868

Te-hi-deu-ra-gwa (테히드라과)

Hydrothecae arranged in two or more longitudinal rows on stem and branches. Hydrothecae stalked or sessile, if sessile, adnate to a varying degree, bilaterally symmetrical, usually with a toothed margin and a hinged operculum of one or more valves, with a diaphragm in stalked species, a definite floor perforated by an asymmetrical hydropore in sessile species. Hydranth with a single circle of filiform tentacles and a conical hypostome. Nematothecae absent. Gonophores in the form of fixed sporosacs.

The stem may be fascicled or unfascicled, branched or unbranched. The branches arise in one plane and are opposite or alternate, often rebranching in the same way, though species with spiral or whorled branches also occur. In some cases the branches differ from the main stem in some way, in thickness, arrangement of hydrothecae, and the term hydrocladia is appropriate. Particularly in the small and irregularly branched species, the branches are similar in structure to the stem, but the

term hydrocladia is used here too for the final ramifications of a pinnate stem. The stem is termed stiff when it is able tosupport itself out of fluid and flexuous when it cannot. The stiff stems give rise to bushy colonies, and flexuous stems to long, straggling colonies. Stolonization from the ends of the stem or hydrocladia may occur in any species and is particularly common in *Symplectoscyphus*. It gives the colony a tangled and matted appearance. Stem and branches are divided into internodes, with transverse or oblique nodes. Each internode may bear one or more hydrothecae and may contain internodal septa. In certain species of *Sertularia* hinge joints occur, which allow for movement and provide a point of easy rupture and subsequent regeneration. Hinge joints usually occur in pairs near the base of an unbranched stem or at the bases of hydrocladia of a branched stem, but may also occur at irregular intervals in addition to the normal nodes.

The arrangement of the hydrothecae on the stem and hydrocladia varies. Commonly the hydrothecae are alternate in *Sertularella* and *Symplectoscyphus* or in opposite pairs in many species of *Sertularia*, but they may be subopposite or subalternate. In all of these the hydrothecae form two longitudinal rows. Members of the two rows may be well separated or may be contiguous and touch one another in the centre on one surface. Occasionally the hydrothecae form more than two longitudinal rows in the genus *Selaginopsis*.

In the genus *Sertularella* with its numerous species the curvature of the hydrotheca is important in diagnosis and thus needs precise definition. Three categories are recognized:

1. Margin perpendicular to axis. Hydrotheca not curved, and flask-shaped in lateral view. A line dropped at right angles to the margin and through its center will bisectthe hydrotheca and pass through the base of the adcauline wall.
2. Margin tilted towards abcauline side. Hydrotheca curved away from stem. A line dropped at right angles to the margin and through its centre will pass through the adcauline wall.
3. Margin tilted towards adcauline side. Hydrotheca with double curvature. A line dropped at right angles to the margin and through its centre will pass through the abcauline wall or through the hydropore.

Most of the Sertulariidae have sessile and bilaterally symmetrical hydrothecae, with one side adnate to the stem to a varying degree.

In the species of the genera *Thuiaria* and *Salacia* all or almost all of one surface of the hydrotheca may be adnate and deeply sunk into the stem. Associated with the adnate condition the hydrotheca is usually curved, with the mouth directed away from the stem.

Because of the curvature of the hydrotheca measurements may be difficult. As a result of curvature the hydrotheca may have intrathecal septa, and these may be adcauline or abcauline or on both sides. They form a useful point of attachment for the hydranth and are characteristic of many species of *Sertularia* (Fig. 35).

In the sessile species the hydrotheca has a definite floor of perisarc with an eccentric hydropore. The hydropore is close to the abcauline side and the floor is attached to, and continuous with, the base of the adcauline wall.The adcauline wall is often produced below the floor as a thickened knot of perisarc. In the family Sertulariidae the margin of the hydrotheca is typically toothed, and the number and shape of the teeth are useful in diagnosis. For instance, *Sertularella* has four marginal teeth, *Symplectoscyphus* three and *Amphisbetia* two. In a few forms of *Abietinaria* and *Thuiaria* the marginal teeth are almost obsolete or absent. Some species have internal teeth formed by pegs of perisarc projecting into the cavity of the hydrotheca just below the margin. These are particularly prevalent in *Sertularella*, where in certain cases their presence or absence, number and position may be diagnostic for the species. The mouth of the hydrotheca is closed by an operculum consisting

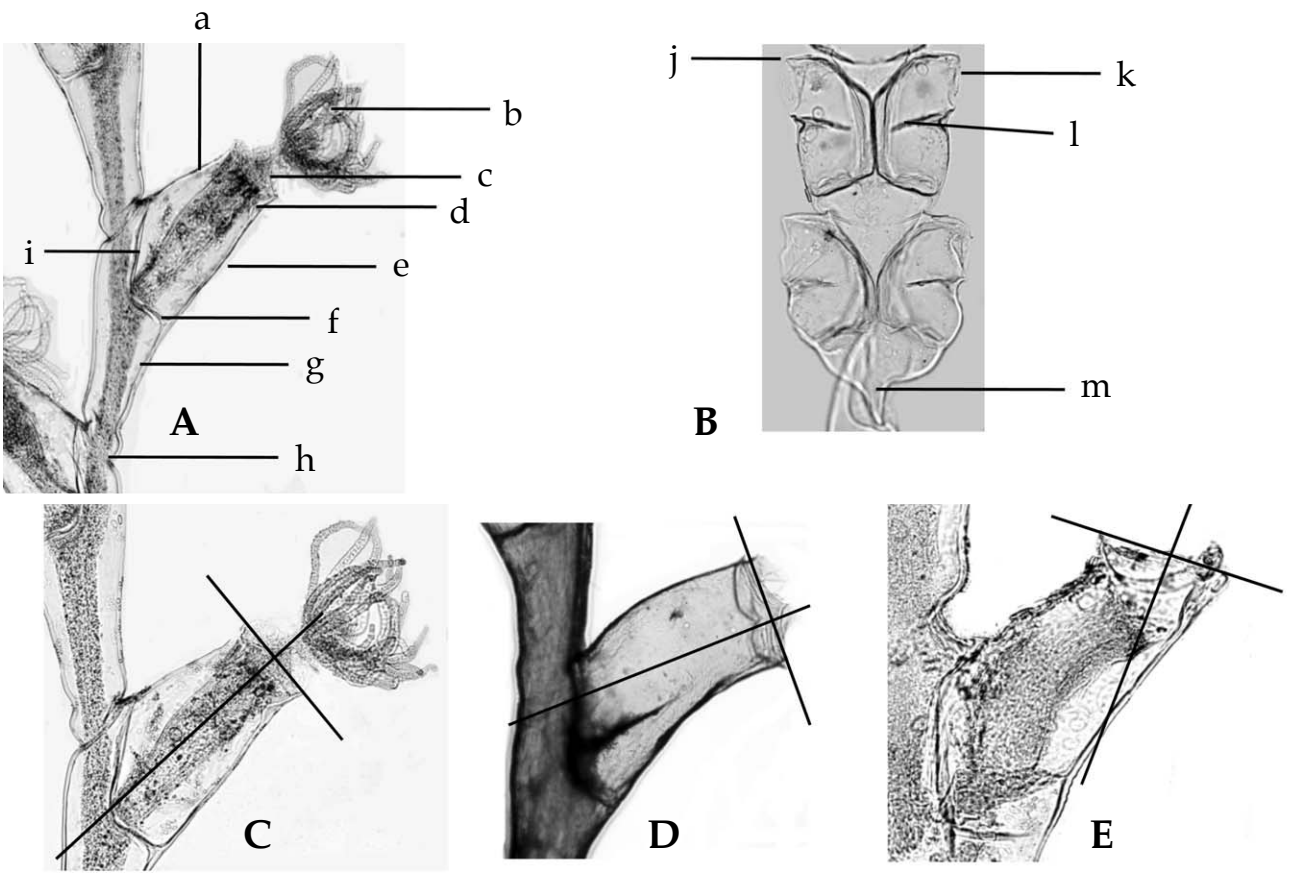

Fig. 35. Structure and shape of hydrothecae. A. *Sertularella*, *Sertularella levigata* (a. free portion of adcauline wall; b. hydranth; c. hydrothecal tooth; d. intrathecal tooth; e. abcauline wall; f. floor; g. internode; h. node; i. adnate portion of adcauline wall); B. *Sertularia, Sertularia turbinata* (j. hydrothecal tooth; k. operculum; l. intrathecal septum; m. hinge joint); C. *Sertularella levigata*, margin perpendicular to axis; D. *Sertularella gigantea*, margin tilted towards abcauline side; E. *Symplectoscyphus hozawai*, margin tilted towards adcauline side.

of one or more valves hinged at the edge. In genera with three or four marginal teeth a similar number of valves is sited in the bays between them and meet in the centre to form a pyramid. Genera with two marginal teeth, as for instance *Sertularia*, *Amphisbetia* and *Dynamena*, have an operculum of two valves of unequal size attached at the ad- and abcauline edges. The larger valve is adcauline in *Amphisbetia* and abcauline in *Dynamena* and *Sertularia*. In these forms the adcauline valve may be divided into two by a partition and bent at an angle like a roof.

Genera with only one large opercular valve include *Diphasia*, *Thuiaria*, *Abietinaria* and *Salacia*. In the genera *Diphasia* and *Abietinaria* the hinge is adcauline and abcauline in *Thuiaria* and *Salcia*. Sometimes the operculum is shed faily early in development and reduced toa membrane or even lost together. On contraction the hydranth is completely withdrawn into the hydrotheca and the operculum closed over it. Regeneration of the margin is accompanied by regeneration of the operculum, so that there may be several opercula, one above the other (Fig. 36).

In the genera, *Abietinaria*, *Amphisbetia*, *Sertularella*, *Sertularia*, *Symplectoscyphus* and *Thuiaria*, con-

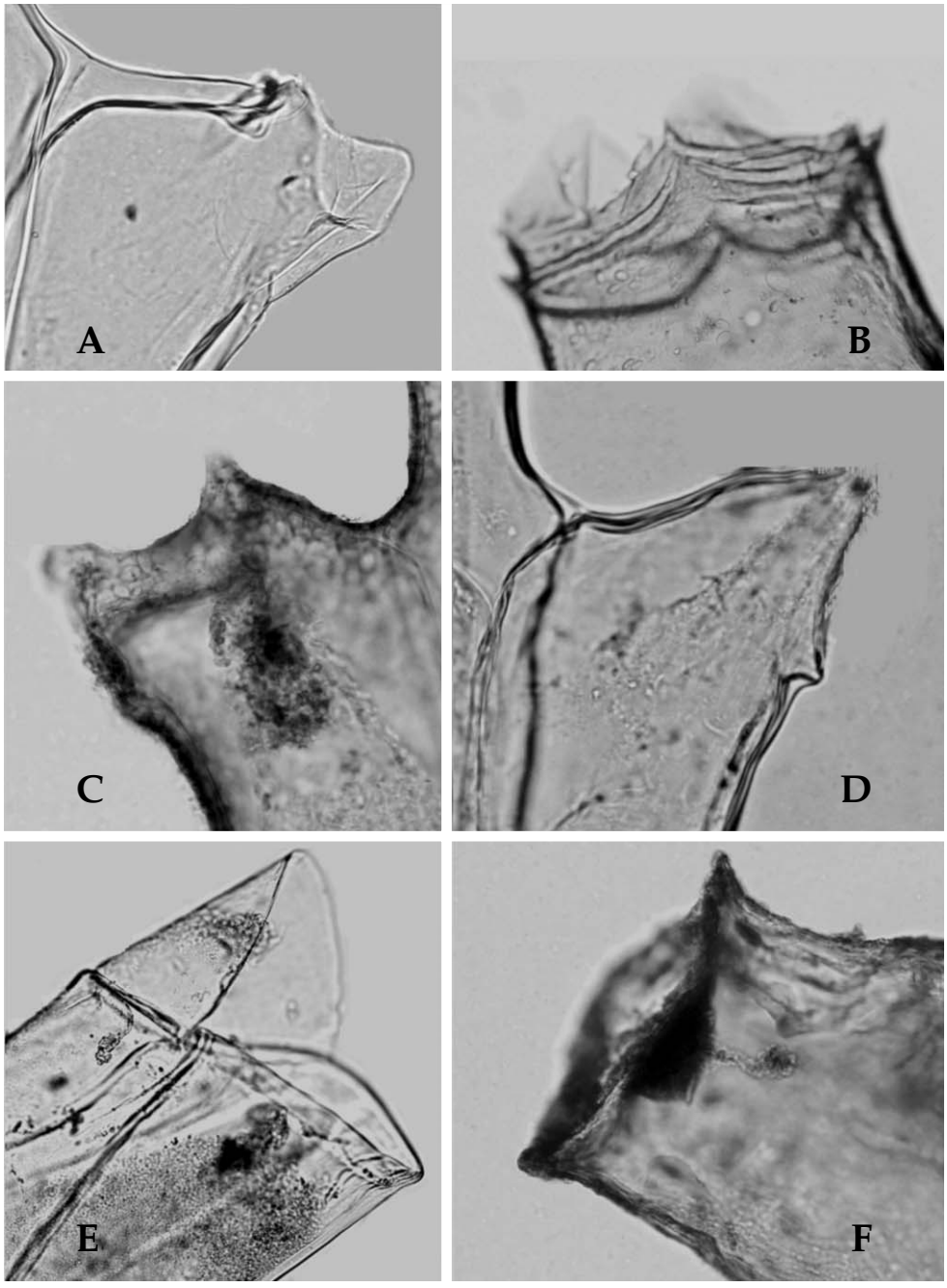

Fig. 36. Marginal teeth and operculum. A. two teeth and two valves; B. regenerated teeth and valves; C, D. three teeth and valves; E. one operculum; F. four teeth and valves.

traction of the hydranth into the hydrotheca causes the proximal part of the gastral cavity wall to be folded into a blind caecum on the abcauline side. This blind caecum is useful in generic diagnosis. In other genera, *Diphasia*, *Dynamena* and *Salacia*, the hydranth is withdrawn symmetrically into the hydrotheca and there is no caecum.

The gonothecae are usually dioecious and sometimes also dimorphic. No special protective struc-

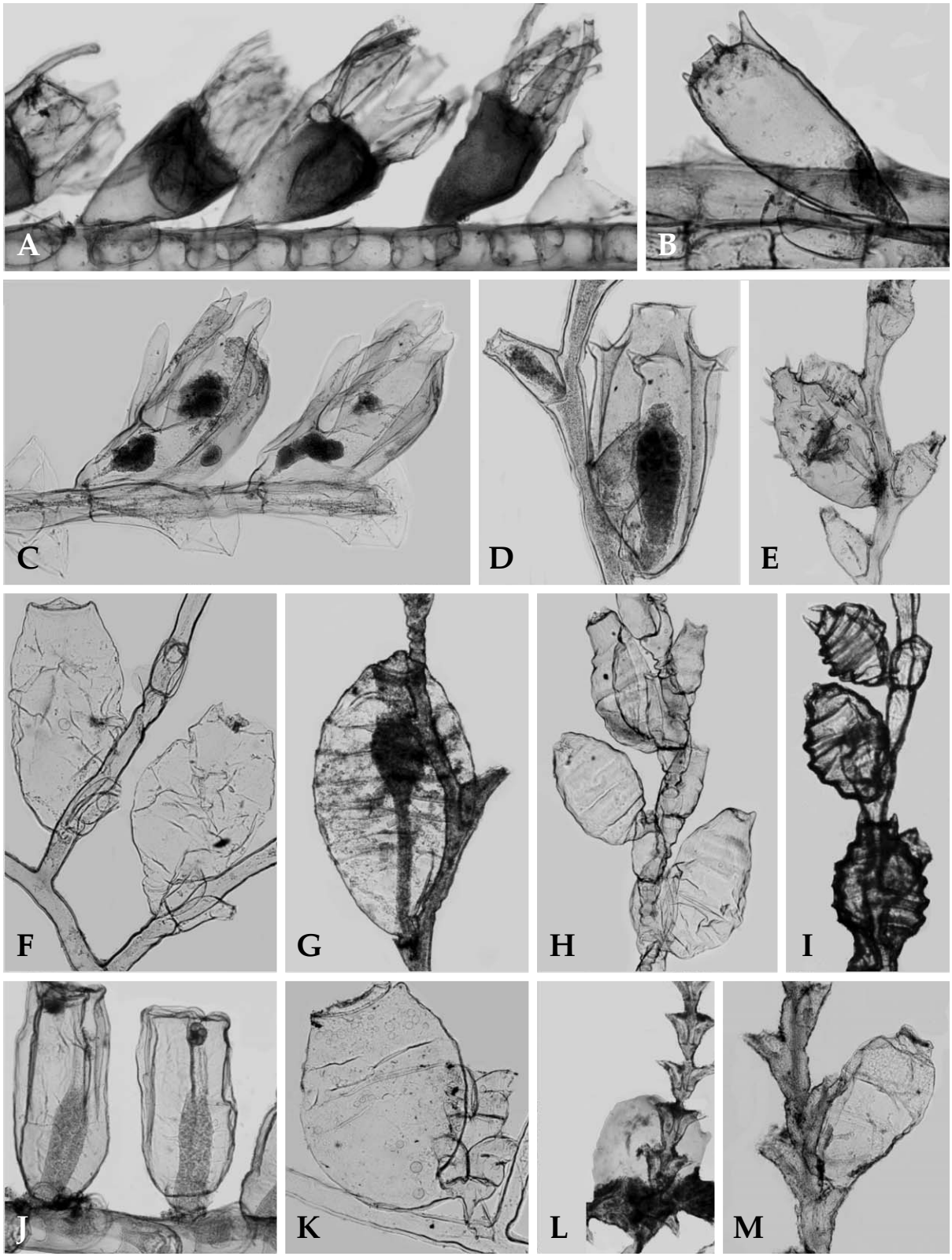

Fig. 37. Various types of gonothecae. A, B. *Thuiaria*; C. *Diphasia*; D, E, G–J. *Sertularella*; F. *Salacia*; K. *Sertularia*; L. *Amphisbetia*; M. *Symplectoscyphus*.

tures are developed around them and they are not aggregated, but the perisarc may be transversely annulated or sculptured with an elaborate arrangement of spines. The eggs are usually fertilized in situ and the planulae developed within the gonotheca. In *Salacia desmoides* the eggs are brooded in an acrocyst. In *Diphasia* the spiny processes of the gonotheca may bend over and meet in the centre to enclose a brood-chamber or marsupium (Fig. 37).

Genera 39 (9 in Korea), species 796 (49 in Korea).

Key to the subfamilies of family Sertulariidae

1. Hydranth without blind caecum ····· Sertomminae
− Hydranth with blind caecum ····· Sertulariinae

Subfamily Sertomminae Stechow, 1920

Nun-te-hi-deu-ra-a-gwa (눈테히드라아과)

Hydranth without blind caecum. Hydrothecae sessile and arranged in two longitudinal rows on stem and branches.

Key to the genera of subfamily Sertomminae

1. Hydrotheca without marginal teeth and operculum of one valve ····· 2
− Hydrotheca with two marginal teeth and operculum of two valves ····· *Dynamena*
2. Hydrotheca expanding distally ····· *Diphasia*
− Hydrotheca not expanding distally ····· *Salacia*

Genus *Diphasia* L. Agassiz, 1862

Neol-beun-ip-hi-deu-ra-sok (넓은입히드라속)

Nigellastrum Oken, 1815.
Diphasiella Stechow, 1921.

Stem unfascicled and branched. Hydrocladia opposite, subopposite or alternate. Hydrothecae arranged in two longitudinal rows and margin expanding, usually without marginal teeth and with operculum of one valve.

Type species: *Sertularia rosacea* Linnaeus, 1758.

Species 36 (1 in Korea).

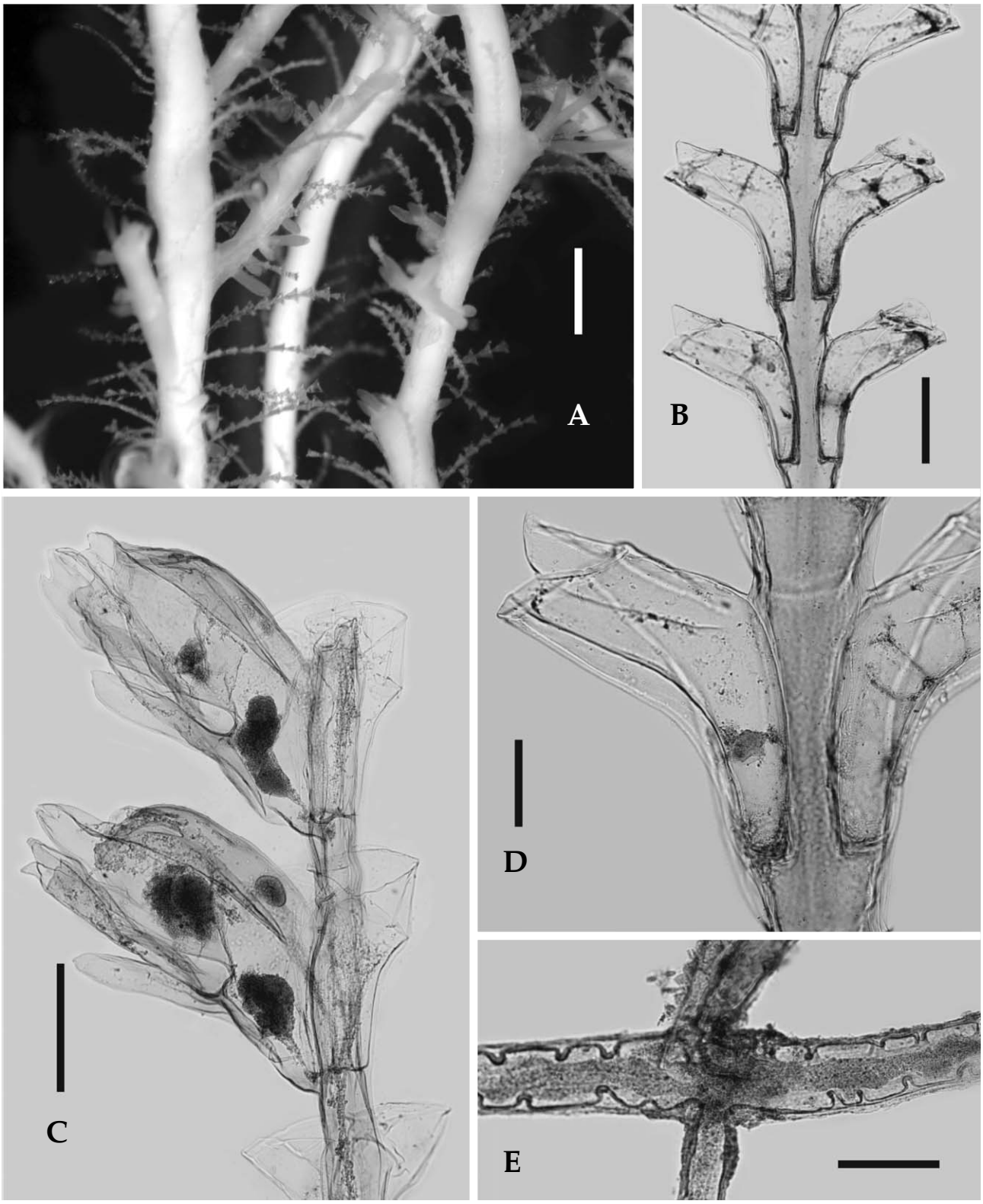

Fig. 38. *Diphasia palmata*. A. colonies on algae; B. hydrothecae; C. gonothecae; D. hydrotheca; E. hydrorhiza. Scales: A=2 mm, B, C=0.5 mm, D, E=200 μm.

28. *Diphasia palmata* Nutting, 1905 (Fig. 38)

Neol-beun-ip-hi-deu-ra (넓은입히드라)

Diphasia palmata Nutting, 1905, p. 950, pl. 4, fig. 6, pl. 11, figs. 8–10; Stechow, 1913b, p. 143, fig. 117; Jäderholm, 1919, p. 16; Yamada, 1959, p. 54; Hirohito, 1969, p. 18; Rho and Chang, 1972, p. 103, pl. 4, figs. 14, 15; 1974, p. 141; Park, 1990, p. 79; 1992, p. 288; 1993, p. 269; 1995, p. 12.

Stem erect, unbranched, divided into irregular internodes, each internode bearing one pair of hydrothecae. Hydrothecae in opposite, tubular, widening to margin, curved outwards, about 2/3 below adcauline wall adnate, and remainder 1/3 curved outwards horizontally, without marginal teeth and operculum of one valve. Gonothecae borne on middle of stem, from below hydrotheca, large, ovate, arranged in one row on one side of stem, at distal end divided into four valves, front one slender, two lateral ones broad, and rear one very broad. Lateral and rear valves with splits at distal end.

The measeurements of a colony collected from Seogwipo (1969) are as follows (μm).

Hydrotheca, length of attached part	657–686
length of free part	220–292
total length	832–876
diameter of margin	336–453
Gonotheca, total length	1723–1840
maximum diameter	788–876
Colony, total length	10–30 mm

Distribution: Korea, Japan, Hawai.

Korea: GN, JN, CN, JJ.

Specimen examined: GN: (Mipo: 12.xii.1969; 25.v.1981), JN: (Jindo: 23.vii.1994), CN: (Anmyeondo: 10.viii.1973), JJ: (Seogwipo: 15.xii.1969; 8.viii.1970; 8.ii.1971; 26.xii.1971; 20.x.1973; 12.iv.1975); (Saeseom: 15.xii.1969); (Supseom: 6.ii.1971); (Bomok-ri: 25.v.1981); (Munseom: 1.vii.1993).

Ecology: This species attaches on algae in waters about 20 m deep.

Genus *Dynamena* Lamouroux, 1812

Min-te-hi-deu-ra-sok (민테히드라속)

Pasythea Lamouroux, 1812 (part).
Pasya Stechow, 1912.

Stem erect, branched or unbranched. Hydrothecae arranged in two longitudinal rows on stem and branches. Hydrothecae opposite or subopposite, or sometimes concentrated in groups. Hydrotheca sessile, partly or completely adnate, with two marginal teeth and operculum of two valves, a smaller adcauline one and a larger abcauline one. Hydranth with no abcauline caecum.

Type species: *Sertularia pumila* Linnaeus, 1758.

Species 31 (3 in Korea).

Key to the species of genus *Dynamena*

1. Hydrothecae arranged in alternate but sometimes opposite on branches ····· *D. crisioides*
− Hydrothecae in opposite and one more pairs in groups. Each of a pair of hydrothecae of a group unequal in size ····· *D. quadridentata*

29. *Dynamena crisioides* Lamouroux, 1824 (Fig. 39)

Min-te-hi-deu-ra (민테히드라)

Dynamena crisioides Lamouroux, 1824, p. 613, pl. 90, figs. 11, 12 (not seen); Bedot, 1905, p. 75; 1910, p. 293; 1916, p. 97; 1918, p. 124; Leloup, 1937a, p. 36; 1937b, p. 107; 1960, p. 228; Millard, 1958, p. 183; Millard and Bouillon, 1973, p. 32, fig. 6D; Yamada, 1958, p. 56, fig. 2a–c; 1959, p. 56; Vervoort, 1959, p. 260, fig. 27a, b; Vervoort and Vasseur, 1977, p. 35; Rho, 1967, p. 351, fig. 21, pl. 1, fig. 5; 1969, p. 169; Hirohito, 1969, p. 19; 1974, p. 15; 1977, p. 20, text-fig. 5; Rho and Chang, 1972, p. 103; 1974, p. 141; Park, 1990, p. 80; 1992, p. 289; 1993, p. 269; 1995, p. 14; Hirohito, 1995, p. 170, fig. 55a, b.
Sertularia tubuliformis: Jäderholm, 1919, p. 15.
Thuiaria tubuliformis: Nutting, 1904, p. 70, pl. 11. figs. 1–8.
Dynamena tubuliformis: Stechow, 1923a, p. 12; Yamada, 1955, p. 354, pl. 23, figs. 1, 2.

Colonies in one plane, erect, branched alternately, making angle 40°–50° upwards. Stem divided into irregular internodes, each internode bearing three or more hydrothecae and one hydrocladium near base. Hydrothecae subopposite or opposite, tubular, about 6/7 adcauline wall adnate and remainders curved outwards, with three marginal teeth, two laterial ones and one adcaline one. Gonothecae arising from below hydrotheca, wall smooth or folded irregularly, with curved distal neck and operculum.

The measurements of the specimen from Udo are as follows (μm).

Stem, length of internode ····· 993–1416
diameter of base of node ····· 277
Hydrotheca, length of fused adcauline wall ····· 409–511
length of free adcauline wall ····· 161–175
total length ····· 526–657
maximum diameter ····· 161–190
diameter of margin ····· 161
Gonotheca, total length ····· 1095–1314
maximum diameter ····· 584–643
diameter of mouth ····· 205–234
Colony, total length ····· 14 mm

Distribution: Korea, Japan, Philippines, South China Sea, Indo-China Sea, Indonesia, Micronesia, Red Sea, South Africa, Annobon Isl. (Africa), West Indies, Brazil, Florida, Freetown.

Korea: GW, GN, JN, JB, JJ.

Specimen examined: GW: (Gangneung: 10.x.1967), GN: (Haeundae: 10.vi.1967); (Mijo-ri: 18.vii. 1967; 5.viii.1973); (Jangseungpo: 18.vii.1970; 4.viii.1973); (Yundoldo: 3.viii.1973); (Sangju-ri: 6.viii.1973);

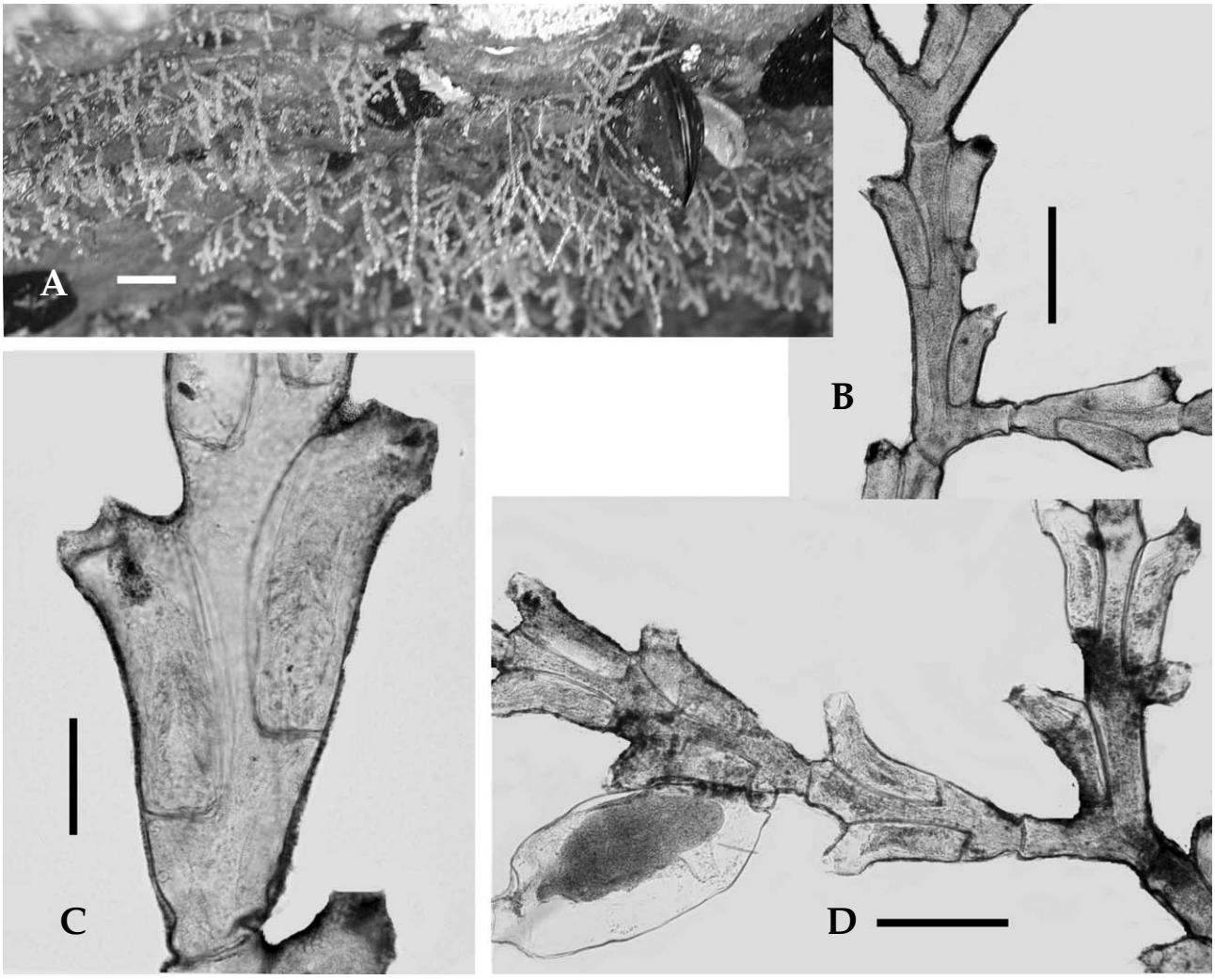

Fig. 39. *Dynamena crisioides*. A. colonies on rock; B. stem and branches; C. hydrothecae; D. branch with gonotheca. Scales: A=20 mm, B, D=0.5 mm, C=200 μm.

(Mokdo: 7.vii.1974); (Yeonhwado: 19.vii.1978); (Sinheung-ri: 25.vii.1981), JN: (Jindo: 5.viii.1974; 6.iii.1974; 23.vii.1994); (Wando: 24.vii.1981); (Geomundo: 31.vii.1988), JJ: (Seongsanpo: 10.vii.1965; 15.vii.1973); (Sasudo: 8.viii.1969); (Hoenggando: 9.viii.1969); (Seogwipo: 3.viii.1970; 14.vii.1973); (Udo: 15.vii.1973; 24.vii.1981).

Ecology: This species attaches on rocks in coastal to 20 m deep waters.

30. *Dynamena quadridentata* (Ellis and Solander, 1786) (Fig. 40)

Cheung-ssang-keop-hi-deu-ra (층쌍컵히드라)

Sertularia quadridentata Ellis and Solander, 1786, p. 57, pl. 5, figs. g, G (not seen).

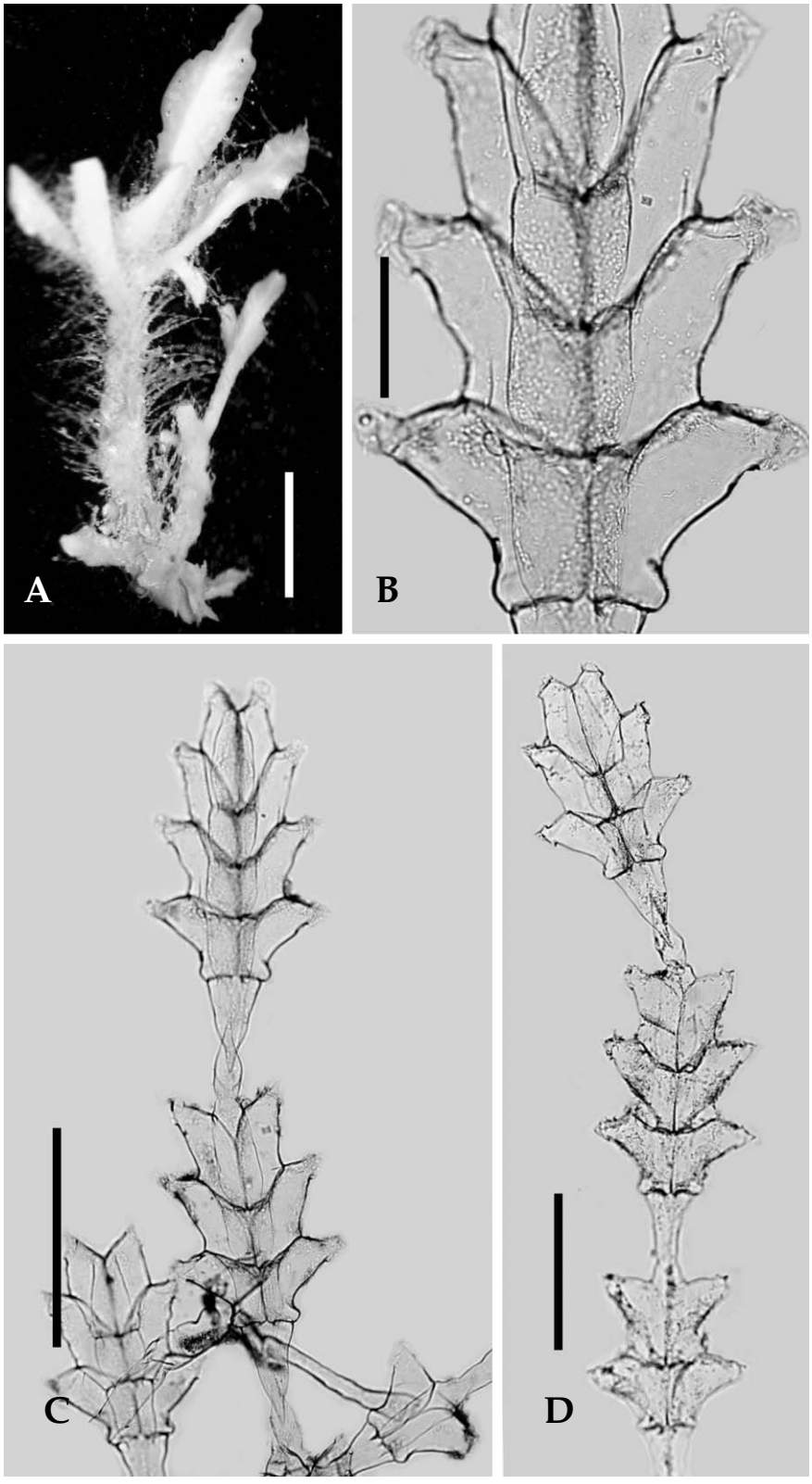

Fig. 40. *Dynamena quadridentata*. A. colonies on alga; B. hydrothecae; C, D. 1–4 paired hydrothecae. Scales: A=10 mm, B=200 μm, C, D=500 μm.

Pasythea nodosa: Stechow, 1913b, p. 150, figs. 129, 130; Bedot, 1925, p. 315; Rho, 1967, p. 358, fig. 21A–C; 1969, p. 171; Rho and Chang, 1972, p. 104; 1974, p. 141; Park, 1992, p. 291; 1993, p. 269; 1995, p. 14.
Dynamena quadrdentata: Millard, 1975, p. 266, fig. 87G–J; Hirohito, 1995, p. 176, fig. 57a–e.

Colonies small, attached on algae. Stem in one plane, arising from hydrorhiza, unbranched, divided into irregular internodes. Hydrothecae opposite, one or four pairs grouped, within a group above and below hydrothecae fused, tubular, distal curved outwards, with three marginal teeth, two lateral ones and one adcauline one, operculum of abcauline one larger and adcauline one smaller.

The measurements of the specimens from Seogwipo and Mopo are as follows (μm).

	(Seogwipo)	(Mopo)
Hydrotheca, length of fused adcauline wall	292	280
length of free adcauline wall	190	175
total legth	336–343	321
diameter of margin	95–102	102
maximum diameter	161	131
total length of three pairs	978	934
diameter at base	307	263
diameter at below of mouth	628	584
Colony, total length	5 mm	

Distribution: Korea, Japan, USA (Woods Hole.).
Korea: GB, GN, JN, JJ.
Specimen examined: GB: (Guryongpo: 25.xii.1975), GN: (Mijo-ri: vii.1967); (Mipo: 21.vii.1968), JN: (Jindo Hoedong: 5.viii.1974), JJ: (Seogwipo: 10.vii.1965; 10.vi.1965; 12.xii.1969; 15.vii.1971; 24.xii.1971; 13.vii.1973; 21.x.1973; 13.vii.1979; 22.v.1982); (Munseom: 30.xi.1978; 1.vii.1993); (Supseom: 2.vii.1993).
Ecology: This species inhabites in waters 10–20 m deep.

Genus *Salacia* Lamouroux, 1816

Sa-seul-hwa-gwan-hi-deu-ra-sok (사슬화관히드라속)

Dymella Stechow, 1922.

Stem erect and branched or unbranched. Hydrothecae arranged in two longitudinal rows, sessile, partly or completetly adnate, without distinct marginal teeth. Operculum of one large abcauline valve.

Type species: *Salacia tetracythara* Lamouroux, 1816.

Species 33 (1 in Korea).

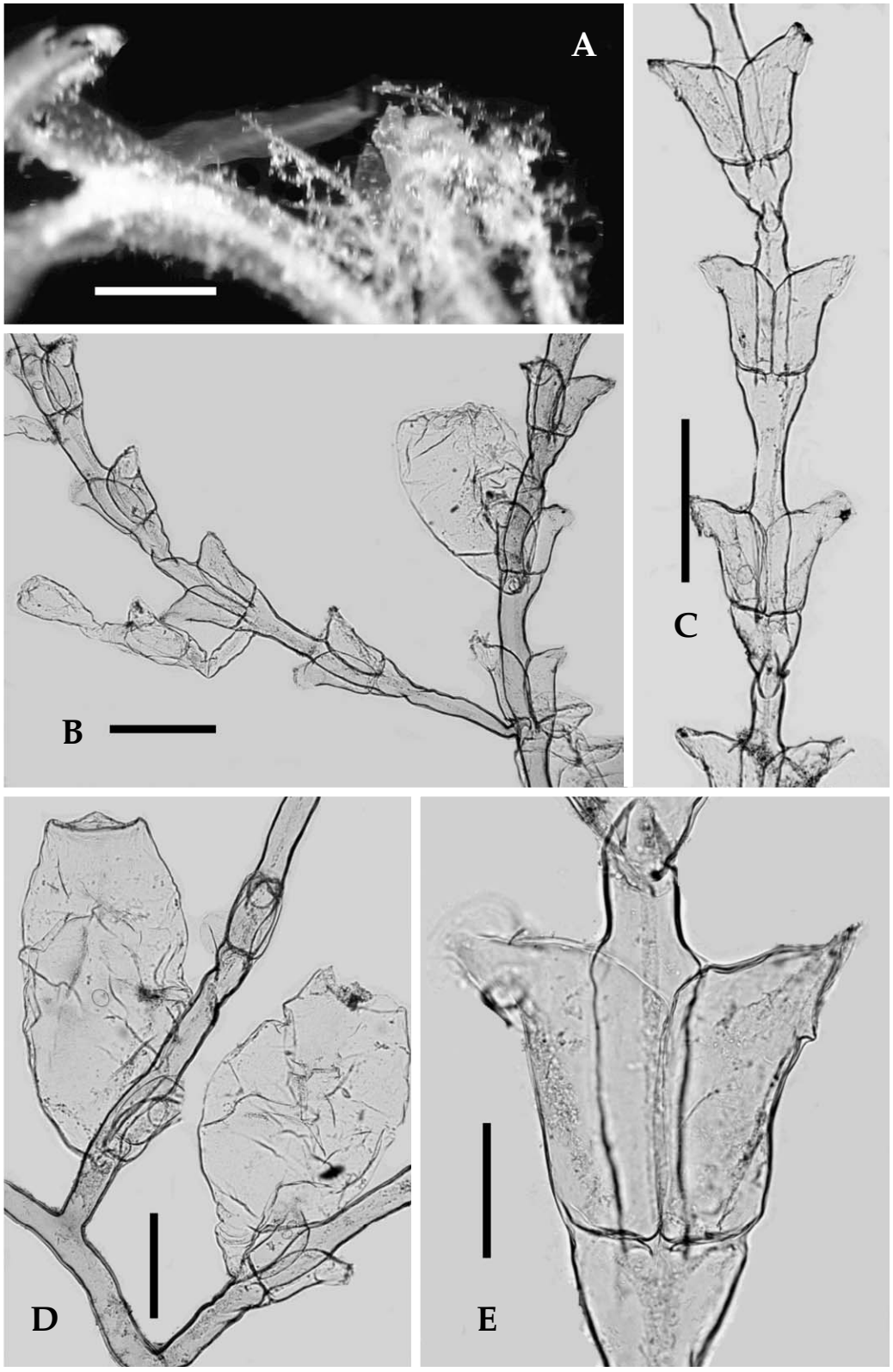

Fig. 41. *Salacia desmoides*. A. colonies on algae; B. branching pattern of colony; C. one internode of stem; D. gonothecae on basal portion; E. hydrothecae. Scales: A=5 mm, B–D=500 μm, E=200 μm.

31. *Salacia desmoides* (Torrey, 1902) (Fig. 41)

Sa-seul-hwa-gwan-hi-deu-ra (사슬화관히드라)

Sertularia desmoides Torrey, 1902, p. 65, pl. 8, figs. 70–72; Nutting, 1904, p. 56, pl. 3, figs. 1–3; Bedot, 1925, p. 396; Fraser, 1937, p. 161, pl. 37, fig. 194a–d; 1938, p. 54; 1948, p. 247; Park and Rho, 1986, p. 22, fig. 6a–e, pl. 2, figs. c, d; Park, 1992, p. 291; 1993, p. 270.
Salacia desmoides: Millard, 1975, p. 274, fig. 90A–C.

Colonies slender, small and branched or unbranched. Stem divided into irregular internodes, each internode with 1–5 hydrothecae. Hydrocladia arising from the hydrotheca, often branched. Hydrothecae opposite, tubular, the pairs contiguous in front, distal portion free and curved outward, margin without teeth, operculum with one flap. Gonothecae borne below hydrothecae, ovate, length twice width, with broad round aperture.

The measurements of the specimens from Anmyeondo are as follows (μm).

Stem, length of internode	640–3880
diameter at above hydrotheca	90–100
Hydrotheca, length of abcauline wall	210–230
length of fused adcauline wall	140–200
length of free adcauline wall	220–270
diameter at margin	110–130
diameter at base	90–130
Colony, total length	8–19 mm

Distribution: Korea, California, Pacific coasts of Mexico, Newfoundland.

Korea: GN, JN, CN, JJ.

