

A Systematic Study on the Ascidians from Cheju Island, Korea

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濟州島産 海鞘類(Ascidians)의 分類學的 研究

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적 요

제주도산 해초류의 분류학적 연구를 위해 1969년 12월부터 1989년 1월까지 제주도의 11개 지역(Fig.1.)에서 채집된 재료들을 동정, 분류하였고, 본 연구자에 의해 이미 보고된 것을 합하여 제주도산 해초류의 분류 목록을 작성하였다. 본 연구의 결과, 제주도산 해초류는 모두 10과 50종으로 밝혀졌고 이들 중 3종 (*Didemnum apersum*, *Didemnum translucidum*, *Botrylloides perspicuum*)은 한국 미기록종이었으며 10종은 제주도에서만 분포하는 종이였다. 한국 미기록종에 대해서는 기재를 하고 그림을 작성하였다.

지금까지 밝혀진 한국산 해초류 73종중, 제주도에서 분포하는 종은 50종(68%)으로서 전체 종의 반이상을 차지하였고, 이들을 수성별로 보면 냉수종이 1종(2%), 냉온수종이 7종(14%), 난온수종이 38종(76%), 열대수종이 4종(8%)으로서 많은 종이 난온수종으로 나타났다.

Key words: Systematics, Ascidians, Cheju Isl., Korea.

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INTRODUCTION

With regard to the systematic study of Korean ascidians, the first recorded species, *Styela clava* from Incheon Bay, was reported by Kamita and Sato in 1941. After that, Rho (one of the authors of this study) recorded seven species of ascidians around Cheju Island in her report "Taxonomic study on the Prochordates from Korea." Rho (1967, 1968, 1970, 1971, 1975) and Rho and Huh (1984) reported seventy species in eleven families in a series of reports. Among these species, thirty nine species in nine families were found in the waters around Cheju Island. But up to now there has not been and study focused specifically on the ascidians around Cheju Island.

Cheju Island is a large island located at the southern tip of the Korean peninsula. The annual water temperature is between 17.7C and 18.7C. Compared with the water temperatures around the eastern and western coasts of Korea, the water temperature around Cheju Island is quite warm. The waters off Cheju Island are expected to have many warm temperate water species of ascidians as well as some cold water species and tropical water species because the water currents around Cheju Island is affected by the Tsushima warm current, which is a branch of the Kuroshio warm water current.

The object of this project is to study the classification and distribution of ascidian in the water off Cheju Island as one of the monographic studies of Korean plants and animals.

MATERIALS AND METHODS

The materials identified were collected from the surfaces of the rocks, piers, seaweeds, SCUBA and other objects in the intertidal and subtidal zones. The specimens were collected from 11 localities (Fig. 1) in Cheju Island from December 1969 to January 1989. The collected materials were narcotized with menthol and then preserved in about 5% neutral formalin or 95% alcohol. To observe the internal structure of the animal, they should be kept in the solution which was composed of 1% chromic acid and 50% acetic acid in the ratio 1:10 for a day and then they were replaced into the solution of 1% chromic acid for a few hours before dissecting and halves dissected were observed under the binocular dissecting microscope. The collected materials are deposited in the Department of Biology, Ewha Womans University, Seoul, Korea. The system of classification in this study was done by referring to Tokioka (1953, 1960) and Kott (1985).

For the purpose of observing the spicules of Didemnidae more in detail, the spicules were gold-coated with ion sputter (JFC-1100) at 1.0KV, 50mA during 10 minutes and photographed with JSM 35CF-type scanning electron microscope.

SYSTEMATIC ACCOUNT

The following systematic account of the ascidian fauna in Cheju Island includes all the species of ascidians which are newly examined in this study and in previous works. The species marked with three