Specimen examined: GN: (Mipo: 7.iv.1976), JN: (Daeheuksando: 5.vii.1978); (Hongdo: 20.vii.1978), CN: (Anmyeondo: 8.viii.1973), JJ: (Munseom: 30.vi.1993); (Supseom: 2.vii.1993).

Ecology: This species is attached on algae in waters coastal to 20 m deep.

Remarks: The colonies of this species are irregular in growth. The one from is branched irregularly and the other is unbranched. As well, the internodes of stem and branch are also variable in length. The internodes of specimens of Nutting (1904) and Fraser (1937) are very long and slender, but those of our specimens are relatively short. The other characters are agreement with those of Nutting (1904) and Fraser (1937).

Subfamily Sertulariinae Stechow, 1920

Te-hi-deu-ra-a-gwa (테히드라아과)

Hydranth with abcauline caecum. Hydrothecae sessile, arranged in two longitudinal rows.

Key to the genera of subfamily Sertulariinae

1. Hydrotheca without marginal teeth ····· *Abietinaria*

– Hydrotheca with marginal teeth ····· 2
2. Hydrothecae in alternate right and left side ····· 3
– Hydrothecae in opposite or subopposite ····· 4
3. With three marginal teeth and operculum of three valves ····· *Symplectoscyphus*
– With four marginal teeth and operculum of four valves ····· *Sertularella*
4. Marginal tooth near abcauline wall ····· *Amphisbetia*
– Marginal tooth in centre between ab- and adcauline wall ····· 5
5. Marginal teeth distinct ····· *Sertularia*
– Marginal teeth indistinct ····· *Thuiaria*

Genus *Abietinaria* Kirchenpauer, 1884

Na-mu-te-hi-deu-ra-sok (나무테히드라속)

Stem erect, divided into regular internodes, and branched. Branches arising alternately from right and left sides, divided into irregular internodes. Hydrothecae arranged in two longitudinal rows, sessile, flask-shaped, and tapering toward distal. Hydrotheca without marginal teeth and operculum of one valve.

Type species: *Sertularia abietina* Linnaeus, 1758.

Species 35 (1 in Korea).

32. *Abietinaria filicula* (Ellis and Solander, 1786) (Fig. 42)

Sil-te-hi-deu-ra (실테히드라)

Sertularia filicula Ellis and Solander, 1786, p. 57, pl. 6, fig. C.
Abietinaria filicula: Fraser, 1944, p. 240, pl. 50, fig. 224; Naumov, 1960, p. 411, fig. 272; Cornelius, 1979, p. 253, fig. 5; Park, 1992, p. 289, fig. 2A–D.

Colonies less than 10 cm in height, erect and pinnate. Main stem straight or more or less sinuous in general, divided into regular internodes, but node indistinct, each internode with three hydrothecae and a process for attachment of branch. Branches arising from process on base of each internode of stem, divided into irregular internodes, often branched again, sometimes more than once. Hydrothecae subopposite, 1/3–2/3 adcauline adnate, arranged in two rows on stem and branches, flask-shaped, bulbous basally, tapering distally to neck and expanding again slightly to aperture, margin smooth, operculum attached to inner side.

The measurements of the specimens from Sokcho are as follows (μm).

Stem, length of internode ····· 1350
diameter at node ····· 280–330
Branch, length of internode ····· 1100–1700

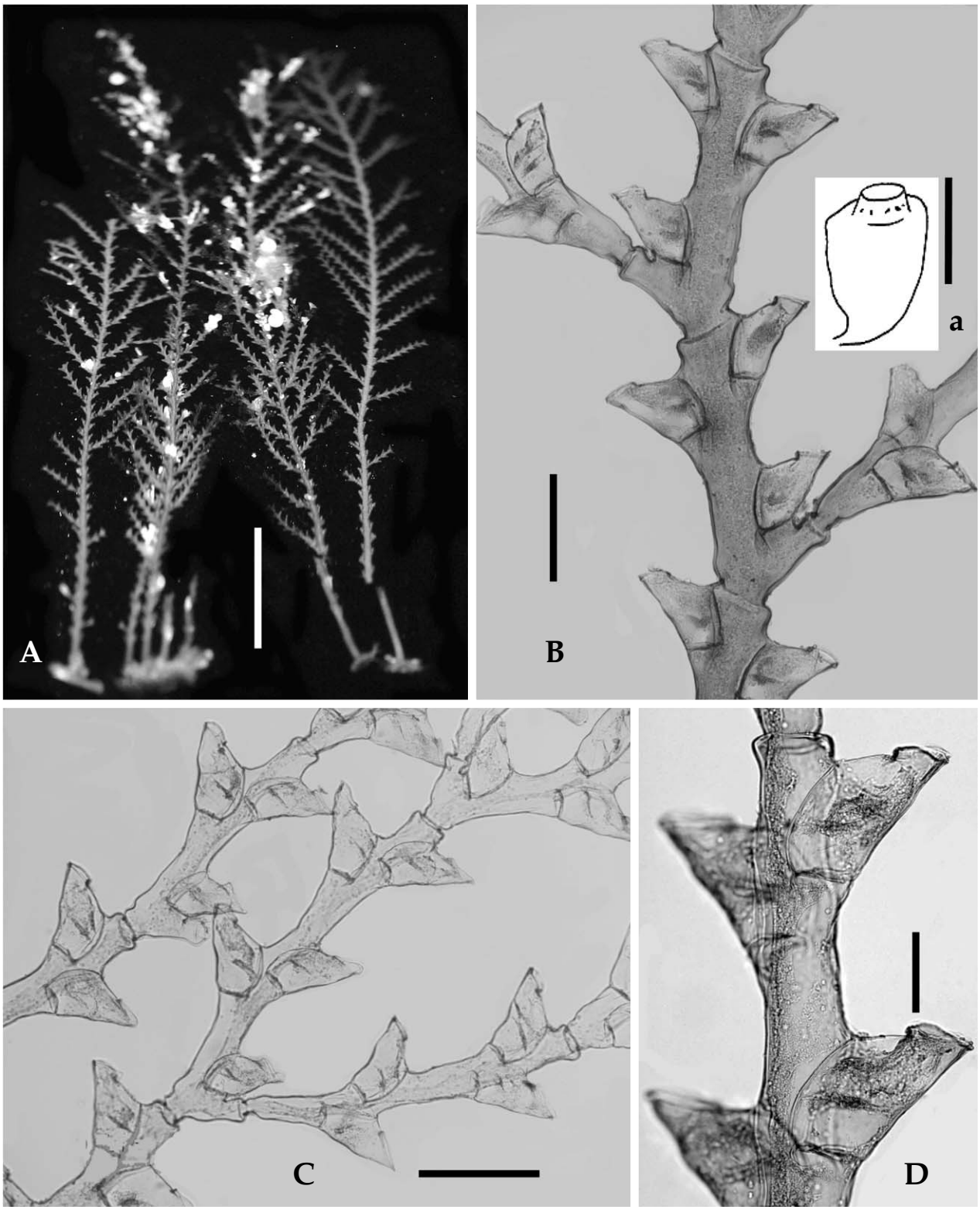

Fig. 42. *Abietinaria filicula*. A. colonies; B. stem with branches, a. gonotheca (cited from Cornelius, 1979); C. branching pattern of branches; D. stem with hydrothecae. Scales: A=10 mm, B, a, C=500 μm, D=200 μm.

diameter at node ····· 100–140
Hydrotheca, length of fused adcauline wall ····· 240–290
length of free adcauline wall ····· 200–250
length of abcauline wall ····· 400–500
diameter at margin ····· 123–164
Gonotheca, total length ····· 697
length of neck ····· 123
diameter at mouth ····· 205
Colony, total length ····· 45–55 mm

Distribution: Korea, Japan, England (Scarborough, Yorkshire), Grand Manan, New England coast, Cape Code to Gulf of St. Lawrence, Labrador, White Sea, Barents Sea, Bering Sea, Seas of Okhotsk and Japan, North Atlantic coast of America and Europe to the latitude of central France, North and Norwegian seas, Pacific coast of America and north of California.

Korea: GW.

Specimen examined: GW: (Jumunjin: 26.v.1986); (Sokcho: 28.vi.1989); (Imwon: 30.vi.1989).

Ecology: This species is attached on rocks in coastal waters.

Remarks: Unfortunately infertile colonies were collected on the rocks in the eastern coasts of Korea, so that the gonophores were not examined. According to Fraser (1944), the gonangia is oval, tapering into narrow neck above, and with pedicel, somewhat curved below and surface smooth.

Genus *Amphisbetia* L. Agassiz, 1862

Tae-pyeong-yang-te-hi-deu-ra-sok (태평양테히드라속)

Odontotheca Levinsen, 1913.

Stem erect, branched or unbranched. Hydrothecae arranged in two longitudinal rows on stem and branches, with two distinct marginal teeth near abcauline wall, and smaller one adcauline wall. Operculum of two valves.

Type species: *Sertularia operculata* Linnaeus, 1758.

Species 35 (1 in Korea).

33. *Amphisbetia pacifica* Stechow, 1931 (Figs. 43, 44)

Tae-pyeong-yang-te-hi-deu-ra (태평양테히드라)

Amphisbetia pacifica Stechow, 1931, p. 185; Stechow and Uchida, 1931, p. 563, fig. 11; Kamita and Sato, 1941, p. 2; Yamada, 1955, p. 19, fig. 3; 1959, p. 69; Ito and Inoue, 1962, p. 450, pl. 8, figs. 85–87; Rho, 1967, p. 356, fig. 19a, b; 1969, p. 170; 1974, p. 141; Rho and Chang, 1972, p. 104; Kubota,

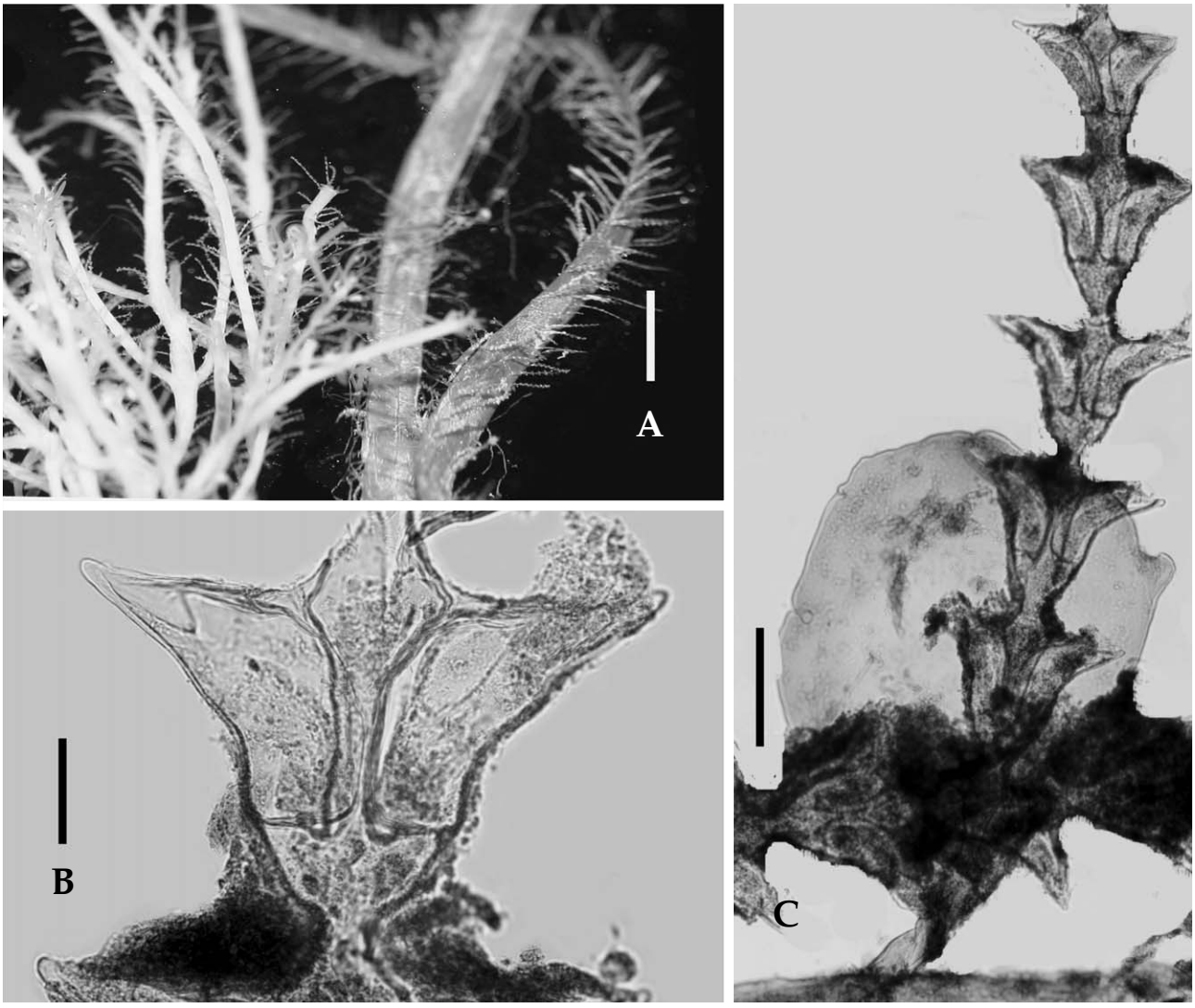

Fig. 43. *Amphisbetia pacifica*. A. colonies on algae; B. hydrothecae; C. hydrocladium with gonotheca and hydrothecae. Scales: A=20 mm, B=100 μm, C=200 μm.

1976, p. 240, figs. 4, 16, 17; Park, 1992, p. 289; 1993, p. 269; 1995, p. 12; Hirohito, 1995, p. 159, fig. 50a–d, pl. 2, fig. B.

Colonies small, attached on algae and arising from hydrorhiza directly. Stem unbranched, divided into regular internodes, and bearing about 10 pairs of hydrothecae, two annulations on its base and periderm very thin. Hydrothecae opposite, above and below ones not grouped, cylinder-shaped, with two marginal teeth, which larger abcauline one and a smaller adcauline one. One or two gonothecae arising from base of stem, large, round, with short pedicel and neck on distal, small teeth arranged in a whole inside of margin, and with short processes on shoulder.

The measurements of the specimens from Mopo and Seogwipo are as follow (μm).

	(Mopo)	(Seogwipo)
Hydrotheca, length of fused adcauline wall	205–220	220–248
length of free adcauline wall	146–175	190
total length	292–336	351–380
diameter at margin	102–146	88
Gonotheca, total length	1037–1130	759–832
length of neck	22–37	15–29
maximum diameter at neck	569–847	555–569
Colony, total length	4–7mm	

Distribution: Korea, Japan.

Korea: GW, GB, GN, JN, JB, CN, JJ.

Specimen examined: GW: (Jumunjin: 27.vi.1989); (Imwon: 30.vi.1989); (Jangho: 8.viii.1991), GB: (Mopo: 21.vii.1968), GN: (Mijo-ri: 18.vii.1967); (Mokdo: 23.vii. 1981), JN: (Geomundo: 8.viii.1965); (Dolsan Bangjukpo: 4.vi.1968); (Jindo Hoedong: 5.viii.1974; 25.vii.1994; 6. viii.1974), JB: (Gyeokpo-ri: 7.viii.1975), CN: (Anmyeon-do: 9.viii.1973); (Biin: 13.viii.1973); (Daecheon: 2.vii. 1984), JJ: (Seogwipo: 10.vii.1965; 12.xii.1969; 15.vii.1973; 8.viii.1973; 12.xii.1969; 13.vii.1979; 22.vii.1981; 1.v.1982); (Supseom: 6.ii.1971; 2.vii.1993); (Wimi-ri: 8.vii.1972).

Ecology: This species is attached on algae and plants in waters coastal to 20 m deep.

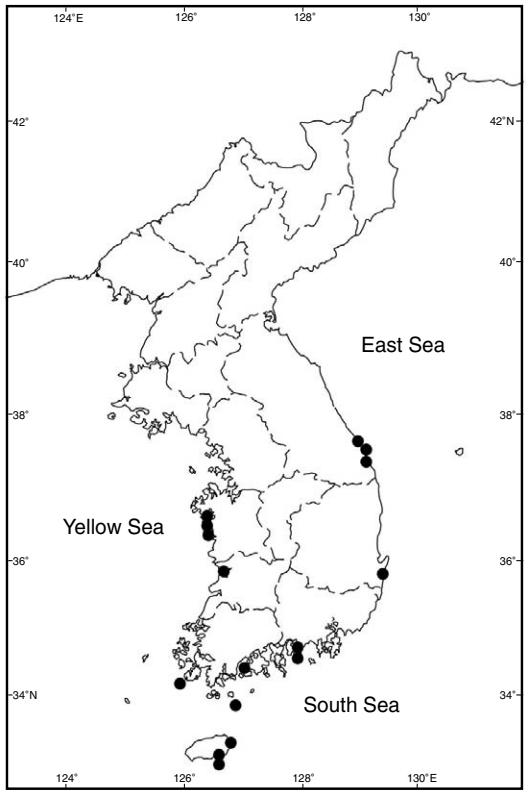

Fig. 44. Distribution of *Amphisbetia pacifica*.

Genus *Sertularella* Gray, 1848

Te-hi-deu-ra-sok (테히드라속)

Thecocladium Allman, 1886.

Stem erect, branched or unbranched. Hydrothecae arranged in two longitudinal rows alternately, sessile, with four marginal teeth and operculum of four triangular valves. Each valve placed in bays between teeth and meeting in centre as a pyramid. Hydranth with abcauline caecum.

Type species: *Sertularia polyzonias* Linnaeus, 1758.

Species 151 (21 in Korea).

Key to the species of genus *Sertularella*

1. Hydrotheca wall with distinct transverse rings ····· 2
– Hydrotheca wall without distinct transverse rings ····· 6
2. Colony reticulated ····· 3

– Colony unreticulated ····· 4
3. Transverse ring thick and spiny processes developed at neck of gonotheca ····· *S. sinensis*
– Transverse ring thin and spiny processes undeveloped or indistinct at neck of gonotheca ····· ····· *S. mirabilis*
4. Adcauline wall corrugated only ····· *S. gayi*
– Abcauline wall or all hydrothecal wall corrugated ····· 5
5. Hydrotheca with two or three corrugations ····· *S. areyi*
– Hydrotheca with three more corrugations ····· *S. tenella*
6. Stem fascicled ····· 7
– Stem unfascicled ····· 8
7. Gonotheca long funnel-shaped ····· *S. distans*
– Gonotheca cylinder-shaped ····· *S. diaphana*
8. Hydrothecal wall smooth ····· 9
– Hydrothecal wall corrugated ····· 10
9. Stem branched ····· *S. gigantea*
– Stem unbranched ····· *S. tongensis*
10. Hydrothecae arranged in subopposite ····· *S. quinquelaminata*
– Hydrothecae arranged in alternate ····· 11
11. Gonothecae without corrugations ····· 12
– Gonothecae with corrugations ····· 13
12. Spiny processes at neck only ····· *S. levigata*
– Spiny processes on all surface ····· *S. gotoi*
13. Spiny processes on neck of gonotheca distinct and pointed ····· *S. miurensis*
– Spiny processes on neck of gonotheca absent or obtuse ····· *S. obtusa*

34. *Sertularella areyi* Nutting, 1904 (Fig. 45)

A-re-i-te-hi-deu-ra (아레이테히드라)

Sertularella areyi Nutting, 1904, p. 83, pl. 17, fig. 6; Stechow, 1913a, p. 128, fig. 98; Rho and Chang, 1974, p. 142, pl. 4, figs. 4, 5; Hirohito, 1995, p. 190, fig. 61c–e.

Colonies attaining about 10 mm heigh in largest specimen. Stem arising from creeping stolon, very slender, monosiphonic and divided into long internodes. Each internode bearing a hydrotheca near its distal end. Hydrothecae barrel-shaped, margin square, with four obscure teeth and two very distinct annular rugosities which divided the body into three nearly equal zones.

The measurements of the specimens from Seogwipo are as follow (μm).

Stem, length of internode ····· 1070–1310
maximum diameter ····· 110–150
Hydrotheca, total length ····· 540–720
length of fused adcauline wall ····· 240–295
length of free adcauline wall ····· 315–480
maximum diameter ····· 400–460
diameter at margin ····· 260–350

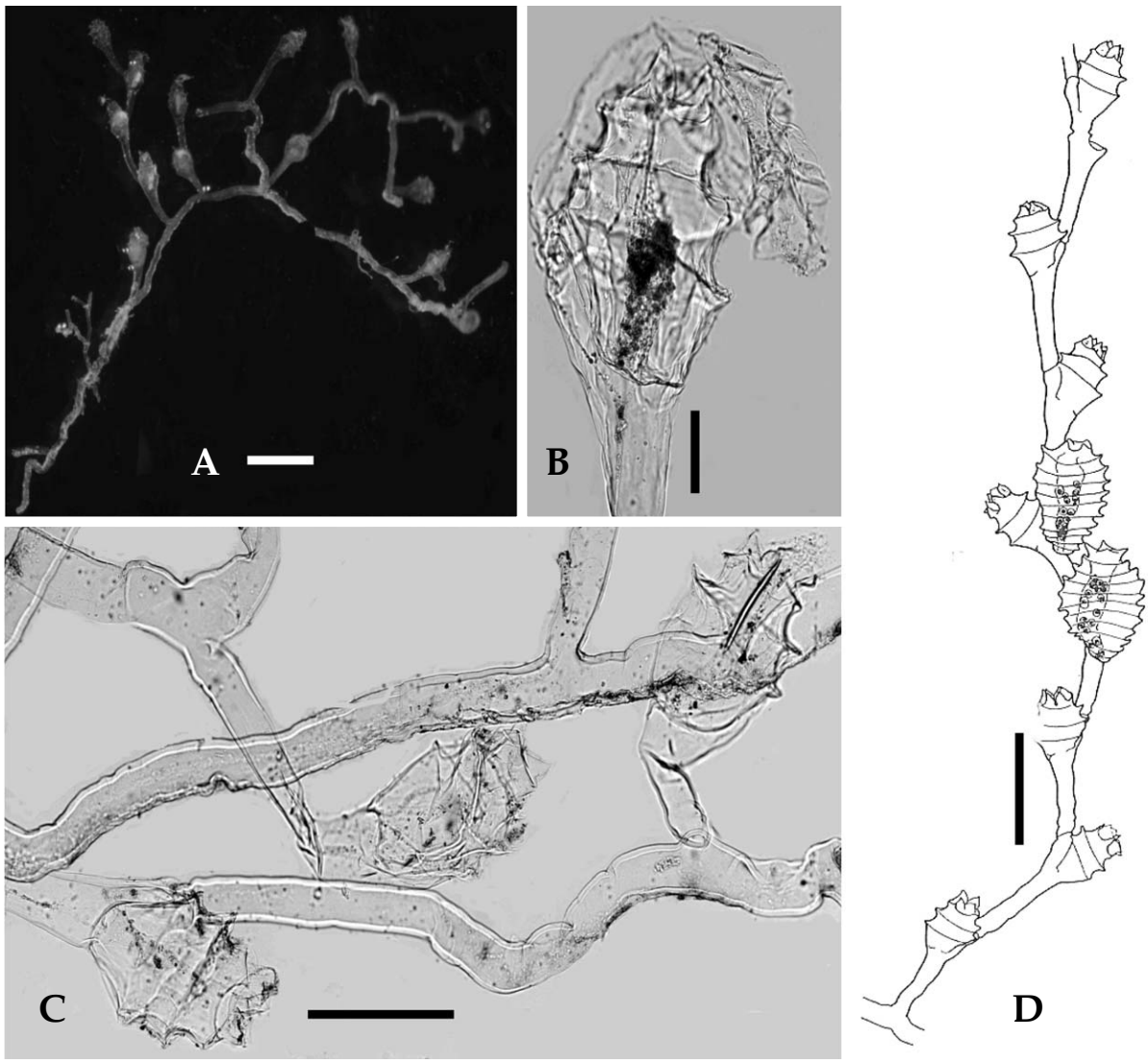

Fig. 45. *Sertularella areyi*. A. colony; B. hydrotheca; C. stem and branches; D. part of colony with gonothecae and hydrothecae (cited from Hirohito, 1995). Scales: A, D=1 mm, B=200 μm, C=500 μm.

Colony, total length ····· 10 mm

Distribution: Korea, Japan, Cuba (Habana).
Korea: JJ.
Specimen examined: JJ: (Seogwipo: 5.viii.1970; 26.xii.1971).
Ecology: This species inhabits in waters 20–30 m deep.

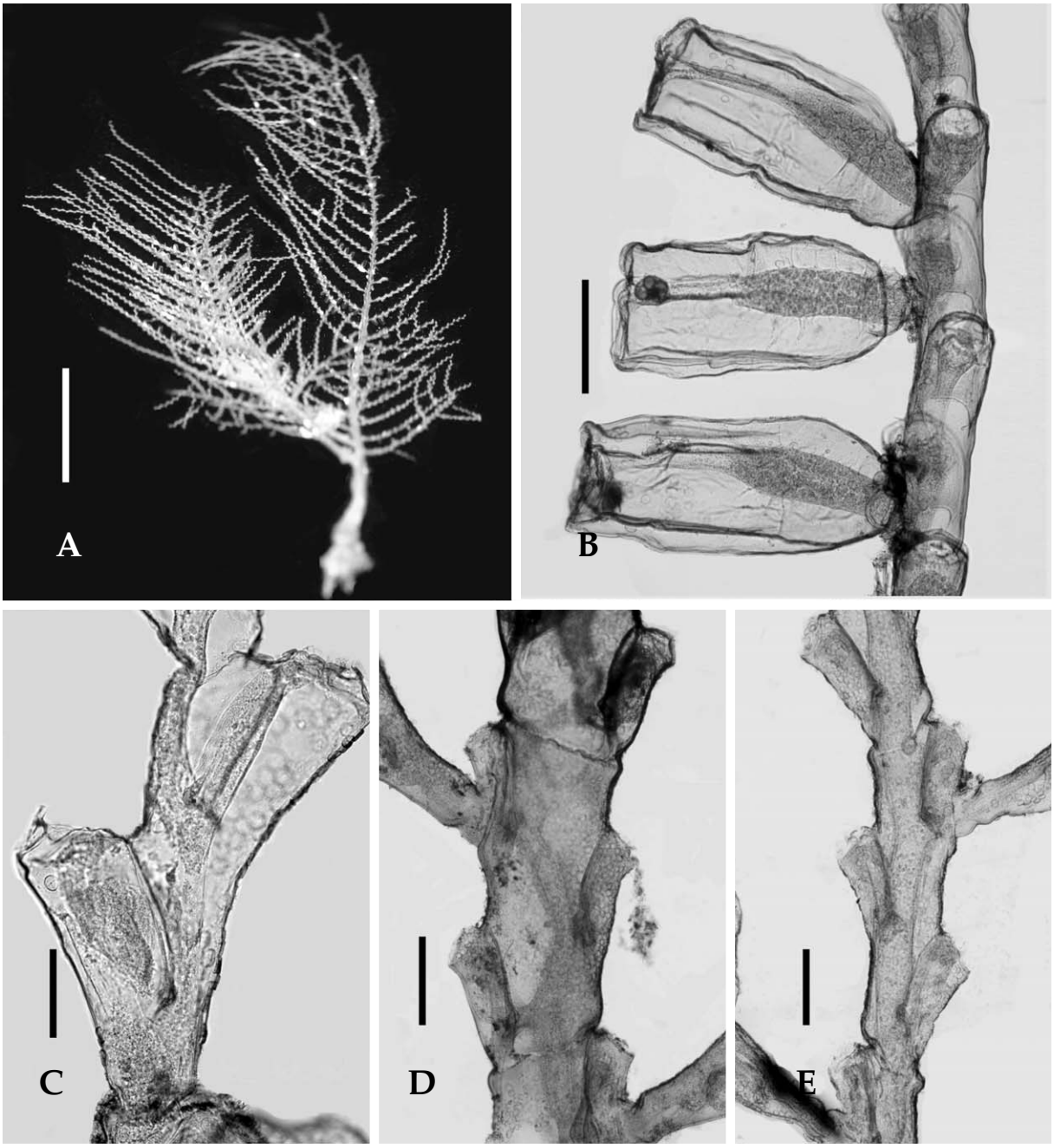

Fig. 46. *Sertularella diaphana*. A. colony; B. gonothecae on branch; C. hydrothecae; D. basal portion of stem; E. apical portion of stem. Scales: A=20 mm, B, D, E=500 μm, C=200 μm.

35. ***Sertularella diaphana*** (Allman, 1886) (Fig. 46)

Tu-myeong-te-hi-deu-ra (투명테히드라)

Thuiaria diaphana Allman, 1885, p. 145, pl. 18, figs. 1–3.

Sertularella diaphana Yamada, 1959, p. 63; Millard, 1975, p. 285, fig. 93A–D; Hirohito, 1995, p. 192, fig. 62b–d, pl. 12, fig. A; Park, 2008, p. 179, fig. 2A–E.

Colonies attaining about 12 cm heigh, branched irregularly. Stem and branches divided into regular internodes, each internode bearing three hydrothecae and a hydrocladium. Hydrocladia arising from just below hydrothecae. Hydrocladium and branches not in one plane but shift on to anterior surface. Hydrothecae completely adnate or very nearly so, smooth, curved outward at distal end, with broad mouth; margin with four short but distinct teeth and operculum of four valves. No internal teeth. Gonotheca borne on anterior surface of hydrocladia, tubular, truncated above and tapering downwards, with several longitudinal ridges.

The measurements of the specimens from Mundo are as follows (μm).

Stem, length of internode	1760–2050
diameter at node	315–630
Branch, maximum diameter	290
Hydrotheca, total length	420
diameter at base	180
diameter at margin	220–240
Gonotheca, total length	1100–1360
maximum diameter	570–640
Colony, total length	12–14 cm

Distribution: Korea, Japan, Philippines, Hawaii, Indonesia, Australia, West Indies.

Korea: JJ.

Specimen examined: JJ: (Beomseom, Munseom: 28.viii.2007); (Supseom: 9.ix.2007).

Ecology: This species inhabits in waters 20–30 deep.

Remarks: This species is similar to *Sertularella distans* in the shape of hydrotheca and colony, but it is distinguished from the latter in the shape of gonotheca. The gonotheca of this species is cylindrical and has no spiny processes distally, but the gonotheca of *Sertularella distans* is long, funnel shaped, and has four short spiny processes distally.

36. *Sertularella distans* (Allman, 1877) (Fig. 47)

Bul-li-te-hi-deu-ra (분리테히드라)

Thuiaria distans Allman, 1877, p. 17, figs. 1, 2; Bedot, 1912, p. 378; 1916, p. 245; 1918, p. 276; 1925, p. 443.

Sertulaella distans: Nutting, 1904, p. 88, pl. 19, figs. 5, 6; Fraser, 1944, p. 260, pl. 55, fig. 245a–c; Park and Rho, 1986, p. 11, fig. 2c–e, pl. 1, fig. b; Park, 1993, p. 270.

Stem fascicled at base but unfascicled distally, divided into regular internodes, each internode bearing three hydrothecae and one hydrocladium. Hydrocladium arising from cauline process, arranged in alternate and divided into regular internodes. Hydrothecae in alternate, beaker-shaped, narrowing slightly towards base, with four marginal teeth and operculum of four valves. Gonothecae arising from just below hydrotheca, very large compared to hydrotheca, funnel-shaped; wall

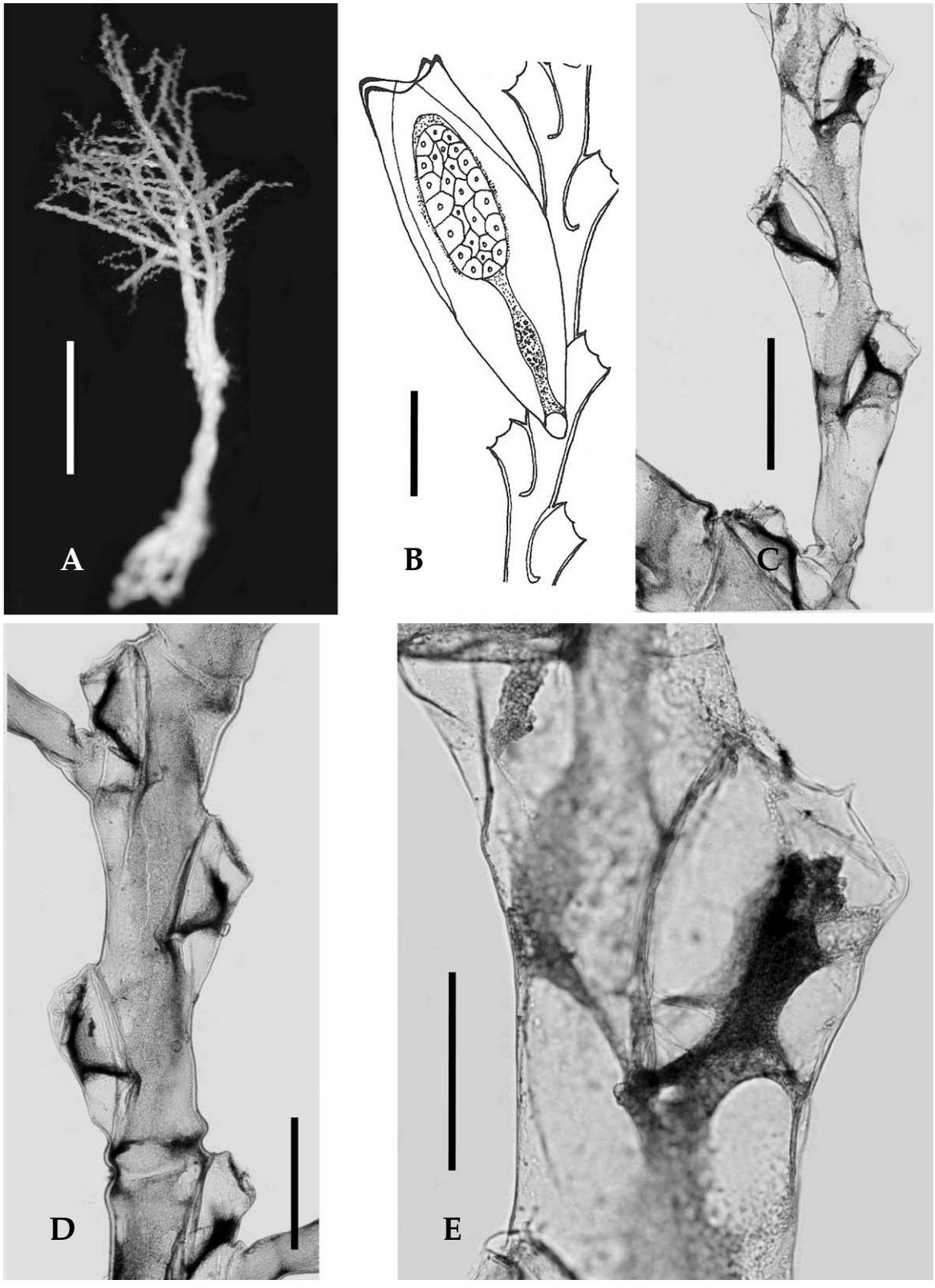

Fig. 47. *Sertularella distans*. A. colony; B. gonotheca on hydrocladium; C. hydrocladium; D. stem with hydrocladia; E. hydrotheca. Scales: A=20 mm, B–D=500 μm, E=200 μm.

with four longitudinal grooves from one-third below to distals, with four short distal processes.

The measurements of the specimens from Seogwipo are as follows (μm).

Stem, length of internode ····· 1700–1600
diameter at node ····· 270–310
Branch, length of internode ····· 550–1880
diameter at node ····· 160–180
Hydrotheca, total length ····· 380–400
diameter at base ····· 130–140
diameter at margin ····· 200–210
Gonotheca, total length ····· 210
maximum diameter ····· 710
Colony, total length ····· 29 mm

Distribution: Korea, Tortugas, between Eleuthera and Little Cat Is., Bahamas, off Haven, off Yucatan, Puerto Rico.

Korea: JJ.

Specimen examined: JJ: (Seogwipo: 15.xii.1969; 19.x.1973); (Munseom: 2.vi.1993; 30.vi.1993).

Ecology: This species inhabits in waters 20–30 m deep.

37. *Sertularella gayi* (Lamouroux, 1827) (Fig. 48)

Ga-i-te-hi-deu-ra (가이테히드라)

Sertularia gayi Lamouroux, 1821, p. 12 (not seen).

Sertularella gayi: Bedot, 1905, p. 105; 1910, p. 360; 1912, p. 354; 1916, p. 204; 1918, p. 238; 1925, p. 368; Billard, 1906a, p. 73; 1906b, p. 330; 1909, p. 315; Hargitt, 1924, p. 495, pl. 5. fig. 21; Stechow, 1912. p. 359; 1919, p. 89; 1925, p. 482; Leloup, 1937a, p. 37, fig. 24; Cunha, 1944, p. 46, fig. 23; Fraser, 1944, p. 262, pl. 56, fig. 248; Vervoort, 1949, p. 151; 1959, p. 273, figs. 33b, c, 34b; Rees and Thurfield, 1965, p. 134; Hirohito, 1969, p. 21, fig. 15; Ralph, 1961, p. 833, fig. 24d–f; Park and Rho, 1986, p. 18, fig. 5a, b, pl. 2, fig. a; Park, 1990, p. 80; 1995, p. 14.

Colonies shrub-shaped and branched. Hydrocaulus polysiphonic, however distal part monosiphonic, divided into regular internodes, each internode with one hydrotheca. Hydrothecae arranged alternately to right and left sides, long flask-shaped, a few gentle corrugations on free part of adcauline wall, but abcauline wall smooth, margin with four teeth and operculum with four flaps.

The measurements of the specimens from Jagyakdo are as follows (μm).

Stem, length of internode ····· 520–570
diameter at node ····· 300–350
Branch, length of internode ····· 480–580
diameter at node ····· 250–290
Hydrotheca, length of abcauline wall ····· 560–590
length of fused adcauline wall ····· 350–380
length of free adcauline wall ····· 350–380

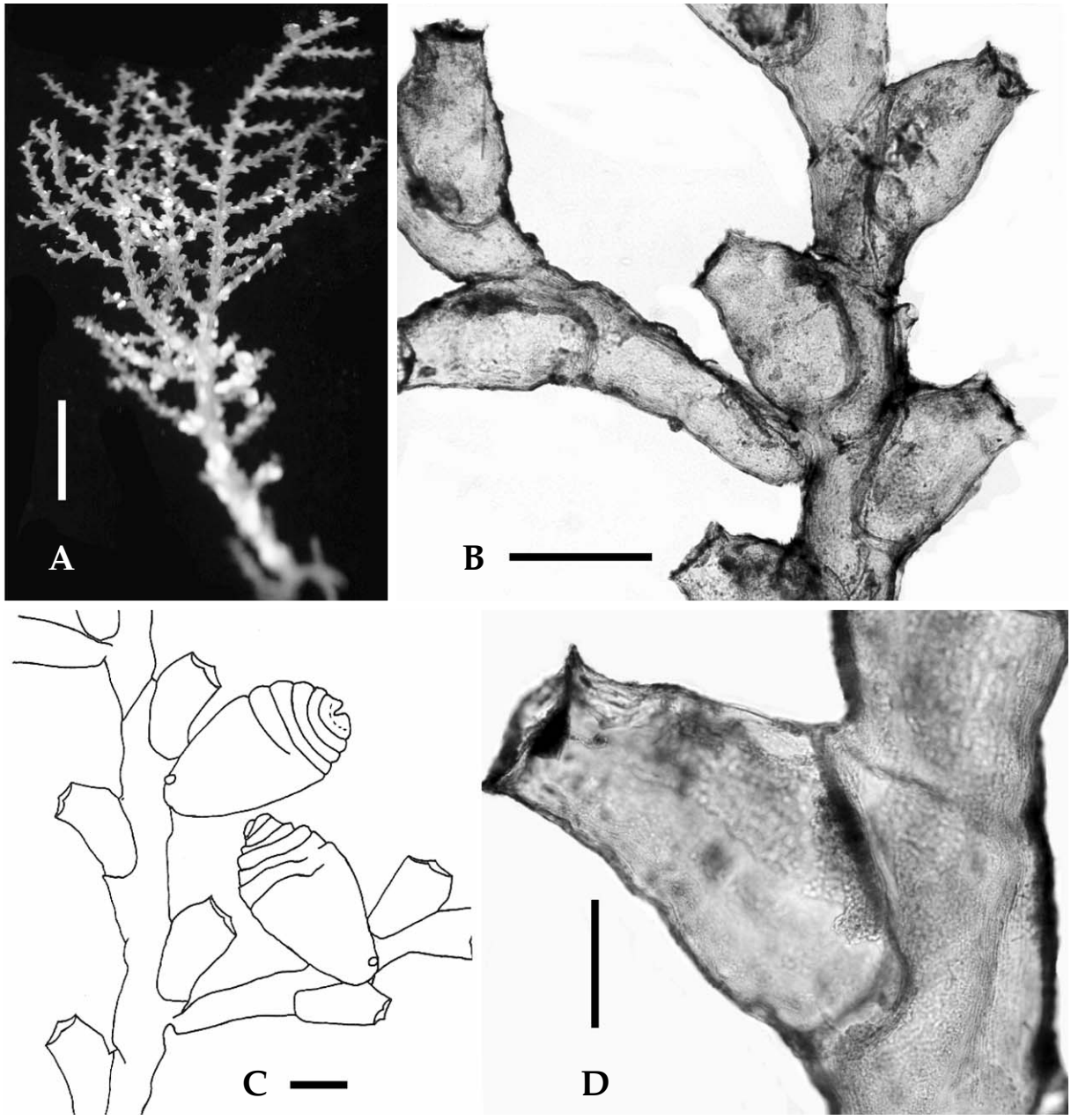

Fig. 48. *Sertularella gayi*. A. whole colony; B. stem and branch; C. gonothecae on stem and branch (cited from Cornelius, 1979); D. hydrotheca. Scales: A=10 mm, B, C=500 μm, D=200 μm.

Colony, total length ····· 20–28 mm

Distribution: Korea, Japan, Bering Sea, Philippine, New Zealand, Peru, Cuba, Mexico, Atlantic coasts of America, Gulf of St. Lawrence, Greenland, Sweden, Norway, English Channel, Portugal, Mediterranean, Moroco, Cape of Good Hope.

Korea: GN, JN, GG, JJ.

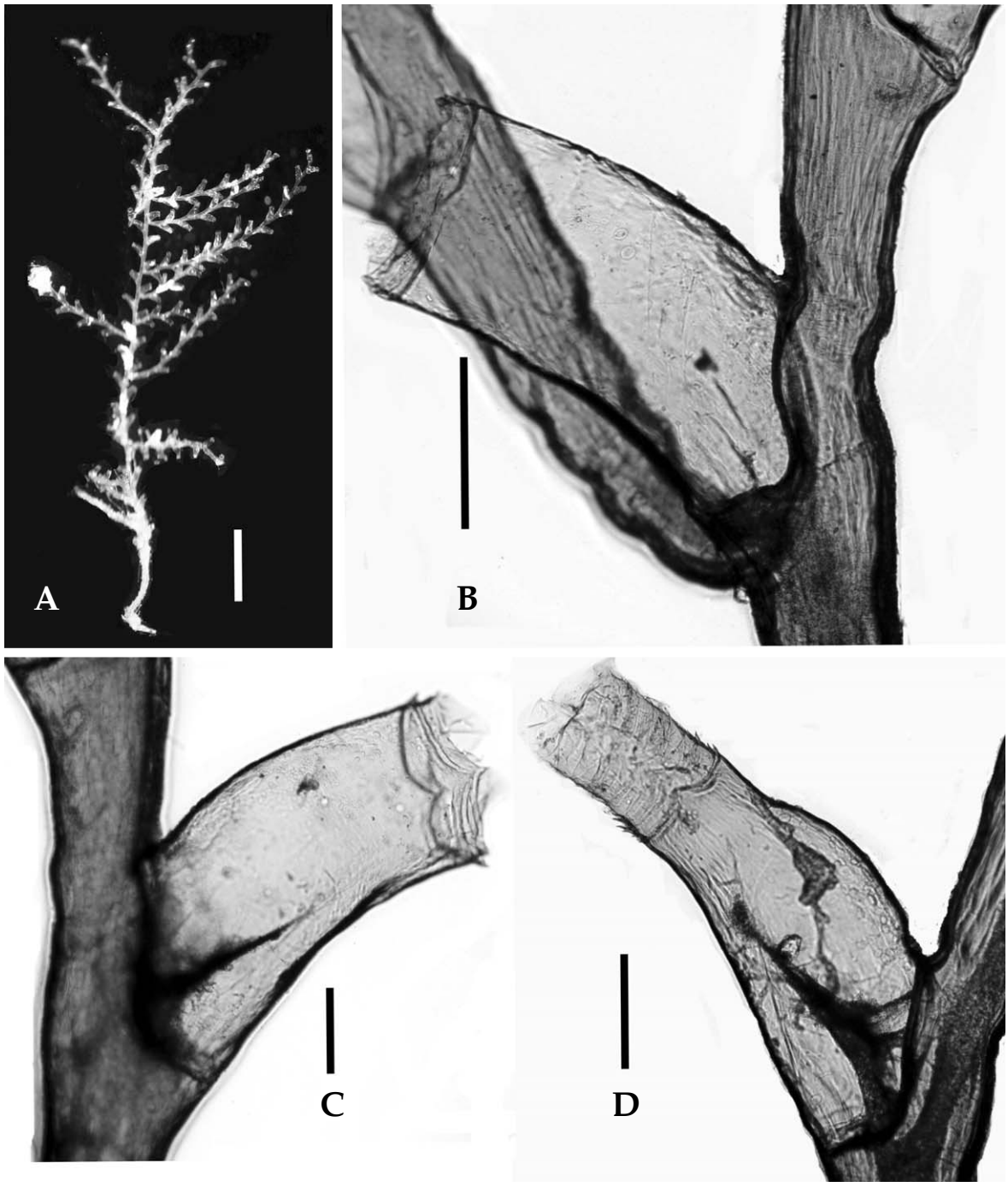

Fig. 49. *Sertularella gigantea*. A. colony; B. stem with branch and hydrotheca; C, D. hydrothecae. Scales: A=10 mm, B–D=500 μm.

Specimen examined: GN: (Mipo: 6.xii.1978); (Geojedo Daepo: 8.vii.1996); (Bijindo: 10.vii.1996), JN: (Cheongsando: 25.vii.1981); (Jindo: 23.vii.1994), GG: (Jagyakdo: 14.xii.1973; 17.ix.1974; 25.xi.1976; 2.ix.1978), JJ: (Moseulpo: 18.vi.1985).

Ecology: This species inhabits in waters 10–20 m deep.

Remarks: The descriptions and figures of Nutting (1904), Fraser (1944) and Vervoort (1959) were refered to in the identification of this species. The shape of hydrothecae, irregular branching pattern and fascicled stem at the base are in agreement with those of theirs. Though the present specimens are sterile, the identification admits of no doubt. *S. gayi* is similar to *S. polyzonias* (Linnaeus, 1758) reported by Nutting (1904) and Ralph (1961) in general form. But this species can be distinguished from *S. polyzonias* by the fascicled stem at the base and distinct undulations of adcauline wall of hydrothecae.

38. *Sertularella gigantea* Mereschkowsky, 1878 (Fig. 49)

Keun-te-hi-deu-ra (큰테히드라)

Sertularella gigantea Mereschkowsky, 1878, p. 330, pl. 14, figs. 6, 7; Fraser, 1944, p. 264, pl. 56, fig. 250; Yamada, 1950, p. 11, pl. 1, fig. 10; 1955, p. 18, fig. 2; Naumov, 1960, p. 365, fig. 227, pl. VI, fig. 1; Park, 1990, p. 80, fig. 4A, B.

Colonies large, attaining about 30 cm long. Stem monosiphonic, branched irregularly, divided into regular internodes, internodes of different length, nodes between internodes undistinct, each internode bearing one hydrotheca distally. Hydrothecae arranged in alternate in one plane, cylinder-shaped, about 1/3 adcaline wall adnate, with four marginal teeth and operculum of four valves. Margin of hydrotheca renovated several times.

The measurements of the specimens from Sokcho are as follows (μm).

Stem, length of internode	1110–1180
diameter at node	350–420
Hydrotheca, length of abcauline wall	1130–2100
length of free adcauline wall	1050–1750
length of fused adcauline wall	500–1000
Colony, total length	7–10 cm

Distribution: World wide distribution in boreal Pacific and Atlantic Oceans.

Korea: GW.

Specimen examined: GW: (Imwon: 30.vi.1989); (Sokcho: 3.x.1990).

Ecology: This species inhabits in waters 10–20 m deep.

39. *Sertularella gotoi* Stechow, 1913 (Fig. 50)

Go-tto-te-hi-deu-ra (고또테히드라)

Sertularella gotoi Stechow, 1913b, p. 132, fig. 104; Rho and Chang, 1974, p. 142, pl. 5, figs. 3–5; Park, 1990, p. 80; 1992, p. 291; 1995, p. 14.

Stem generally unbranched, but often branched, divided into regular internodes, each internode

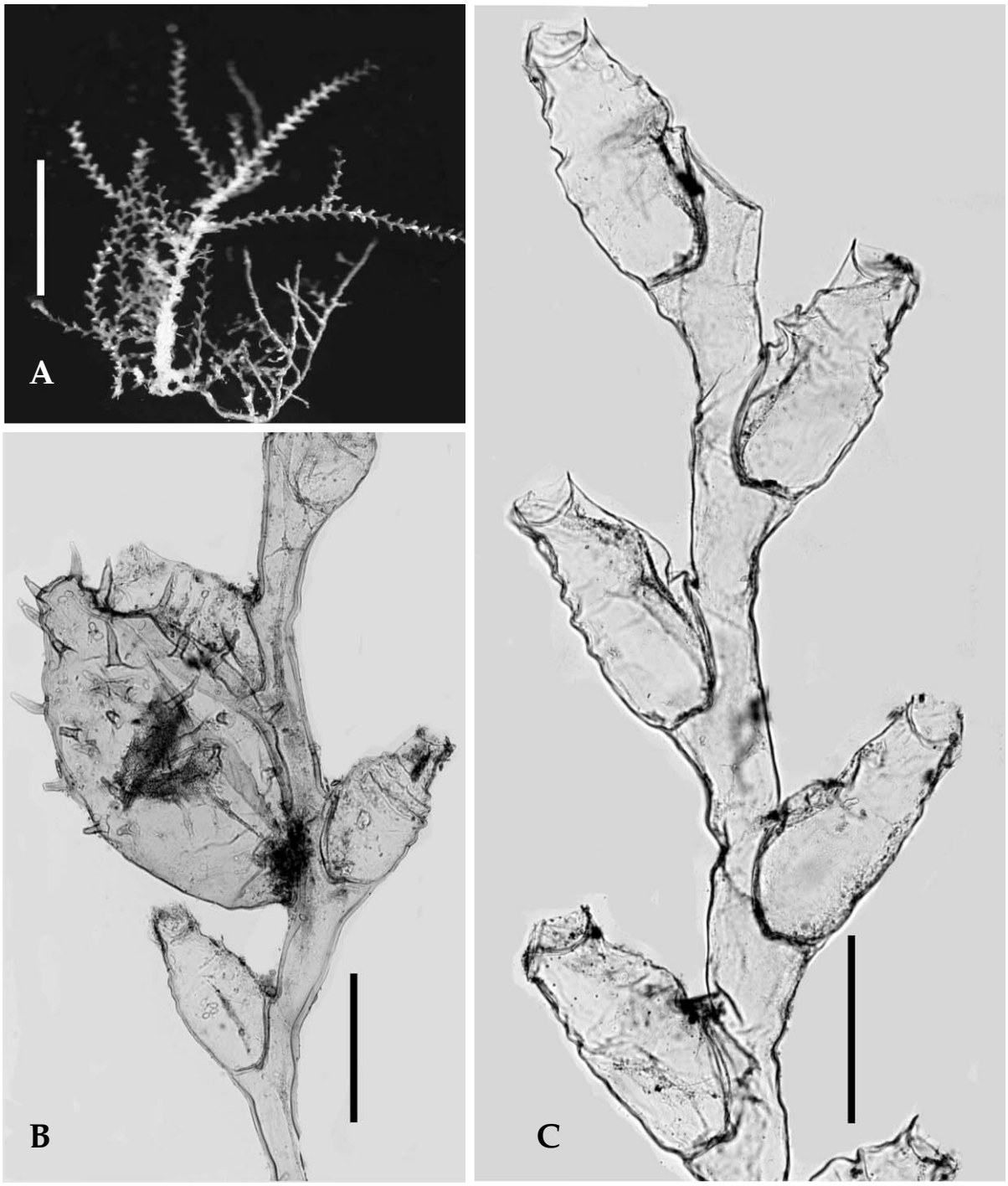

Fig. 50. *Sertularella gotoi*. A. colonies; B. stem with hydrothecae and gonotheca; C. apical portion of stem with hydrothecae. Scales: A=10 mm, B, C=500 μm.

bearing one hydrotheca. Hydrothecae in alternate, flask-shaped, tapering towards distal, with three marginal teeth and operculum of three valves, about 1/3 below adcauline adnate, adcauline wall

with deep corrugations and abcauline wall smooth. Gonothecae arising from below stem, spiny processes distributed on its surface through, more or less curved, with narrow neck.

The measurements of the specimens from Yeosu, Seogwipo and Anmyeondo are as follows (μm).

	(Yeosu)	(Seogwipo)	(Anmyeondo)
Stem, length of internode	370–520	460–685	390–540
diameter of internode	200–240	20–260	150–200
Hydrotheca, length of fused adcauline wall	350–370	425–445	280–350
length of free adcauline wall	540–630	460–555	550–555
total length	760–830	830–870	670–780
maximum diameter	350–400	390–425	330–370
diameter at margin	240–280	260–280	220–260
Gonotheca, total length	1670–1790	1700–1980	1055–1130
maximum diameter	890–1130	905–960	630–670
Colony, total length	8–25 mm		

Distribution: Korea, Japan, Indo-Pacific, California.

Korea: GW, GB, GN, JN, CN, JJ.

Specimen examined: GW: (Jumunjin: 27.vi.1989), GB: (Ulleungdo: 10.vii.1984), GN: (Mipo: 15.iv. 1975; 6.xii.1978; 25.v.1981; 26.xi.1983), JN: (Yeosu: 15.vi.1969; 8.viii.1973); (Docheong-ri: 27.vii.1974); (Cheongsando: 25.vii.1981); (Jindo: 23.vii.1994), CN: (Anmyeondo: 10.viii.1973), JJ: (Seogwipo: 25.xii.1971).

Ecology: This species inhabits in waters coastal to 20–30 m deep.

40. *Sertularella levigata* Stechow, 1931 (Figs. 51, 52)

Te-hi-deu-ra (테히드라)

Sertularella levigata Stechow, 1931, p. 183; Stechow and Uchida, 1931, p. 559, text-fig. 9; Leloup, 1940, p. 9, fig. 4A–E; Yamada, 1959, p. 61; Rho, 1967, p. 352, fig. 15, pl. 1, fig. 6; 1969, p. 169; Rho and Chang, 1972, p. 103; 1974, p. 143; Park, 1990, p. 80; 1992, p. 291; 1993, p. 270; 1995, p. 14.

Colonies arising from hydrorhiza directly. Stem branched or unbranched, divided into regular internodes, each internode bearing one hydrotheca on distal and with two distinct annulations on base. Hydrothecae in alternate, tube-shaped, 1/2 adcauline wall adnate, with three marginal teeth and operculum of three valves. Perisarc thick in lower portion of stem. Gonothecae borne on middle of stem, about four times larger than hydrotheca, tapering towards below, with large round mouth and about four processes around mouth, and with 6–7 distinct longitudinal ridges from 1/4 above to below and spiny processes distally, wall smooth.

The measurements of the specimens from Geomundo are as follows (μm).

Stem, length of internode	657–730
diameter at base of internode	190–205
Hydrotheca, length of fused adcauline wall	321–336
length of free adcauline wall	485–526
total length	730–745
maximum diameter	336–350

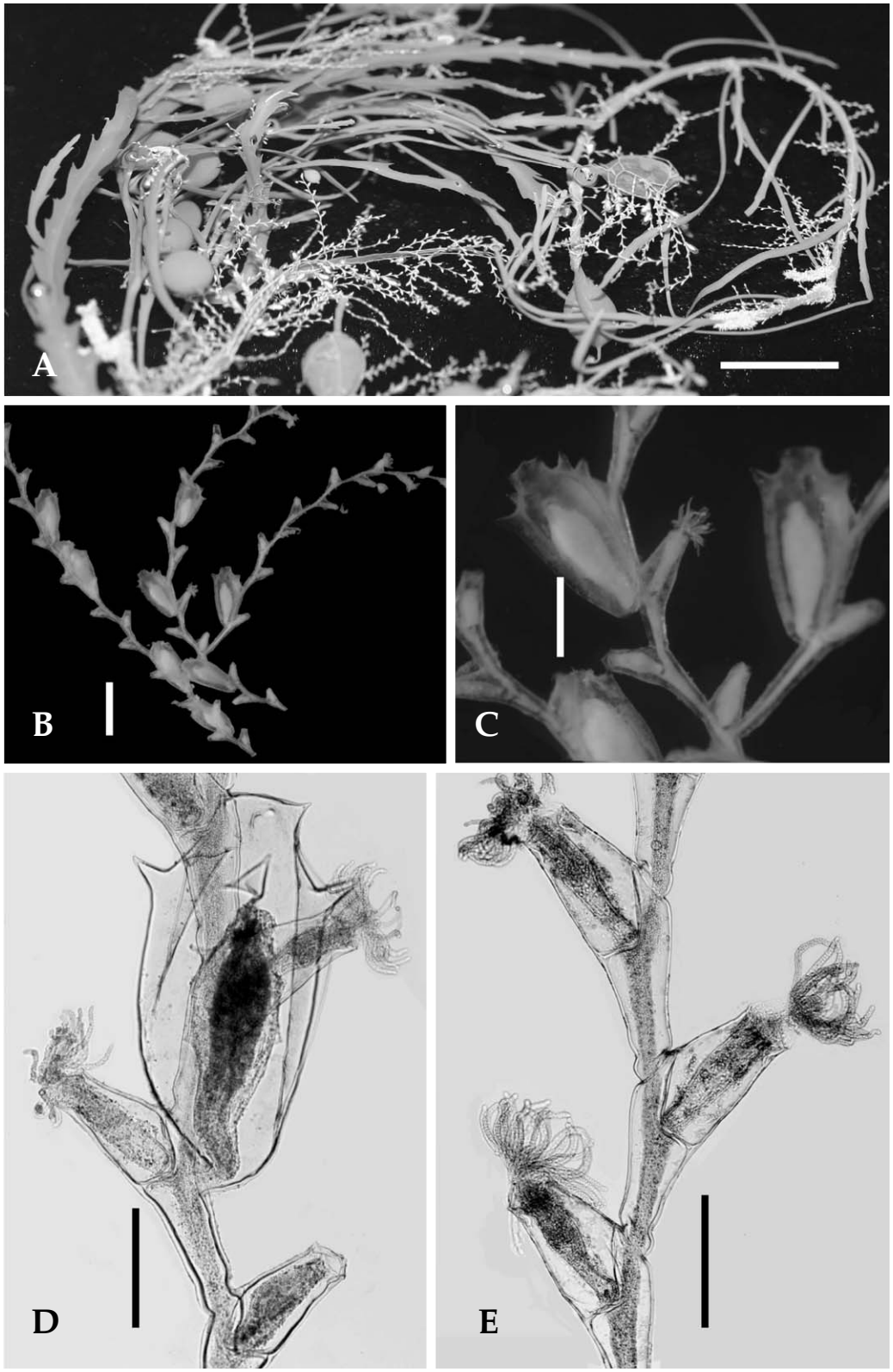

Fig. 51. *Sertularella levigata*. A. colonies on alga; B. part of colony; C. gonothecae; D. stem with a gonotheca; E. stem with hydrothecae. Scales: A=20 mm, B=1 mm, C–E=500 μm.

diameter at margin ····· 205–220
Gonotheca, total length ····· 2292–2453
maximum diameter ····· 1080–1095
Colony, total length ····· 17 mm

Distribution: Korea, Japan.
Korea: GW, GB, GN, JN, JB, CN, GG, JJ.
Specimen examined: GW: (Gangneung: 26.vi.1989); (Naksan: 14.viii.1973); (Geundeok: 7.viii.1984); (Donghae Imgong-ri: 9.vii.2002); (Jumujin: 27.vi.1989), GB: (Pohang: 24.xi.1983), GN: (Mijo-ri: 8.vii.1967; 5.vii.1974); (Sangju-ri: 6.vii.1974; 21.v.1981); (Mokdo: 7.vii.1974); (Mipo: 14.vii.1974; 11.v.1975; 18.iv.1976; 5.vii.1983); (Nodo: 22.vii.1966); (Gujora: 21.vii.1970); (Haeundae: 11.v.1974); (Bijindo: 19.vii.1984; 10.vii.1996); (Samcheonpo: 20.vii.1984); (Geojedo Daepo, Ssanggeun: 9.vii.1996), JN: (Geomundo: 8.viii.1965; 25.vii.1988); (Bangjukpo Dolsan: 26.vi.1966; 22.v.1967; 3.vi.1968); (Impo: 23.v.1967); (Jindo: 6.vi.1968); (Yeosu: 15.vi.1969; 4.viii.1973); (Odongdo: 4.viii.1973); (Yesong-ri: 21.vii.1981); (Yeoseodo: 20.viii.1982); (Jindo Hoedong, Jeopdo: 6.viii.1974; 5.viii.1978); (Nokjin: 4.viii.1974), JB: (Oecheongdo: 10.iv.1978); (Gomso: 12.vi.1980); (Gyeokpo-ri: 7.viii.1975), CN: (Anmyeondo: 9.viii.1973); (Biin: 14.viii.1973); (Daecheon: 2.vii.1984), GG: (Sorae: 9.x.1971), JJ: (Seongsanpo: 10.vii.1965; 14.iv.1975; 13.vii.1979; 4.ii.2001); (Seogwipo: 11.vii.1965; 12.xii.1969; 8.viii.1970; 7.ii.1971; 8.vii.1972; 13.vii.1973; 13.iv.1975; 12.vii.1979; 22.v.1982); (Supseom: 7.ii.1971; 2.vii.1993); (Wimi-ri: 8.vii.1971); (Beomseom: 30.vii.1980); (Gapado: 16.vi.1985); (Munseom: 30.vi.1993; 22.vi.2007).
Ecology: This species is attached to algae, mostly *Sargassumin* in waters about 10–20 m deep.

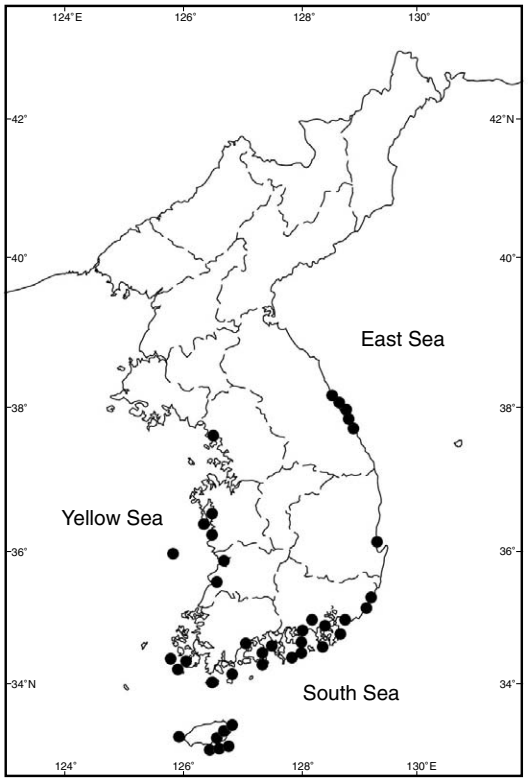

Fig. 52. Distribution of *Sertularella levigata*.

41. *Sertularella mirabilis* Jäderholm, 1896 (Fig. 53)

Meot-jin-te-hi-deu-ra (멋진테히드라)

Sertularella mirabilis Jäderholm, 1896, p. 9, pl. 2, fig. 1; Yamada, 1959, p. 50; Hirohito, 1983, p. 45; 1995, p. 195, fig. 54a–g, pl. 12, fig. 13; Park, 1998, p. 166, fig. 1A–C, pl. 1, fig. A.

Colonies large. Hydrorhiza polysiphonic and fused with one another. It is difficult to distinguish hydrocaulus, hydrocladium and second hydrocladium with one another. Hydrocaulus branched irregularly, not in one plane, anastomosing to network with some resemblance to sponge as a whole. Hydrotheca arranged alternately with long interval, not on one plane, tapering upwards, with 6–7 transverse rings on wall, margin with four teeth, three internal teeth and four flaps. Gonotheca arising from below hydrotheca, with distinct transverse rings on wall and short pedicel.

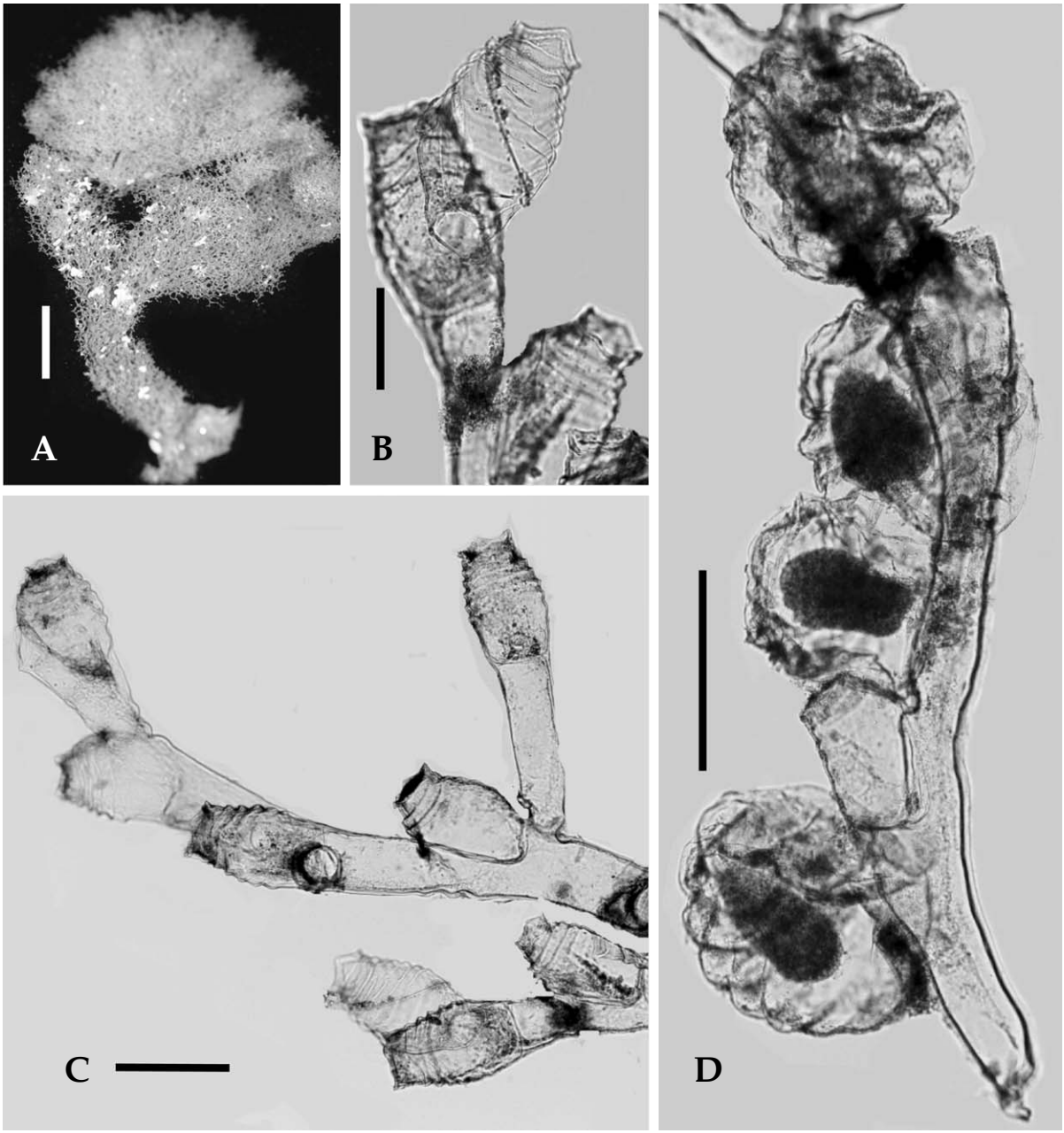

Fig. 53. *Sertularella mirabilis*. A. colony; B. hydrothecae; C. branches with hydrothecae; D. gonothecae. Scales: A=20 mm, B=200 μm, C, D=0.5 mm.

The measurements of the specimens from Daepo are as follows (μm).

Hydrotheca, total length	260–300
length of fused adcauline wall	240–280
length of free adcauline wall	200–210
maximum diameter	240–260
diameter at margin	160

Gonotheca, total length ····· 830
maximum diameter ····· 600–740

Distribution: Korea, Japan (Sagami Bay), South China Sea.
Korea: GN.
Specimen examined: GN: (Geojedo Daepo: 3.viii.1994; 9.vii.1996).
Ecology: This species set in sand-muddy bottom in waters about 30 m deep.
Remarks: Though this species is similar to *Sertularella sinensis* reported by Jäderholm (1896) and Hirohito (1995) in the shapes of hydrotheca and gonotheca, the transverse rings on hydrothecal wall of *S. sinensis* are more distinct than those of this species, and its gonothecae have distinct curved outward processes, while this species has no such processes in gonotheca.

42. *Sertularella miurensis* Stechow, 1921 (Figs. 54, 55)

Ga-ro-te-hi-deu-ra (가로테히드라)

Sertularella miurensis Stechow, 1921, p. 258; 1923a, p. 13; 1923b, p. 175, fig. T; Yamada, 1950, p. 11; 1957, p. 158; 1958, p. 57; 1959, p. 62; Ito and Ioue, 1962, p. 86, pl. 8, fig. 8U; Kubota, 1976, p. 238, figs. 4, 8, 9; Hirohito, 1969, p. 22; 1995, p. 197, fig. 65a–c; Rees and Thursfield, 1965, p. 145; Rho, 1967, p. 353, fig. 15A, B; 1969, p. 169; Rho and Chang, 1972, p. 103; 1974, p. 143; Park, 1990, p. 81; 1992, p. 292; 1993, p. 270; 1995, p. 14.

Colonies arising from hydrorhiza directly, bearing 2–4 distinct annulations on its base. Stem branched or unbranched, divided into regular internodes, each internode bearing one hydrotheca on distal, and perisarc thick. Hydrothecae in alternate in one plane, flask-shaped, about 1/2 adcauline adnate, with narrow neck, with four marginal teeth, three internal teeth and operculum of four valves. Gonotheca borne on base of stem, oblong oval-shaped, wall with 4–5 corrugations, 3–4 pointed processes around mouth.

The measurements of the specimens from Biin, Guryongpo and Bangjukpo are as follows (μm).

	(Biin)	(Guryongpo)	(Bangjukpo)
Stem, length of internode	467–511	336–409	394–455
diameter at node	131–146	131–175	146–161
Hydrotheca, length of fused adcauline wall	175–205	205	190–205
length of free adcauline wall	248–277	292	277–292
total length	394–423	453–485	453–470
maximum diameter	220–234	264	278–292
diameter at margin	175–190	205	235
Gonotheca, total length	599–745	905–978	964–978
maximum diameter	440–485	467–584	672–686
Colony, total length	12 mm		

Distribution: Korea, Japan.
Korea: GW, GB, GN, JN, JB, CN, JJ.
Specimen examined: GW: (Sokcho: 15.viii.1973; 28.vi.1989); (Jumunjin: 26.vi.1989); (Daejin: 28.vi.

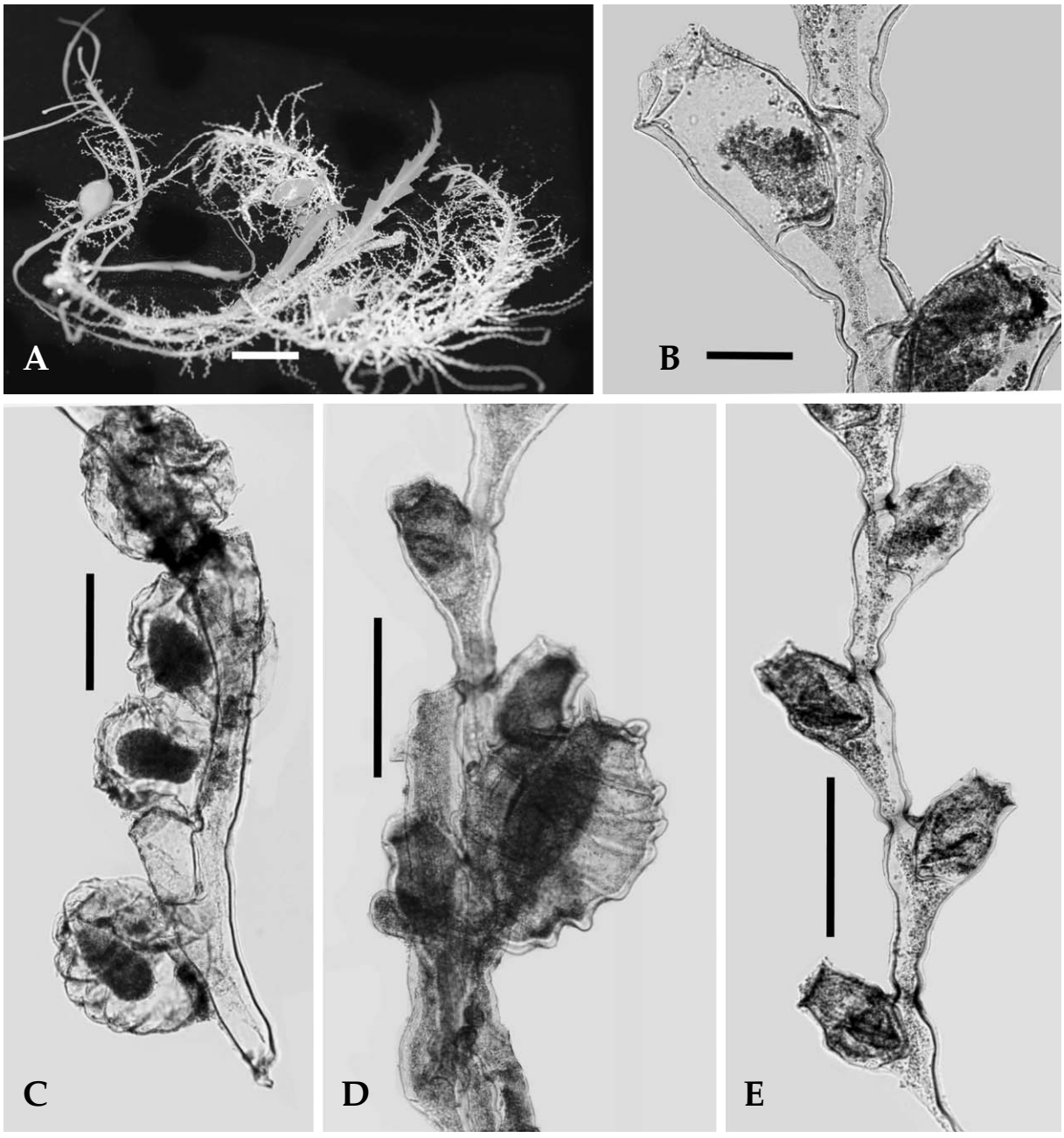

Fig. 54. *Sertularella miurensis*. A. colonies; B. hydrotheca; C, D. stem with gonothecae; E. stem with hydrothecae. Scales: A=20 mm, B=200 μm, C–E=0.5 mm.

1989); (Imwon: 30.vi.1989); (Samcheok: 30.vi.1989), GB: (Guryongpo: 19–22.vii.1968; 9.vii.2002); (Gampo: 1.viii.1972); (Ulleungdo: 20.vi.1988); (Dangsa: 1.vii.1997); (Ulgi Deungdae: 30.vi.1997); (Homigot: 9.vii.2002); (Uljin: 26.vi.1988), GN: (Haeundae: 13.vi.1967); (Mijo-ri: 18.vii.1967); (Nodo: 22.vii.1967); (Yeocha: 9.vii.1996); (Geojedo Gudo: 6.ii.1996), JN: (Bangjukpo: 26.vi.1966; 22.v.1967; 3.vi. 1968); (Daeheuksando: 20.vii.1966); (Impo: 23.v.1967); (Odongdo: 8.viii.1973); (Jindo Jeopdo, Hoedong:

23.vii.1994); (Yeosu: 8.viii.1973), JB: (Eocheongdo: 14.iv. 1972; 9.vii.1986); (Maldo: 3.viii.2003), CN: (Biin: 23.vii. 1971; 13.viii.1973); (Anmyeondo: 7.viii.1973); (Bangpo: 25.vi.1995); (Seocheon: 2.viii.1995); (Daecheon: 1.viii. 1995); (Chunjangdae: 22.viii.1995), JJ: (Seogwipo: 11.vii. 1965; 21.x.1973; 21.ix.1985; 11.xii.1969; 8.viii.1970; 24. xii.1971; 13.vii.1973); (Wimi-ri: 8.vii.1972); (Udo: 7.x. 1985); (Munseom: 22.vi.2007); (Kkotji: 25.vi.1995).

Ecology: This species is attached to *Sargassum* in waters coastal and 20 m deep.

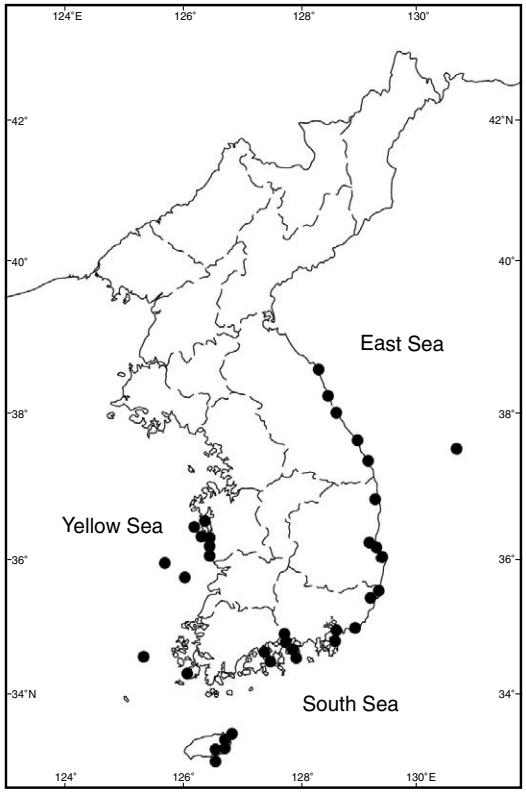

Fig. 55. Distribution of *Sertularella miurensis*.

43. *Sertularella obtusa* Stechow, 1931 (Fig. 56)

Mu-din-te-hi-deu-ra (무딘테히드라)

Sertularella obtusa Stechow, 1931, p. 181; Stechow and Uchida, 1931, p. 558, text-fig. 8; Park and Rho, 1986, p. 14, fig. 3c–k, pl. 1, fig. d; Park, 1990, p. 82; 1992, p. 292; 1993, p. 271; 1995, p. 14.

Colonies arising from stolon creeping on algae, branched or unbranched. Hydrocaulus with 1–4 annulations at base, divided into regular internodes. Hydrothecae arranged alternately to right and left sides, flask-shaped, wall with 2–5 corrugations, margin with four teeth and operculum with four flaps. Gonothecae arising from base of hydrocaulus or stolon, oblong-shaped, distal end with or without processes, wall folded transversally overall.

The measurements of the specimens from Daeheuksando are as follows (μm).

Stem, length of internode	390–440
diameter at node	70–100
Hydrotheca, length of abcauline wall	330–360
length of fused adcauline wall	130–190
length of free adcauline wall	230–320
maximum diameter	270
diameter at base	101–200
diameter at margin	180–210
Gonotheca, total length	780–1,150
maximum diameter	400–430
Colony, total length	7–15 mm

Distribution: Korea, Japan.

Korea: GW, GB, JN, CN, JJ.

Specimen examined: GW: (Naksan: 28.vi.1989), GB: (Jukbyeon: 30.vi.1989), JN: (Jindo Hoedong: 5.viii.1974; 25.vii.1994); (Daeheuksando: 5.vii.1978), CN: (Anmyeondo: 8.viii.1973); (Bangpo: 25.vi.

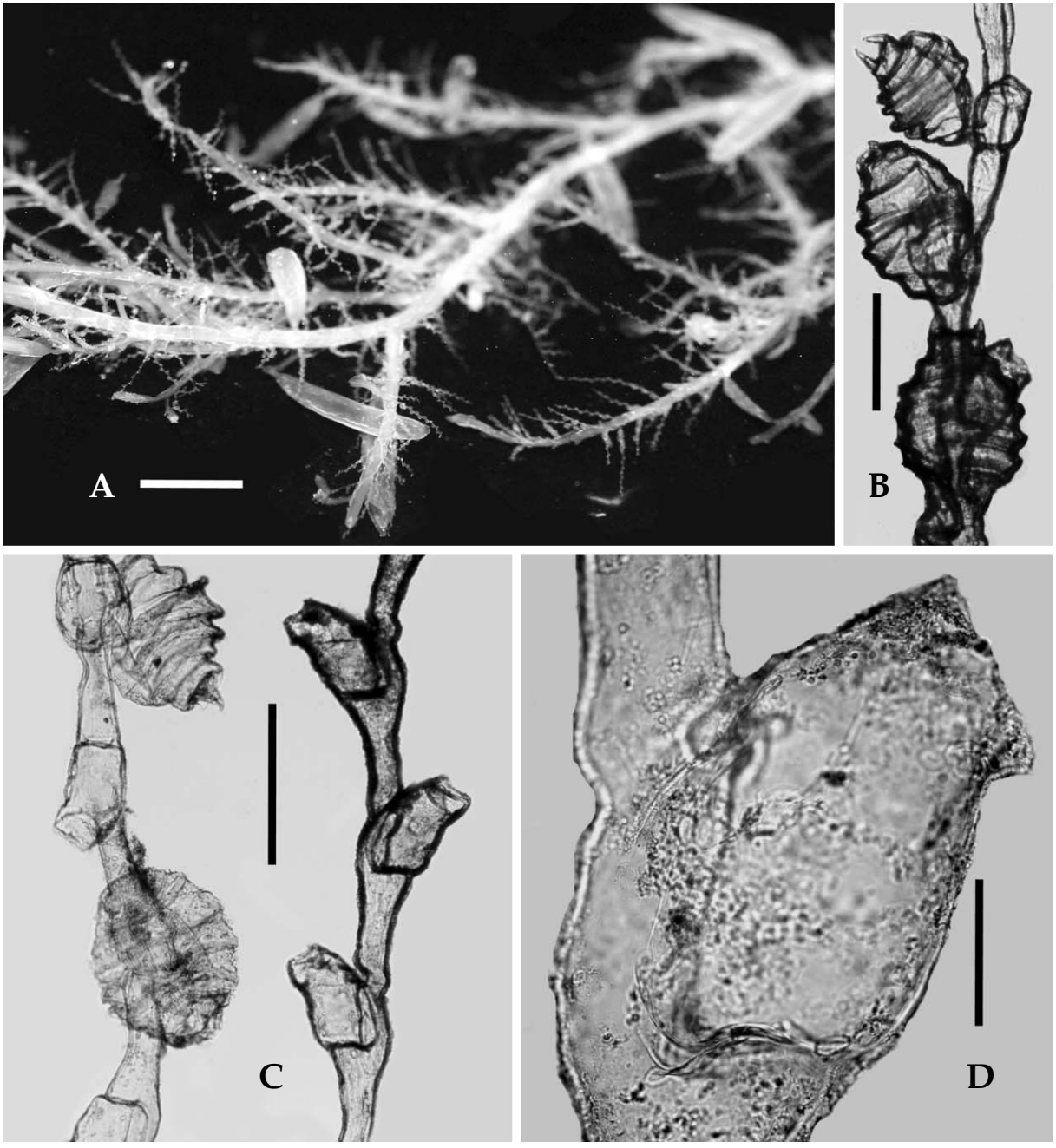

Fig. 56. *Sertularella obtusa*. A. colonies on alga; B. gonothecae; C. stems with gonothecae and hydrothecae; D. hydrotheca. Scales: A=10 mm, B, C=0.5 mm, D=100 μm.

1995), JJ: (Seogwipo: 13.vii.1979); (Munseom: 30.vi.1993); (Udo: 11.vii.1979); (Gimryeong: 8.x.1985).

Ecology: This species is attached to *Sargassum* in waters coastal to 20 m deep.

Remarks: This species was reported by Prof. Hozawa from Emmusubi-Jido (Japan) and his type specimen was not branched. Though the stems of present specimens are branched or unbranched, the comparison of our specimens with Stechow's (1931) description shows mostly complete confor-

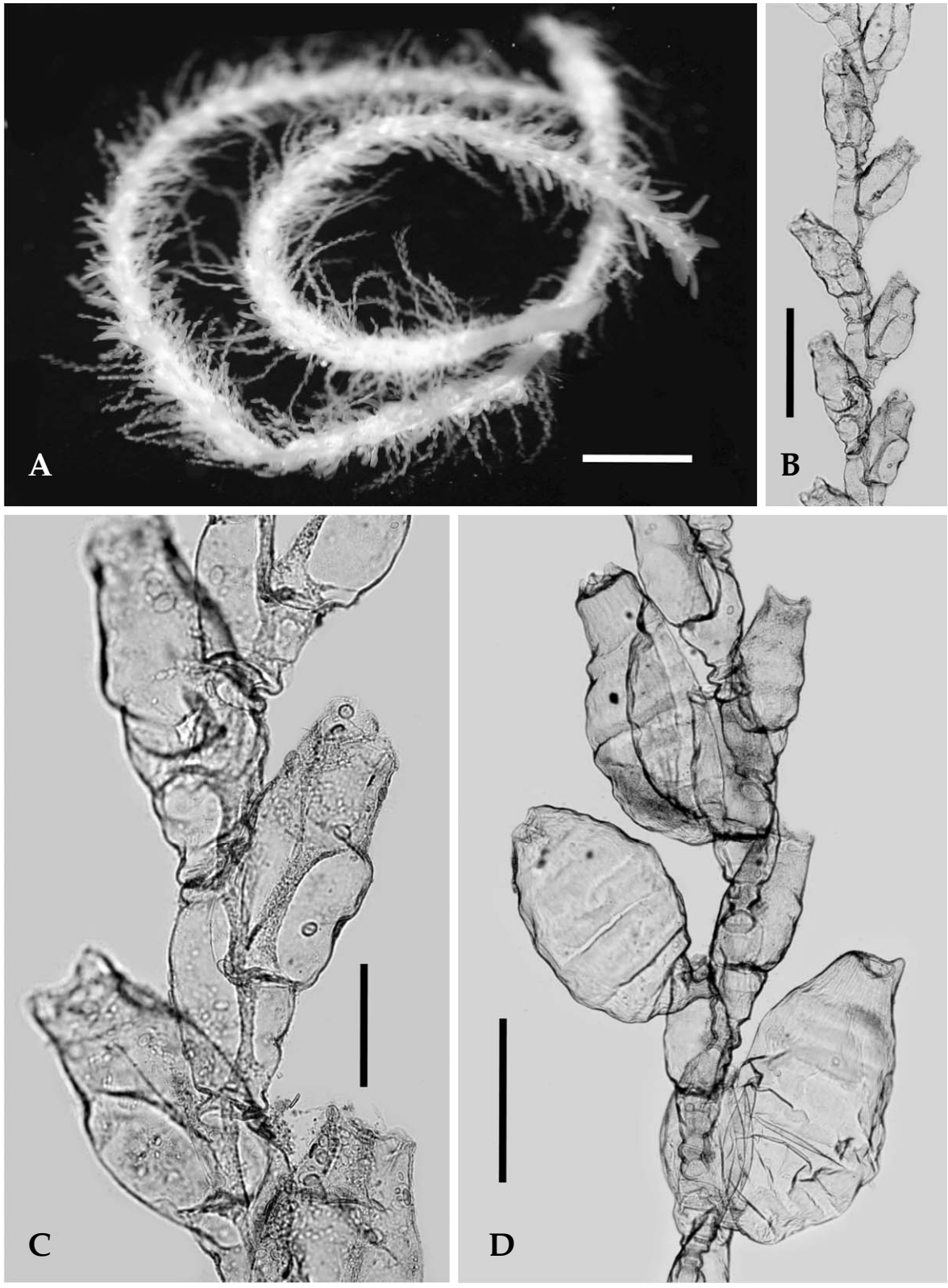

Fig. 57. *Sertularella quinquelaminata*. A. colonies on algae; B, C. stem with hydrothecae; D. gonothecae. Scales: A=10 mm, B, D=0.5 mm, C=200 μm.

mity. The characteristic of this species is the shape of gonothecae with two low processes or without any processes on the distal end.

44. *Sertularella quinquelaminata* Stechow, 1931 (Fig. 57)

O-keop-te-hi-deu-ra (오컵테히드라)

Sertularella quinquelaminata Stechow, 1931, p. 180; Stechow and Uchida, 1931, p. 553, text-fig. 5; Yamada, 1959, p. 64; Rho, 1967, p. 334, fig. 17.

Colonies arising from hydrorhiza creeping on algae. Stem straight, unbranched, sinuated along margin, divided into regular internodes, and perisarc thin. Hydrothecae arranged in alternate, flask-shaped, tapering toward distal, with four marginal teeth and operculum of four valves, wall with corrugations. Gonotheca large compared to hydrotheca, borne below hydrotheca, oval shaped, wall corrugated through out and with neck and processes around mouth.

The measurements of the specimens from Geomundo are as follows (μm).

Stem, length of internode	350–438
diameter at base of internode	87–102
Hydrotheca, length of fused adcauline wall	175
length of free adcauline wall	220–256
diameter at margin	131–146
total length	438
maximum diameter	175–197
Colony, total length	5 mm

Distribution: Korea, Japan, New Zealand.

Korea: GW, GN, JN, GG, JJ.

Specimen examined: GW: (Jumunjin: 25.vi.1989), GN: (Mokdo: 7.vi.1974); (Mijo-ri: 6.viii.1974); (Sinsudo: 21.vii.1984), JN: (Geomundo: 8.viii.1965); (Bangjukpo: 22.v.1967), GG: (Jagyakdo: 15.x.1988), JJ: (Seogwipo: 12.iv.1975).

Ecology: This species inhabits in waters about 20 m deep.

45. *Sertularella sinensis* Jäderholm, 1896 (Fig. 58)

Geu-mul-te-hi-deu-ra (그물테히드라)

Sertularella sinensis Jäderholm, 1896, p. 11, pl. 2, figs. 11, 12; 1919, p. 17; Stechow, 1913b, p. 129, figs. 99, 100; 1923a, p. 13; Bedot, 1925, p. 385; Yamada, 1959, p. 65; Rees and Thursfield, 1965, p. 138; Hirohito, 1969, p. 23; 1995, p. 203, fig. 67a–d; Rho and Chang, 1974, p. 144, pl. 5, figs. 1, 2; Park, 1990, p. 82; 1995, p. 15.