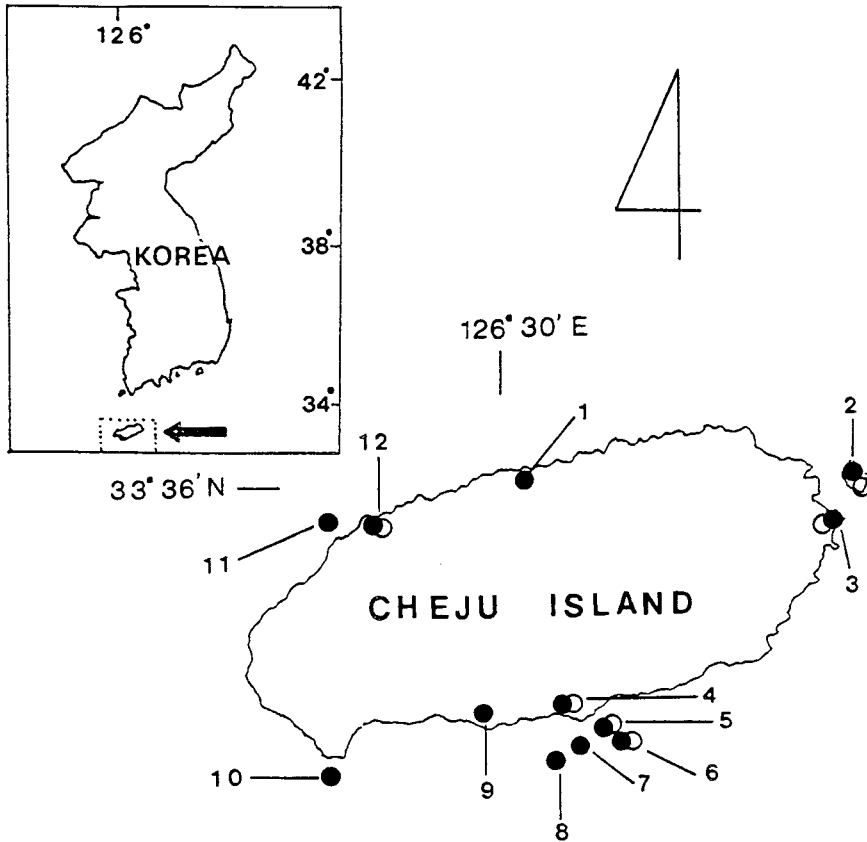


Fig. 1. A map showing the localities where the specimens were collected. 1, Cheju (濟州); 2, Udo (牛島); 3, Söngsanp'o (城山浦); 4, Sögwip'o (西歸浦); 5, Supsöm (숲섬); 6, Chigwido (地歸島); 7, Munsöm (문섬); 8, Pömsöm (범섬); 9, Taep'o (大浦); 10, Kap'ado (加波島); 11, Piyangdo (飛揚島); 12, Hallim (翰林).

(○: localities recorded in the previous papers ●: localities examined during the present research period.)

asterisks(***) are newly reported from Korea, the ones with two asterisks(**) are reported only in Cheju Island and the ones with one asterisk(*) are not recorded by the present work but recorded by previous works in Cheju Island.

About several recorded species the remarks are given along with location of the material examined.

Class Ascidiacea	해초 강
Order Enterogona Perrier, 1989	내성해초 목
Suborder Aplousobranchiata Lahille, 1886	무관 아목
Family Policlinidae Verrill, 1871	만두멍게 과

1. **Amaroucium multiplicatum* Sluiter, 1909 주름만두멍게
 Sögwip'o (Rho & Huh, 1984).

2. *Amaroucium yamazii* Tokioka, 1949 야마지만두멍게
Sögwip'ö (Rho & Huh, 1984).

3. *Amaroucium glabrum* Verrill, 1871 미끈만두멍게
Sögwip'ö (Rho & Huh, 1984).

4. *Amaroucium pliciferum* Redikorzev, 1927 만두멍게
Hallim (Rho, 1966; Rho, 1967); Sögwip'ö (Rho & Huh, 1984); Udo (Rho & Huh, 1984).
Material examined: Sögwip'ö, Dec. 10, 1969(B.J. Rho); Sögwip'ö, Jul. 21, 1970 (Korea uni.); Sögwip'ö, Apr. 13, 1975 (B.J. Rho & J.I. Song); Sögwip'ö, Feb. 16, 1976 (B.J. Rho & J.I. Song); Sögwip'ö, May 21, 1982 (J.I. Song); Söngsanp'ö, Jul. 13, 1979 (B.J. Rho & S. Shin).

Remarks: The specimens from Sögwip'ö are red in color. Zooid may reach 13-18mm in length. Stigmatal rows are 12~15 with 10~12 stigmata in each row. Anus situated on the level of the 6-7th transverse vessel. The present specimens differ from Tokioka's specimens (1953) in terms of the number of the longitudinal plications on the stomach (less than 20) and size of larva (570~600 μ in length).

5. *Amaroucium translucidum* Ritter, 1901 투명만두멍게
Sögwip'ö (Rho & Huh, 1984).

6. *Synoicum pulmonaria* Ellis & Solander, 1786 폐공생만두멍게
Sögwip'ö (Rho & Huh, 1984).

Material examined: Munsööm, Dec. 28, 1987 (H.S. Han).

Remarks: Club-shaped colonies attached to small base and color is yellowish white. Zooid is nearly transparent and attains 5~9mm in length. Thorax attains 1.7~2mm and abdomen is about half as long as the thorax while postabdomen is longer than thorax and abdomen measured together. Ovary is situated just below the intestinal loop and contains up to 5 ovums. Among five ovums, especially one is large. Larvae are small.