Stem branched many times in one plane, branching repeatedly, and fusing making a network. Hydrothecae in alternate, cylindrical, about half adcauline wall adnate, remainder free and curved

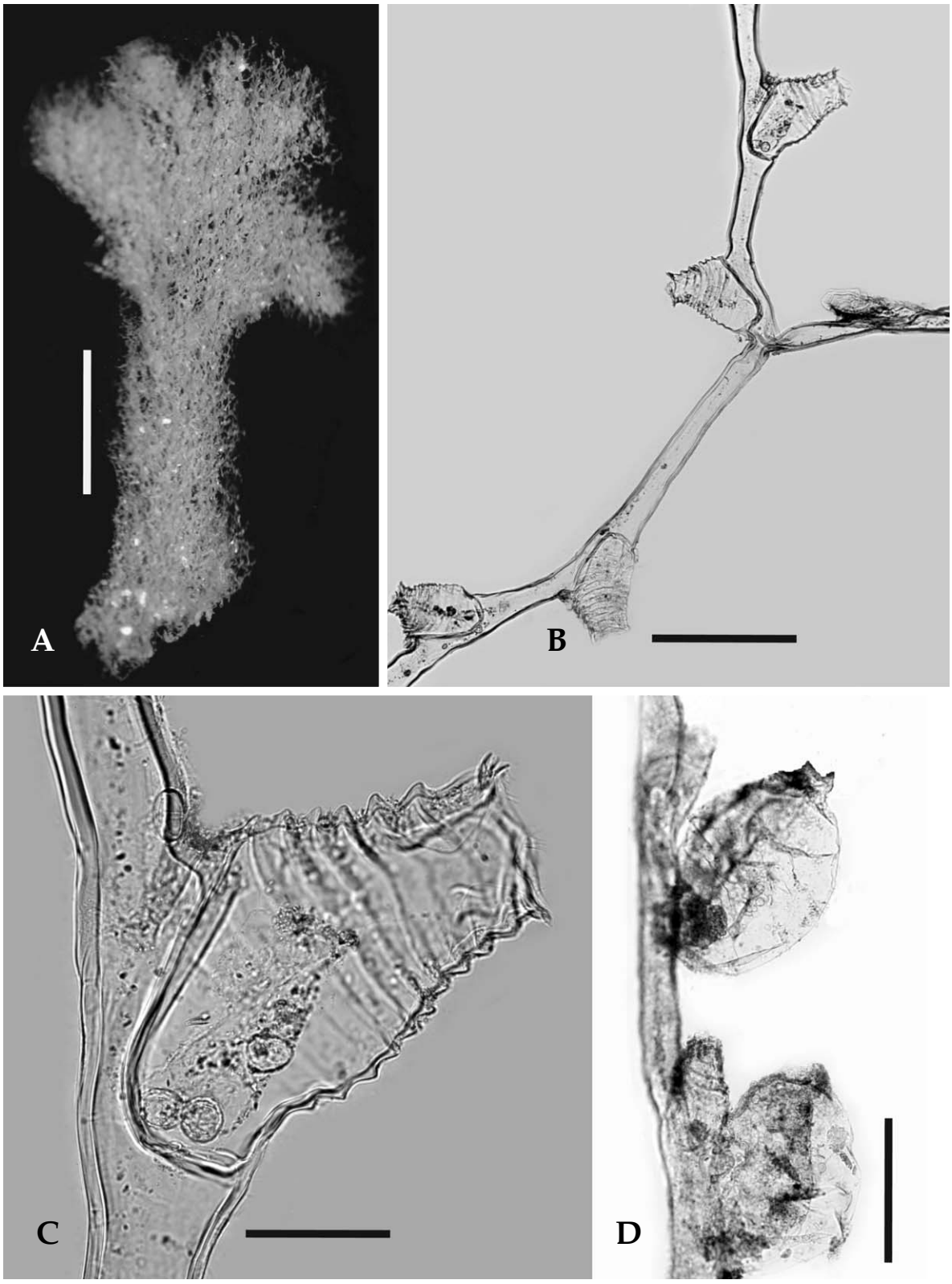

Fig. 58. *Sertularella sinensis*. A. colony; B. branching pattern; C. hydrotheca; D. gonothecae. Scales: A=20 mm, B, D=500 μm, C=100 μm.

outward, wall with 12–13 distinct corrugations , with four marginal teeth and three internal teeth, operculum of four valves. Gonothecae oval, wall with distinct corrugations, with short neck and spiny processes around mouth.

The measurements of the specimens from Seogwipo are as follows (μm).

Stem, length of internode ····· 759–925
maximum diameter of internode ····· 170–200
Hydrotheca, length of free adcauline wall ····· 310–370
length of fused adcauline wall ····· 330–390
total length ····· 450–570
maximum diameter ····· 315–370
Colony, total length ····· 20 mm

Distribution: Korea, Japan.

Korea: GW, GN, JN, JJ.

Specimen examined: GW: (Jumunjin: 26.vi.1989), GN: (Mipo: 12.v.1974; 19.xii.1974; 25.iv.1975; 5.vii.1976; 6.xii.1978; 25.v.1981); (Busan: 26.v.1981), JN: (Yeosu: 8.viii.1973); (Docheong-ri: 25.vii.1981); (Jindo Geumgaphaesuyokjang: 23.vii.1994), JJ: (Seogwipo: 12.xii.1969; 15.ix.1975; 22.v.1982; 18.vi. 1985); (Jejuhang: 8.vii.1965); (Supseom: 15.iv.1975); (Beomseom: 21.v.1982); (Moseulpo: 18.vi.1985).

Ecology: This species set in sandy mud bottom about 30 m deep.

46. *Sertularella tenella* Alder, 1856 (Fig. 59)

Yeon-te-hi-deu-ra (연테히드라)

Sertularella tenella Alder, 1856, p. 357, pl. 13, figs. 3–6; Hincks, 1868, p. 242; Nutting, 1904, p. 83, pl. 18, figs. 1, 2; Bedot, 1905, p. 108; 1910, p. 363; 1916, p. 213; 1918, p. 245; 1925, p. 387; Jäderholm, 1905, p. 31, pl. 12, fig. 8; Fraser, 1937, p. 158, pl. 36, fig. 190a–c; 1944, p. 273, pl. 6, fig. 263a–c; Rees and Thursfield, 1965, p. 138; Calder, 1970, p. 1529, pl. 6, fig. 6; Park and Rho, 1986, p. 15, fig. 4a–d, pl. 1, fig. e; Park, 1990, p. 82; 1992, p. 293; 1993, p. 271.

Colonies small and unbranched. Hydrocaulus zigzag-shaped, divided into regular internodes, each internode with one hydrotheca. Hydrothecae arranged in alternate, fusiform, hydrothecal wall with distinct 3–8 corrugations, margin with four teeth and operculum with four flaps. Gonothecae arising from the base of colony and hydrorhiza, conical-shaped, gonothecal wall with numerous annulations, margin with 3–5 processes.

The measurements of the specimens from Jagkyakdo are as follows (μm).

Stem, length of internode ····· 210–500
diameter at node ····· 50
Hydrotheca, total length ····· 220–240
maximum diameter ····· 120–130
Gonotheca, total length ····· 400–630
maximum diameter ····· 230–390
diameter at margin ····· 90–150
Colony, total length ····· 3–8 mm

Fig. 59. *Sertularella tenella*. A. colonies on alga; B, D. parts of stems with hydrothecae; C. gonothecae on hydrorhiza. Scales: A=1 mm, B=200 μm, C, D=500 μm.

Distribution: Korea, Japan, Sea of Okhotsk, Bering Sea, Alaska, Canada, Secas Isl., Australia, New Zealand, Argentina, Brazil, Caribbean Sea, West Indies, Cuba, Bermuda, Northumberland, north of Cheticamp Is., Greenland, Barents Sea.

Korea: GN, JB, GG, JJ.

Specimen examined: GN: (Mipo: 11.v.1975), JB: (Yeondo: 22.vii.1971), GG: (Jagyakdo: 12.x.1968; 14.x.1973; 12.vii.1975; 2.xi.1978; 27.x.1984), JJ: (Beomeom: vii.1980); (Kkotji: 25.vi.1995).

Ecology: This species is attached to algae in waters 10 m deep.

Remarks: This little species has been reported by Alder (1856) from Northumberland. Alder's specimens were growing on *Plumularia falcata* and other zoophytes. The type specimen was deposited in the Museum of the Natural History Society, Newcastle-upon-Tyne, England. This species is similar to *Sertularella rugosa* (Linnaeus, 1758) reported by Fraser (1944). However *Sertularella rugosa* is more erect and its internode is shorter than this species. Specifically, this species is distinguished from *S. rugosa* by the shape of gonothecae. This species also resembles *Sertularella geniculata* Hincks, 1874 reported by Fraser (1944) and Nutting (1904) in various characters. We have found only one difference in both species. The internode of this species is annulated throughout, but that of *S. geniculata* is annulated only one time at the base of each internode.

47. *Sertularella tongensis* Stechow, 1919 (Fig. 60)

Tong-ga-te-hi-deu-ra (통가테히드라)

Sertularella tongensis Stechow, 1919, p. 89, figs. F, G; Vervoort and Vasseur, 1977, p. 52; Park and Rho, 1986, p. 12, fig. 3a, b, pl. 1, fig. c; Park, 1990, p. 82; 1992, p. 293; 1993, p. 271.

Colonies small, attaining about 4–8 mm long and attached on algae. Stem mostly unbranched, divided into regular internodes, each internode bearing one hydrotheca on its distal. Hydrothecae in alternate, cylinder-shaped, about 2/5 below adcauline wall adnate, and remainders free. Margin often renovated repeatedly in various times, so that it is difficult to the margin structure, with two marginal teeth and operculum of two valves. Gonotheca comparatively large, arising from within hydrotheca, oval-shaped, wall with transverse corrugations and short small neck.

The measurements of the specimens from Mundo are as follows (μm).

Stem, length of internode	300–430
diameter at node	40–70
Hydrotheca, length of abcauline wall	190–220
length of fused adcauline wall	110–150
length of free adcauline wall	180–200
diameter at margin	90–100
maximum diameter	110–130
Gonotheca, total length	690–740
maximum diameter	450–560
length of neck	30–40
Colony, total length	4–8 mm

Distribution: Korea, Tonga Is., Moorea.

Korea: GB, GN, JJ.

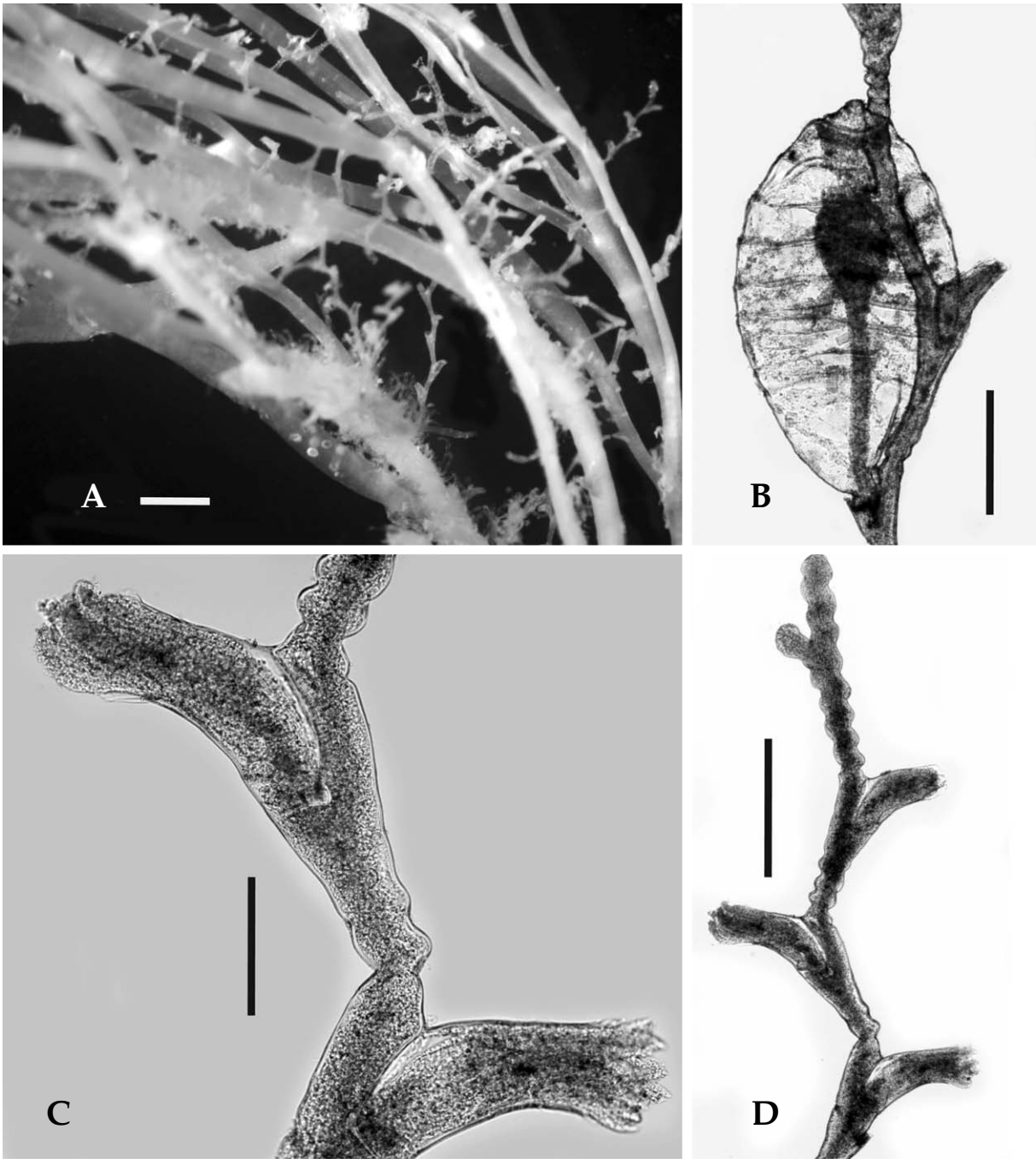

Fig. 60. *Sertularella tongensis*. A. colonies on algae; B. gonotheca; C. hydrothecae; D. apical portion of stem. Scales: A=1 mm, B, D=500 μm, C=200 μm.

Specimen examined: GB: (Guryongpo: 9.vii.2002), GN: (Cheongsa: 6.vi.1978), JJ: (Seogwipo: 9.ii. 1971); (Munseom: 31.xii.1978); (Supseom: 2.vii.1993).

Ecology: This species is attached to algae in waters about 10 m deep.

Remarks: Many small specimens growing on algae with gonosome were collected from the shal-

low waters of Munseom and Cheongsa. This species has been reported by Stechow (1919) from Tonga Island. Though the present specimens are unbranched and the stem is divided into undistinct internodes, the shape of hydrothecae and gonothecae and particularly the hydrothecal margin renovated repeatedly in various forms leave no room for doubt. *S. tongensis* is an uncommon species in Korean waters.

Genus *Sertularia* Linnaeus, 1758

Hwa-gwan-hi-deu-ra-sok (화관히드라속)

Stem erect, unfascicled, branched or unbranched. Hydrothecae sessile, partially adnate, in opposite or subopposite, with two marginal teeth and operculum of two valves, a smaller adcauline one and a larger abcauline one.

Type species: *Sertularia cupressina* Linnaeus, 1758.

Species 138 (6 in Korea).

Key to the species of genus *Sertularia*

1. Hydrothecal wall smooth ····· 2
− Heavy contraction on abcauline wall ····· *S. turbinata*
2. Each internode bearing one more pairs hydrothecae ····· *S. dalmasi*
− Each internode bearing one pair hydrothecae ····· *S. hattorii*

48. *Sertularia dalmasi* (Versluys, 1899) (Fig. 61)

Dal-ma-seu-hwa-gwan-hi-deu-ra (달마스화관히드라)

Desmoscyphus dalmasi Versluys, 1899, p. 38, figs. 7, 8.

Sertularia dalmasi: Fraser, 1944, p. 280, pl. 60, fig. 267a–e; Vervoort, 1959, p. 279, fig. 38; Rees and Thursfield, 1965, p. 146; Rho, 1967, p. 15, fig. 18A–C, pl. 1, fig. 8; Rho and Chang, 1972, p. 8; 1974, p. 144; Park, 1992, p. 291; 1993, p. 269.

Colonies attached on algae, arising from hydrorhiza directly and straight. Stem unbranched, divided into irregular internodes, each internode bearing one or more pairs of hydrothecae and periderm comparatively thick. Hydrothecae tube-shaped, arranged in opposite, about 1/2 above hydrotheca curved outward, with two marginal teeth and operculum of two valves.

The measurements of the specimens from Geomundo and Seogwipo are as follows (μm).

	(Geomundo)	(Seogwipo)
Hydrotheca, length of fused adcauline wall	350–365	365–380
length of free adcauline wall	190–204	161–175
total length	423–438	438
diameter at margin	117–131	117–131

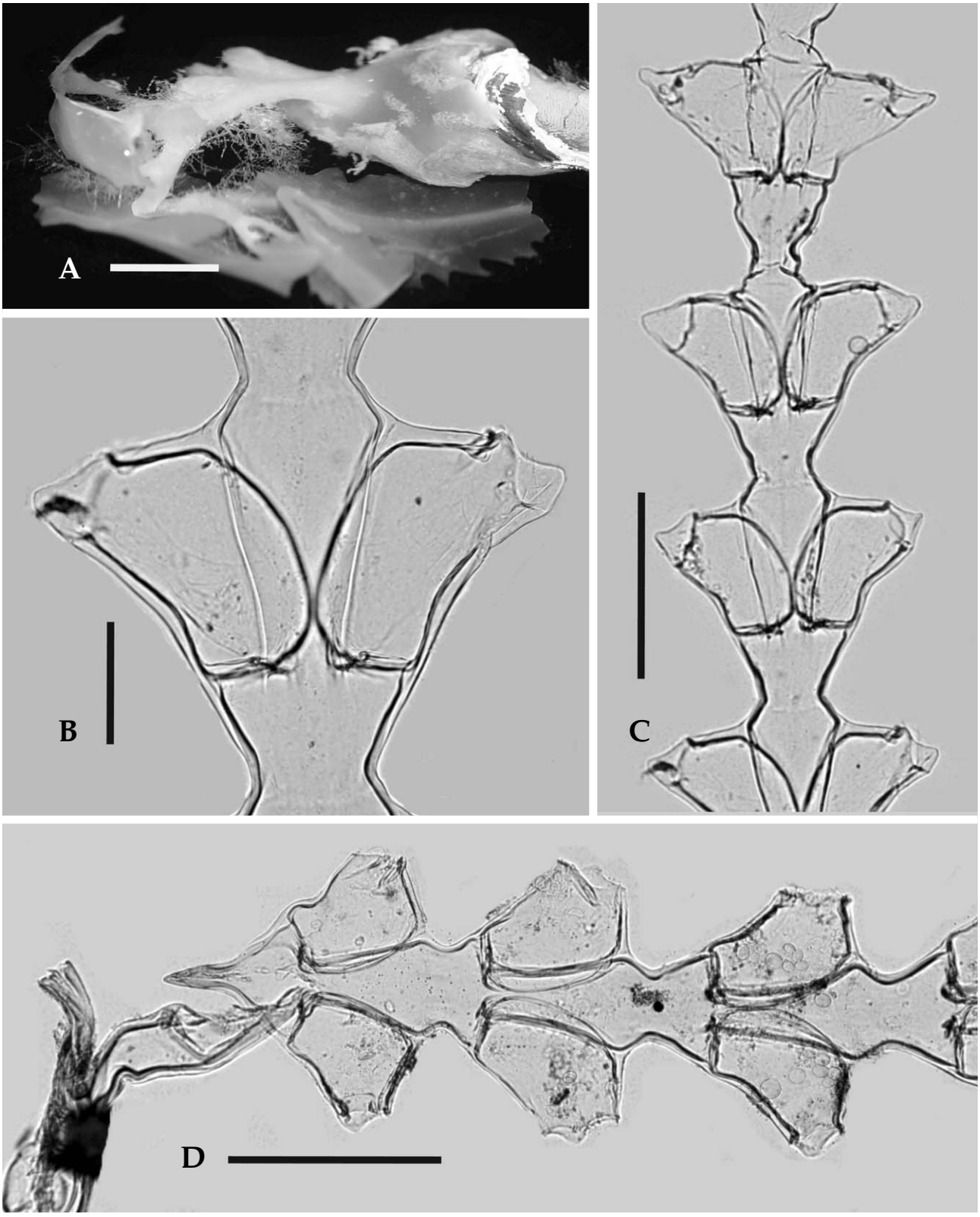

Fig. 61. *Sertularia dalmasi*. A. colonies on alga; B. hydrothecae; C. middle portion of colony; D. basal portion of colony. Scales: A=10 mm, B=200 μm, C, D=500 μm.

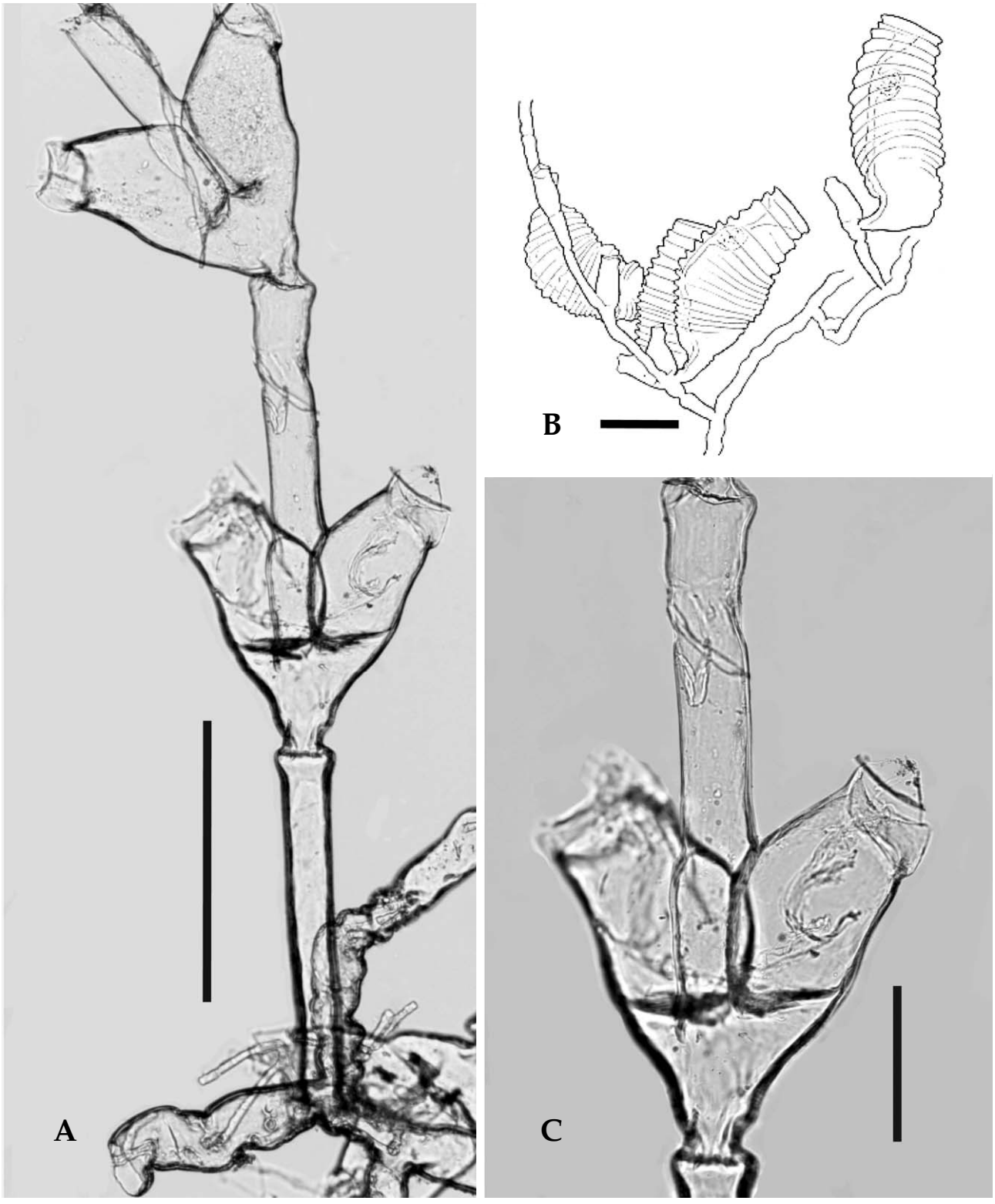

Fig. 62. *Sertularia hattorii*. A. part of colony; B. gonothecae (cited from Hirohito, 1995); C. internode of stem with paired hydrothecae. Scales: A, B=500 μm, C=200 μm.

maximum diameter ····· 212–234 234–249
Colony, total length ····· 15 mm

Distribution: Korea, Abrolhos Bank, Brazil, Scotia, Mexico Bay, West Africa.
Korea: GN, JN, CN, JJ.
Specimen examined: GN: (Hongdo: 20.vii.1978), JN: (Geomundo: 8.viii.1965), CN: (Biin: 13.viii. 1973), JJ: (Seogwipo: 11.vii.1965; 16.viii.1969; 9.viii.1970; 24.xii.1971; 13.vii.1973; 15.vii.1973; 12.iv. 1975); (Wimi-ri: 8.vii.1972); (Beophwan: 19.vi.1985); (Munseom: 30.vi.1993).
Ecology: This species is attached to kelp in waters about 10 m deep.

49. *Sertularia hattorii* Leloup, 1940 (Fig. 62)
Ha-tto-ri-hwa-gwan-hi-deu-ra (하또리화관히드라)

Sertularia hattorii Leloup, 1940, p. 3, fig. 3; Yamada, 1959, p. 71; Rho and Chang, 1972, p. 8, pl. 5, figs. 18–20; 1974, p. 12; Park, 1992, p. 291; 1993, p. 269.

Colonies slender, arising from hydrorhiza. Stem unbranched, divided into regular internodes, transverse node between them distinct. Hydrothecae arranged in opposite, tubular, with three teeth and operculum of three valves. Gonothecae arising from base of stem, 1–3 in number, oblong ovate, with large mouth in distal, wall with about 10 distinct corrugations.
The measurements of the specimens from Seogwipo are as follows (μm).
Stem, length of internode ····· 701–730
maximum diameter of internode ····· 102–115
Hydrotheca, length of fused adcauline wall ····· 220–235
length of free adcauline wall ····· 161–175
maximum diameter ····· 336–380
maximum diameter at margin ····· 146–161
Gonotheca, total length ····· 1314–1553
maximum diameter ····· 832–876
Colony, total length ····· 10 mm

Distribution: Korea, Japan.
Korea: GN, JJ.
Specimen examined: GN: (Mipo: 15.vii.1974), JJ: (Hoenggando: 9.viii.1969); (Seogwipo: 5.viii.1970; 15.vii.1973; 18.x.1973; 19.xii.1973).
Ecology: This species inhabits in waters about 10 m deep.

50. *Sertularia turbinata* (Lamouroux, 1816) (Fig. 63)
Won-ppul-hwa-gwan-hi-deu-ra (원뿔화관히드라)

Dynamena turbinata Lamouroux, 1816, p. 180.

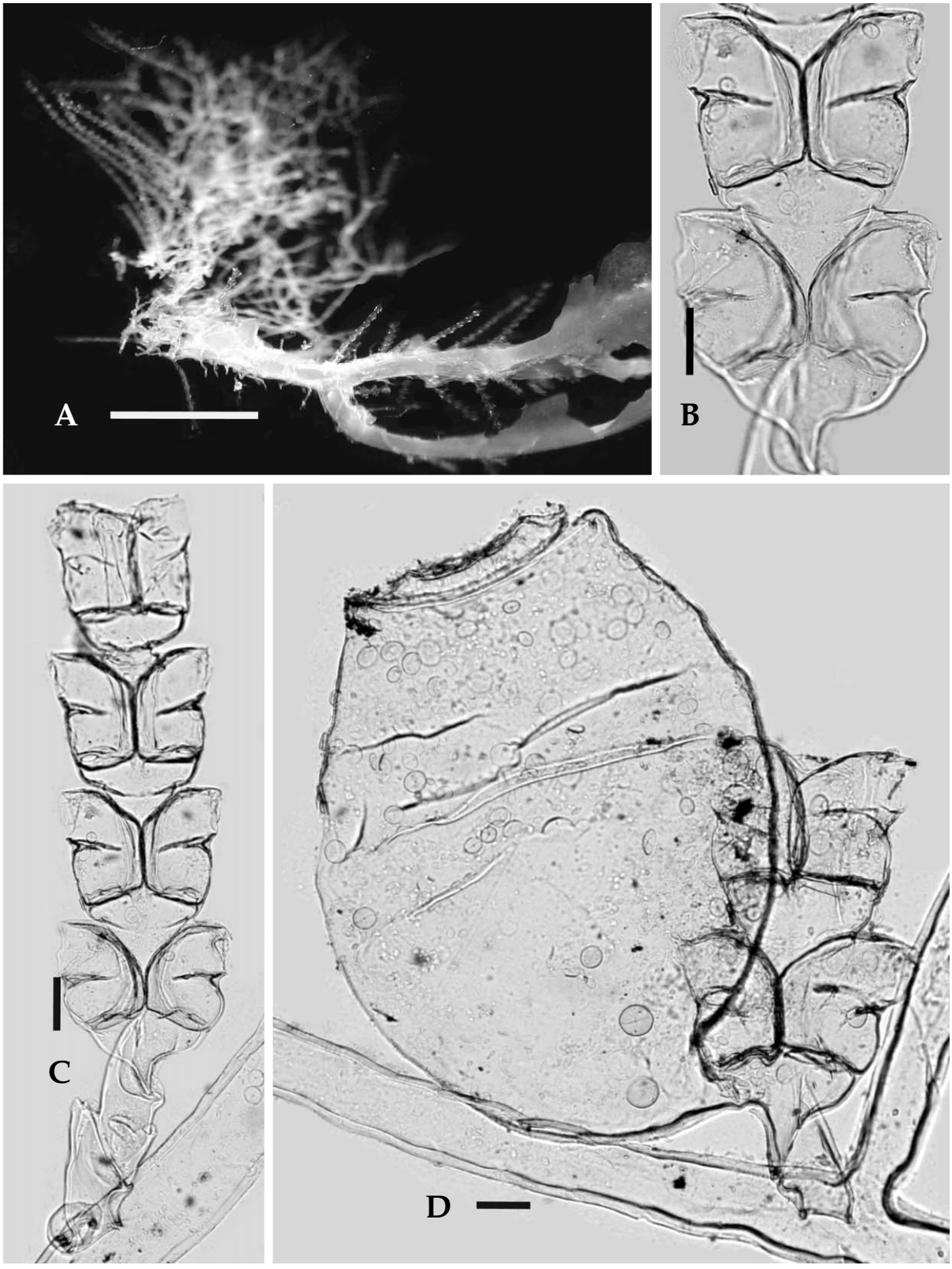

Fig. 63. *Sertularia turbinata*. A. colonies on algae; B. hydrothecae; C. stem (hydrocladium); D. gonotheca. Scales: A=5 mm, B–D=100 μm.

Sertularia turbinata: Billard, 1909, p. 322; 1910, p. 190; Bedot, 1910, p. 378; 1912, p. 258; 1925, p. 408; Ritchie, 1910, p. 821; Stechow, 1913b, p. 145, figs. 119, 120; Jäderholm, 1919, p. 14, pl. 3, fig. 8; Leloup, 1937b, p. 106; Fraser, 1944, p. 290, pl. 62, fig. 278a–c; Millard, 1958, p. 197, fig. 88; 1964, p. 49; Millard and Bouillon, 1973, p. 8; Pennycuik, 1959, p. 198; Vervoort, 1959, p. 275, figs. 35, 36; Yamada, 1959, p. 70; Park and Rho, 1986, p. 24, fig. 6f–h, pl. 2, fig. e; Park, 1992, p. 291; 1993, p. 269.

Colonies small and unbranched. Stem divided into regular internodes, sometimes distal portion transformed into hydrorhiza, from which new colonies arise. Hydrothecae tubular-shaped, margin smooth or sinuous, abcauline wall with a heavy constriction and curved outward. Gonothecae arising from the base of colony, relatively large, oval-shaped, wall with distinct annulations, and without pedicel.

The measurements of the specimens from Yeonhwado are as follows (μm).

Stem, length of internode	460–570
diameter at node	60–80
Hydrotheca, length of abcauline wall	180–190
length of fused adcauline wall	130–190
length of free adcauline wall	170–200
diameter at margin	90–100
diameter at base	100–110
Gonotheca, total length	690
maximum diameter	580
Colony, total length	6–8 mm

Distribution: Korea, Japan, Java, Indonesia, Lingga-lingga Point, Bahamas, Caribbean Sea, Puerto Rico, Bermuda, Between Eleuthera and Little Cat Is., Curtis, Dunwich.

Korea: GN, JJ.

Specimen examined: GN: (Yeonhwado: 19.vii.1978), JJ: (Seogwipo: 8.xii.1988).

Ecology: This species inhabits in waters 10 m deep.

Remarks: For the identification of this species we refered mainly to the descriptions and figures of Jäderholm (1919), Stechow (1913b), Vervoort (1959), Millard (1958) and Fraser (1944). Though the shape of hydrothecae of Millard (1958) and Vervoort (1959) shows little difference from that of ours, those of Jäderholm (1919), Stechow (1913b) and Fraser (1944) agree well with our specimens. The hydrothecae of Millard (1958) and Vervoort (1959) are gently curved outward and marginal teeth more developed. *S. turbinata* resembled *S. inflata* (Versluys) reported by Fraser (1944). But this species can be readily distinguished from later by only the colony structure which is branched. *S. turbinata* is an uncommon species in Korean waters.

Genus *Symplectoscyphus* Marktanner-Turneretscher, 1890

Ho-ja-wa-te-hi-deu-ra-sok (호자와테히드라속)

Stem erect, branched or unbranched. Hydrothecae in alternate and two longitudinal rows on stem and hydrocladia. Hydrothecae sessile and generally more cylindrical than in *Sertularella*, with three

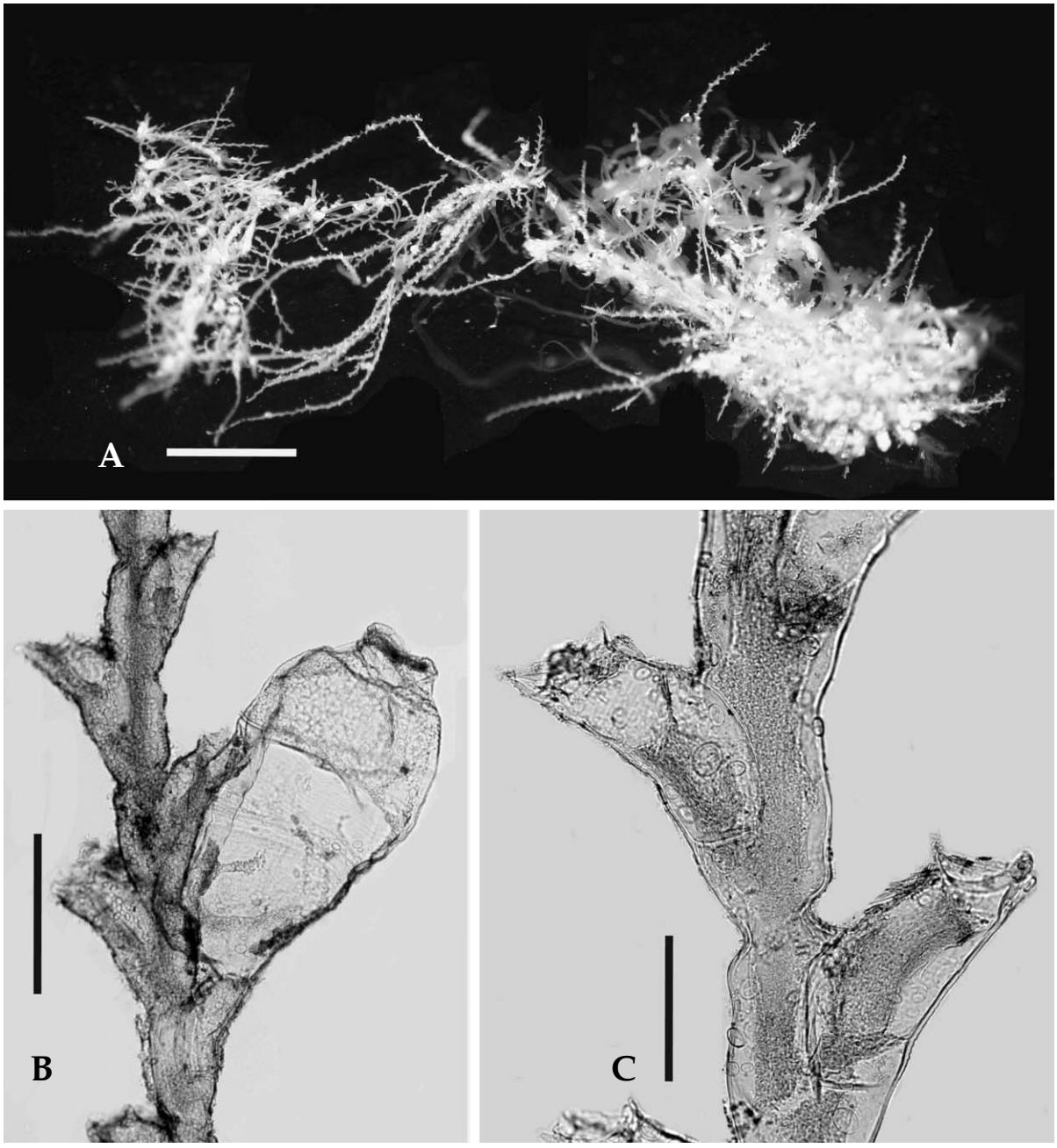

Fig. 64. *Symplectoscyphus hozawai*. A. colonies; B. gonotheca within hydrotheca; C. hydrothecae. Scales: A=10 mm, B=500 μm, C=200 μm.

marginal teeth and operculum of three triangular valves.

Type species: *Symplectoscyphus australis* Marktanner-Turneretscher, 1890=*Sertularia johnstoni* Gray, 1843.

Species 114 (2 in Korea).

51. *Symplectoscyphus hozawai* Stechow, 1931 (Fig. 64)

Ho-ja-wa-te-hi-deu-ra (호자와테히드라)

Symplectoscyphus hozawai Stechow, 1931, p. 171; Stechow and Uchida, 1931, p. 551, text-fig. 4; Yamada, 1955, p. 17, fig. 1; Rho, 1967, p. 15, fig. 18, pl. 1, fig. 7; Rho and Chang, 1974, p. 12; Park, 1990, p. 80; 1992, p. 291; 1993, p. 269.

Colonies arising from hydrorhiza creeping on algae. Stem branched or unbranched, divided into regular internodes, each internode bearing one hydrotheca. One or two annulations on base of stem and perisarc, comparatively thick. Hydrothecae tube-shaped, about 3/5 below adcauline adnate and remainders free, with three marginal teeth, two abcauline ones and one adcauline one, operculum of three triangular valves. Gonotheca arising from within hydrotheca, large compared to hydrotheca, oblong oval-shaped, wall smooth , with short neck on distal.

The measurements of the specimens from Bangjukpo are as follows (μm).

Stem, length of internode ····· 220–248
Hydrotheca, length of fused adcauline wall ····· 117
length of free adcauline wall ····· 146–175
total length ····· 470–485
diameter at margin ····· 161–175
maximum diameter at margin ····· 175–205
Gonotheca, total length ····· 1360–1490
Colony, total length ····· 30 mm

Distribution: Korea, Japan.

Korea: GW, GB, GN, JN, CN, JJ.

Specimen examined: GW: (Daejin: 26.vi.1989); (Jumunjin: 27.vi.1989); (Imwon: 30.vi.1989), GB: (Pohang: 18.vii.1967), GN: (Mipo: 12.v.1974); (Mijo-ri: 18.vii.1967); (Yeonhwado: 19.vii.1978); (Yejak-do: 21.vii.1981), JN: (Dolsan Bangjukpo: 27.vi.1966); (Jindo Hoedong: 5.viii.1974; Jeopdo: 6.viii.1974); (Daedundo: 22.vii.1982), CN: (Biin: 13.viii.1973), JJ: (Seogwipo: 8.vii.1972); (Supseom: 15.iv.1975).

Ecology: This species is attached to algae in waters 10–20 m deep.

Genus *Thuiaria* Fleming, 1828

Git-te-hi-deu-ra-sok (깃테히드라속)

Hydrothecae arranged in two or three longitudinal rows, alternate or subopposite, adcauline wall partially or completely adnate, with 2–3 marginal teeth. Gonothecae oval-shaped, with pointed processes on shoulder.

Species 67 (9 in Kores).

Key to the species of genus *Thuiaria*

1. Hydrothecae in opposite ····· *T. articulata*

– Hydrothecae in subopposite ····· 2
2. Gonotheca with special marsupium ····· *T. cornigera*
– Gonotheca with spiny processes on shoulder ····· *T. argentea*

52. *Thuiaria argentea* (Ellis and Solander, 1786) (Fig. 65)

A-reu-hen-tin-te-hi-deu-ra (아르헨틴테히드라)

Sertularia argentea Ellis and Solander, 1786, p. 38.
Thuiaria argentea: Nutting, 1901, p. 363, fig. 65; 1904, p. 71, pl. 12, figs. 3–9; Billard, 1904, p. 178; Bedot, 1905, p. 121; Stechow, 1912, p. 361; 1919, p. 104; Rho and Park, 1980, p. 25, pl. 6, figs. 3–5.

Stem long and slender, divided into regular internodes and giving rise to branches from base of each internode. Hydrothecae in alternate or subalternate, tubular, with two marginal teeth and operculum of two valves. Gonothecae borne above hydrocladia, with short neck and spiny processes on shoulder.

The measurements of the specimens from Mipo (1976) are as follows (μm).

Stem, length of internode ····· 1577–1752
maximum diameter of internode ····· 540–599
Hydrotheca, total length ····· 409–482
maximum diameter ····· 175
Gonotheca, total length ····· 950–978
maximum diameter ····· 467–526
length of neck ····· 44–58
diameter at margin ····· 175
Colony, total length ····· 150 mm

Distribution: Korea, Alaska, Pacific and north Atlantic coasts of America, Long Island Sound, South Africa.

Korea: GN, JN.

Specimen examined: GN: (Mipo: 12.v.1974; 12.vii.1974; 5.xi.1976; 25.v.1981; 27.xi.1983); (Oryukdo: 18.iv.1976); (Samcheonpo: 20.viii.1984); (Geojedo: 9.vii.1996), JN: (Nohwado: 20.viii.1980).

Ecology: This species inhabits in waters coastal to 20–30 m deep.

53. *Thuiaria articulata* (Pallas, 1766) (Fig. 66)

Gwan-jeol-te-hi-deu-ra (관절테히드라)

Sertularia articulata Pallas, 1766, p. 133.
Thuiaria articulata: Stechow, 1913b, p. 152, figs. 131–134; Kudelin, 1914, p. 273, fig. 90; Bedot, 1925, p. 439; Park and Rho, 1986, p. 31, fig. 9a–c, pl. 3, fig. d; Park, 1992, p. 293; 1993, p. 272.
Salacia articulata: Rees and Thursfield, 1965, p. 149.

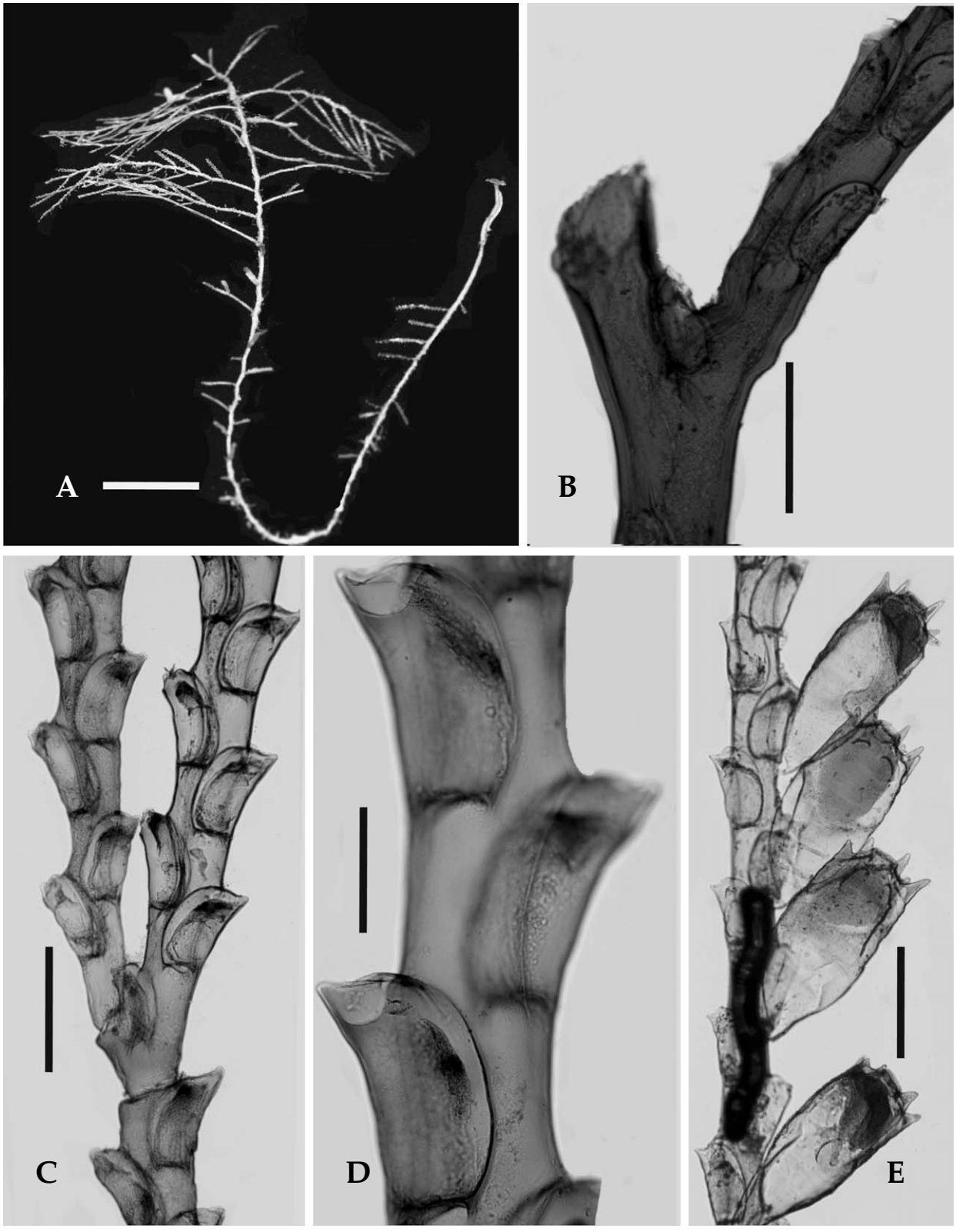

Fig. 65. *Thuiaria argentea*. A. colony; B. stem with branch; C. branching pattern of branch; D. hydrothecae; E. gonothecae on hydrocladium. Scales: A=20 mm, B, C, E=500 μm, D=200 μm.

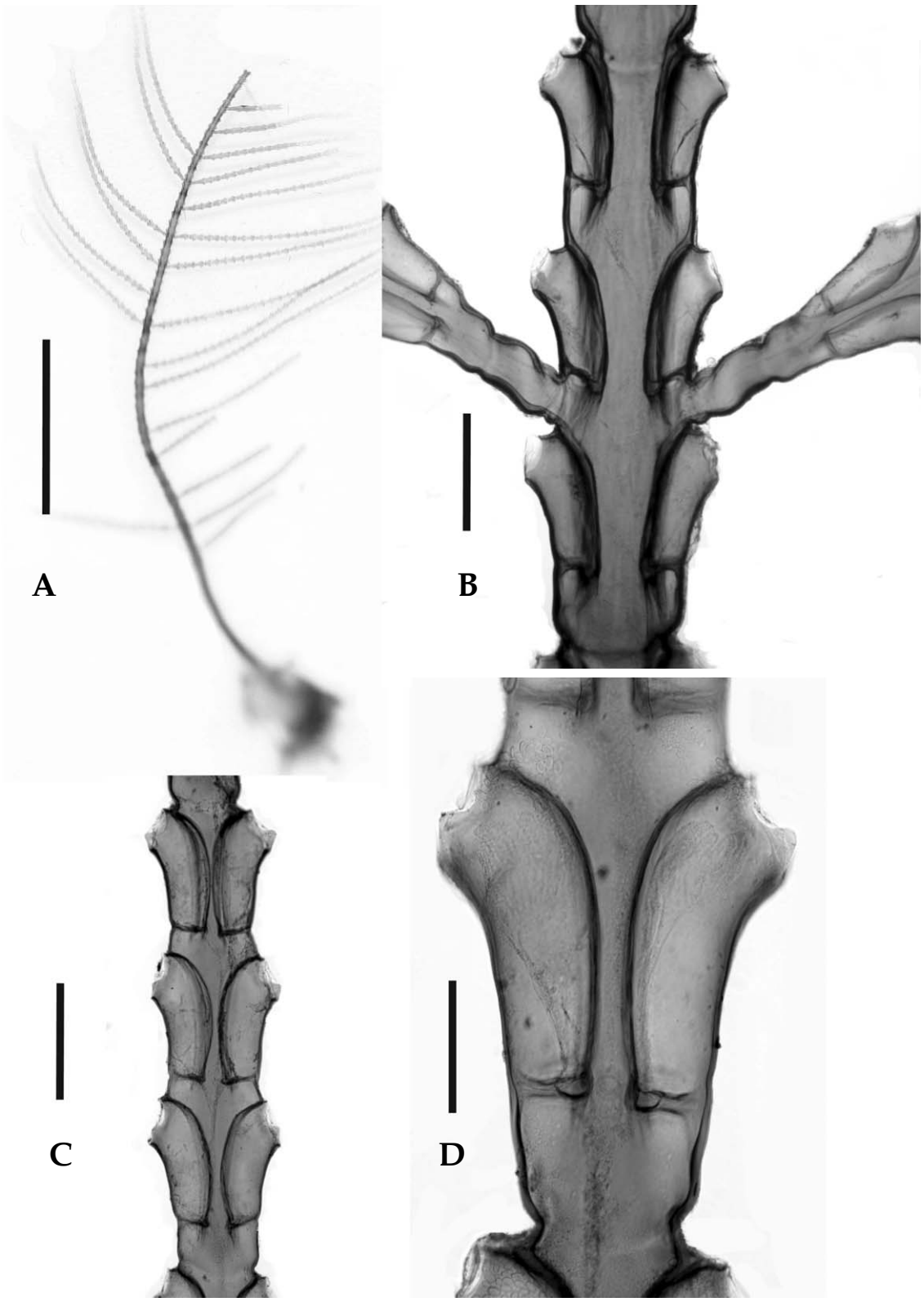

Fig. 66. *Thuiaria articulata*. A. colony; B. stem and branches; C. hydrocladium; D. hydrothecae. Scales: A=20 mm, B, C=500 μm, D=200 μm.

Colonies dark brown, rigid, unflexible, periderm thick. Hydrocaulus divided into long irregular internodes, each internode with 3–8 pairs hydrothecae. Hydrocladia arising from the base of hydrothecae, opposite, divided into irregular internodes, each internode with 1–4 pairs hydrothecae. Hydrothecae arranged in opposite, tubular shaped, distal portion slightly curved outward, margin with three teeth.

The measurements of the specimens from Supdo are as follows (μm).

Stem, length of internode	1200–2450
diameter at node	380–470
Branch, length of ineternode	1670–2350
diameter at node	200–310
Hydrotheca, length of abcauline wall	320–350
length of adcauline wall	450–480
diameter at base	120–150
maximum diameter	150–190
Colony, total length	45–55 mm

Distribution: Korea, Sea of Okhotsk, South Africa.

Korea: JJ.

Specimen examined: JJ: (Supseom: 21.v.1983); (Munseom: 1.vii.1993).

Ecology: This species inhabits in waters 20–30 m deep.

Remarks: According to Nutting (1904), "Pallas (1766) gave the name *Sertularia articulata* to an Atlantic species under the mistaken impression that it was identical with the "sea-spleenwort" of Ellis. Afterwards Fleming (1828) erected the genus *Thuiaria* and apparently misled by Pallas, called the spleenwort of Ellis *Thuiaria articulata*. In the meantime Ellis and Solander (1758) gave the name *Sertularia lonchitis* to Ellis's species of Sea-spleenwort, thus securing the priority for the name *lonchitis*, which is essentially a northern form. Since that time most workers have confused the two species under the common name *Thuiaria articulata*." This species was distinguished from *T. lonchitis* by the characteristic opposite arrangement of hydrocladiae and hydrothecae.

54. *Thuiaria cornigera* Kudelin, 1914 (Fig. 67)

Ppul-te-hi-deu-ra (뿔테히드라)

Thuiaria cornigera Kudelin, 1914, p. 320, figs. 105, 106.
Selaginopsis cornigera: Park and Rho, 1986, p. 36, fig. 12a–e, pl. 4, fig. b.

Stem divided into irregular internodes, each internode bearing 3–6 hydrocladia. Hydrocladium undivided into internodes, arranged in alternate proximally and in spiral distally. Hydrothecae in two longitudinal rows, flask-shaped, with two marginal teeth. Gonothecae borne on hydrocladia on distal portion of colony, conical-shaped, with marsupium consisted of several bifurcated long pointed gonangial leaves.

The measurements of the specimens from Sangju-ri are as follows (μm).

Stem, diameter	450–480
Branch, total length	22–27

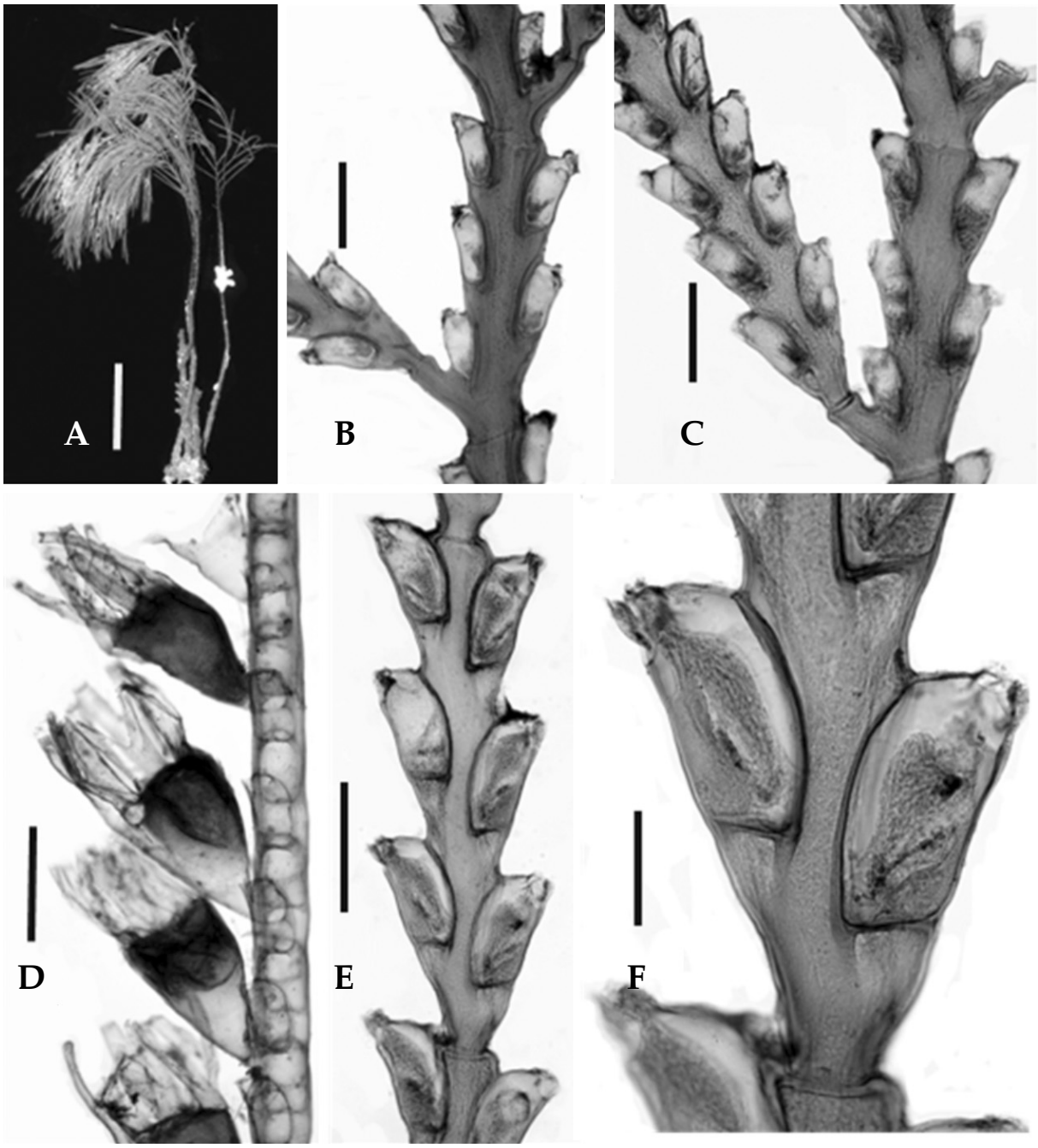

Fig. 67. *Thuiaria cornigera*. A. colony; B. stem with branches; C. branching pattern of branch; D. gonothecae on branch; E. 2nd branch with hydrothecae; F. hydrothecae. Scales: A=20 mm, B–E=500 μm, F=200 μm.

diameter	310–400
Hydrotheca, length of abcauline wall	240–290
length of adcauline wall	310–380

diameter at base ····· 90–140
Gonotheca, total length ····· 490–540
maximum diameter ····· 340–420
length of gonangial leaf ····· 450–820
Colony, total length ····· 70–141 mm

Distribution: Korea, Kamchatka.
Korea: GN, CN, CB, GG.
Specimen examined: GN: (Sangju-ri: 24.v.1981); (Busan: 26.v.1981), JB: (Yeondo: 18.iv.1972), CN: (Anmyeondo: 22.v.1982), CB: (Mumyeongdo Oeyeondo: 26.vi.2007), GG: (Songdo: 29.iv.1972); (Jagyakdo: 24.xii.1973).
Ecology: This species inhabits in waters coastal to 20–30 m deep.
Remarks: The gonothecae have characteristic brooding chambers. This species is similar to *Selaginopsis triserialis* reported by Mereschkowsky (1878) in the structure of colony and the shape of hydrotheca, but it is distinguished from *S. triserialis* by the structure of gonotheca.

Family Plumulariidae L. Agassiz, 1862

Git-hi-deu-ra-gwa (깃히드라과)

The family Plumulariidae is divided into the following four subfamilies: Halopterinae Millard, 1962; Kirchenpauerinae Stechow, 1921; Plumulariinae Kuhn, 1913 and Aglaopheninae Stechow, 1911. Hydrothecae usually borne on hydrocladia and sometimes on stem and branches, and forming a single row on one surface. Hydrotheca sessile, without flaps and bilaterally symetrical. Hydranth with a conical hypostome and a whorled filiform tentacles. Nematocysts always present. Gonophores protected by phylactocarps which are modified hydrocladia, or unprotected, or protected by open corbula or closed corbula. Only the gonothecae protect the gonophores.

The branching pattern of the Plumulariidae is very variable and complicated. The stem is simple and unbranched, or arising from directly from a hydrorhiza and bearing hydrothecae. In this case the terms stem and hydrocladium are synonymous, or branching one or two more. The most typical branching is the pinnate type with alternate or opposite hydrocladia arising from stem or branches. Dichotomous branching type in Aglaophenia, whorled type in *Nemertesia* and helicoid sympodium in *Monostaechas* are present. Except for them a scorpioid sympodium and a dichotomous sympodium are present (Fig. 68).

The stem may be fascicled (polysiphon) or unfascicled (monosiphon). The most common fascicled stem has a single axial tube and hydrocladia arising from it alone and it is surrounded by peripheral tubes. The branches may arise from the axial tube or the peripheral tubes. The second type of fascicled stem has no special axial tube, but consists of a bundle of similar tubes. Any one of them may give rise to hydrocladia. In this case the branching is simply a separation of groups of tubes (Fig. 68). Sometimes two growth forms are present in one species. In the species *Plumularia filicaulis*, the pinnate type is normal, though simple stems may also occur.

Hydrothecae borne alone on hydrocladia, absent on stem and branches, so that they are distinguished from hydrocladia by hydrothecae. But in the genus *Halopteris*, hydrothecae borne on stem,

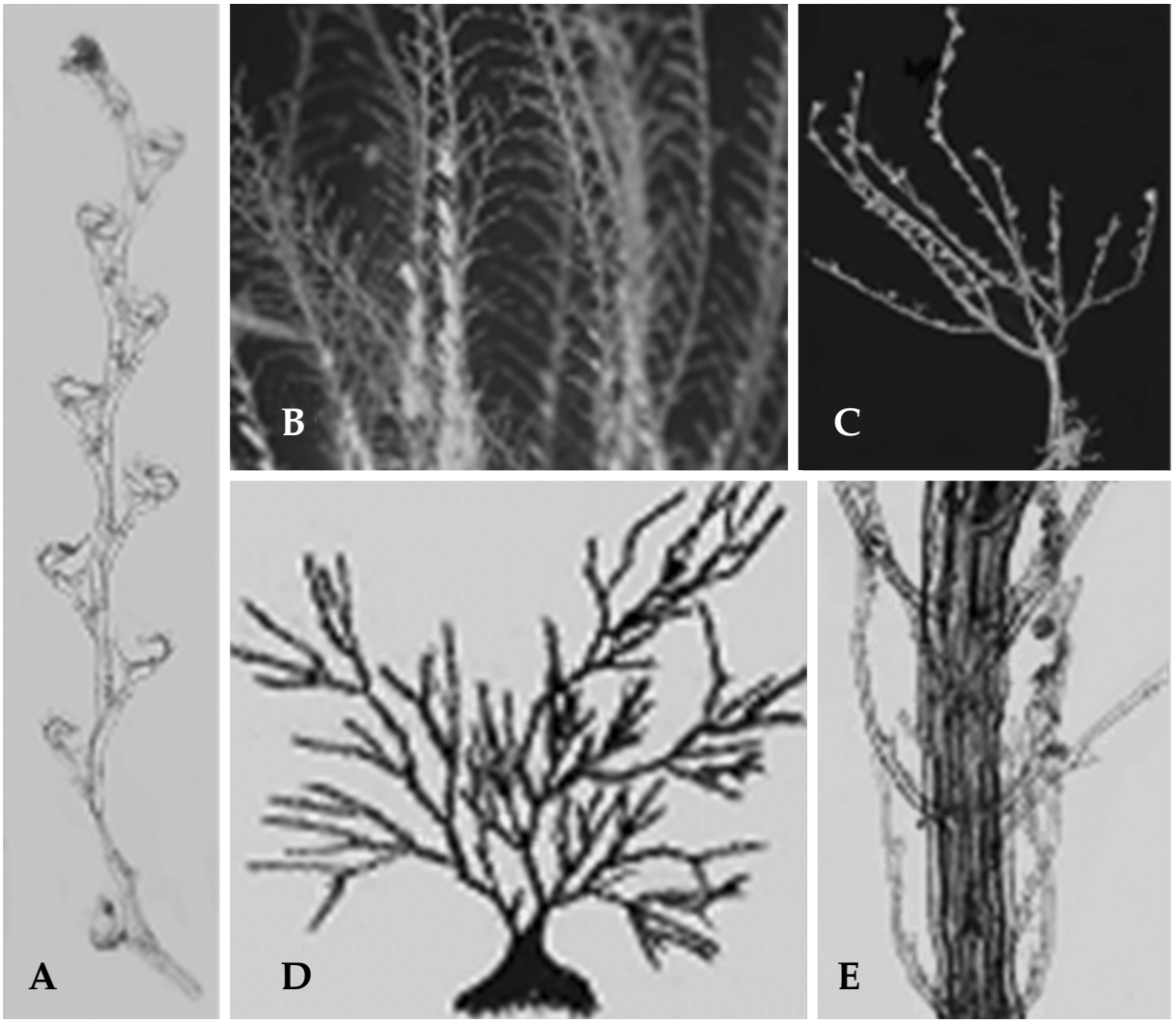

Fig. 68. Types of stem and branching. A. simple and monosiphonic stem; B. pinnate type; C. sympodial helicoid type; D. sympodial dichotomous type; E. whorled type and polysiphonic stem.

branches and hydrocladia. The cauline hydrotheca is a major diagnostic character of the subfamily Halopterinae. Hydrocladium is divided into regular internodes and bears hydrothecae on every internode (homomerous) or on every alternate one (heteromerous). Within a colony the homomerous and the heteromerous hydrocladia occur (Fig. 69).

The hinge joints, which are oblique nodes, may occur in various parts of the colony, near the base of stem, branches or hydrocladia.

The hydrothecae are bilaterally symmetric, sessile and the adcauline wall is partly or completely adnate to the hydrocladia. The definite floor has a hydropore of varying size. An intrathecal septum may be present, either adcauline or abcauline in position. The hydrothecal margin may be toothed or untoothed. Sometimes the median abcauline tooth is changed to a spine or thickened to form a keel-like ridge or spine (Fig. 69).

Nematophores are usually present, contained in nematothecae. The typical nematotheca of the

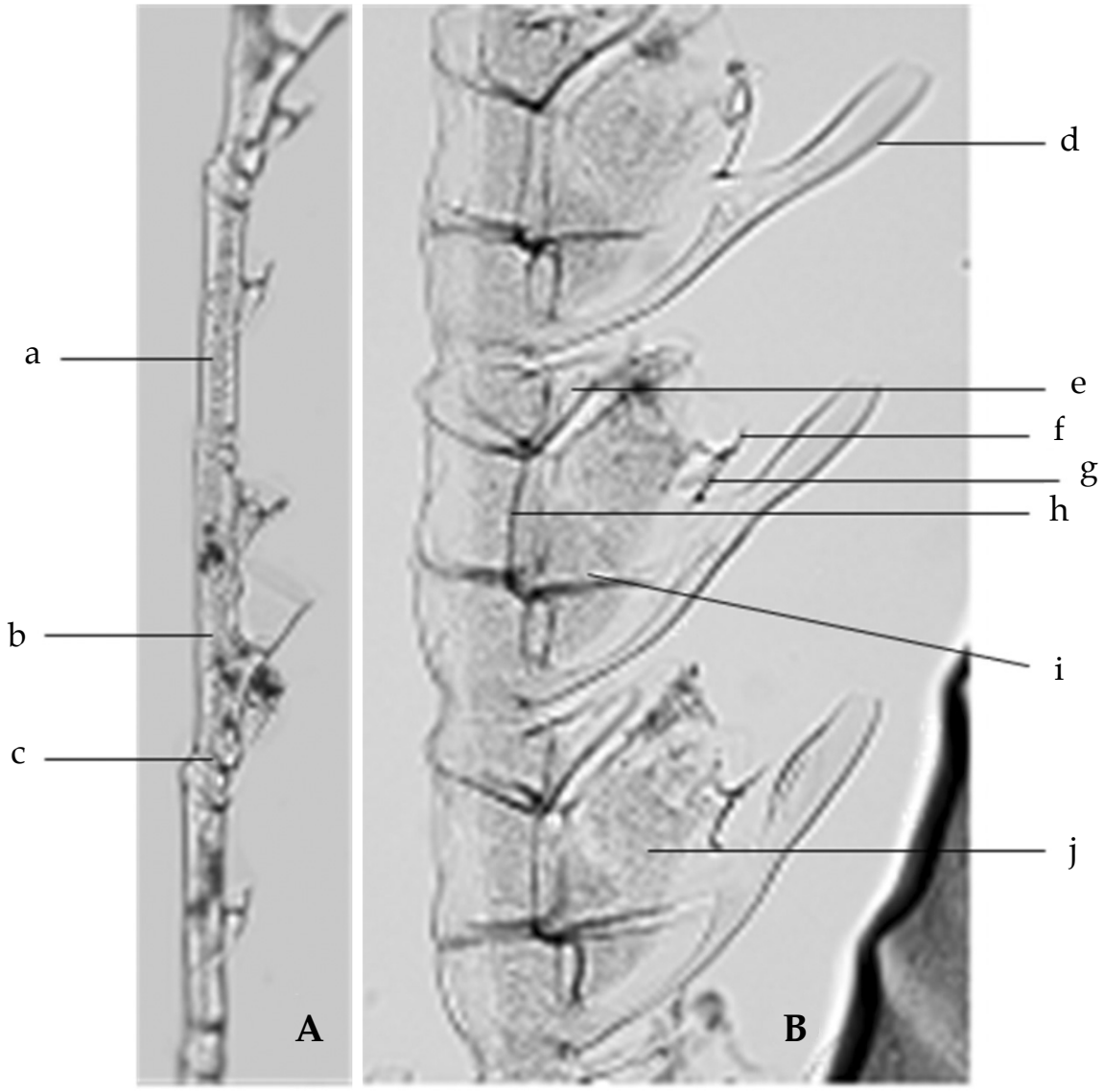

Fig. 69. Types of hydrocladium and structure of hydrotheca. A. heteromerous hydrocladium with movable nematothecae (a. athecate internode; b. thecate interode; c. node (=hinge joint)); B. homomerous hydrocladium with immovable nematothecae (d. median inferior nematotheca; e. lateral nematotheca; f. frontal tooth; g. abcauline wall; h. adcauline wall; i. intrathecal septum; j. hydrotheca).

family Plumulariidae is movable, two-chambered, and composed of a slender basal chamber and a funnel-shaped distal chamber. Its structures are variable. They may be fixed or one chamber or reduced or small saucer-shaped or scoop-shaped structures. In some species of the genus *Kirchenpaueria*, the nematotheca is completely absent. In these species the nematophore emerges through a hole in the periderm.

The basic arrangement of nematothecae includes one median inferior below hydrotheca and one

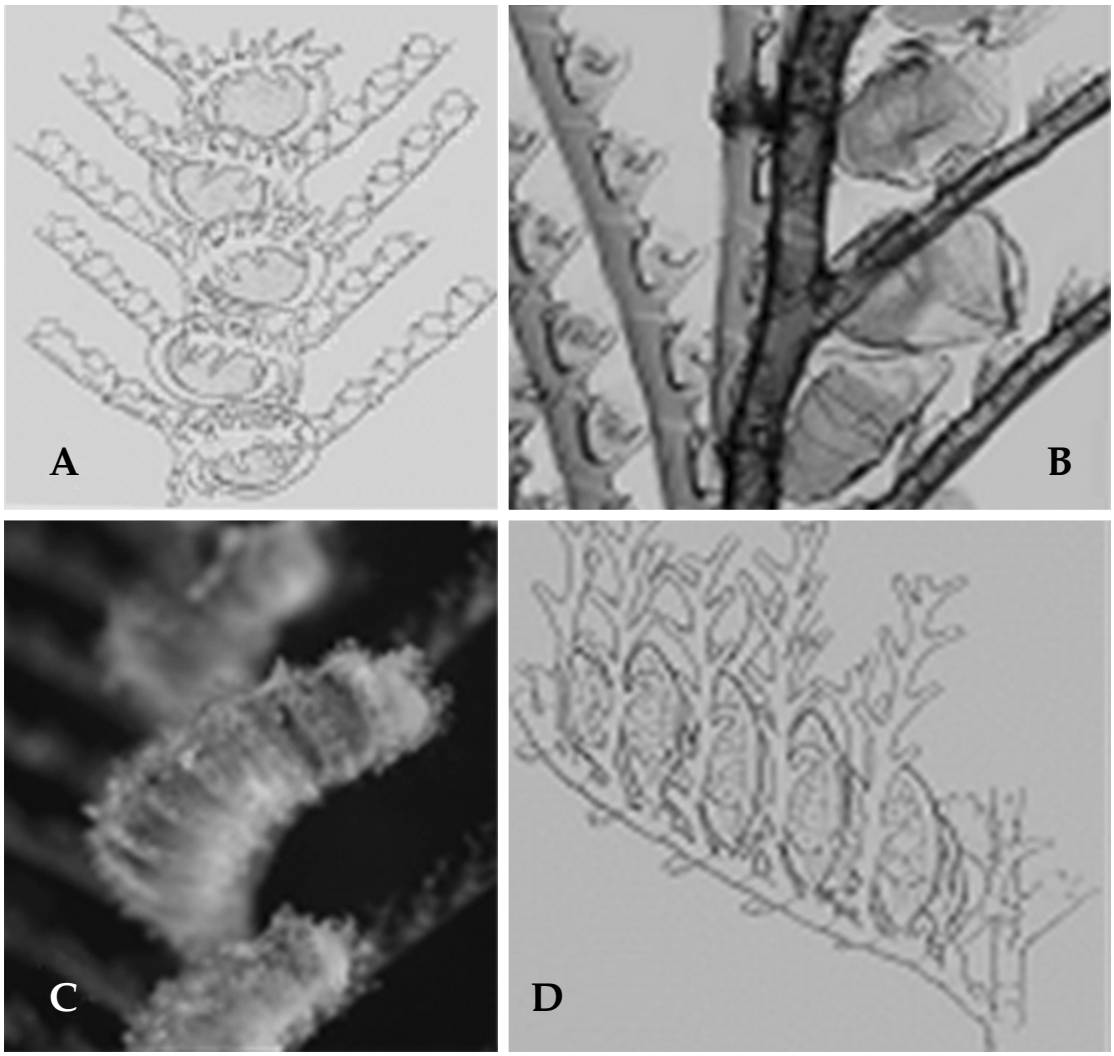

Fig. 70. Types of structures protecting the gonothecae. A. phylactocarps; B. unprotected type; C. closed corbula; D. open corbula.

lateral on each side. In addition one or more median superior may be seated above the level of the hydrotheca. Many variations of this pattern occur.

In the subfamily Aglaopheniinae, three immovable and single chambered nematothecae are present. The laterals always are fused to the side wall of the hydrotheca and have more than one opening. The median inferior is fused to the abcauline wall of the hydrotheca and has a distal opening, the distal end extends toward beyond the hydrothecal margin. The lateral nematothecae of the subfamily Halopterinae are seated on long pedicels attached to the side wall of the hydrotheca (Fig. 69).

The nematothecae may occur on athecate stems, internodes, peripheral tubes of fascicled stems, hydrorhizae and gonothecae or other reproductive organs.

The gonophores are always sessile sporosacs contained in gonothecae. Most of the species are dioecious and the gonothecae are sexually dimorphic. In the subfamilies Plumulariinae, Kirchen-

paueriinae, Halopteriinae and the genus *Gymnangium* of Aglaopheniinae, the gonothecae occur singly on stem, hydrocladia and hydrorhiza. However in the subfamily Aglaopheniinae phylactocarps are present, which are the appendages of hydrocladia or modified hydrocladia. The hydrocladia are transformed into the phylactocarps at maturity in the genus *Lytocarpus*. In *Lytocarpus phoenicea*, every third hydrocladium ruptures above the level of the first hydrotheca and regenerates as a phylactocarp. In the genera *Thecocarpus* and *Aglaophenia* the phylactocarp forms a pod-like structure called a corbula. The corbula consists of a central axis and a number of lateral ribs which bearing nematothecae and arching over to close the gonothecae. The corbula may be open, when the ribs separate, or closed, when the ribs fuse with one another (Fig. 70).

Genera 18 (15 in Korea), species 247 (36 in Korea).

Key to the subfamilies of family Plumulariidae

1. Paired lateral nematothecae present and fused to hydrotheca ····· Aglaopheniinae
– Paired lateral nematothecae present or absent, when present not fused to hydrotheca ····· 2
2. Paired lateral nematothecae absent. Median superior nematotheca always reduced and single chambered ····· Kirchenpaueriinae
– Paired lateral nematothecae present. Nematotheca usually two chambered ····· 3
3. Hydrocladia arising from erect stem. No cauline hydrothecae. Stem when fascicled hydrocladia arising from a single axial tube ····· Plumulariinae
– Hydrocladia arising from hydrorhiza or from erect stem. Stem or branches with cauline hydrothecae. Stem or branches when fascicled, hydrocladia arising from any of its components ····· Halopterinae

Subfamily Halopterinae Millard, 1962

Dal-mu-ri-git-hi-deu-ra-a-gwa (닭무리깃히드라아과)

Erect stem present or absent. Hydrocladia arising ① independently from hydrorhiza, or ② from stem with hydrothecae, or ③ from irregularly the superficial tubes of a fascicled stem or its branches. Branches when present, with cauline hydrothecae. Hydrocladia branched or unbranched. Hydrothecae generally large, with or without teeth. Nematothecae movable or immovable, one- or two-chambered, not fused to hydrothecae. Every hydrotheca with three nematothecae, one median and a paired laterals. Lateral nematothecae generally borne on pedicels which are adherent to the hydrotheca. Gonothecae unprotected, not aggregated, usually dimorphic and with the female bearing nematothecae.

Key to the genera of subfamily Halopterinae

1. Hydrocladia arising from hydrorhiza ····· *Antennella*
– Hydrocladia arising from stem ····· 2
2. With cauline hydrothecae, and hydrocladia arranged in pinnate ····· *Halopteris*
– Without cauline hydrothecae, and hydrocladia arranged in sympodial ····· *Monostaechas*

Genus *Antennella* Allman, 1877

An-te-nel-la-sok (안테넬라속)

Antennellopsis Jäderholm, 1896.

Hydrocladia arising directly from hydrorhiza and unbranched. Hydrothecae cup-shaped, without teeth, untoothed margin.

Type species: *Antennella gracilis* Allman, 1877.

Species 28 (4 in Korea).

Key to the species of genus *Antennella*

1. Hydrorhiza aggregated into bundle ····· *A. integerrima*
− Hydrorhiza not aggregated into bundle ····· 2
2. Athecate internode with usually one nematotheca and two paired lateral nematothecae ····· *A. africana*
− Athecate internode with usually one or two nematothecae and paired lateral nematothecae ····· *A. secundaria*

55. *Antennella africana* Broch, 1914 (Fig. 71)

A-peu-ri-ka-git-hi-deu-ra (아프리카깃히드라)

Antennella quadriaurita forma *africana* Broch, 1914, p. 26.

Antennella africana: Stechow, 1925, p. 110, fig. 41; Rho, 1967, p. 344, fig. 3; Rho, 1969, p. 165; Rho and Chang, 1972, p. 100; Rho and Chang, 1974, p. 146; Millard, 1975, p. 331, fig. 107A–E; Rho and Park, 1986, p. 91; Park, 1993, p. 273.

Antennella serrata Totton, 1930, p. 212, text-fig. 53.

Colonies tufted, unbranched, attaining 5–31 mm in height. Hydrocladia directly a rising from stolon creeping on algae, divided into regular internodes, thecate internodes and athecate internodes, which arranged alternately. Thecate internode with one large hydrotheca, two paired lateral nematothecae and one median inferior nematotheca. Athecate internode with one median nematotheca. Hydrothecae cylindrical, widening upward, margin smooth, adcauline wall 1/2 below adnate and remainders free, margin making angle 50–60° with axis. Median inferior nematotheca below hydrotheca, not reaching hydrotheca, movable and two-chambered. Paired lateral nematothecae, one large, the other small, movable and two-chambered. Large lateral nematotheca attached on pedicel which arising from upper part of adnate side. Small lateral nematotheca arising inside of pedicel of large nematotheca. Gonotheca borne below hydrotheca, singly or paired, male developed distally and female proximally. Female pear-shaped, with two-chambers, two large nematothecae on basal region and two annulated short stalks. Male smaller than female, spindle-shaped, with a large, two-chambered nematotheca on basal region.

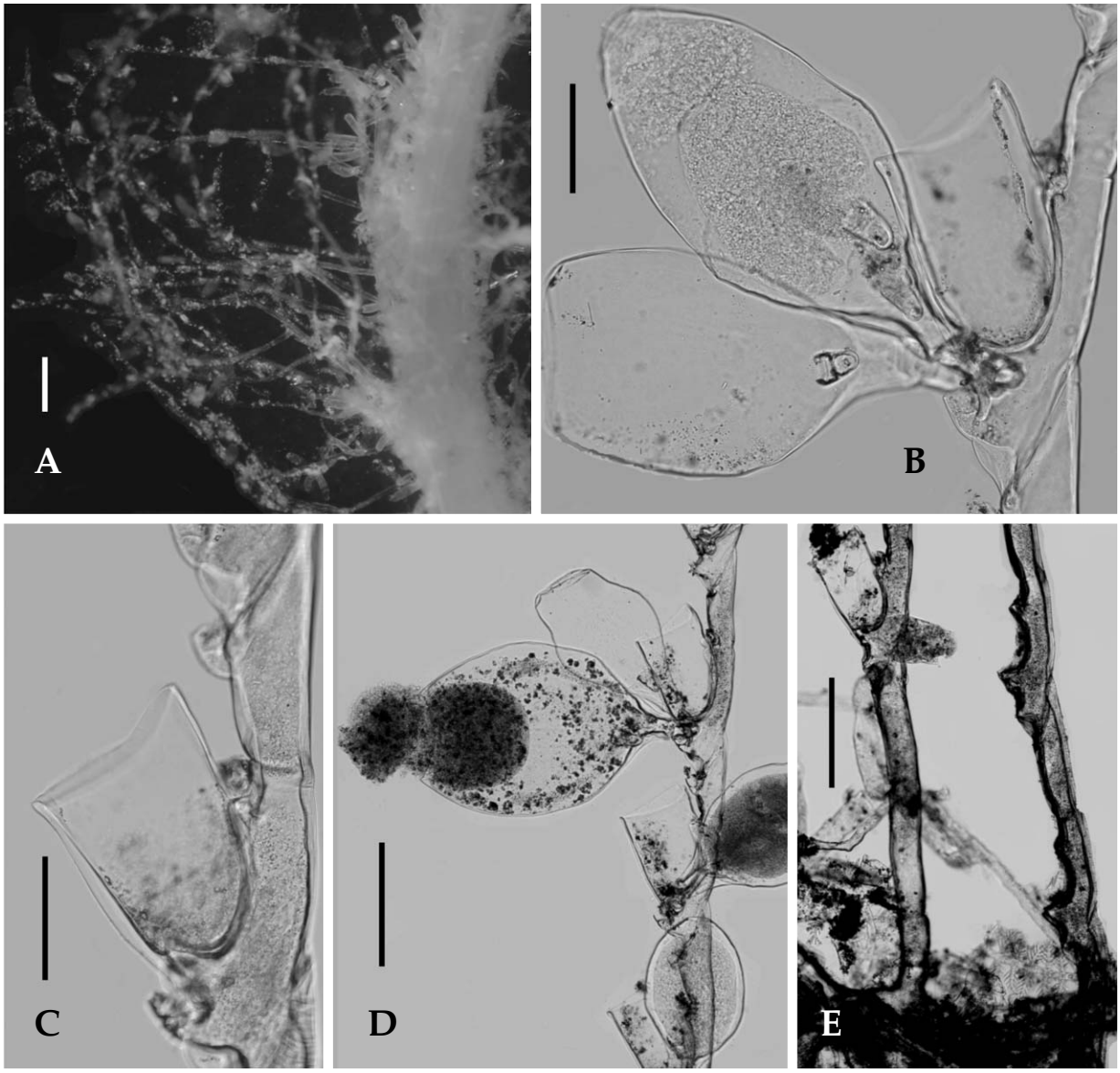

Fig. 71. *Antennella africana*. A. colonies on alga; B. gonothecae and hydrotheca; C. hydrotheca; D. part of hydrocladium with gonothecae and hydrothecae; E. basal portions of hydrocladia. Scales: A=1 mm, B, C=200 μm, D, E=500 μm.

Distribution: Korea, New Zealand, South Africa, S.W. Africa, South Atlantic.

Korea: GW, GB, GN, JN, CN, GG, JJ.

Specimen examined: GW: (Naksan: 15.viii.1973); (Gangneung: 20.x.1967), GN: (Mipo: 26.xi.1985); (Haeundae: 12.vi.1967), JN: (Geomundo: 8.viii.1965); (Odongdo: 4.viii.1974); (Daeheuksando: 20.vii. 1982), CN: (Anmyeondo: 9.viii.1973), GG: (Jagyakdo: 14.x.1973), JJ: (Seogwipo: 11.vii.1965; 14.vii. 1973); (Hoenggando: 9.ix.1969); (Wimi-ri: 8.viii.1972); (Udo: 15.vii.1973).

Ecology: This species inhabits from coastal to 20–30 m deep waters.

56. *Antennella integerrima* (Jädermolm, 1896) (Fig. 72)

Dung-geul-git-hi-deu-ra (둥글깃히드라)

Antennleopsis integerrima Jäderholm, 1896, p. 16, pl. 2, figs. 7, 8; Bedot, 1918, p. 70; 1925, p. 95; Jäderholm, 1919, p. 20; Stechow 1923a, p. 232; Yamada, 1959, p. 82; Rees and Thursfield, 1965, p. 168; Rho and Chang, 1972, p. 101, pl. 3, figs. 10, 11; 1974, p. 146.
Antennellopsis dofleini Stechow, 1907, p. 196; 1909, p. 86, pl. 2, fig. 4, pl. 6, fig. 6.
Antennella integerrima: Rho and Park, 1986, p. 91; Park, 1992, p. 294; 1993, p. 273; Hirohito, 1995, p. 233, fig. 78a–c.

Colonies relatively large, hydrorhizae aggregated into bundle. Hydrocladia arising from upper parts of hydrorhizal bundle, homomerous, not branched, divided into irregularly internodes. Hydrothecae densely placed on hydrocladium, bell-shaped, margin large, without tooth: making a right angle with hydrocladium, slightly widening upward and adcauline wall entirely adnate to hydrocladium. With one small pair of lateral and one median inferior nematotheca. Lateral nematothecae small, reaching to margin of hydrotheca and two-chambered. A median inferior nematotheca small, not reaching to hydrotheca and two-chambered. Gonothecae arising from just below hydrotheca placed in proximal part of hydrocladium, large compared with hydrothecae, oval-shaped, with two to three annulated pedicel.

Distribution: Korea, Japan.
Korea: JJ.
Specimen examined: JJ: (Seogwipo: 4.iv.1975; 20.x.1973); (Daepo: 16.vi.1985).
Ecology: This species inhabits in waters 10–40 m deep.

57. *Antennella secundaria* (Gmelin, 1789) (Fig. 73)

Dul-jjae-git-hi-deu-ra (둘째깃히드라)

Sertularia secundaria Gmelin, 1789, p. 3854.
Antennella secundaria: Stechow, 1907, p. 199; Stechow, 1913b, p. 89; Stechow, 1923b, p. 17, no. 184; Stechow, 1925, p. 111; Leloup, 1938, p. 18, fig. 13a, b; Uchida, 1956, p. 1647, fig. 4615; Yamada, 1958, p. 59; 1959, p. 77; Rho, 1967, p. 345, fig. 5A, B; Rho and Chang, 1972, p. 100; 1974, p. 146; Millard, 1975, p. 332, fig. 107F–L; Rho and Park, 1986, p. 92; Park, 1990, p. 84; 1993, p. 273; 1995, p. 15; 1997, p. 150; Hirohito, 1995, p. 236, fig. 79a–c; Agis et al., 2001, p. 140, fig. 63a–e.

True stem absent. Hydrocladia arising directly from hydrorhiza, slender, unbranched, attaining about 20 mm high, divided into thecate internodes and athecate internodes arranged in alternate, and thecate internode terminated by transverse node, athecate internode terminated by oblique node, and its basal region without hydrothecae. Thecate internode with one hydrotheca, one median inferior, a pair of laterals and one median superior. Athecate internode with one or two median nematothecae. Hydrothecae bowl-shaped, approximately same depth and breadth, comparatively large, adcauline wall 1/2 below adnate, and margin smooth: making angle about 35–50° with axis. Periderm thick. Median inferior nematotheca below hydrotheca, reaching to hydrotheca or not,

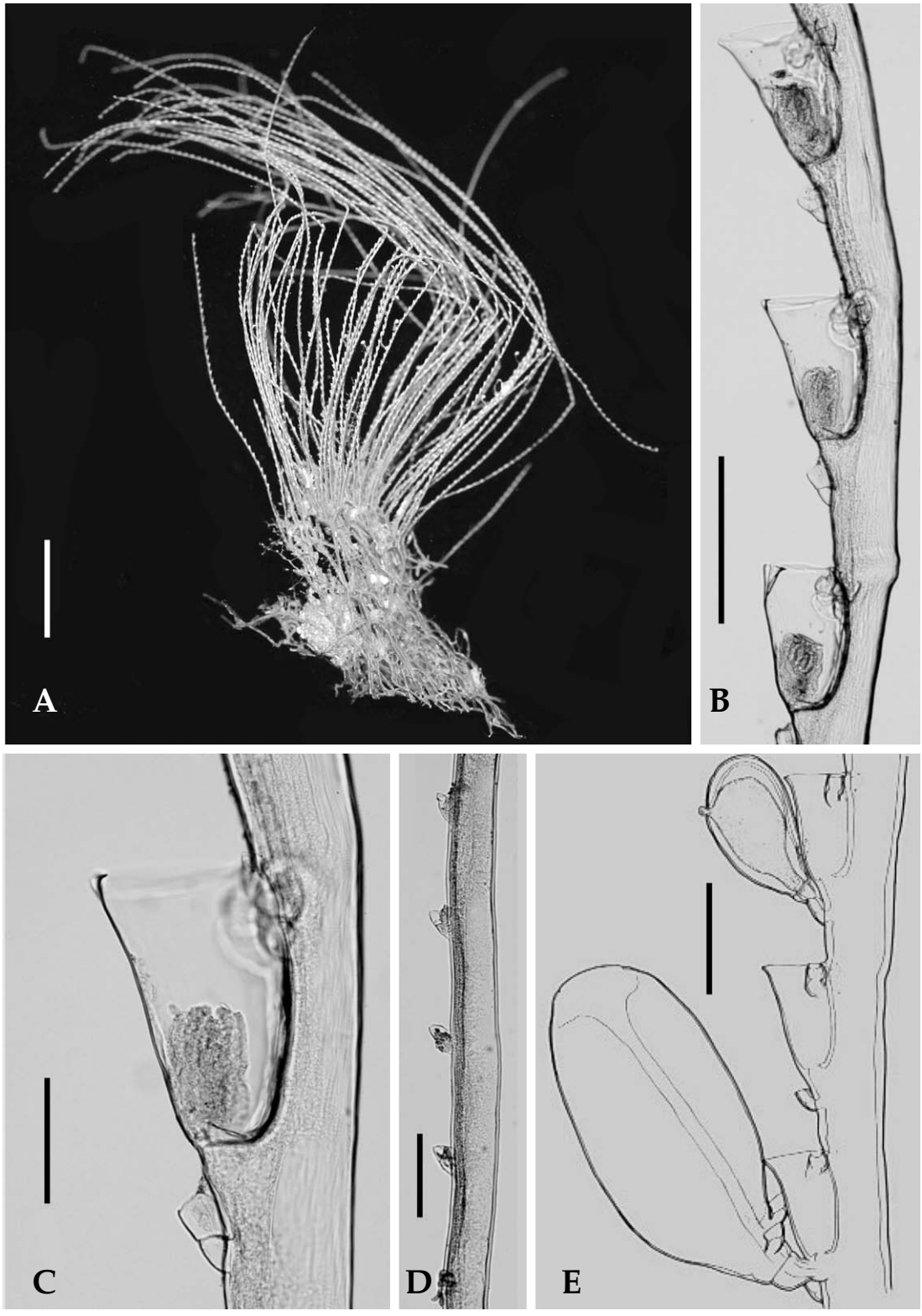

Fig. 72. *Antennella integerrima*. A. colonies; B. part of hydrocladium with hydrothecae; C. enlarged hydrotheca; D. basal portion of hydrocladium with nematothecae; E. gonothecae (cited from Hirohito, 1995). Scales: A=10 mm, B, D, E=500 μm, C=200 μm.