7. *Policlimum saturnium* Savigny, 1816 회색만두멍게
Hallim (Rho, 1966; Rho, 1971).

Family Didemnidae Verrill, 1871 흰덩이멍게 과

8. *Dedemnum moseleyi* Herdman, 1886 흰덩이멍게 (Pl. I. A, B)
Sögwip'ö (Rho, 1975), Chigwido (Rho & Huh, 1984), Udo(Rho & Huh, 1984).

Material examined: Sögwip'ö, Aug.2, 1970(B.J. Rho); Sögwip'ö, Jul. 15, 1973 (B.J. Rho); Sögwip'ö, Feb. 16, 1976(B.J. Rho); Sögwip'ö, Jul. 11, 1978 (B.J. Rho); Sögwip'ö, Jul. 12, 1979(J.I. Song); Sögwip'ö, May.21, 1982(J.I. Song); Sögwip'ö, Jul. 13, 1987 (J.I. Song); Sögwip'ö, Dec.8, 1988(J.W. Lee & J.E. Lee); Piyangdo, Jun. 19, 1985 (B.J. Rho); Piyangdo, Feb. 6, 1986 (J.W. Lee); Piyangdo, Dec. 11, 1988 (J.E. Lee); Udo, Jul. 12, 1979(J.I. Song); Udo, Oct.7, 1985 (J.H. Park); Munsööm, Jul. 13, 1985 (J.I. Song); Munsööm, Jan. 14, 1989 (H.S. Han); Söngsanp'ö, Jul. 9, 1986 (J.I. Song); Taep'ö, Dec.10, 1988 (J.E. Lee); Kap'ado, Jun. 16, 1985 (B.J. Rho).

Remarks: The zooids are generally 1mm in Söngsanp'ö specimen (9/VII/1986). The thorax of the zooid reaches 650 μ in expanded state and the abdomen is 450 μ in length. Spicules mostly 25-30 μ in diameter. Proximal portion of vas deferens 7-8 coiled. Larva very large, about 700 μ in length.

9. ****Didemnum apersum* Tokioka, 1953 돌기 흰덩이멍게 (신칭) (Fig. 2. a-c. Pl. I. C, D)
Didemnum apersum Tokioka, 1953 (pp. 190-191, pl. 19, figs. 1-7); 1955 (pp. 205~206, pl.11, figs. F & G); Kott & Goodbody, 1980 (pp. 515-517, fig. 5, pl. 2a).

Material examined: Sögwip'o, Aug. 7, 1970 (B.J. Rho), 2 colonies; Sögwip'o, Jul. 12, 1979 (B.J. Rho), 1 colony.

Description: Two colonies are 40mm × 15mm, 30mm × 15mm in extent and 1.5mm in thickness with encrusting leaves of *Sargassum*. The colonies are completely white in color. The surface of colony is covered with many small finger-shaped hollow protuberances, while remaining part is plain. Spicules are densely present in the surface but absent on the bottom layer. The branchial aperture is not conspicuous and common cloacal aperture is absent in the colony. Spicules are rather small and about 20-30 μ in diameter. The zooids are small, the thorax is only 450 μ and the abdomen is 420 μ . Stigmatal rows are 4. But it is difficult to determine the number at each row in the contracted thorax. Thorax has rather thick retractor muscle in posterior part. Larvae are present in the basal test and measure 580-600 μ in the length of trunk. The structure of larva resembles that of larva *D. moseleyi*. There is a single testicular follicle and proximal portion of vas deferens coils 6-7 times. Stomach is small and rounded. Intestinal loop consists of a few tubular organs and is slightly twisted.

Remarks: The present specimen conforms well to the type specimen (Tokioka, 1953) in case of feature of spicules, finger-shaped protuberances and structure and size of larva. But it differs from the facts that zooids are smaller in the present specimen and small thorax bud and abdomen bud are inserted in mother individual. This specimen differs from *Didemnum siphonale* by Tokioka(1967) in spicules size and the existence of the short common cloacal siphon. These specimens are similar to Kott's & Goodbody's (1980) except that in the former fan-shaped lateral organ is absent and its larva size is larger than the latter. This species is new to Korean waters.

Distribution: Korea (Cheju Is.); Japan(Sagami Bay); Hongkong; East China sea; North Pock.

10. ****Didemnum translucidum* Tokioka, 1953 투명 흰덩이멍게 (신칭) (Fig. 2. d-e. Pl. II. A, B)
Didemnum translucidum Tokioka, 1953, (pp. 189~190, pl. 18, figs. 5-7); 1962b (pp. 268~270, text-fig. 5).

Material examined: Munsö, Jul. 13, 1985 (J.I. Song), I Colony.