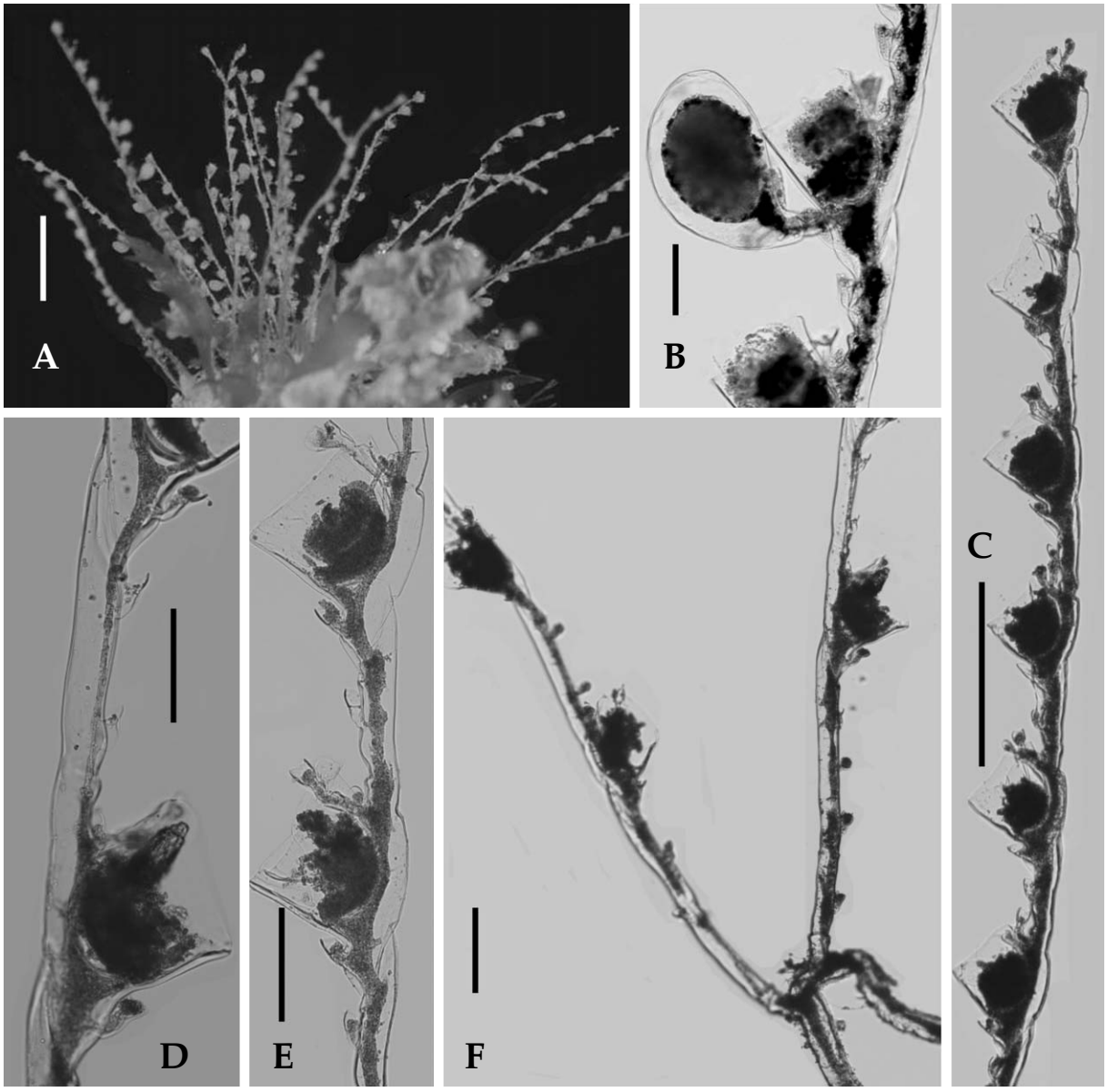

Fig. 73. *Antennella secundaria*. A. colonies; B. part of hydrocladium with gonophore; C. hydrocladium; D, E. parts of hydrocladia; F. basal portions of colonies. Scales: A=2 mm, B, D, E=200 μm, C=500 μm, F=300 μm.

movable and two-chambered, distal chamber scoop-shaped, adcauline wall reduced. Lateral nematothecae on finger-shaped pedicels which arising on top of adnate part of hydrotheca, usually not reaching thecal margin, movable, two-chambered, distal chamber funnel-shaped. Median superior behind free adcauline wall, not reaching margin, small, one- or indistinctly two-chambered. Gonothecae borne immediately below hydrothecae, singly or in pairs, curved, pear-shaped, with two-chambered and paired large nematothecae on basal region, and two annulated stalk. Male more proximal than female. Female gonothecae large, and with a wide distal aperture, but male distal round.

Distribution: Korea, Japan, Andaman Sea, Borneo, Australia, Banda Sea, Indian Ocean, Red Sea, South Africa, N.W. Africa, Mediterranean, North East Atlantic, Caribbean Sea, Gulf of Mexico.

Korea: GB, GN, JN, CN, GG, JJ.

Specimen examined: GB: (Guryongpo: 25.xii.1974), GN: (Yokjido: 5.vi.1978); (Hongdo: 20.vii.1978), JN: (Yejakdo: 23.vii.1981); (Jindo Hoedong, Jeopdo: 5, 6.viii.1974; 23.vii.1994), CN: (Anmyeondo: 8.viii.1973); (Cheonripo: 26.vi.1974), GG: (Jagyakdo: 6.xi.1971), JJ: (Seogwipo: 10.vii.1965; 15.iv.1975); (Supseom, Munseom: 8.ii.1971; 30.vi.1993).

Ecology: This species attaches on chitinous tubes of annelids or shells in waters about 10–30 m deep.

Genus *Halopteris* Allman, 1877

Dal-mu-ri-git-hi-deu-ra-sok (닭무리깃히드라속)

Erect stem, simple, divided into regular internodes. Hydrocladia arranged alternately right and left sides. Cauline hydrothecae present. Hydrothecae cup-shaped, untoothed margin.

Type species: *Halopteris carinata* Allman, 1877.

Species 54 (1 in Korea).

58. *Halopteris constricta* Totton, 1930 (Fig. 74)

Su-chuk-git-hi-deu-ra (수축깃히드라)

Halopteris constricta Totton, 1930, p. 217, text-fig. 56; Ralph, 1961, p. 43, fig. 6a–e; Vervoort and Vasseur, 1977, p. 68, figs. 29, 30a, b; Park, 1988, p. 83, fig. 5A–E.

Colonies small, less than 10 mm in height. Stem unfascicled, branched plumulately, divided into regular internodes, which consist of thecate internodes and athecate internodes, arranged in alternate each other. Thecate internode with one hydrotheca, one hydrocladia, paired lateral nematothecae and one median nematotheca. Athecate internode with only one median nematotheca. Oblique nodes usually between internodes very distinct. Hydrocladia arising from front of stem, at side of hydrotheca, arranged in alternate except for basal pair of hydrocladia which frequently opposite on same internode. Hydrothecae cup-shaped, margin slightly but distinctly everted, abcauline wall more or less straight, free part of adcauline wall distinctly concave. Gonothecae borne in pairs on hydrocaulus or hydrocladia immediately below hydrothecae, with short annulated pedicels, curved toward stem or hydrocladia, with broad distal aperture facing inward and a flap.

Distribution: Korea, Glendowie, Auckland, Island Bay, Cook Strait, off Cape Maria van Diemen (type locality), Moorea, South Africa (Table Bay to Transkei coast, False Bay), Madagascar area, Angola and Vema Seamount.

Korea: GW, JJ.

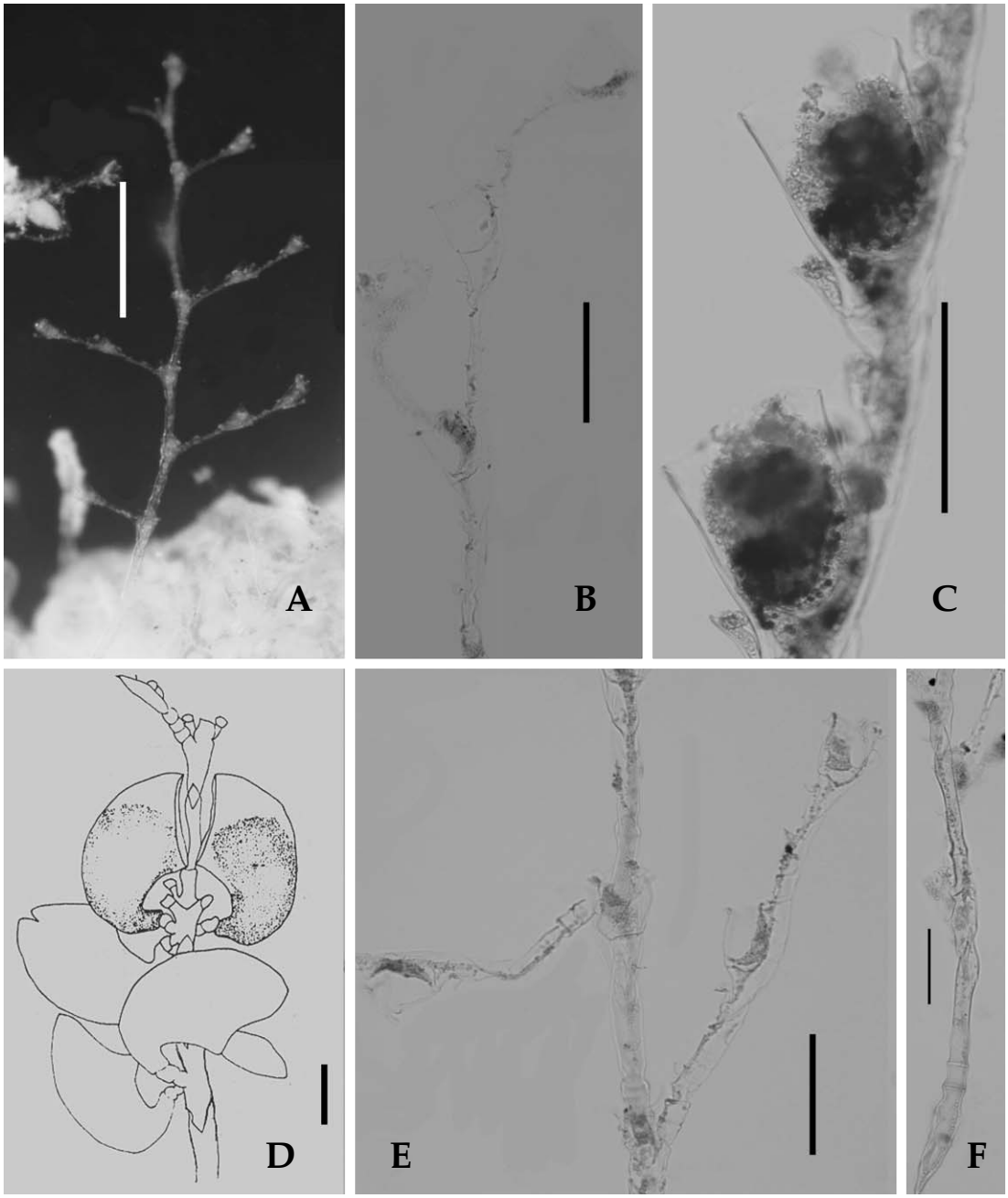

Fig. 74. *Halopteris constricta*. A. colony; B, E. parts of stems; C. hydrothecae; D. gonothecae (cited from Park, 1988); E. middle portion of stem; F. basal portion of stem. Scales: A=500 μm, B, E, F=200 μm, C, D=300 μm.

Specimen examined: GW: (Sokcho: 28.vi.1989), JJ: (Seogwipo: 15.xii.1969; 24.xii.1971; 15.iv.1974).

Ecology: This species is rare in Korean waters, and is attached on floating algae in waters about 5 m deep.

Genus *Monostaechas* Allman, 1877

Ne-ju-reum-git-hi-deu-ra-sok (네주름깃히드라속)

Erect stem present. Hydrocladia branching in sympodial. Hydrotheca cup shaped, margin smooth.

Type species: *Monostaechas dichotoma* Allman, 1877=*Plumularia quadridens* McCrady, 1858.

Species 5 (1 in Korea).

59. *Monostaechas quadridens* (McCrady, 1858) (Fig. 75)

Ne-ju-reum-git-hi-deu-ra (네주름깃히드라)

Plumularia quadridens McCrady, 1858, p. 97.
Monostaechase dichotoma: Allman, 1877, p, 37, figs. 1–5; Bedot, 1912, p. 321; 1918, p. 186; 1925, p. 286.
Monostaechas quadridens: Leloup, 1935, p. 2, figs. 2, 3; Rho and Chang, 1972, p. 101, pl. 111, figs. 12, 13; 1974, p. 148; Millard, 1975, p. 365, fig. 117D–F; Rho and Park, 1986, p. 92; Park, 1993, p. 273; Hirohito, 1995, p. 249, fig. 84a–g; Agis et al., 2001, p. 171, fig. 71a–e.

Colonies attaining about 8–40 mm high, first hydrocladium arising directly from hydrorhiza. Basal region of first athecate internode, long, with terminal second apophysis of hydrocladium. Basal region of second hydrocladium athecate internode, with terminal third apophysis of hydrocladium. As the same method, 4th, 5th ... hydrocladium is formed, all hydrocladia helicoid sympodium in one plane. In basal long internode, two-five nematothecae arranged in one row. From 3rd hydrocladium, it consists of thecate internodes and athecate internodes alternately. Thecate internode with one hydrotheca, one median inferior and two paired laterals, and one median superior behind adcauline wall. Athecate internode with two median nematothecae. Hydrothecae cup-shaped, widening toward distal, 1/2 below of adcauline wall adnate to hydrocladia. With no intrathecal septum. Laterals reaching to margin of hydrotheca, two-chambered, upper chamber trumpet-shaped. Median superior small and one-chambered. Median inferior two-chambered, upper chamber scoop-shaped and basal chamber a little wider. Median nematothecae similar to median inferior. Gonothecae oval-shaped, borne on hydrocladia below hydrothecae, with two-annulated pedicel and bearing two nematothecae near base.

Distribution: Korea, Japan, Hawai, Philippines, Australia, Pacific and Atlantic coasts of USA, Brazil, West Indies, Gulf of Mexico, South Africa.

Korea: JJ.

Specimen examined: JJ: (Seogwipo: 14.vii.1969; 22.viii.1970; 8.ii.1971; 10.vii.1972; 19.xii.1973); (Munseom: 8.ii.1971).

Ecology: This species is attached to hard substratums in waters about 10–30 m deep.

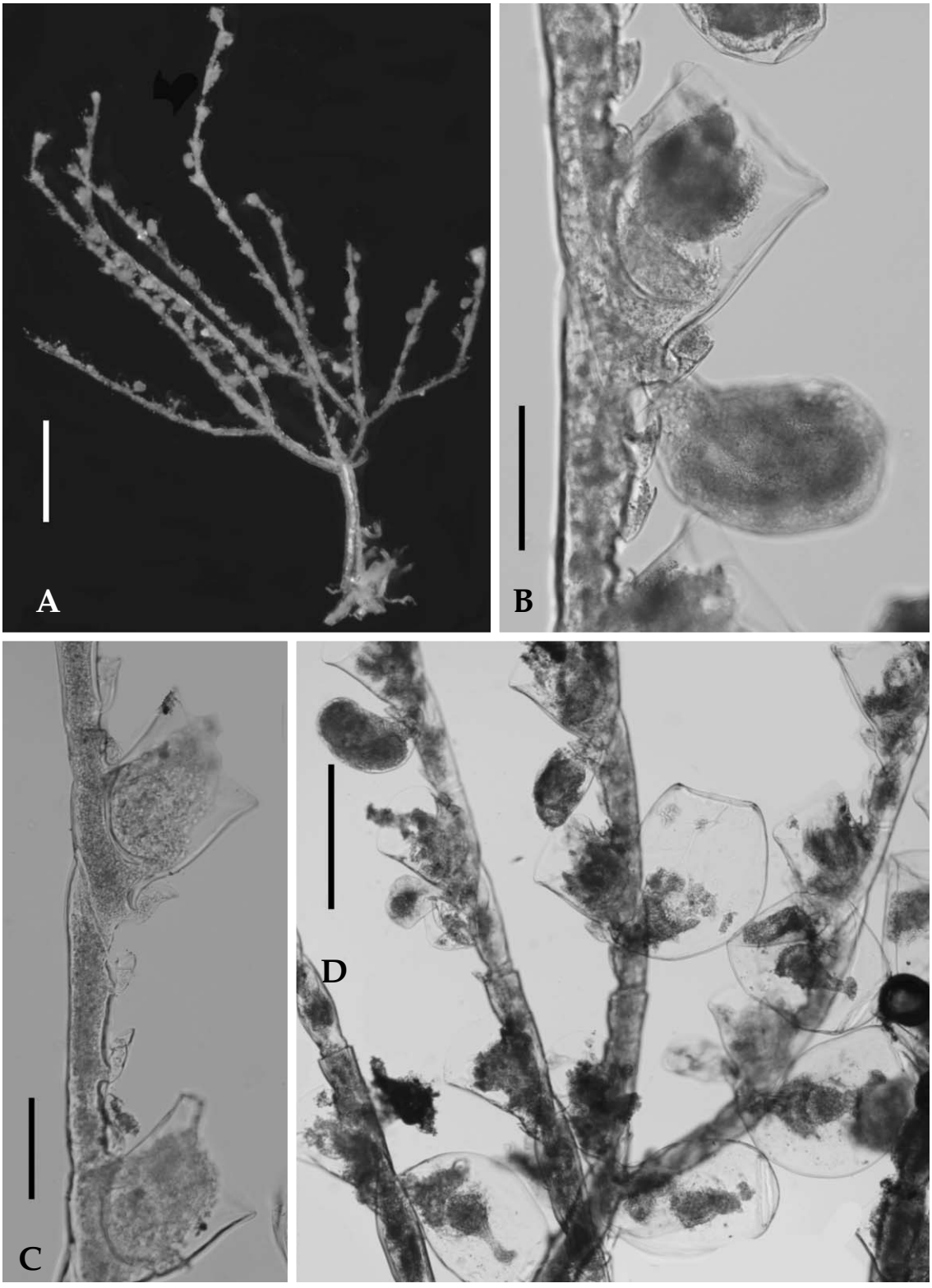

Fig. 75. *Monostaechas quadridens*. A. whole colony; B. part of hydrocladium with gonotheca and hydrotheca; C. part of hydrocladium with hydrothecae; D. parts of hydrocladia. Scales: A=1 mm, B, C=200 μm, D=500 μm.

Subfamily Kirchenpaueriinae Stechow, 1921

Kwil-ken-pa-u-el-git-hi-deu-ra-a-gwa (퀼켄파우엘깃히드라아과)

Erect stem, branched or unbranched and simple. Hydrocladia homomerous, pinnate-form and arranged alternately. With no cauline hydrothecae. Hydrothecae small. Nematothecae reduced: lateral nematothecae absent, medians poorly developed and one-chambered. Gonothecae unprotected, not bearing nematothecae.

Genus *Pycnotheca* Stechow, 1919

Jil-gin-keop-hi-deu-ra-sok (질긴컵히드라속)

Diplocheilus Allman, 1883.

Stem unbranching, giving rise to hydrocladia in alternate. Hydrothecae cup-shaped, with distinct abcauline intrathecal septum and no teeth at margin.

Type species: *Diplocheilus mirabilis* Allman, 1883.

Species 4 (1 in Korea).

60. *Pycnotheca mirabilis* (Allman, 1883) (Fig. 76)

Jil-gin-keop-hi-deu-ra (질긴컵히드라)

Diplocheilus mirabilis Allman, 1883, p. 49, pl. 8, figs. 4–7; Stechow, 1913b, p. 88, figs. 55, 56.
Pycnotheca mirabilis: Stechow, 1923b, p. 17; Uchida, 1956, p. 646, fig. 4611; Yamada, 1958, p. 59; Rho, 1967, p. 350, fig. 11A, B, pl. 1, figs. 2, 3; Rho and Chang, 1972, p. 102; 1974, p. 148; Millard, 1975, p. 377, fig. 120D–G; Rho and Park, 1986, p. 94; Park, 1990, p. 84; 1993, p. 274; 1995, p. 16; 1997, p. 151; Hirohito, 1995, p. 56, fig. 86a–e.

Hydrorhiza stolonate. Stem simple, without hydrocladia in its base, divided into regular internodes. Each internode with two apophyses of hydrocladia bearing one nematotheca on it. Hydrocladia arranged in alternate, divided into regular internodes, each internode with one hydrotheca, one median inferior and sarcostyle behind adcauline wall. Internodes of hydrocladia short, hydrothecae closely set, margin of one almost reaching to base of next one. Hydrothecae cup-shaped, about 2/3 below of adcauline wall adnated, distinct abcauline intrathecal septum reaching about half-way across cavity. Median inferior and cauline nematothecae scoop-shaped and one-chambered, immovable and with no adcauline wall. Median superior sarcostyle. Gonothecae large compared to hydrothecae borne on hydrorhiza or base of stem, without nematothecae, elongated oval-shaped, with transverse rings on their surface, distal end truncated.

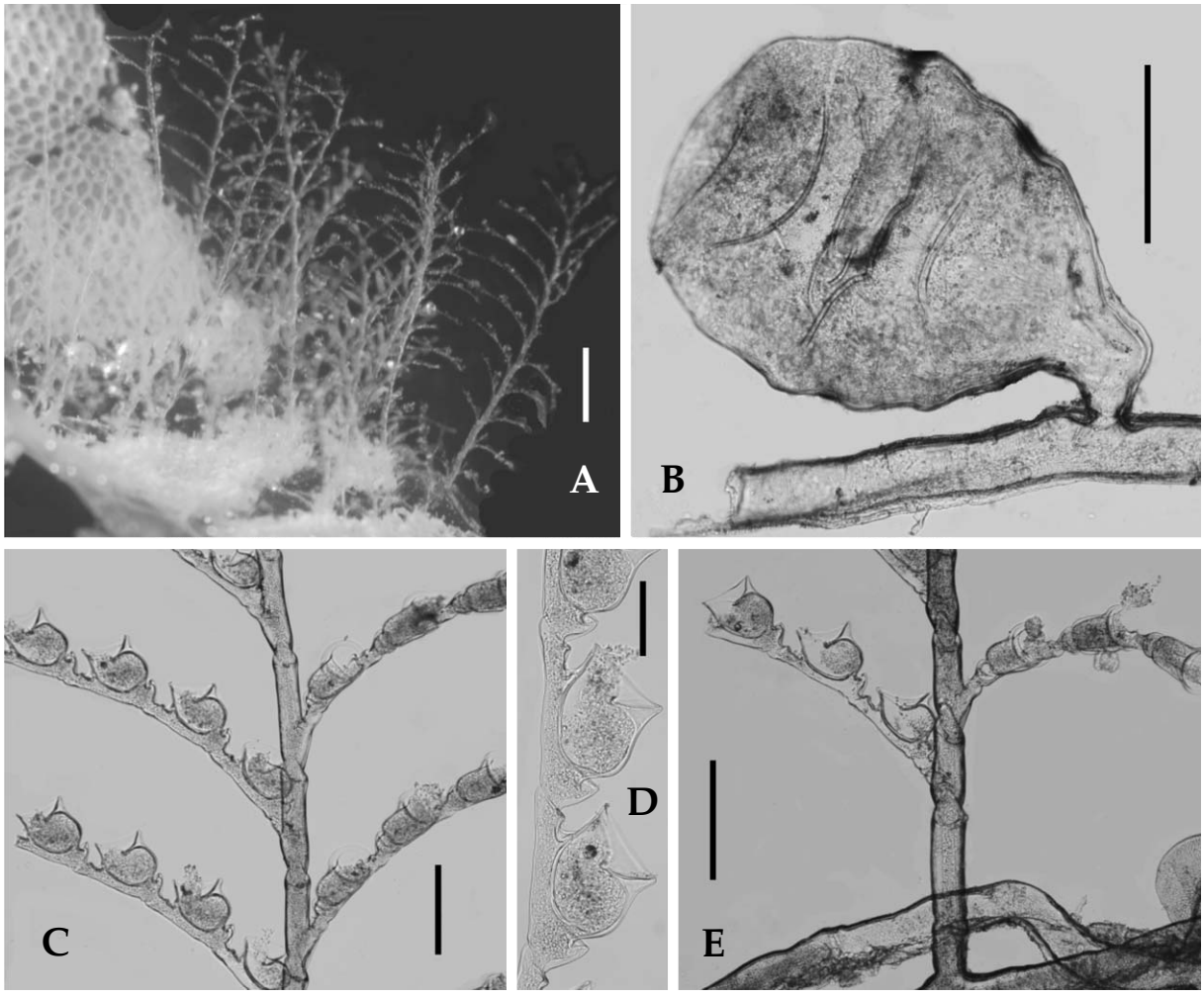

Fig. 76. *Pycnotheca mirabilis*. A. colonies; B. gonotheca arising from stolon; C. middle portion of stem; D. hydrothecae; E. basal portion of stem. Scales: A=1 mm, B, D=500 μm, C, E=200 μm.

Distribution: Korea, Japan, New Zealand, Australia, Red Sea, South Africa.

Korea: GW, GB, GN, JN, JJ.

Specimen examined: GW: (Jumunjin: 26.v.1985), GB: (Guryongpo: 24.xii.1974), GN: (Samcheonpo: 22.vii.1984); (Mipo: 11.v.1974; 25.vi.1975), JN: (Jindo Jeopdo: 6.viii.1974; 23.vii.1994), JJ: (Seogwipo: 8.viii.1960; 11.vii.1965; 16.vii.1966; 12.vii.1969; 12.xii.1969; 13.iv.1975; 13.vii.1979); (Wimi-ri: 8.vii. 1972); (Gapado: 16.vii.1985); (Munseom: 1.vii.1993); (Supseom: 2.vii.1993).

Ecology: This species is attached to the surface of annelid tubes, bryozoans, shells and other hydroids in waters coastsal to about 30 m deep.

Subfamily Plumulariinae Kuhn, 1913

Git-hi-deu-ra-a-gwa (깃히드라아과)

Erect stem branched or unbranched and fascicled or unfascicled. Hydrocladia arranged in right and left sides alternately or verticils. Hydrocladia, if fascicled, arising from axial tube. Hydrothecae small. Nematothecae generally two-chambered, movable, not fused to hydrotheca. Each hydrotheca with one median inferior and a pair of laterals. Gonothecae unprotected, with no nematothecae in common.

Key to the genera of subfamily Plumulariinae

1. Hydrothecae with no toothed margin ····· 2
− Hydrothecae with toothed margin ····· *Dentitheca*
2. Hydrocladia arranged in alternate ····· *Plumularia*
− Hydrocladia in verticils ····· *Nemertesia*

Genus *Dentitheca* Stchow, 1919

Hyeop-ni-git-hi-deu-ra-sok (협니깃히드라속)

Colonies pinnate, hydrocladia arranged in alternate. Hydrothecae cylindrical or cup-shaped, margin with a large tooth on each side.

Type species: *Plumularia hertwigi* Stechow, 1907.

Species 5 (1 in Korea).

61. *Dentitheca hertwigi* (Stechow, 1907) (Fig. 77)

He-reu-teu-bi-hi-git-hi-deu-ra (헤르트비히깃히드라)

Plumularia hertwigi Stechow, 1907, p. 195; 1909, p. 76, pl. I, fig. 9, pl. 6, figs. 1–3; 1913b, p. 93; 1919, p. 117, fig. T; Bedot, 1925, p. 332; Rho and Park, 1983, p. 44, pl. 5, figs. 3–5; 1986, p. 99; Park, 1992, p. 295; 1993, p. 274.

Dentitheca hertwigi: Stechow, 1923b, p. 18; Hirohito, 1995, p. 261, fig. 88a–c.

Colonies comparatively large, fascicled strongly, dark-brown color and branched irregularly. Branches divided into regular internodes, each internode with two or three hydrocladia. Hydrocladia arranged alternately to right and left side on axial tube, monosiphonic, divided into regular internodes, each internode with one hydrotheca, one median inferior and a paired laterals. Hydrothecae cylindrical, about three times as high as wide, margin with a large conspicuous tooth on each side, adcauline wall entirely adnate to hydrocladium. Nematothecae relatively small, trumpet-

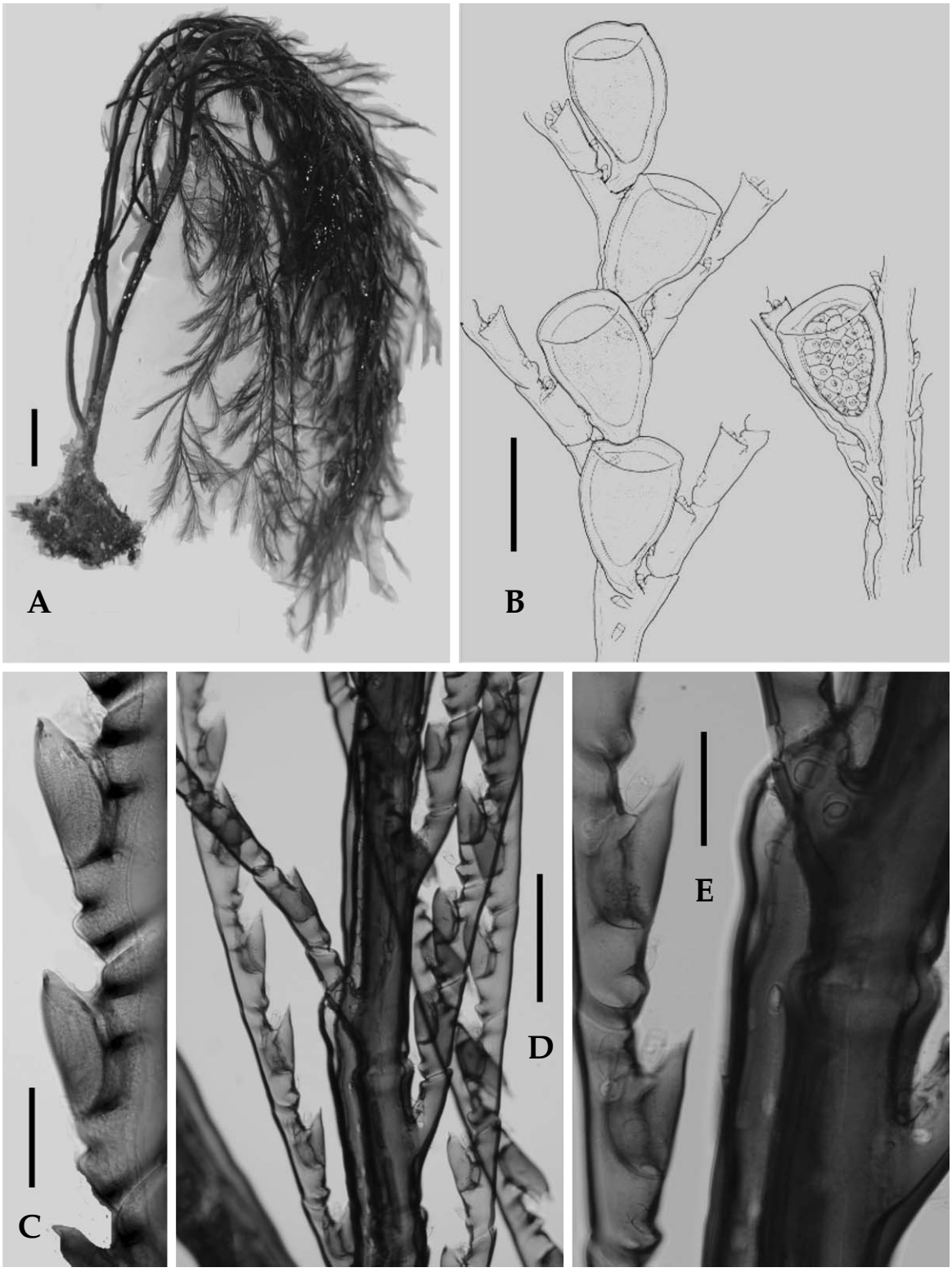

Fig. 77. *Dentitheca hertwigi*. A. colony; B. male gonothecae (left) and female gonotheca (right) (cited from Hirohito, 1995); C. hydrothecae; D, E. polysiphonic stems with hydrocladia. Scales: A=20 mm, B, D=500 μm, C, E=200 μm.

shaped, sometimes inconspicuous as they are small and transparent. A median inferior nematotheca below hydrotheca, a pair of laterals above each side of hydrotheca and others scattered on stem and branches. Female and male gonothecae similar in shape. Gonothecae laterally borne on apophysis for hydrocladium, lower part tapering to pedicel-like base, upper end truncated (Hirohito, 1995).

Distribution: Korea, Japan (Sagami Bay, Misaki Bay, Shishigahama).
Korea: GN, JJ.
Specimen examined: GN: (Hongdo: 20.vii.1978), JJ: (Seogwipo: 22.x.1982); (Munseom: 30.vi.1993); (Wimi-ri: 8.vii.1970).
Ecology: This species inhabits in waters about 10–30 m deep.

Genus *Nemertesia* Lamouroux, 1812

Sil-git-hi-deu-ra-sok (실깃히드라속)

Antennularia Lamarck, 1816.

Hydrocladia whorled. Hydothecae cup-shaped, with no toothed margin.
Type species: *Sertularia antennina* Linnaeus, 1758.

Species 58 (2 in Korea).

Key to the species of genus Nemertesia

1. Stem thread-like, simple and unbranched ····· *N. antennina*
– Stem fascicled, branching in dichotomous sympodium ····· *N. ciliata*

62. *Nemertesia antennina* (Linnaeus, 1758) (Fig. 78)

Chok-gak-sil-git-hi-deu-ra (촉각실깃히드라)

Sertularia antennina Linnaeus, 1758, p. 811.
Antennularia antennina: Nutting, 1900, p. 185, pl. 9, figs. 1–5; 1901, p. 367, fig. 72.
Nemertesia antennina: Bedot, 1911, p. 225; 1918, p. 188; 1925, p. 287; Leloup, 1937b, p. 46, fig. 31; 1947, p. 33; Stechow, 1925, p. 25; Vervoort, 1946, p. 326; 1949, p. 147; Hamond, 1957, p. 319; Vervoort, 1959, p. 297; 1972, p. 229; Ralph, 1961, p. 48; Millard, 1975, p. 381, fig. 121D, E; Hughes, 1977, p. 641; Rho and Park, 1983, p. 44; 1986, p. 95; Park, 1993, p. 274; Hirohito, 1995, p. 264, fig. 89a–g; Agis et al., 2001, p. 193, figs. 76a–f, 77a–f.

Colonies growing on substrata of variable size composed of hydrorhizae and remnants of dead stem. Stem divided into obscure regular internodes, monosiphonic and canaliculated. Hydrocladia

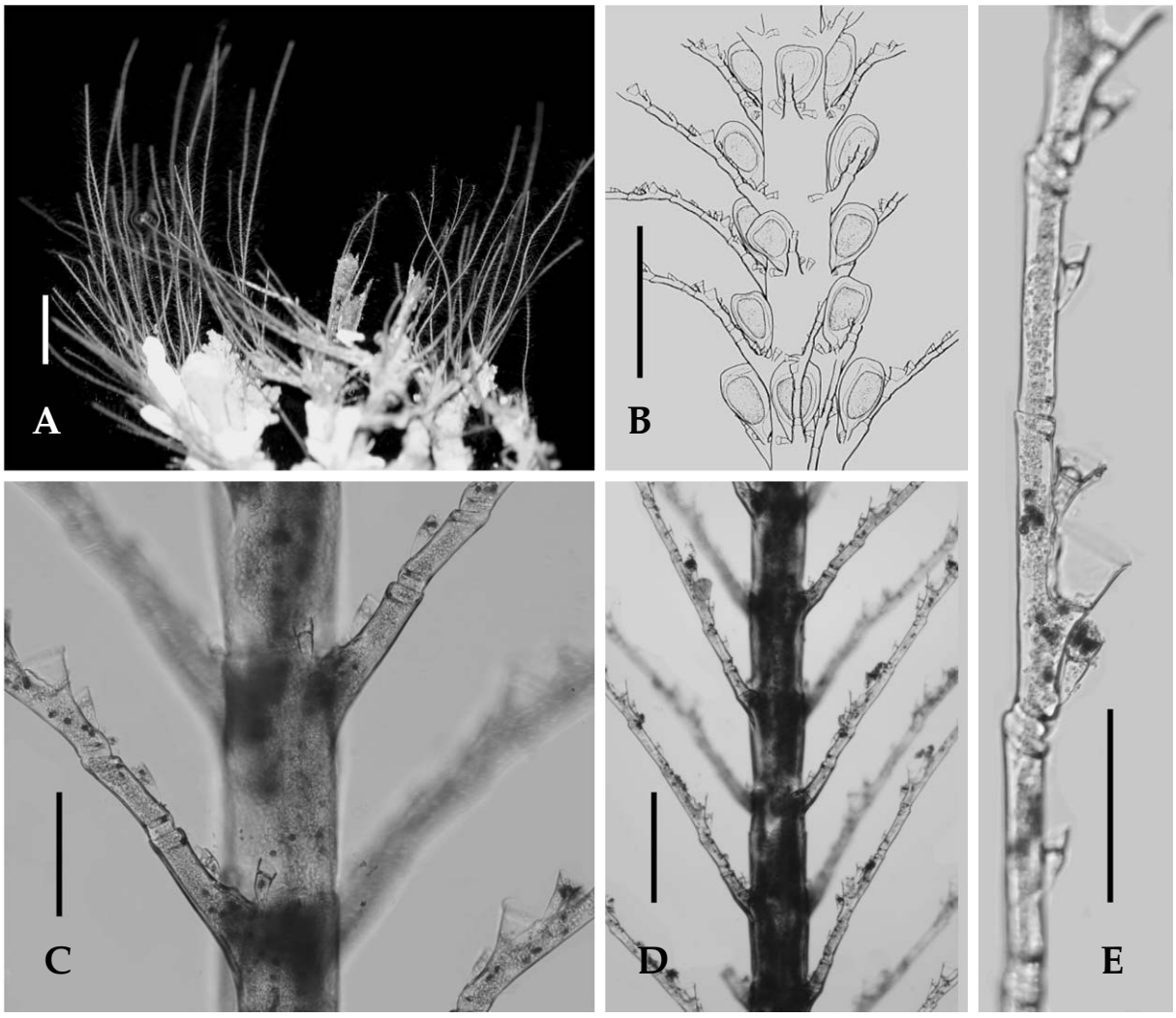

Fig. 78. *Nemertesia antennina.* A. colonies; B. upper part of stem with gonothecae (cited from Hirohoto, 1995); C, D. part of stems with hydrocladia; E. hydrocladium with hydrothecae and nematothecae. Scales: A=10 mm, B, D=500 μm, C, E=200 μm.

arranged in whorls on apophysis from distal ends of nodes, usually divided into thecate internodes and athecate internodes alternately. Athecate internode with one or two median nematothecae. Thecate internode with one hydrotheca, a pair of laterals and one median inferior. Hydrothecae small, cup-shaped, adcauline wall entirely adnate to hydrocladium, slightly everted in margin, with no teeth. Nematothecae trumpet-shaped, two-chambered, movable.

Distribution: Korea, Japan, Australia, New Zealand, Barents Sea, North Sea, English Channel, Mediterranean, Western Africa, French Guinea.

Korea: JJ.

Specimen examined: JJ: (Seogwipo: 6.ii.1971; 18.xi.1973; 12.iv.1975).

Ecology: This species is found on muddy bottoms, anchored by hydrorhizae in waters about 10–

30 m deep.

Remarks: This species characteristic in cruster from tangled mass of fine chitinous hydrorhizae. This species bears different numbers of hydrocladiae in specimens from different geographical areas. Hughes (1977) compaired the numbers of hydrocladia in the laboratory materials with material from Torbay. In the laboratory, the first internode with hydrocladia of the stem bears two hydrocladia but the specimens from Torbay bears 6–8 hydrocladia.

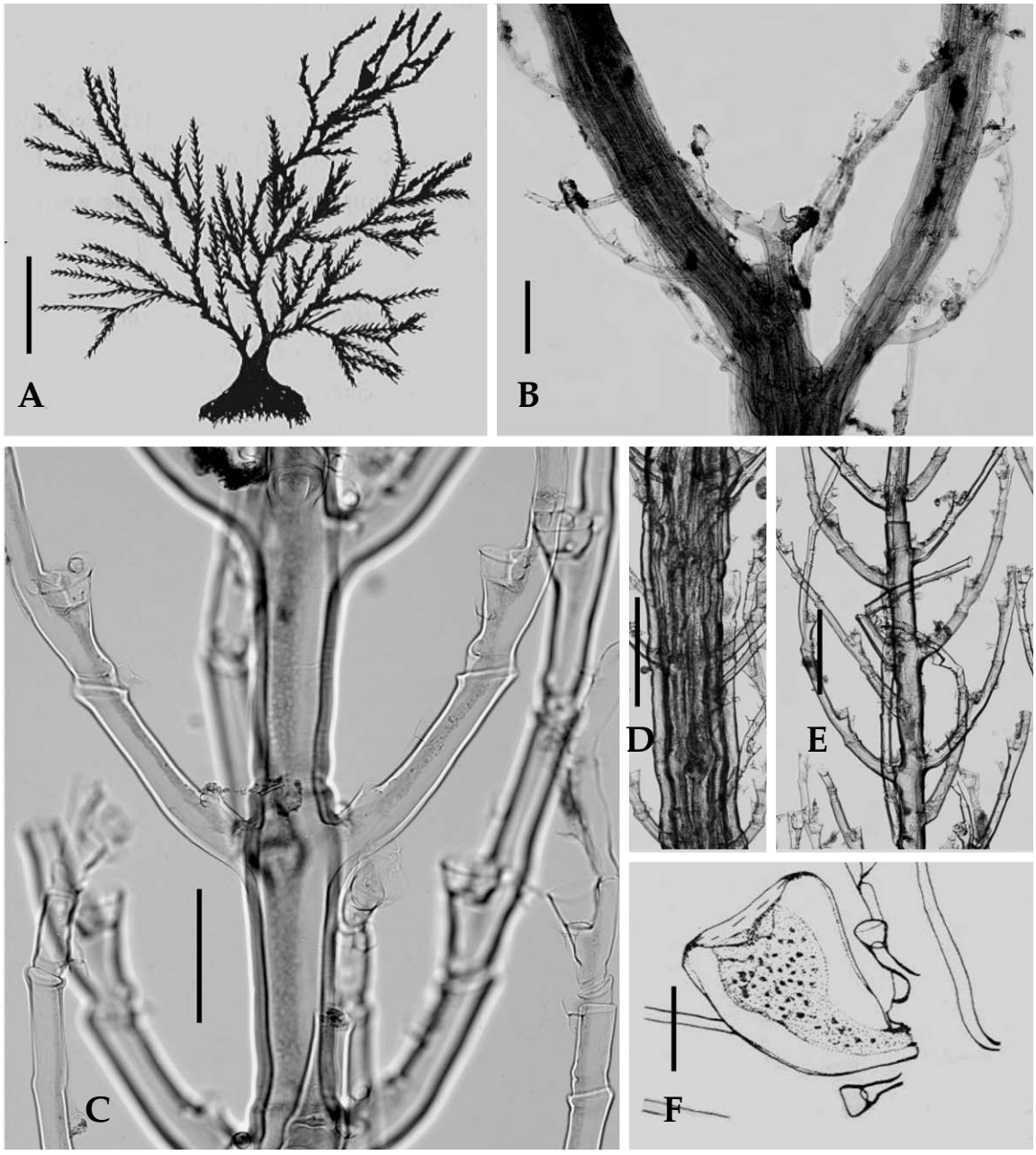

Fig. 79. *Nemertesis ciliata*. A. whole colony; B. branching pattern of polysiphonic stem; C, E. part of stem with hydrocladia; D. polysiphonic stem; F. gonotheca (cited from Rho and Park, 1984). Scales: A=25 μm, B, D, E=500 μm, C=200 mm, F=100 μm.

63. *Nemertesia ciliata* Bale, 1914 (Fig. 79)

Seom-mo-sil-git-hi-deu-ra (섬모실깃히드라)

Nemertesia ciliata Bale, 1914, p. 170, pl. 36, fig. 1; Jäderholm, 1919, p. 23; Yamada, 1959, p. 82; Millard, 1975, p. 383, figs. 121F–K; Hirohito, 1995, p. 266, fig. 90a–c; Ramil and Vervoort, 2006, p. 120.
Nemertesia polygeniculata: Rho and Park, 1984, p. 256, figs. 2, 3.

Main stem arising from a tangled mass of short filamentous rootlets, fascicled, zigzag-shaped and divided into regular internodes, with no distinct nodes between each internode. Each internode alternately curved from axis at angled about 15°, so that whole stem formed in zigzag fashion. Main stem divided into regular second and third stems from each other at angles of about 30°. Branches arising from peripheral tubes, repeatedly branching off dichotomously; spodially in one plane, last branch unfascicled. Hydrocladia monosiphonic, but sometimes polysiphonic in base, arising straight from between stems and monosiphonic branches. Hydrocladia arising from apophysis of axial tube of polysiphonic stem, divided into long thecate internodes and short athecate internodes. Each thecate internode with one hydrotheca, one median inferior nematotheca, a pair of laterals. Each athecate internode with one median nematotheca, and others occur on tubes of polysiphonic portions. Hydrothecae cup-shaped, widening toward margin, adcauline wall entirely adnate. All nematothecae trumpet-shaped and bithalamic. Lateral nematothecae larger than median nematothecae. Gonothecae arising from bases of apophysis of branches, small oval-shaped and upper gonothecae dome-shaped or truncate.

Distribution: Korea, Japan, Tasmania, South Africa.
Korea: GB, GN, JJ.
Specimen examined: GB: (Ulleungdo Dodong: 24.vii.1976), GN: (Mipo: 12.v.1974), JJ: (Seogwipo: 25.xii.1971; 22.v.1982).
Ecology: This species attaches on hard bottoms in waters about 10–30 m deep.

Genus *Plumularia* Lamarck, 1815

Git-hi-deu-ra-sok (깃히드라속)

Stem branched or unbranched. Hydrocladia arising on stem, arranged alternately in right and left side, sometimes arising directly from hydrorhiza.
Type species: *Sertularia setacea* Linnaeus, 1758.

Species 140 (9 in Korea).

Key to the species of genus *Plumularia*

1. Hydrocladium with one hydrotheca ····· 2
– Hydrocladium with one or more hydrothecae ····· 3
2. Intrathecal septum present ····· *P. spinulosa*

– Intrathecal septum absent ····· *P. obliqua*
3. Hydrocladia arising directly from hydrorhiza ····· *P. filicaulis japonica*
– Hydrocladia arising from stem or branch ····· 4
4. Colonies large and branched ····· *P. spiralis*
– Colonies small and unbranched ····· 5
5. Hydrothecae without teeth ····· *P. setacea*
– Hydrothecae with one frontal tooth ····· *P. undulata*

64. *Plumularia filicaulis japonica* Jäderholm, 1919 (Fig. 80)

Wae-go-bi-git-hi-deu-ra (왜고비깃히드라)

Plumularia filicaulis japonica Jäderholm, 1919, p. 21, pl. 5, figs. 2, 3; Stechow, 1923b, p. 18; Yamada, 1958, p. 60, fig. 4; 1959, p. 79; Ito and Inoue, 1962, p. 451, pl. 7, figs. 57–60; Hirohito, 1969, p. 27; 1995, p. 273, fig. 93e–i; Rho and Park, 1980, p. 28, pl. 8, figs. 1–4; Rho and Park, 1986, p. 96; Park, 1992, p. 294; 1993, p. 274.

Colonies arising from hydrorhiza creeping on algae, straight, unbranched. Stem absent and hydrocladia arising directly from hydrorhiza. Hydrocladia homomerous, divided into regular internodes, each internode with one large hydrotheca, one median inferior nematotheca and a pair of laterals. Hydrothecae mixing bowl-shaped, with strong constriction on adcauline wall and periderm of abcauline wall side particularly thick. Gonothecae compressed, closely adhering to substratum, irregular oblong-shaped, with about 10 transverse furrows on surface.

Distribution: Korea, Japan, Australia, Chile, South Africa.
Korea: GN, JN, JJ.
Specimen examined: GN: (Mipo: 29.xii.1974); (Haegeumgang: 22.xii.1978), JN: (Geomundo: 17.vii.1977), JJ: (Jigwido: 9.ii.1971); (Udo: 12.vii.1979); (Bomog-ri: 21.v.1982); (Seogwipo: 13.vii.1979); (Munseom: 1.vii.1993); (Hwasunpo: 17.i.1985).
Ecology: This species attaches on brown algae in waters about 5–10 m deep.

65. *Plumularia obliqua* (Johnston, 1847) (Fig. 81)

Oe-to-ri-git-hi-deu-ra (외톨이깃히드라)

Laomedea obliqua Johnston, 1847, p. 106, pl. 28, fig. 1.
Plumulara obliqua: Bedot, 1905, p. 99; 1910, p. 352; 1912, p. 342; 1916, p. 186; 1918, p. 221; Jäderholm, 1919, p. 22, pl. 5, fig. 6; Stechow and Uchida, 1931, p. 565, pl. 15, fig. 5; Leloup, 1934, p. 15; Pennycuik, 1959, p. 180; Hirohito, 1995, p. 275, fig. 94b–f.
Monotheca obliqua: Stechow, 1919, p. 113; 1923b, p. 17; Yamada, 1955, p. 355, pl. 23, fig. 5; 1959, p. 78; Rho, 1967, p. 348, fig. 9A, B; 1969, p. 166, text-fig. 7; Rho and Chang, 1974, p. 148; Rho and Park, 1986, p. 99.

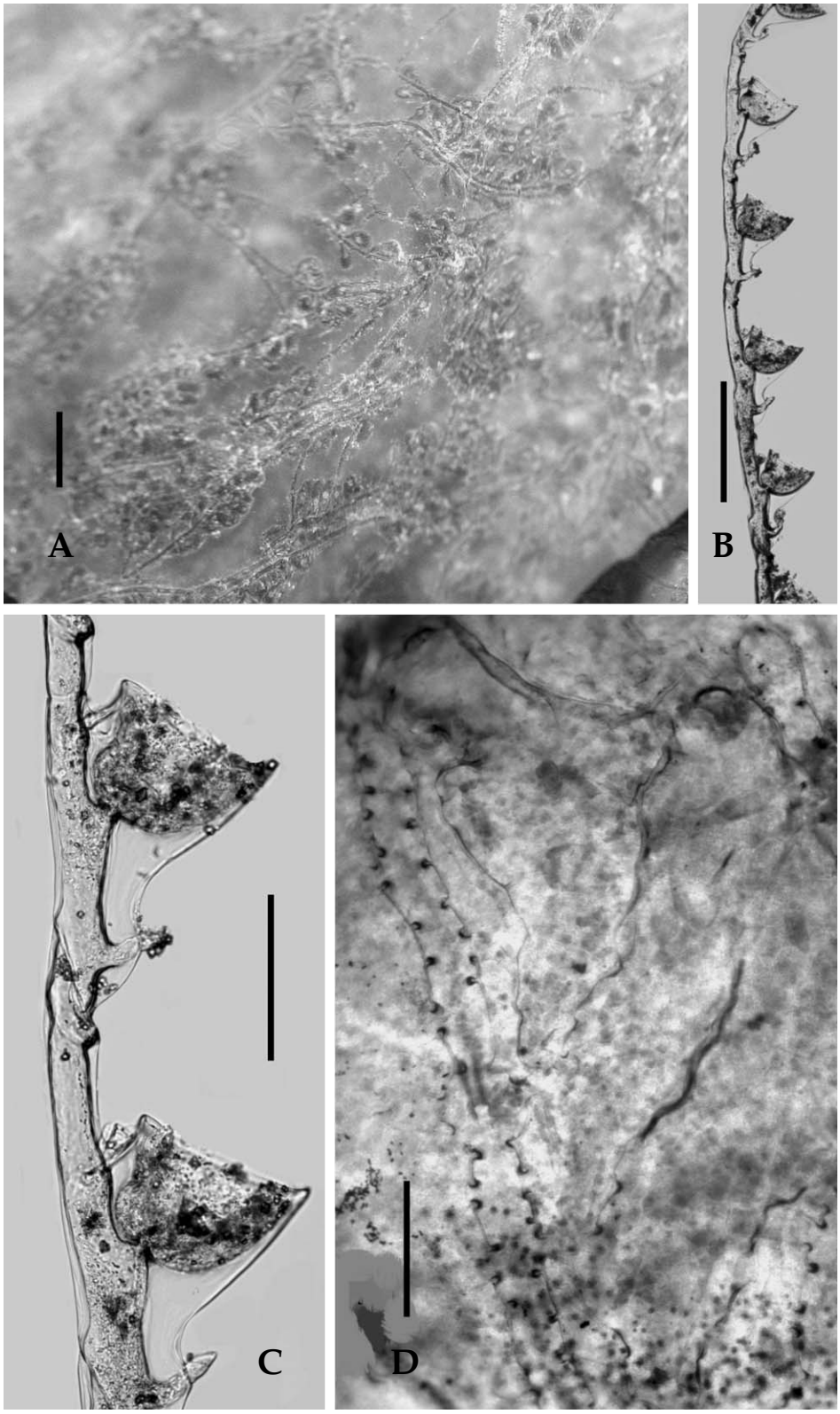

Fig. 80. *Plumularia filicaulis japonica*. A. gonothecae attached on surface of alga; B. hydrocladia with hydrothecae; C. hydrothecae; D. gonotheca and hydrorhiza. Scales: A=5 mm, B, D=500 μm, C=200 μm.

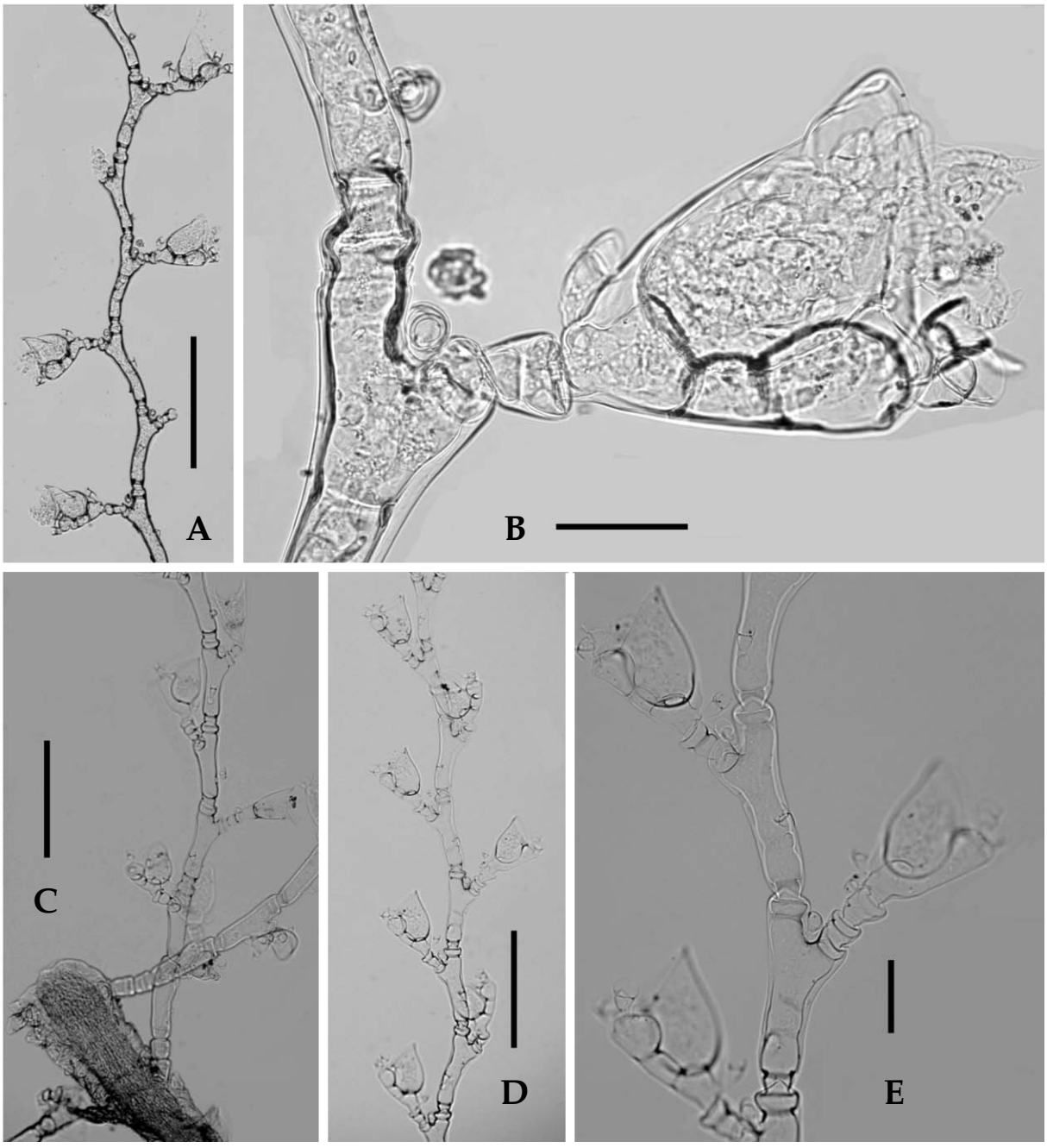

Fig. 81. *Plumularia obliqua*. A, D. parts of colonies; B. hydrotheca; C. basal portion of colonies; E. part of colony with hydrothecae. Scales: A, C, D=500 μm, B, E=100 μm.

Colonies attaining about 15 mm high, very delicate and small, growing on algae, arising directly from stolon. Hydrocladia alternate, divided into a small internode without anything at base and a thecate internode which bearing a relatively large hydrotheca, one median inferior nematotheca and a pair of laterals. Hydrothecae cup or bell-shaped, adcauline wall entirely adnate to hydrocladium, margin slightly everted toward outside, with no toothed margin and without any

intrathecal septum. According to Hirohito (1995), gonothecae borne on lower part of stem, bell-shaped, distally broad and truncate.

Distribution: Korea, Japan, Australia, England, Adriatic, Mediterranean, South Africa.
Korea: GN, JJ.
Specimen examined: GN: (Mijo-ri: 18.vii.1967); (Yeongjongdo: 8.x.1967), JJ: (Hoenggando: 9.viii. 1969); (Seogwipo: 10.xii.1969).
Ecology: This species inhabits in waters about 10–20 m deep.

66. *Plumularia setacea* (Linnaeus, 1758) (Fig. 82)

Git-hi-deu-ra (깃히드라)

Sertularia setacea Linnaeus, 1758, p. 813.
Plumularia setacea: Stechow, 1912, p. 362; 1913b, p. 89; 1923b, p. 17; 1925, p. 500; Leloup, 1937b, p. 46; Vervoort, 1946, p. 323, fig. 6; 1949, p. 146; Yamada, 1958, p. 60; 1959, p. 78; 1965, p. 362; Uchida, 1956, p. 1646, fig. 4612; Rho, 1967, p. 349, fig. 10A, B; 1969, p. 167; Rho and Chang, 1972, p. 102; 1974, p. 148; Millard, 1975, p. 399, fig. 124E–K; Rho and Park, 1986, p. 97; Park, 1993, p. 275; 1995, p. 16; 1997, p. 151; Hirohito, 1995, p. 278, fig. 95c, d; Agis et al., 2001, p. 238, fig. 91a–j.

Colonies attached on algae, arising directly from stolon, attaining 7–10 mm high. Stem very delicate, branched, covered with dark brown periderm, and divided into regular internodes. Hydrocladia alternate, just below hinge joint of stem, divided into regular thecate long internodes and short athecate internodes alternately. Thecate internode with one hydrotheca, one median inferior, a pair of laterals. Athecate internode one median nematotheca. Hydrothecae small, cup-shaped, adcauline, entirely adnate to hydrocladium, with no toothed margin or any intrathecal septum, margin slightly oblique. Each internode of stem bears two nematothecae. Nematothecae two-chambered, movable and distal chamber funnel-shaped. Gonothecae borne on base of hydrocladium, sexually dimorphic, without nematothecae, rather larger, elongate, tubular, with distal end sharply truncated, tapering towards terminal aperture. Male and female gonothecae occur from separate colonies. Male slender, with small aperpture. Female larger, compressed, with larger aperture on terminal tube-like neck, curved slightly to one side.

Distribution: Almost cosmopolitan.
Korea: GB, GN, JN, JJ.
Specimen examined: GB: (Uljin Wangdolcho: 7.vi.2006), GN: (Haeundae: 13.vi.1967), JN: (Geomundo: 8.viii.1965); (Bangjukpo: 22.v.1967); (Jindo Jeopdo: 23.vii.1994), JJ: (Seogwipo: 15.vii.1969; 21.x. 1973); (Munseom: 30.vi.1993); (Supseom: 2.vii.1993).
Ecology: This species attaches on algae, cirripedes, sponges, other hydroids and bryozoans in waters coastal to 30 m deep.

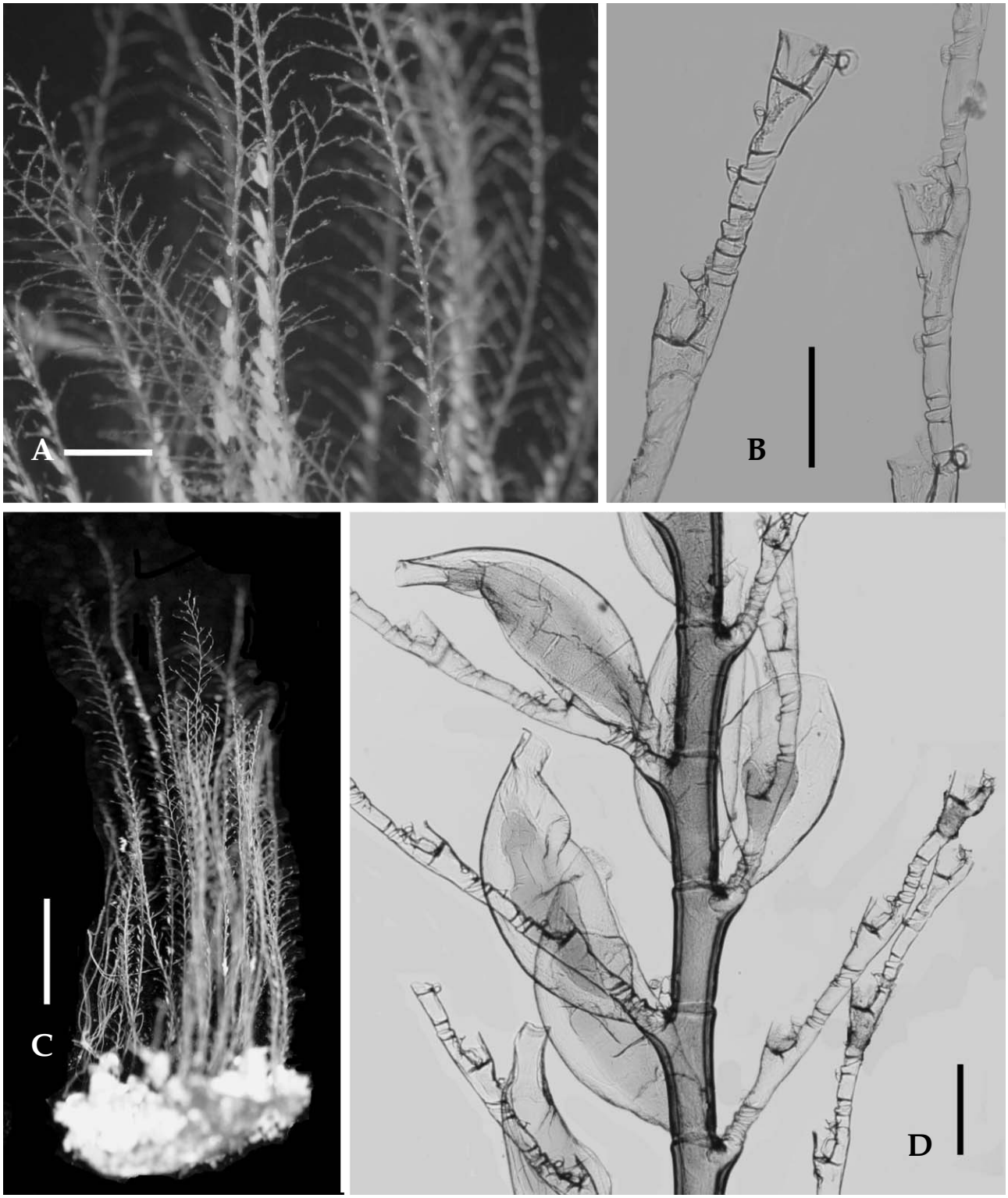

Fig. 82. *Plumularia setacea*. A. part of colonies; B. hydrocladia with hydrothecae; C. whole colonies; D. part of hydrocaulus with female gonothecae. Scales: A=1 mm, B=200 μm, C=1 cm, D= 300 μm.

67. *Plumularia spinulosa* Bale, 1882 (Fig. 83)

Ga-si-git-hi-deu-ra (가시깃히드라)

Plumularia spinulosa Bale, 1882, p. 42, pl. 15, fig. 8; Bedot, 1916, p. 190; 1925, p. 338; Pennycuik, 1959, p. 180; Millard, 1962, p. 301; 1975, p. 401, fig. 125E–J; Rho and Park, 1986, p. 98, fig. 4a, pl. 1, fig. d; Park, 1992, p. 296; 1993, p. 275; Hirohito, 1995, p. 279, fig. 96a–c.
Monotheca spinulosa: Stechow, 1921, p. 260; 1923b, p. 17.
Plumularia spinulosa typica: Millard, 1958, p. 212.
Plumularia spinulosa var. *spinulosa*: Ralph, 1961, p. 37, fig. 4.

Colonies very small, attaining about 2.5 mm height, with internal chitinous pegs in hydrorhiza. Stem arising from hydrorhiza, unbranched. Stem divided into regular internodes. Hydrocladia alternate, consisting of one or two long thecate internodes and a short single athecate internode. Thecate internode bearing one hydrotheca, one median inferior nematotheca and a pair of laterals which curved distally and extending into a short bluntly pointed spine. Hydrothecae rounded at base, laterally compressed, margin slightly everted on abcauline side, distinctive large intrathecal ridge arising the adcauline side. Nematothecae two-chambered, trumpet-shaped and movable. Gonothecae borne on base of stem, opposite side of hydrotheca, large comparing to hydrotheca, wide tube-shaped and distal truncate.

Distribution: Korea, Japan, Australia, Lord Howe Island, New Zealand, South Africa.
Korea: GN, JJ.
Specimen examined: GN: (Mipo: 11.v.1975), JJ: (Munseom: 1.vii.1993).
Ecology: This species attaches on algae in waters about 5–20 m deep.

68. *Plumularia spiralis* Billard, 1911 (Fig. 84)

Na-sa-git-hi-deu-ra (나사깃히드라)

Plumularia spiralis Billard, 1911, p. 49, fig. 12; Vervoort, 1946, p. 325; Rho, 1969, p. 7, pl. I, figs. 4, 5, pl. II, fig. 7; Rho and Park, 1986, p. 99; Park, 1992, p. 296; 1993, p. 275; Hirohito, 1995, p. 280, fig. 96d, e.

Colonies attaining about 10 cm high, dark brown colour, branched in several directions irregularly and branched in 2nd, 3rd etc. like this method. Stem and branches almost straight throughout, unfascicled, divided into regular internodes, each bearing a hydrocladium alternately. Hydrocladia divided into thecate internodes. Thecate internode with one hydrotheca, one median inferior and a pair of laterals. Athecate internode with one median nematotheca. Hydrothecae lined up on same side, cup-shaped, comparatively small, with no toothed margin. Nematothecae trumpet-shaped, two-chambered and movable. According to Hirohito (1995), gonothecae cone-shaped, borne on apophyses of hydrocladia.

Distribution: Korea, Japan, Philippines, Indonesia, Flores Sea, Ceram Sea, Banda Sea, Timor Sea.
Korea: JJ.
Specimen examined: JJ: (Jejuhang: 11.vii.1965); (Seogwipo: 12.iv.1975); (Supseom: 6.ii.1971);

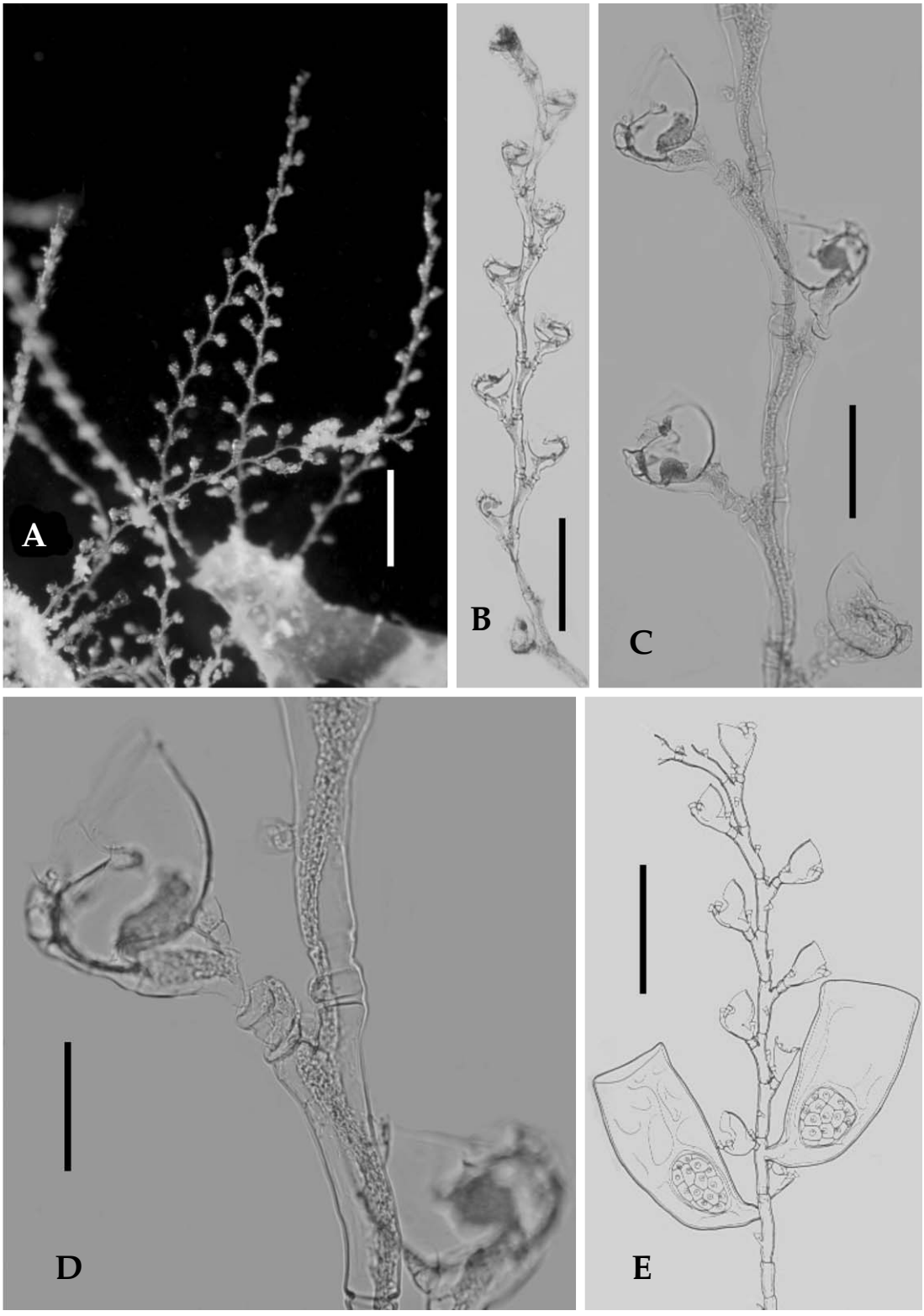

Fig. 83. *Plumularia spinulosa*. A. colonies; B. stem with hydrothecae; C, D. parts of stem with hydrothecae; E. stem with gonothecae (cited from Hirohito, 1995). Scales: A=1 mm, B, E=500 μm, C=200 μm, D=100 μm.

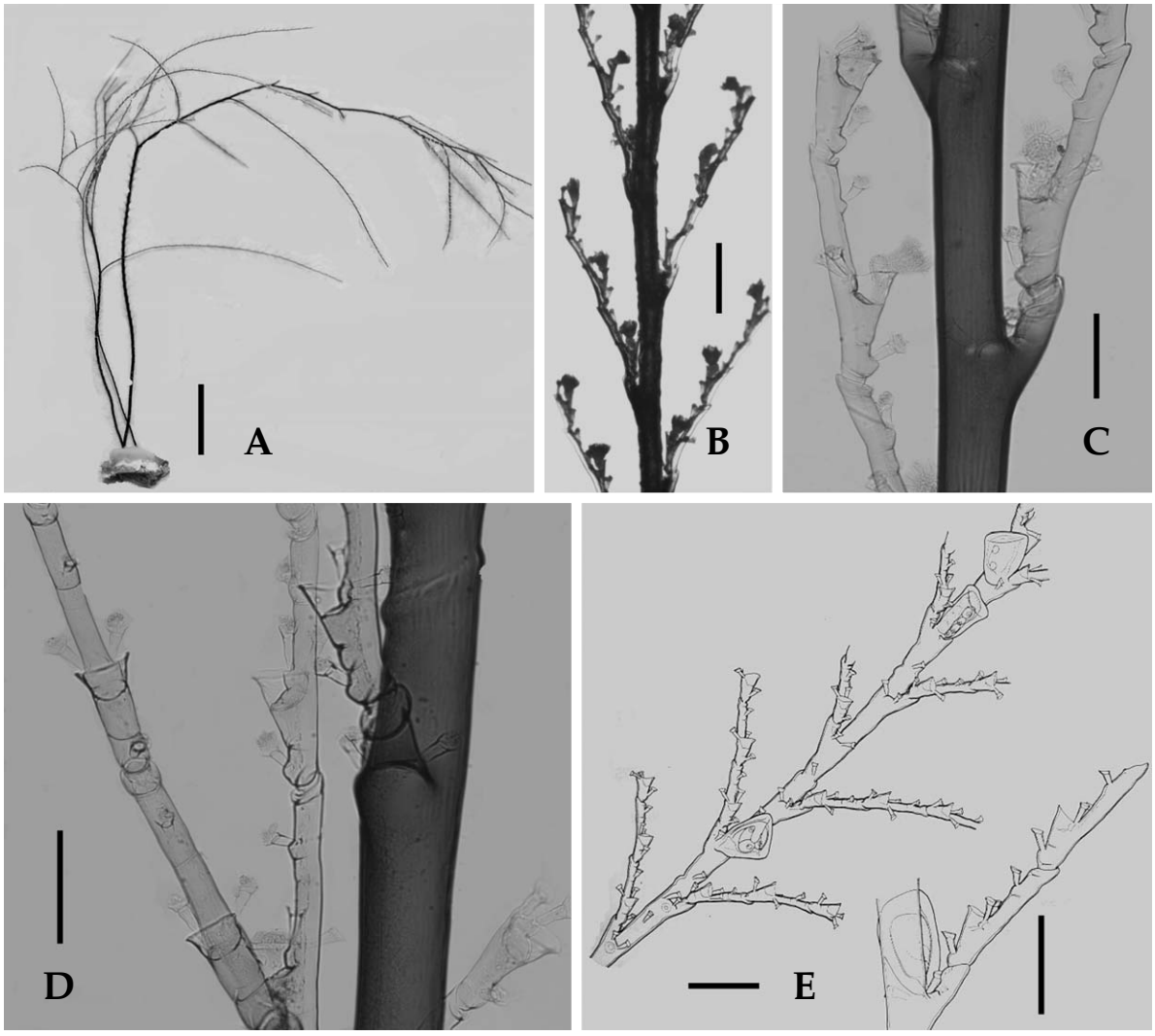

Fig. 84. *Plumularia spiralis*. A. whole colony; B. part of stem; C. lateral view with origins of hydrocladia; D. frontal view with origin of hydrocladium; E. part of stem with female gonophores (left) and proximal part of hydrocladium with male gonophore (right) (cited from Hirohito, 1995). Scales: A=10 mm, B=500 μm, C, D=200 μm, E=500 μm (left), 300 μm (right).

(Munseom: 8.ii.1971).

Ecology: This species attaches on hard bottoms in waters about 10–20 m deep.

69. *Plumularia undulata* Yamada, 1950 (Fig. 85)

Pa-do-git-hi-deu-ra (파도깃히드라)

Plumularia undulata Yamada, 1950, p. 17, pl. 1, figs. 24–26; 1958, p. 80; Park, 1999, p. 202, fig. 3A–E.

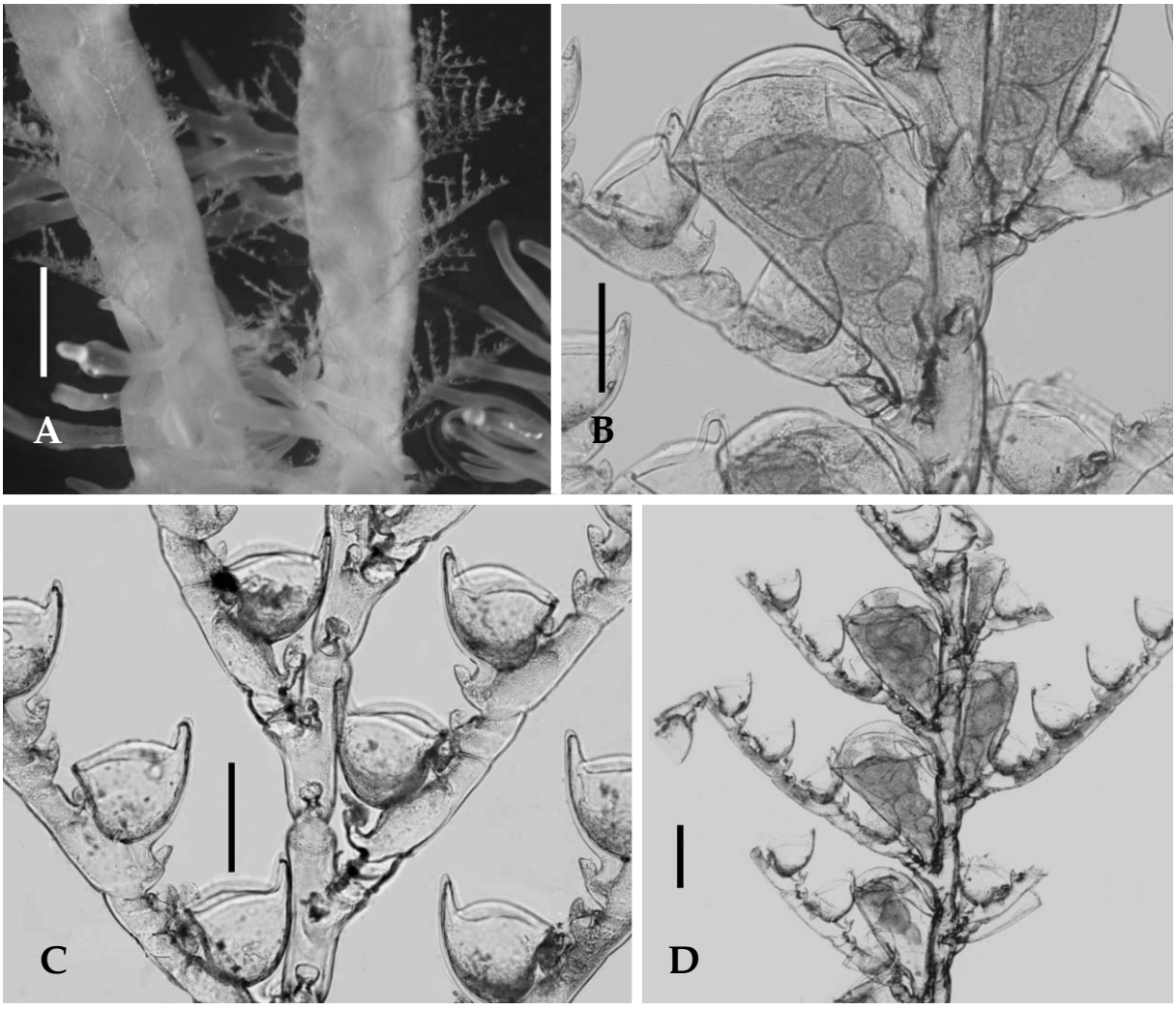

Fig. 85. *Plumularia undulata*. A. whole colonies attached on alga; B, D. parts of colonies with female gonothecae; C. part of colony with hydrothecae. Scales: A=2 mm, B, C=200 μm, D=300 μm.

Colonies small, about 1–2 cm long, simple or pinnate, and arising from hydrorhiza, creeping on seaweeds. Hydrorhiza flattened, with very thick periderm and internal projections. Stem monosiphonic, divided into regular internodes, each internode bearing a hydrocladial apophysis: three cauline nematothecae, one placed in anterior of its base and one pair in base of hydrocladium. Apophyses arranged in right and left sides alternately, not in one plane, placed toward anterior surface. Hydrocladia usually unbranched, but rarely branched, divided into regular internodes, consisting of short athecate internodes and long thecate internodes. Athecate internode with one median nematotheca, and thecate internode with one hydrotheca, one median inferior and a pair of laterals. Hydrothecae bowl-shaped, with large aperture, margin undulated and one tongue-like adcauline projection. Nematothecae small, trumpet-shaped, two-chambered and movable. Gonothecae large compared to hydrotheca, obconical-shaped, wall smooth, margin truncate or with a low and broad neck.

Distribution: Korea, Japan (Hokkaido).
Korea: GW, GB.
Specimen examined: GW: (Sokcho: 28.vi.1989), GB: (Jukbyeon: 21.vii.1997).
Ecology: This species is attached on algae in waters about 5–10 m deep.

Subfamily Aglaopheniinae Stechow, 1911

Tti-sin-git-hi-deu-ra-a-gwa (띠신깃히드라아과)

Erect stem, branched or unbranched, fascicled or unfascicled, giving rise to hydrocladia. If fascicled stem, hydrocladia arising from a single axial tube, homomerous, bearing close-set hydrothecae generally on anterior surface. Hydrothecae entirely adnate to hydrocladium and with toothed margin. A pair of lateral nematothecae and median inferior always present. All nematothecae one-chambered, immovable and more than one opening, of which one communicates with hydrotheca. Gonothecae unprotected or protected by phylactocarps or corbula with simple nematothecae.

Key to the genera of subfamily Aglaopheniinae

1. Gonothecae unprotected ····· 2
− Gonothecae protected ····· 3
2. Erect stem simple, and intrathecal septum present ····· *Gonangium*
− Twisted stem fascicled, and intrathecal septum absent ····· *Haliaria*
3. Gonothecae protected ····· 4
− Gonothecae protected by pseudocorbula ····· *Macrorhynchia*
4. Gonothecae protected by phylactocarps ····· *Lytocarpus*
− Gonothecae protected by corbula ····· 5
5. Corbula ribs with hydrothecae at their base ····· *Thecocarpus*
− Corbula ribs without hydrothecae at their base ····· *Aglaophenia*

Genus *Aglaophenia* Lamouroux, 1812

Tti-sin-git-hi-deu-ra-sok (띠신깃히드라속)

Corbulifera Naumov, 1960.

Stem branched or unbranched, giving rise to hydrocladia alternately. Hydrocladia unbranched. Hydrothecae sac-shaped, always with toothed margin, intrathecal septum developed inward hydrotheca from adcauline wall. Median inferior nematotheca partly adnate to hydrotheca and variable length. Gonothecae protected by corbula which modified hydrocladia. Corbula ribs bearing nematothecae but no hydrothecae.

Type species: *Sertularia pluma* Linnaeus, 1758.

Species 88 (3 in Korea).

Key to the species of genus *Aglaophenia*

1. Open corbula ····· *A. whiteleggei*
− Closed corbula ····· 2
2. Colonies arising in aggregate ····· *A. suensonii*
− Colonies arising in separate ····· *A. pluma*

70. *Aglaophenia pluma* (Linnaeus, 1758) (Fig. 86)

Som-teol-git-hi-deu-ra (솜털깃히드라)

Sertularia pluma Linnaeus, 1758, p. 811.
Aglaophenia pluma: Hincks, 1868, p. 268, pl. 63, fig. 379A–C; Bedot, 1919, p. 18, figs. 1–19; Vervoort, 1946, p. 335, fig. 8a–c; Millard, 1957, p. 235; Naumov, 1960, p. 488, figs. 23, 379A–C; Millard, 1975, p. 411, fig. 129D; Svoboda and Cornelius, 1991, p. 30, figs. 10f, 12, 13a–g, 19a, b, 24a, b; Medel and Vervoort, 1995, p. 17, fig. 6; Park, 1998, p. 168, fig. 2A–D, pl. 1, fig. C; Agis et al., 2001, p. 60, fig. 30a–i.
Aglaophenia chalabocarpa: Allman, 1886, p. 150, pl. 21, figs. 1–4.

Colonies attaining 50–140 mm high, feather-shaped and dark brown-colored. Stem monosiphonic, unbranched, arising from tubular stolon and divided into regular internodes, each internode with an apophysis and three nematothecae: two nematothecae on base of apophysis of hydrocladium and one on opposite side of it. Hydrocladium born on apophysis, arranged alternately on one plane, divided into regular internodes, each internode with one hydrotheca, one median inferior and a pair of laterals. Hydrotheca sac-shaped, with adcauline intrathecal septum in upper part but no intrathecal septum in lower part, and marginal teeth always present. Median inferior nematotheca tube-shaped, adnate to about 2/3 above length of abcauline wall, remainder free, with one opening at base of free part, one distal opening and one opening inward hydrotheca, commonly shorter than hydrotheca. Lateral nematothecae sac-shaped, shorter than hydrotheca, with one distal aperture extanding onto median surface. Cauline nematothecae gutter-shaped. Corbula closed form, transformed hydrocladium, consisting of short pedicel bearing one hydrotheca and three nematothecae at base, 8–14 paired corbula ribs, each rib bearing nematothecae along both edge.

Distribution: Cosmopolitan.
Korea: GN, JJ.
Specimen examined: GN: (Geojedo Gulbiseom: 9.vii.1996), JJ: (Daepo: 8.vii.1996).
Ecology: This species attaches on hard bottoms in waters about 10–30 m deep.

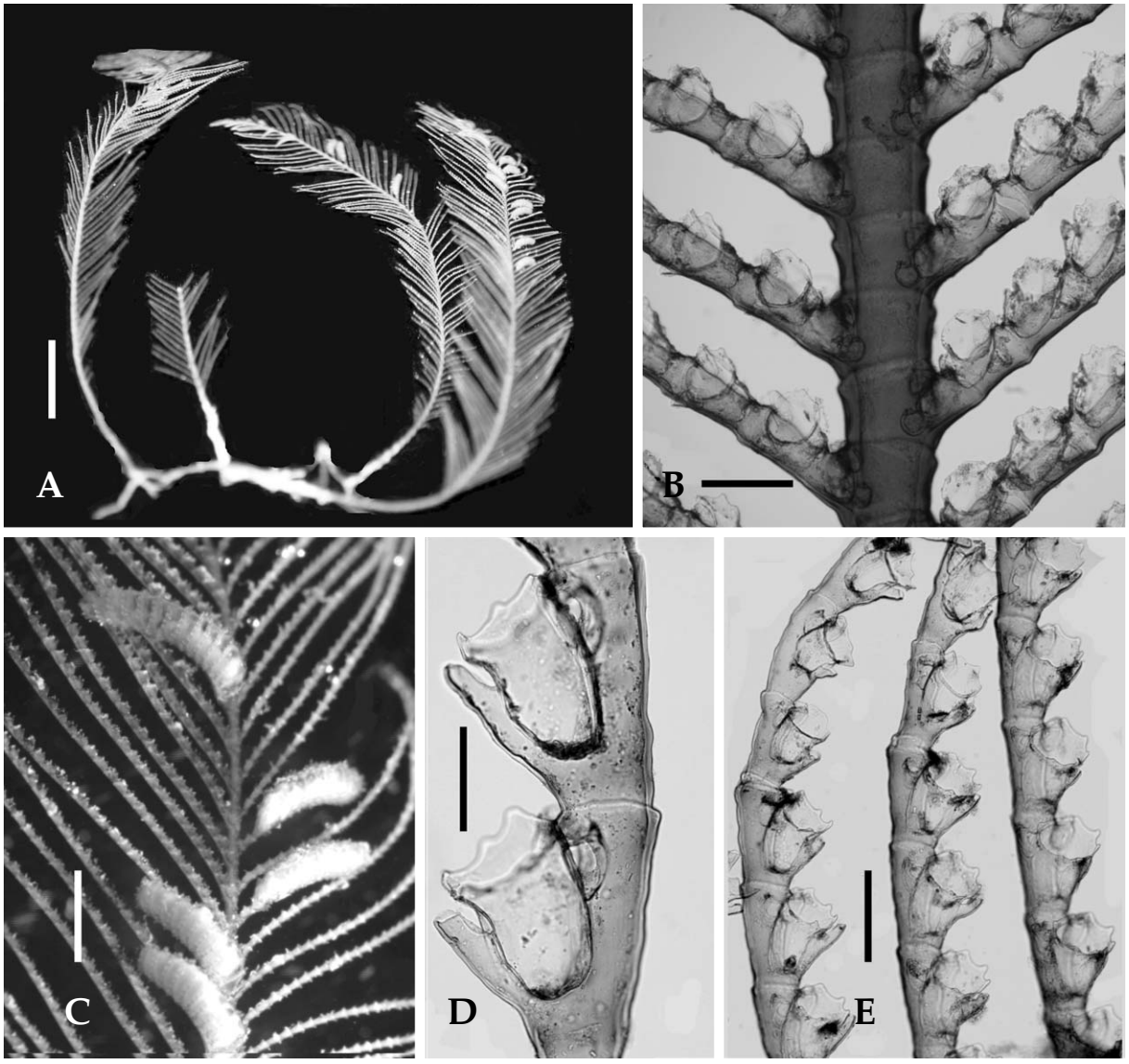

Fig. 86. *Aglaophenia pluma*. A. whole colonies; B. stem with hydrocladia; C. part of colony with gonothecae; D. hydrothecae; E. hydrocladia. Scales: A=5 mm, B, E=500 μm, C=1 mm, D=200 μm.

71. *Aglaophenia suensonii* Jäderholm, 1896 (Fig. 87)

Ju-bal-git-hi-deu-ra (주발깃히드라)

Aglaophenia suensonii Jäderholm, 1896, p. 18, pl. 2, fig. p; Stechow, 1913b, p. 101, figs. 71–74; 1923b, p. 20, no. 217; Rho, 1967, p. 350, fig. 12, pl. 1, fig. 4; 1969, p. 167; Kim and Rho, 1971, p. 10; Rho and Chang, 1972, p. 102.

Aglaophenia ijimai: Stechow, 1907, p. 197.

Aglaophenia suensoni: Bedot, 1925, p. 88; Yamada, 1959, p. 87; Hirohito, 1969, p. 24; 1995, p. 283, fig. 99a–c; Rho and Park, 1986, p. 105; Park, 1992, p. 296; 1993, p. 275; 1995, p. 15.