Description: The colony reaches 22mm × 18mm in extent and about 3mm in thickness. System is indistinct but some places of the colony are aggregated to form small masses. The surface of colony is smooth, gelatinous and bottom layer mixed up hydroids, sea weeds etc. Spicules are distributed evenly throughout the test from surface to bottom. They are very small and most of them are composed of needles, but some are composed of short and thick rays. Spicules may reach 15~19 μ and minimal diameter is 10 μ . The thorax of zooid is up to 500~550 μ , abdomen is rather small. There are 6~8 coils of the vas deferens around the single male follicle. The trunks of larvae are about 650~700 μ long and very advanced. Three cup-shaped adhesive papillae arranged linearly and four pairs of bulbs in the anterior part.

Remarks: The colony, spicules and zooid resemble those previously described from Sagami Bay (Tokioka, 1953). The present specimens have larvae which are fully matured, while those of Tokioka's (1953, 1962) are lacking in larvae or only with immature forms. This species is new to Korean waters.

Distribution: Korea (Cheju Is.); Japan(Hatakezima, Kil, Sagami Bay).

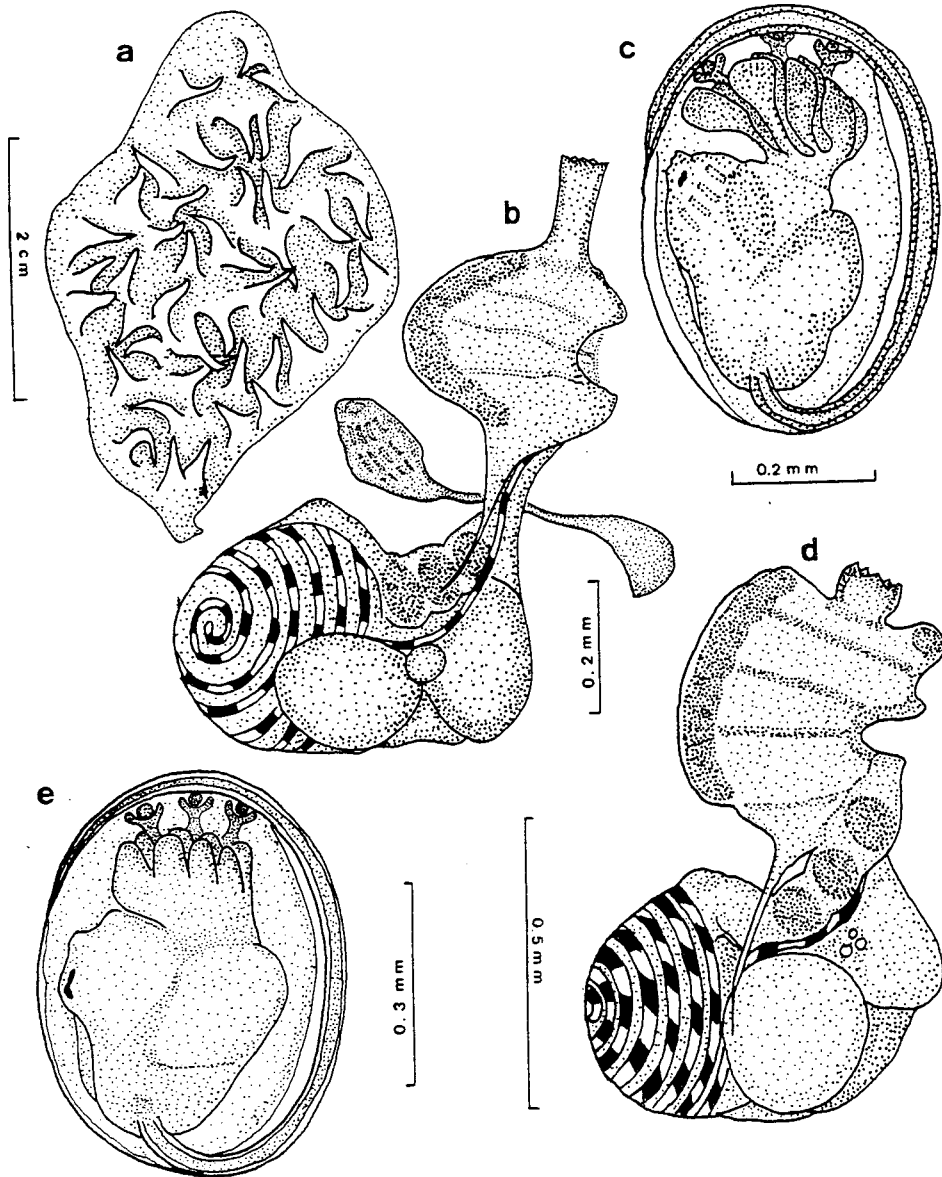


Fig. 2. *Didemnum apersum* a-c: a, surface of the colony with arranged protuberances; b, left side of zooid; c, larva. *Didemnum translucidum* Tokioka, 1953. d-e: d, left side of zooid; e, larva.