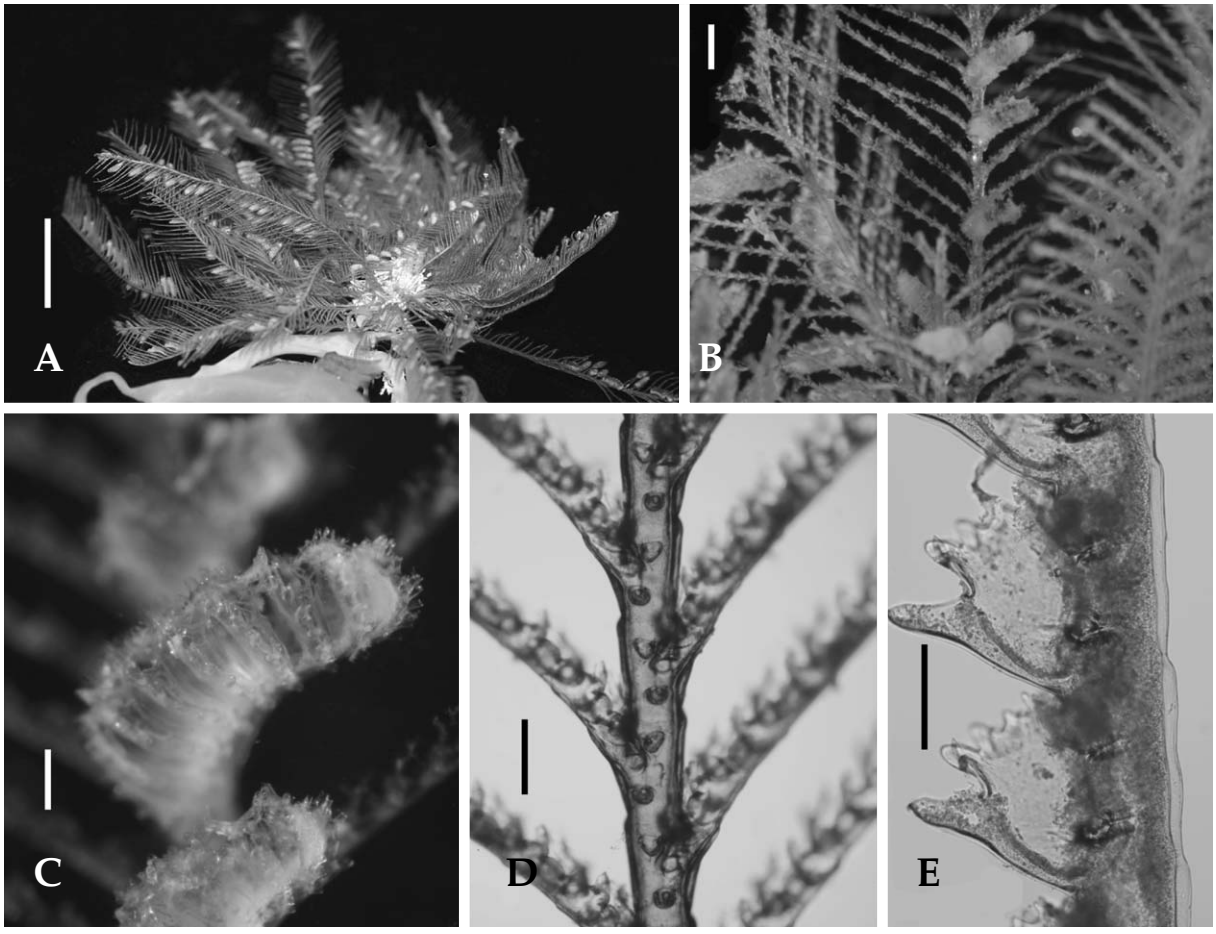

Fig. 87. *Aglaophenia suensonii*. A. colonies on alga; B. part of stem with corbulae; C. corbulae; D. part of stem with hydrocladia; E. hydrothecae. Scales: A=10 mm, B, C=1 mm, D=500 μm, E=200 μm.

Colonies feather-shaped, aggregately attached on stem and leaf of algae, dark brown or yellowish brown in color. Stem almost straight throughout, divided into regular internodes, each of which bears one hydrocladium at about median point. Hydrocladia alternate, homomerous, no single plane, toward anterior, so anterior and posterior sides of colony distinguished, and divided into regular internodes, each internode bearing one hydrotheca, one median inferior nematotheca and a pair of laterals. A pair of cauline nematothecae present at base of hydrocladium. Hydrothecae bowl or cup-shaped, adcauline wall completely adnate, margin broad, oblique to abcauline wall, with four pairs of acute teeth. Frontal tooth longer than others and slightly curved inward. Nematothecae one-chambered and immovable. Median inferior nematotheca adnate to abcauline wall below 2/3 its length and remainder free toward outside. Gonothecae borne on proxsimal of hydrocladia, protected by closed corbula consisting of about seven ribs, with one hydrotheca at its basal internode.

Distribution: Korea, Japan.
Korea: GB, GN, JN, JJ.

Specimen examined: GB: (Guryongpo: 2.xii.1970), GN: (Yokjido: 6.vii.1968; 5.vi.1978); (Haeundae: 11.v.1974); (Mipo: 15.vii.1974); (Chungmu: 19.vii.1978); (Haegeumgang: 22.vii.1978); (Samcheonpo: 20.vii.1984), JN: (Bangjukpo: 22.v.1967); (Jindo: 23.vii.1994), JJ: (Seogwipo: 11.vii.1965; 8.vii.1970; 24.xii.1971; 15.vii.1973; 5.viii.1974; 13.vii.1979; 12.iv.1982); (Sasudo: 8.viii.1969); (Jigwido: 9.ii.1971); (Wimi-ri: 8.vii.1972); (Beomseom: 8.viii.1970); (Saeseom: 13.xii.1969); (Supseom: 6.ii.1971); (Munseom: 30.vi.1993); (Daepo: 6.i.1985).

Ecology: This species aggregately attaches on algae in waters about 1-40 m deep.

72. *Aglaophenia whiteleggei* Bale, 1888 (Fig. 88)

Huin-git-hi-deu-ra (흰깃히드라)

Aglaophenia whiteieggei Bale, 1888, p. 794, pl. 21, fig. 8; Stechow, 1913b, p. 99, text-figs. 68–70; 1923b, p. 20; Stechow and Uchida, 1931, p. 568, pl. 15, fig. 7; Kamita and Sato, 1941, p. 2; Yamada, 1958, p. 62; 1959, p. 87; Ito and Inoue, 1962, p. 87, pl. 9, figs. 94, 95; Rho, 1969, p. 168, text-figs. 8, 9, pl. 2, figs. 9, 10; Rho and Chang, 1972, p. 103; 1974, p. 146; Rho and Park, 1986, p. 105; Park, 1990, p. 85; 1993, p. 275; 1995, p. 15; 1997, p. 150; Hirohito, 1995, p. 286, fig. 99d–f.

Stem fascicled or unfascicled, dark brown-colored, giving rise to branches and hydrocladia irregularly, divided into regular internodes. Two cauline nematothecae present on each internode. Branches divided into regular internodes, each internode bearing an apophysis for hydrocladium, two nematothecae and two tranverse cauline septa. Hydrocladia white-colored, curved toward to outside and divided into regular internodes. Each internode of hydrocladium bearing one hydrotheca, one median inferior and a pair of laterals. Hydrothecae all lining up on same side, deep sac-shaped, intrathecal septum developed inward hydrotheca from 1/3 below adcauline wall, tapering toward proximal and round at base, with an acute frontal tooth, two pairs of distal rounded lateral teeth. Median inferior nematothecae tube-shaped, longer than hydrotheca, free at 1/3 above of abcauline wall, and basal portion of free portion constricted, and middle portion of it swollen, with three apertures, one terminal, one lateral and one into hydrotheca. Lateral nematothecae tubular, adnate to margin of hydrotheca, curved toward axis, with one distal aperture and one lateral. Cauline nematotheca tubular. Corbula opened, consisting of about 17 ribs which bear nematothecae along both edges.

Distribution: Korea, Japan, Australia.

Korea: GB, GN, JN, CN, GG, JJ.

Specimen examined: GB: (Pohang: 27.x.1985); (Yeong-ilman: 26.xii.1974), GN: (Mijo-ri: 18.vii.1967); (Yokjido: 6.vii.1968); (Mipo: 10.v.1974; 17.iv.1976; 21.xi.1983); (Samcheonpo: 21.vii.1984), JN: (Nohwado: 21.vii.1981); (Yeusu: 8.viii.1973); (Jindo Jeopdo: 6.viii.1974); (Geumgaphaesuyokjang: 23.vii.1994); (Hongdo: 7.vii.1978); (Daedundo: 22.vii.1982), CN: (Biin: 25.vii.1971); (Cheollipo: 26.vii.1974), GG: (Deokjeokdo: 16.x.1985), JJ: (Hoenggando: 9.viii.1969); (Seogwipo: 8.viii.1970; 26.xii.1971; 22.v.1982); (Supseom: 8.ii.1971); (Munseom: 30.vi.1993); (Moseulpo: 18.vi.1985); (Udo: 15.vii.1973).

Ecology: This species attaches to inhabiting tubes of annelids, body surface of crustacean, rocks and seaweeds in waters coastal to about 30 m deep.

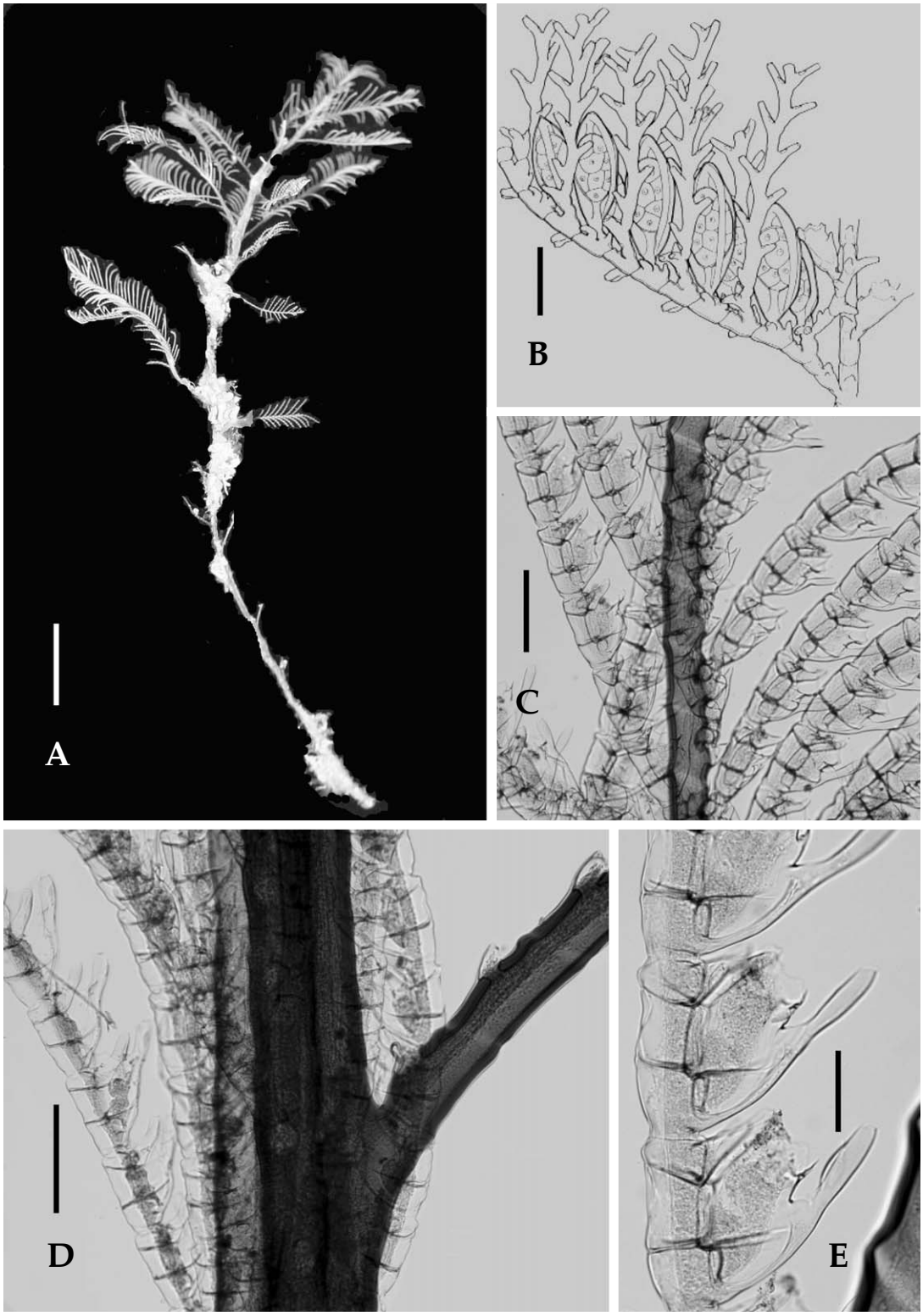

Fig. 88. *Aglaophenia whiteleggei*. A. whole colony; B. female opened corbula (cited from Hirohito, 1995); C. monosiphonic branch with hydrocladia; D. polysiphonic stem, branch and hydrocladia; E, hydrothecae. Scales: A=10 mm, B, C, D=500 μm, E=200 μm.

Genus *Gymnangium* Hincks, 1874

Min-sung-i-git-hi-deu-ra-sok (민숭이깃히드라속)

Halicornaria Allman, 1874.

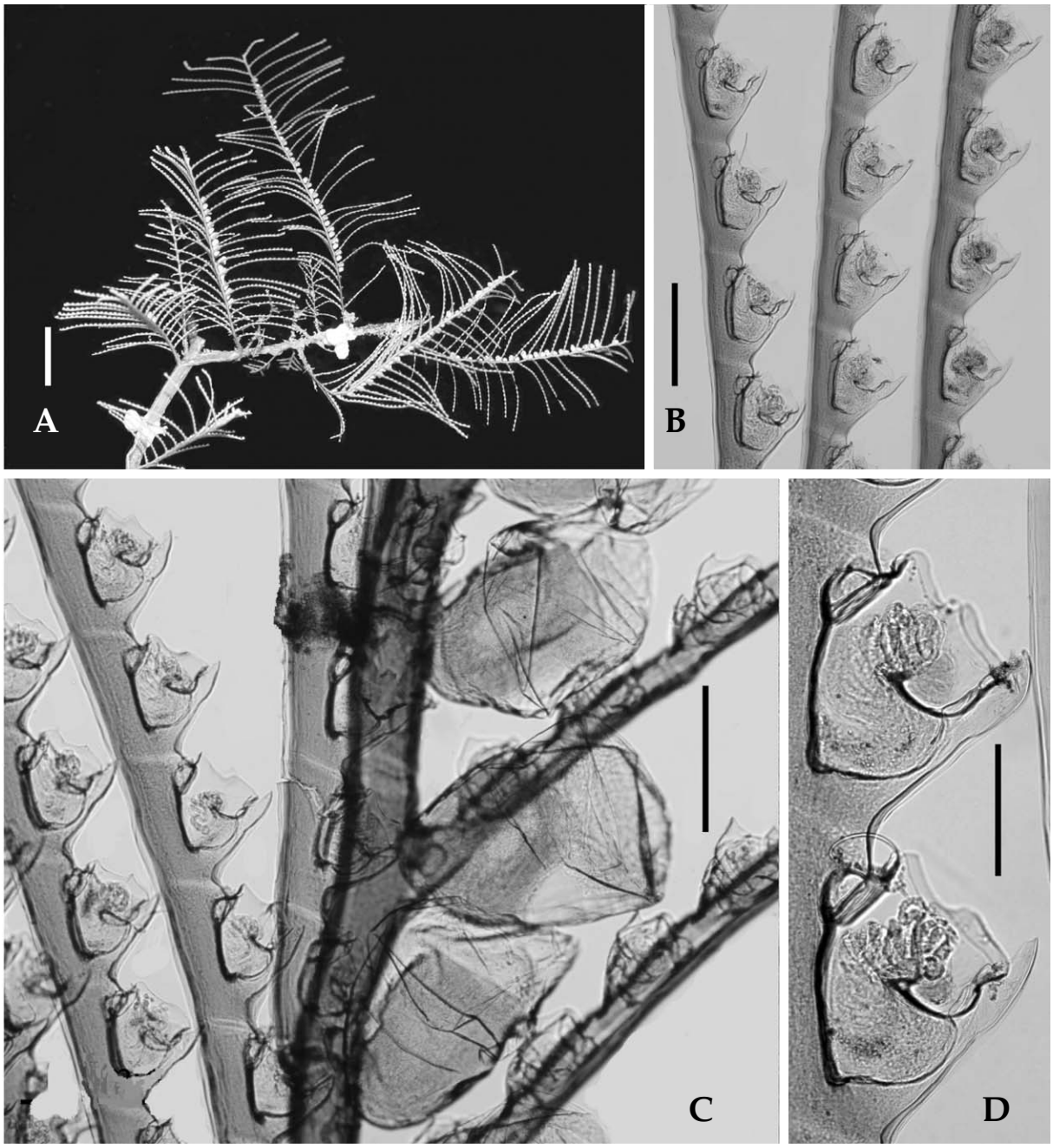

Fig. 89. *Gymnangium hians*. A. colonies; B. hydrocladia with hydrothecae; C. part of colony with gonothecae; D. hydrothecae. Scales: A=10 mm, B, C=500 μm, D=200 μm.

Stem branched or unbranched, giving rise to hydrocladia alternately. Hydrocladia unbranched. Hydrothecae cup- or flask-shaped, with toothed margin. Nematothecae with usually more than one apertures. Gonothecae arising from base of hydrocladia and unprotected.

Type species: *Aglaophenia pennatula* Hincks, 1868 (=*Halicornaria montaqui* Billard, 1912).

Species 50 (3 in Korea).

73. *Gymnangium hians* (Busk, 1852) (Fig. 89)

Min-sung-i-git-hi-deu-ra (민숭이깃히드라)

Plumularia hians Busk, 1852, p. 396.
Halicornaria hians: Stechow, 1907, p. 200; 1913b, p. 94, fig. 6; 1919, p. 125.
Gymnangium hians: Stechow, 1923b, p. 19; Uchida, 1956, p. 1648, fig. 4608; Yamada, 1958, p. 61; Rho, 1967, p. 346, fig. 6A, B; Rho and Chang, 1972, p. 101; 1974, p. 147; Millard, 1975, p. 444, fig. 134G, H; Rho and Park, 1986, p. 101; Park, 1992, p. 294; 1993, p. 273; Hirohito, 1995, p. 87, fig. 101a, b.

Stem unfascicled, divided into regular internodes, giving rise to hydrocladia alternately, each internode bearing one or two hydrocladial apophyses and three nematothecae. Hydrocladia divided into regular internodes, each internode with one hydrotheca, one median inferior nematotheca, a pair of laterals and one median suferior. Hydrothecae cup-shaped, abcauline intrathecal septum reaching about half way across, margin facing outwards and forming angle of 20–40° with hydrocladia, with three pairs of broad lateral teeth. Median inferior nematotheca in variable length, adnate to abcauline wall, overtopping thecal margin, with one oblong aperture extending along upper surface of free part, abcauline wall periderm thick. Lateral nematothecae sac-shaped, not reaching to thecal margin, with a wide terminal aperture. Cauline nematothecae similar to laterals. Gonothecae arising from hydrocladial apophysis, arranged in two rows on anterior surface, cup-shaped and truncated distally.

Distribution: Korea, Japan, China Sea, Australia, New Zealand, Indian Ocean.
Korea: GN, JJ.
Specimen examined: GN: (Mipo: 25.v.1981), JJ: (Seogwipo: 11.vii.1965; 7.viii.1970; 13.viii.1973; 22.v.1982); (Supseom: 6.ii.1971; 2.vii.1993); (Munseom: 13.vii.1985; 1.vii.1993); (Beomseom: 21.v.1982); (Jigwido: 9.ii.1971).
Ecology: This species attaches to stems of other hydroids in waters about 5–50 m deep.

Genus *Haliaria* Stechow, 1921

Ba-da-git-hi-deu-ra-sok (바다깃히드라속)

Aglaophenia Lamouroux, 1812 (in part).
Plumularia Lamarck, 1815 (in part).

Halicornaria Busk, 1852.

Hydrorhiza filamentous. Stem consisting of several tubes and twisted, giving rise to branches in its upper part. Hydrocladia alternate, arising from branches. Hydrothecae large with a chitinous frontal tooth. Median inferior nematotheca tubular, and laterals pear-shaped. Gonothecae unprotected, arising from branches or hydrocladia.
Type species: *Halicornaria vegae* Jäderholm, 1903.

Species (1 in Korea).

74. *Haliaria vegae* (Jäderholm, 1903) (Fig. 90)

Sing-mul-ba-da-git-hi-deu-ra (식물바다깃히드라)

Halicornaria vegae Jäderholm, 1903, p. 301, pl. 15, figs. 1–4; 1919, p. 26.
Haliaria vegae: Yamada, 1959, p. 83; Hirohito, 1995, p. 291, fig. 102c–e; Park, 2007, p. 54, fig. 4A–E.
Halicornaria twista: Rho and Park, 1984, p. 260, fig. 4.

Twisted and fascicled main stem arising from filamentous hydrohiza. Branches spirally arising from axial tube, simple, divided into regular internodes, each internode giving rise to hydrocladia alternately. Hydrocladia homomerous, divided into regular internodes, each internode with a large hydrotheca, one median inferior nematotheca and a pair of laterals. Hydrothecae deep cup-shaped, with an acute frontal toothed and sinuous margin. Abcauline wall slightly thick, adnate to hydrocladium for about 2/3 of its length. Intrathecal septum absent. Median inferior nematotheca tubular, reaching to about 2/5 below abcauline wall, adnate to abcauline wall and with two apertures distally, one wide and trumpet-shaped and oblique toward hydrotheca, and one small, smooth margin and oblique toward outside. Lateral nematothecae pear-shaped, not reaching to thecal margin, with two apertures, one oblique toward hydrocladium and one toward distally. Gonothecae unprotected, arising from base of hydrocladia, deep cup-shaped, with smooth margin.

Distribution: Korea, Japan.
Korea: GN, JJ.
Specimen examined: GN: (Busanhang: 12.xi.1977), JJ: (Seogwipo: 15.xii.1969; 15.iv.1974).
Ecology: This species set in muddy bottoms in waters about 10–20 m deep.

Genus *Lytocarpus* Allman, 1883

Pil-li-pin-git-hi-deu-ra-sok (필리핀깃히드라속)

Lytocarpia Stechow, 1919.

Stem fascicled and branched irregularly, giving rise to hydrocladia alternately. Hydrothecae cup-

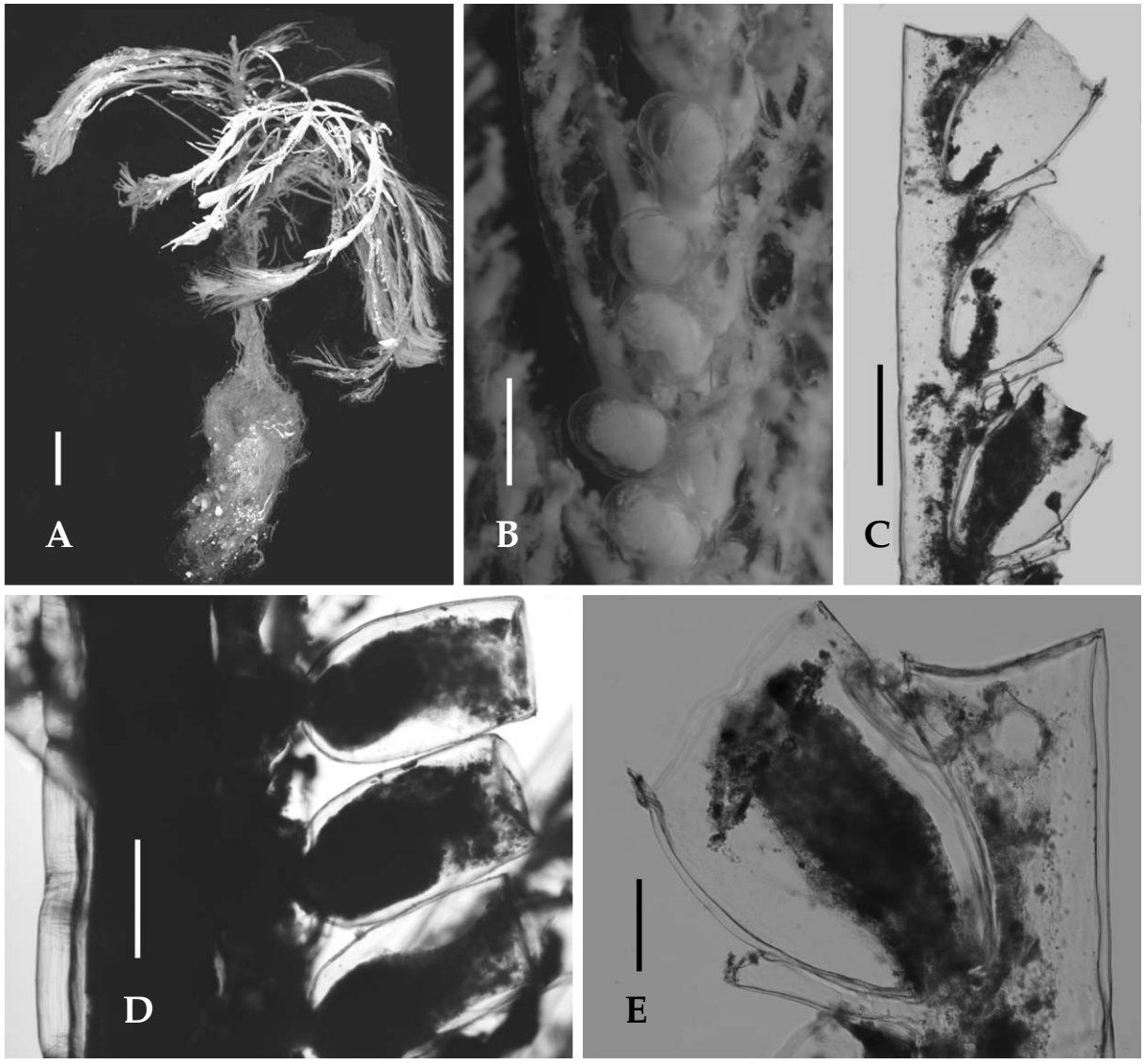

Fig. 90. *Haliaria vegae*. A. whole colony; B. part of stem with gonothecae; C. lateral view of hydrothecae; D. lateral view of gonothecae; E. hydrotheca. Scales: A=20 mm, B, C, D=500 μm, E=200 μm.

shaped, with always adcauline intrathecal septum and toothed margin. Median inferior nematotheca partially adnate to abcauline wall, then free toward outside, generally long and extending over thecal margin and with two apertures, one terminal and one into hydrotheca. Gonothecae protected by phylactocarps.

Type species: *Lytocarpus spectabilis* Allman, 1883=*Plumularia phoenicea* Busk, 1852.

Species 5 (1 in Korea).

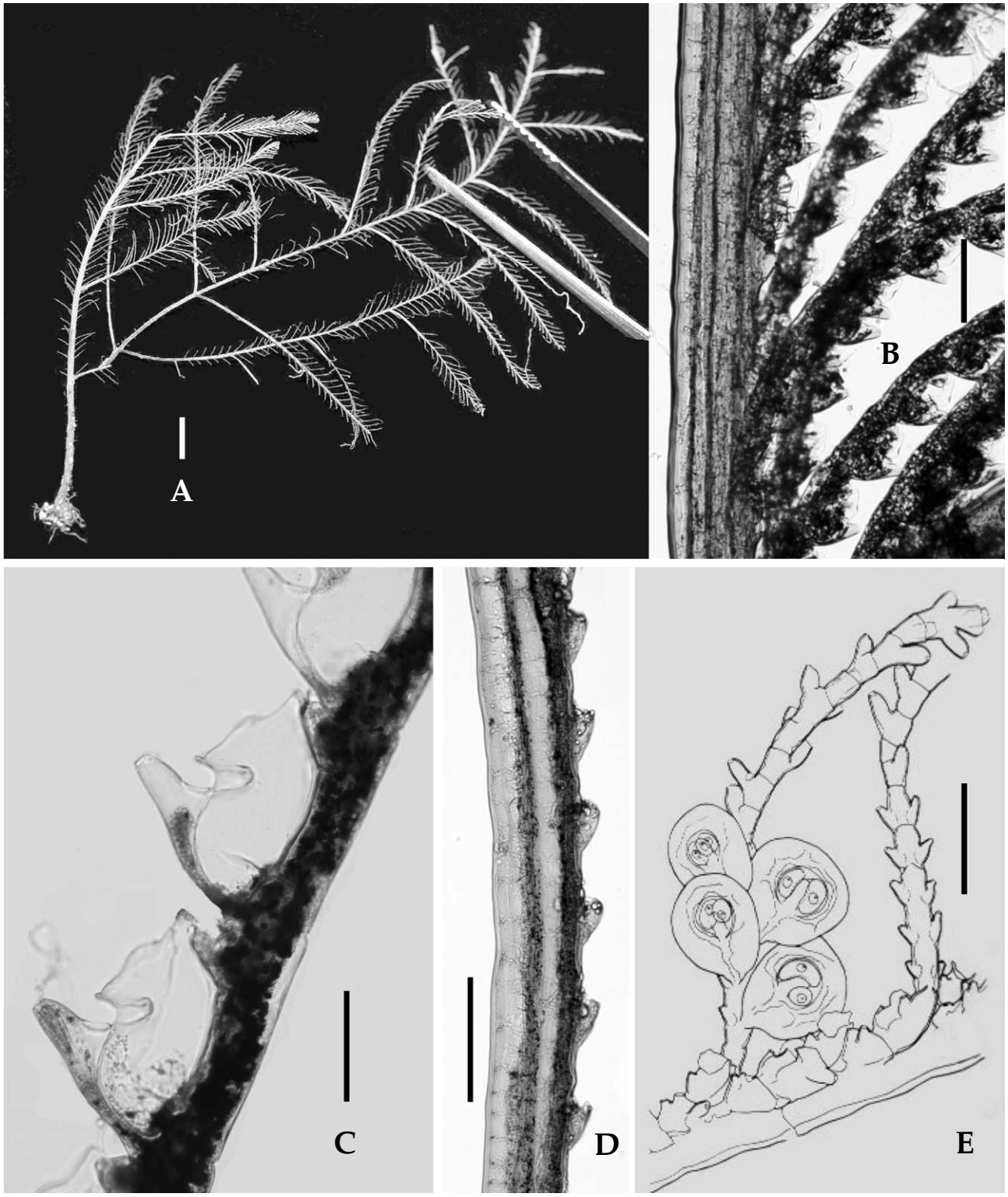

Fig. 91. *Lytocarpus philippinus*. A. colony; B. polysiphonic stem with hydrocladia; C. hydrothecae; D. basal portion of polysiphonic branch with nematothecae; E. phylactocarps with female gonophores (cited from Hirohito, 1995). Scales: A=10 mm, B, D, E=500 μm, C=200 μm.

75. *Lytocarpus philippinus* (Kirchenpauer, 1872) (Fig. 91)

Pil-li-pin-git-hi-deu-ra (필리핀깃히드라)

Aglaophenia philippinus Kirchenpauer, 1872, p. 45, pl. 1, fig. 26, pl. 2, fig, 26, pl. 7, fig. 26.
Lytocarpus philippinus: Vervoort, 1946, p. 329; Rho, 1969, p. 165, text-figs. 5, 6, pl. 1, fig. 6, pl. 2, fig. 8; Kim and Rho, 1971, p. 10; Rho and Chang, 1972, p. 101; 1974, p. 147; Millard, 1975, p. 449, fig. 138A–C; Rho and Park, 1986, p. 104; Park, 1992, p. 296; 1993, p. 275.
Macrorhynchia philippina: Hirohito, 1995, p. 297, fig. 105d–g; Agis et al., 2001, p. 100, fig. 46a–c.

Colonies large, attaining to 200 mm high. Stem and branches fascicled, dark brown color. Main stem branched irregularly and branches rebranched. Hydrocladia arising from axial tube of stem and branches alternately, short, oblique toward distal, divided into regular internodes, each internode bearing one hydrotheca, one median inferior nematotheca and a pair of laterals. Hydrothecae relatively large, vase-shaped, abcauline wall contracted into hydrotheca and forming thecal neck, adcauline wall entirely adnate to hydrocladium. Abcauline wall periderm thick. Median inferior nematotheca adnate to abcauline wall for about 2/3 length, then free, reaching to over thecal margin, with three apertures, one terminal, one on base of free part and one into hydrotheca. Lateral nematothecae tubular, extending over hydrotheca, and two apertures, one terminal and one middle portion. Cauline nematothecae conical, with two apertures, one distal and one lateral. Gonothecae arising from base of phylactocarp, relatively large and round, with a short pedicel. Phylactocarp bearing one hydrotheca at base and one thecate internode.

Distribution: Circumglobal in tropical and subtropical waters.
Korea: JJ.
Specimen examined: JJ: (Jejuhang: 11.vii.1965); (Seogwipo: 8.viii.1970; 6.ii.1971; 13.iv.1975); (Munseom: 21.v.1982; 13.vii.1985; 30.vi.1993).
Ecology: This species inhabits in waters about 5–35 m deep.

Genus *Macrorhynchia* Kirchenpauer, 1872

Ja-saek-git-hi-deu-ra-sok (자색깃히드라속)

Lytocarpus Allman, 1883; Millard, 1975.

Colonies branched in one plane, fan-shaped. Abcauline wall constricted strongly and bent outside, with abcauline intrathecal septum. Gonothecae round and protected by phylactocarps. Pseudocorbula formed with phylactocarps, modified hydrocladia.
Type species: *Macrorhynchia savignyana* Kirchenpauer, 1872.

Species 22 (1 in Korea).

76. *Macrorhynchia phoenicea* (Busk, 1852) (Fig. 92)

Ja-saek-git-hi-deu-ra (자색깃히드라)

Plumularia phoenicea Busk, 1852, p. 398.
Aglaophenia phoenicea: Bale, 1888, p. 159, pl. 15, figs. 1–5, pl. 17, figs. 1–4, pl. 19, fig. 31.
Lytocarpus phoeniceus: Stechow, 1907, p. 200; Stechow, 1913b, p. 95, figs. 62–64; Leloup, 1938, p. 21; Vervoort, 1946, p. 328.
Macrorhynchia phoenicea: Yamada, 1958, p. 62; Uchida, 1956, p. 1645, fig. 4609; Rho, 1967, p. 347, fig. 8; Kim and Rho, 1971, p. 10; Rho and Chang, 1972, p. 102; 1974, p. 47; Rho and Park, 1986, p. 102; Park, 1993, p. 274; Hirohito, 1995, p. 299, fig. 106a–e.

Stem fascicled and branched, giving rise to hydroladia from axial tube in one plane, reaching to

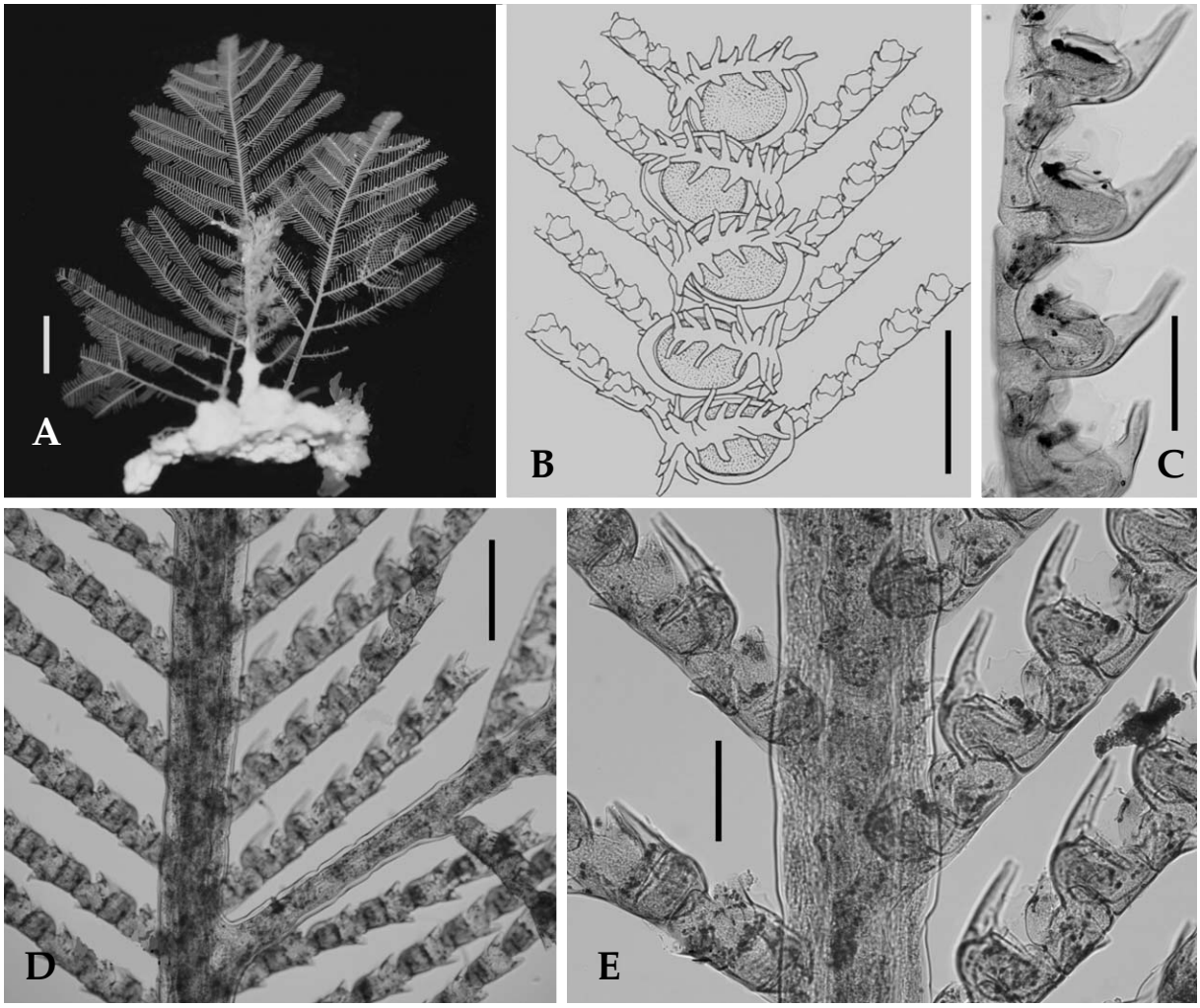

Fig. 92. *Macrorhynchia phoenicea*. A. colonies; B. part of stem with gonothecae (cited from Hirohito, 1995); C. hydrothecae; D. part of branch with second branch; E. part of stem with hydrocladia. Scales: A=10 mm, B=1 mm, C, E=200 μm, D=500 μm.

about 40–50 mm high. Branches arising from peripheral tube in subopposite, fascicled, with median nematothecae at base and hydrocladia from upper part. Hydrocladia arranged in two rows and divided into regular thecate internodes. Hydrothecae cup-shaped, bent toward outside, with abcauline intrathecal septum, margin forming angle of about 30° with hydrocladium, with 1–2 pairs of broad and low triangular lateral teeth and a small rouded lobe on adcauline edge. Median inferior nematotheca adnate to abcauline intrathecal septum, then free which bent toward hydrotheca, usually overtopping thecal margin, with three openings, one distal, one on surface of free part and one into hydrotheca. Lateral nematothecae tubular, reaching over hydrotheca, with two apertures, one distal and one mesial. Cauline nematothecae sac-shaped, with two apertures terminal. Gonothecae lens-shaped, protected by pseudocorbula formed with phylactocarps. Phylactocarps consisting of a normal thecate internode and more than six athecate internodes which bear two or three nematothecae.

Distribution: Tropical Indo-Pacific, from the Pacific Ocean to the east coast of Africa.
Korea: GN, JJ.
Specimen examined: GN: (Mipo: 26.xi.1983), JJ: (Seogwipo: 11.vii.1965; 8.viii.1970; 19.x.1973; 13.xii.1979; 22.v.1982; 19.i.1985); (Jigwido: 9.ii.1971); (Beomseom: 8.ii.1971); (Supseom: 15.iv.1975; 2.vii.1993); (Munseom: 3.xii.1978; 1.vii.1993); (Jejuhang: 21.vi.1985); (Pyoseon: 9.x.1985); (Moseulpo: 18.vi.1985); (Udo: 7.x.1985); (Daepo: 16.i.1985).
Ecology: This species is attached on sponges and tunics of ascidians in waters about 5–30 m deep.

Genus *Thecocarpus* Nutting, 1900

Hyeop-git-hi-deu-ra-sok (협깃히드라속)

Litocarpia Kirchenpauer, 1872.

Stem branched or unbranched, giving rise to hydrocladia alternately. Hydrocladia unbranched. Hydrothecae deep sac-shaped, with always toothed margin. Median inferior nematotheca generally short. Gonothecae protected by closed corbula. Corbula ribs bearing nematothecae and a proximal hydrotheca.
Type species: *Sertularia myriophyllum* Linnaeus, 1758.

Species 2 (1 in Korea).

77. *Thecocarpus niger* Nutting, 1906 (Fig. 93)

Geom-jeong-git-hi-deu-ra (검정깃히드라)

Thecocarpus niger Nutting, 1905, p. 953, pl. 5, fig. 5, pl. 13, figs. 1–6; Stechow, 1907, p. 200; 1913b, p. 96, figs. 65–67; Rho and Park, 1986, p. 103; Park, 1993, p. 275.
Lytocarpia nigra: Stechow, 1923b, p. 20; Yamada, 1959, p. 86; Hirohito, 1995, p. 295, fig. 104c–e.

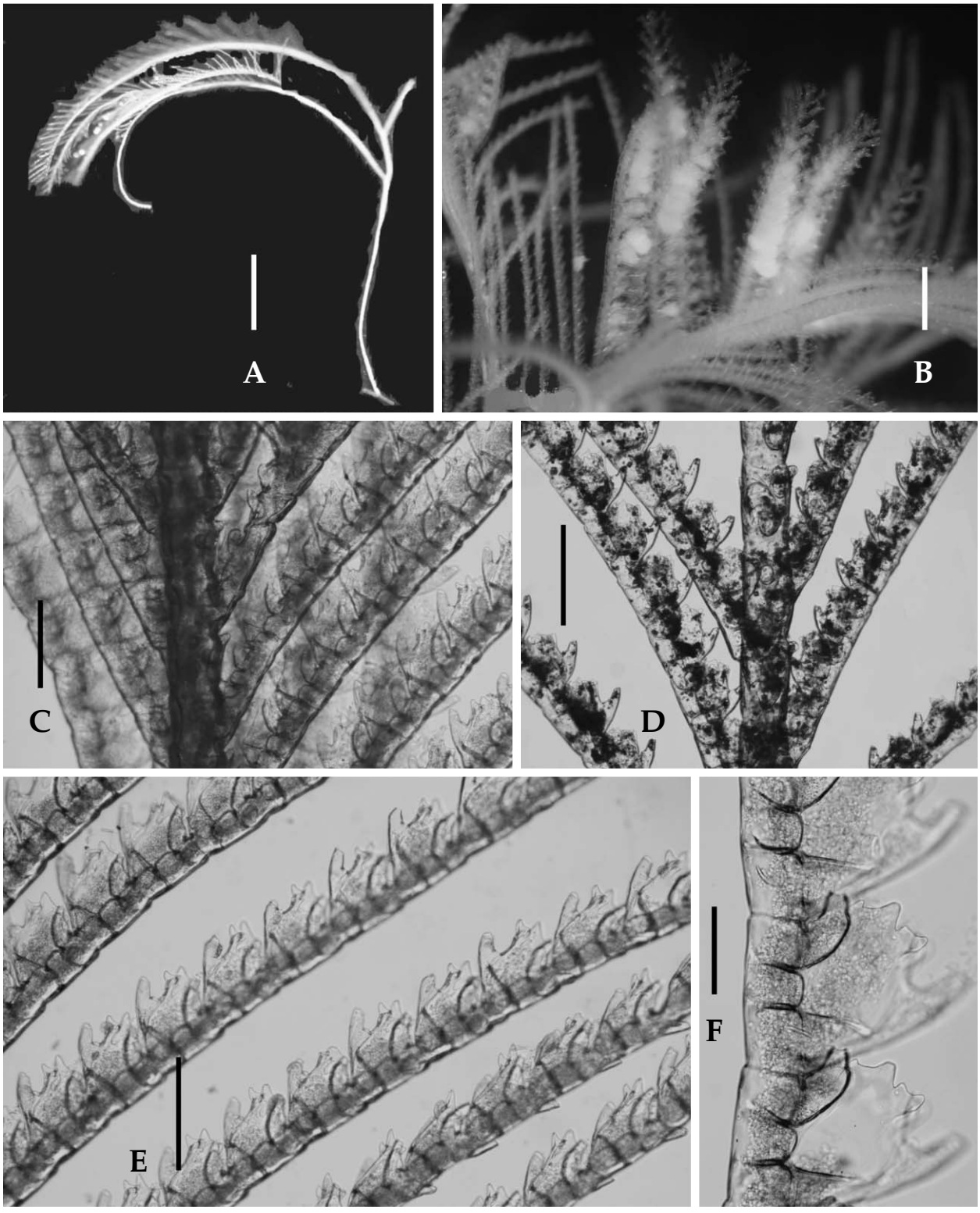

Fig. 93. *Thecocarpus niger*. A. part of colony; B. corbulae; C. part of polysiphonic stem with hydrocladia; D. part of monosiphonic stem with hydrocladia; E. hydrocladia with hydrothecae; F. hydrothecae. Scales: A=10 mm, B=1 mm, C, D, E=500 μm, F=200 μm.

Lytocarpia niger: Rho, 1967, p. 346, fig. 7A, B; pl. 1, fig. 1; Rho and Chang, 1972, p. 101; 1974, p. 147.

Colony blackish violet, large, about 200–250 mm high. Stem fascicled and branched irregularly. Branches rebranched and curved distally, divided into regular internodes, each internode bearing a hydrocladial apophysis and a pair of nematothecae on its base. Hydrocladia alternate, and divided into regular internodes, each internode with two septa, one hydrotheca, one median inferior and a pair of laterals. Hydrothecae all lining up on same side, deep sac-shaped, with narrow and round base and broad margin, intrathecal septum developed from below of adcauline wall and one frontal tooth and four pairs of lateral teeth. Median inferior tubular, not reaching to thecal margin, adnate to hydrotheca for 2/3 below of its length, then free, with three apertures, one terminal, one on surface of free portion and one into hydrotheca. Laterals tubular, bent toward axis, reaching to thecal margin and with two apertures. Corbula opened, ribs bearing nematothecae in two rows along both edges and one hydrotheca at base.

Distribution: Korea, Japan.
Korea: GB, GN, JB, JJ.
Specimen examined: GB: (Pohang: 19.i.1985), GN: (Samcheonpo: 20.vii.1984), JB: (Seonyudo: 16.vii.1966), JJ: (Seogwipo: 11.vii.1965; 12.iv.1965; 12.vii.1979; 22.v.1982); (Hallim: 8.vii.1965); (Moseulpo: 18.vi.1985); (Pyoseon: 9.x.1985); (Munseom: 30.vi.1993).
Ecology: This species inhabits in waters about 5–20 m deep.

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Index to Korean Names

ㅇ

ㅈ

ㅊ

ㅋ

ㅌ

ㅍ

ㅎ

Index to Korean Names as Pronounced

K

M

N

O

P

R

S

T

W

Y

Index to Scientific Names

L

M

N

O

P

R

S

T

Z

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