11. *Leptocliniðes madara* Tokioka, 1953 얼룩무늬멍게

Sõgwip'õ (Rho, 1975), Udo(Rho & Huh, 1984).

Material examined: Supsõm (40 feet), Jan. 15, 1989(H.S. Han).

Remarks: The colony has 18mm × 10mm in extent and its color is light green. Zooid reaches 1.7mm in length, of which the abdomen reaches 700 μ in length. The size of spicules is 20~30 μ . The gonad is not developed. Stigmatal rows are 4 with 12~14 elongated stigmata in a row.

- 12. *Leptoclinides dubius*** Sluiter, 1909 의문열록무늬멍게 (Pl. II. C, D)
Sögwip'ö (Rho & Huh, 1984).

Material examined: Pömsöm, Jan. 17, 1985 (J.E. Seo).

Remarks: The present specimen is similar to that described by Miller (1975) in general appearance of the zooid and in the structure at most part of the body. The colony is about 40mm × 20mm in extent. The common cloacal cavity is small and branchial aperture is conspicuous. Test is yellowish brown in color. Zooid is about 1.5mm in length, thorax is about 0.9mm and semitransparent. Spicules are about 11 μ to 19 μ in diameter which are smaller than those described by Miller. Gonad is not found.

- 13. *Diplosoma macdonaldi*** Herdman, 1886 맥도날드이중멍게
Sögwip'ö (Rho & Huh, 1984).

Material examined: Udo, Oct. 7, 1985 (J.H. Park & J.E. Seo).

Remarks: Test is soft, gelatinous and semitransparent. Zooid is about 0.9mm in length, thorax is about 550 μ and abdomen is about 350 μ . This specimen resembles *Leptoclinum mitsukurii* (Tokioka, 1953) and *Diplosoma macdonaldi* (Eldredge, 1965) due to the gray-orange pigment at the surface of stomach and testis and the thorax bud and abdomen bud at all zooids. However, the size of this material is smaller than that of *Leptoclinum mitsukurii* and *Diplosoma macdonaldi*.

Family Policitoridae Michaelsen, 1924 회색곤봉멍게 과

- 14. *Eudistoma illotum*** Sluiter, 1898 일로툼멍게

Material examined: Munsöm, Jul. 13, 1985 (J.I. Song); Munsöm, Dec. 28, 1987 (H.S. Han).

Remarks: The colony is 18mm × 16mm × 30mm in extent. Generally 8-9 zooids are arranged around common cloacal aperture. Zooid is about nine to 10mm in length, thorax is about 1.5mm. The normal number of tentacles seems to be 11. Three rows of stigmata have about 16 longitudinal vessel. The larva is about 1.0mm long from the end of the papillae to the base of the tail. Zooids and larvae are smaller than those previously described by Rho (1967).

- 15. *Eudistoma viride*** Tokioka, 1955 푸른멍게

Material examined: Munsöm, Dec. 28, 1987 (H.S. Han).

Remarks: The colony has sea weeds embeded in the matrix. The zooids are from 2mm to 5mm long. The pigmentation of the zooids is dark blue-green and is confined to the region around the bases of the siphons. There are about 15~20 elongated stigmata in each of three rows. The present specimens resemble Tokioka's type specimens (1955).

- 16. *Sycozoa kanzasi*** Oka, 1930 무화과곤봉멍게
Sögwip'ö (Rho, 1975; Rho & Huh, 1984).

Suborder Phlebobranchiata Lahille, 1886 편새 아목

Family Cionidae Lahille, 1887 유령멍게 과

- 17. *Syndiazona chinensis*** Tokioka, 1955 지나버섯유령멍게
Sögwip'ö (Rho & Huh, 1984).

18. *****Syndiazona grandis*** Oka, 1926 버섯유령멍게
Sögwip'o (Rho, 1975).
19. ******Aphanibranchion japonicum*** Oka, 1906 민조름버섯멍게
Family Perophoridae Giard, 1872 주머니멍게 과
20. ****Perophora japonica*** Oka, 1927 주머니멍게
Sögwip'o (Rho, 1975); Sögwip'o (Rho & Huh, 1984).
Family Ascidiidae Herdman, 1880 대추멍게 과
21. ****Ascidia zygasima*** Tokioka, 1962 대추멍게
Sögwip'o (Rho, 1971).
22. ****Ascidia divisa*** Sluiter, 1898 갈래대추멍게
Sögwip'o (Rho & Huh, 1984).
23. ******Ascidia samea*** Oka, 1935 사메아대추멍게
Supšöm (Rho & Huh, 1984).
Family Rhodosomatidae Hartmeyer, 1908 안장멍게 과
24. *****Rhodosoma turcicum*** Savigny, 1816 칠면조안장멍게
Material examined: Piyangdo, Jun. 19, 1985(B.J. Rho).
Order Pleurogona Perrier, 1898 축성해초 목
Suborder Stolidobranchiata Lahille, 1886 강새 아목
Family Botryllidae Verrill, 1871 판멍게 과
25. ***Botryllus tuberatus*** Ritter et Forsyth, 1917 국화판멍게
Cheju (Rho, 1966); Sögwip'o (Rho, 1975).
Material examined: Sögwip'o, Jul. 13, 1979 (S.J. Yoon).
Remarks: Zooids are about 850 μ in length and 950 μ in width. In preservative, the zooids are dark red-brown and arranged regularly in stellate systems, each system contains of 6-8 zooids. Stomach with 8 longitudinal plications and coecum protrudes at the distal end.
26. ***Botryllus magnicoecus*** Hartmeyer, 1912 붉은판멍게
Söngsanp'o (Rho, 1966; Rho, 1971); Sögwip'o (Rho, 1975; Rho & Huh, 1984); Udo (Rho & Huh, 1984).
Material examined: Sögwip'o, Aug. 3, 1970 (B.J. Rho).
Remarks: The largest colony is 40mm x 40mm in extent and about 3mm in thickness. Test is soft, cartilaginous, and purple-gray in color. Atrial aperture cleft extends into anterior and posterior lobes, some of these are widely opening whose anterior border extends out into a languet of various size and length. The rows of stigmata are 11 on each side. Stomach has 11 longitudinal plications.

- 27. *Botryllus schlosseri*** Pallas, 1766 스크로세르판명계
Cheju (Rho, 1971).
Material examined: Sögwip'o, Apr. 13, 1975(B.J. Rho); Sögwip'o, Feb.5, 1976(J.I. Song).
Remarks: The colony from Sögwip'o (1975) is 35mm × 25mm in extent and 2mm in thickness. Eight to 15 zooids are grouped into a stellate or slightly elongated system. The surface of colony is covered with some sand. Zooid is about 1mm to 1.5mm in length. Atrial aperture has anterior and posterior lips, the former is considerably protruding into a short of languet in some species. There are usually 10 to 11 series of stigmata and 12 tentacles. The stomach has 10 or 11 plications at the cardiac end. Anus opens on the level of the 4-5th transverse vessel. Gonad unknown.
- 28. *Botrylloides violaceus*** Oka, 1927 보라판명계
Hallim (Rho, 1966; Rho, 1971; Rho, 1975); Söngsanp'o (Rho, 1966; Rho, 1971); Sögwip'o (Rho, 1975; Rho & Huh, 1984); Chigwido (Rho & Huh, 1984); Udo(Rho & Huh, 1984).
Material examined: Sögwip'o, Jul.14, 1973 (B.J. Rho); Sögwip'o, Apr.13, 1975(B.J. Rho); Sögwip'o, Feb.5, 1976 (B.J. Rho); Sögwip'o, Jul. 12, 1979 (S.J. Yoon); Sögwip'o, May 21, 1982(S.I. Song); Söngsanp'o, Jul. 12, 1979(S.J. Yoon); Piyangdo, Jun.19, 1985(B.J. Rho).
- 29. ****Botrylloides perspicuum*** Herdman, 1886 복숭아빛판명계 (신칭) (Fig. 3. a-c)
Botrylloides perspicuum Herdman, 1886 (pp. 45-48, pl.1, figs. 4-5, pl.3, figs. 9-14); Sluiter, 1904 (pp.101-102); Kott and Goodbody, 1980 (pp. 532-534, figs. 17, pl.5); Kott, 1985 (pp.278-279, fig. 135, pl. 6e-h).
Botrylloides niger: Michaelsen, 1918 (pp.45-46); 1919 (pp. 105-111).
Botrylloides leachii: Kott, 1972b (p.185); 1972d (p.253); 1976a (p.74).
Material examined: Munsöm, Jul. 13, 1985 (J.I. Song), 2 Colonies.
Description: The colonies are 55mm × 22mm × 4mm, 35mm × 26mm × 3mm in extent and encrusting of the shell. The test is rather firm, semitransparent and smooth. Ten to 20 zooids are always circular system and arranged in rows along the system's margin. These systems become elongate and finally long double-row systems extending parallel to one another, with large areas of zooid-free test in between. The colony consists of many bulbous heads containing vascular ampullae between circular systems. These ampullae are sometimes elongated and crowded in the border of the colony. In preservative, the test is colorless, but it has a dark purplish color in the body wall and in the terminal ampullae. Zooids are about 3mm to 3.5mm in length and less than 1mm in thickness. The atrial aperture is very large and broad, exposing a large part of the branchial sac. There are 8~16 branchial tentacles which have unequal size, placed alternately. There are 12~13 stigmatal rows on the left side and 13~15 on the right side, and about 17 stigmata per row. The stomach is large, trumpet-shaped and has 9~10 longitudinal plications. There is a very small pyloric caecum. The anal opening is exposed above the posterior of the atrial opening. There is a rounded or hemispherical testis at each side on the posterior end of the body and testis have 25~35 testicular follicles. Ovary is not found.
Remarks: The present are very similar to Kott's(1985) specimen in the appearance of the zooid, tentacles, stomach and testis. But, the zooids of these specimens are smaller than those of Kott's and the former have 12 to 15 stigmatal rows, the latter having 14 to 18 rows. This specimen resembles the type specimen by Herdman (1886) and Kott & Goodbody (1980) with respect to the terminal knobs of the vessels which are formed at the raised areas of the colony. But, the testis described by Kott & Goodbody

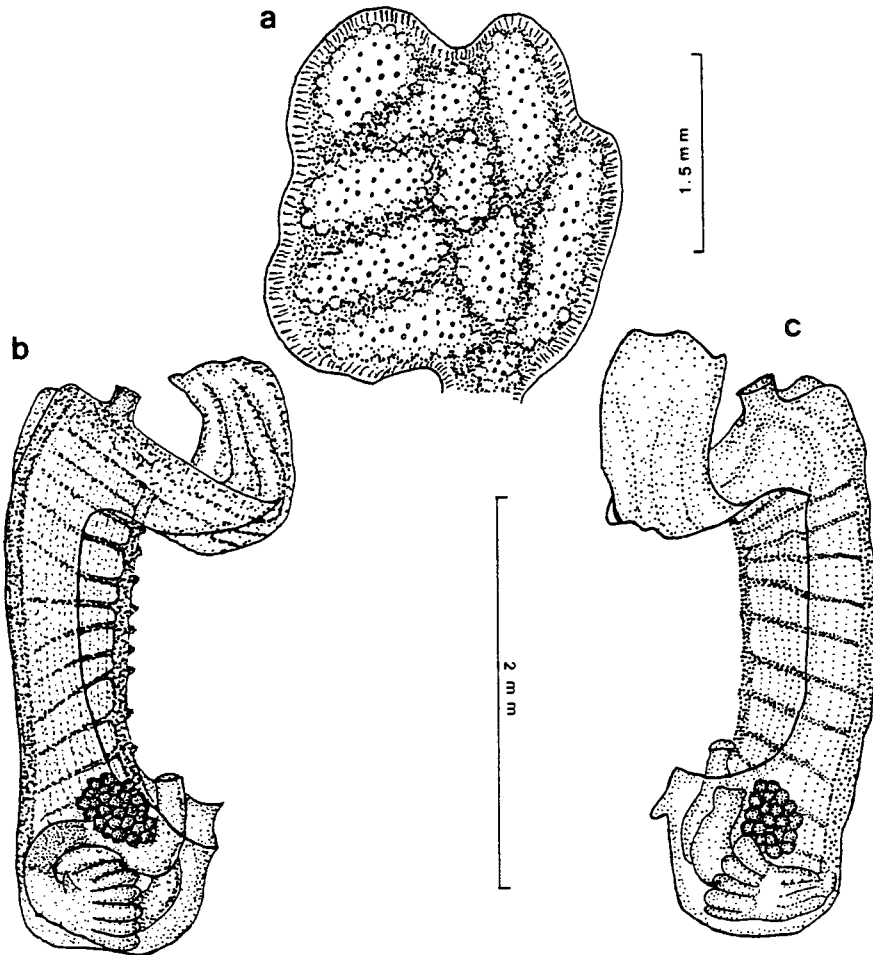


Fig. 3. *Botrylloides perspicuum*. a, surface view of colony; b, left side of zooid; c, right side of zooid.

(1980) has 8 lobers arranged in the form of a rosette. This material differs from those studied by Kott & Goodbody.

Distribution: Korea (Cheju Is.); Hong Kong (East Nine pines, Long ka Bay); Philippine Islands; East Indies; Australia; Tasmania Beach (Tinderbox); Victoria; New South Wales; Queensland; Indonesia; Red sea.

Family Styelidae Sluiter, 1985

미더덕 과

30. *Symplegma connectans* Tokioka, 1949 새공멍게

Material examined: Supsöm, Apr. 15, 1975 (B.J. Rho).

Remarks: The colony encrusting the stem of sea-weeds. Test is thin and transparent. Zooids are elliptical, and 1.5mm × 2.5mm in size. The intestinal loop is one half of the body length. Parastigmatal vessel is absent. Tentacles may reach 7 to 8. Rows of stigmata are 9 to 10 on the dorsal side and 11 on the ventral side. Stomach is composed of about 10~11 longitudinal folds on the surface which is smaller

than those specimens previously described by Rho & Huh (1984). A pair of gonads are developed in the anterior half of the body, each consists of a pair testicular lobes, but ovary is absent. The present specimens closely resembles *S.reptans* by Kott and Goodbody (1980).

31. *Symplegma japonica*** Tokioka, 1962 투명새공멍게

Sögwip'o (Rho & Huh, 1984).

Material examined: Sögwip'o, Aug.3, 1970(B.J. Rho); Udo, Jul.15, 1973 (B.J. Rho).

Remarks: The stigmatal rows are 8 on each side, and there are four inner longitudinal vessels in a row, and five elongated stigmata in single vessel. Stomach has about 20~22 longitudinal plications on the surface and there is a prominent pyloric coecum. Marked constriction is formed between the stomach and the intestine. The anus is opened on the dorsal side at the 5th transverse vessel. This specimen resembles most closely the specimen described by Rho & Huh (1984) in terms of the development of gonads.

32. *Plyzoa pacifica* Tokioka, 1951 태평양멍게

Material examined: Munsö, Dec.3, 1978(B.J. Rho).

Remarks: Bodies are 3.5mm~4mm in length and mantle is dark brown in color. Rows of stigmata are 13 on the left side, and 12 on the right side. They 7~8 inner longitudinal vessels are on the side with a slender parastigmatal vessel. The tentacles are 14, seven are large and others small. Stomach is large with 17~18 plications on the surface. The present species resembles those described by Rho(1970) in general appearance and structure of zooid.

33. *Polyza sagamiana* Tokioka, 1953 사가미멍게

Material examined: Hallim, Oct.9, 1987 (B.J. Rho & J.W. Lee).

Remarks: The colony encrusts the stem of sea-weeds and body is 2.5mm long. Mantle is vermilion in color. Brnchial sac has 8 inner longitudinal vessels on the left side and 7 on the right side. Stigmatal rows are 11~12 in number. Tentacles are 12, but some specimens have 13~14. Stomach is marked by 12~13 plications on the surface. Gonads on the right side which are composed of 6 small capsules while gonads on the left side are composed of 5.

34. *Polycarpa maculata*** Hartemeyer, 1906 점멍게

Sögwip'o (Rho, 1975; Rho & Huh, 1984).

Material examined: Sögwip'o, Jan. 16, 1985 (J.H. Park & J.E. Seo); Piyangdo, Jun. 20, 1985 (B.J. Rho).

Remarks: The specimens from Sögwip'o and Piyangdo are 20mm × 30mm, 40mm × 30mm in extent. Mantle is dark in color. Branchial sac has four folds are inner longitudinal vessels are arranged as follows in the 40mm long specimen (D = dorsal, V = ventral):

Left D 2 (12) 2 (16) 2 (17) 2 (14) 2 V

Right D 1 (11) 2 (13) 2 (15) 2 (13) 1 V

Seven to nine thinner transverse vessels inserted between thick ones, and 9~10stigmata in a mesh. Tentacles number 43. There are 24 gonads on the left side and 35 on the right side.

35. *Polycarpa dorderleini siranuhi*** Tokioka, 1960 시라누점멍게

Sögwip'o (Rho, 1975; Rho & Huh, 1984).

Material examined: Piyangdo, Feb. 5, 1986 (J.W. Lee & J.E. Seo); Piyangdo, Dec. 12, 1988 (J.E. Lee).

Remarks: The largest specimen (12/XII/1988) is 43mm in length, while the smallest one is 25mm in length. The whole body is densely encrusted with fine sand grains. Mantle is usually colored yellow green. Branchial sac has four folds on the left and three on the right side, and inner longitudinal vessels are arranged as follows in the 43mm long specimen (D = dorsal, V = ventral):

Left D 0 (28) 16 (38) 18 (35) 21 (28) 23 V

Right D 5 (32) 18 (38) 17 (42) 16 V

Tentacles are 39. The stomach plications on the right surface are 10~11. The anal margin is cut into 12 lobes. The number of gonads is 22 on the left side and 24 on the right side.

36. *Cnemidocarpa areolata* Heller, 1878 유두멍게

Sögwip'o (Rho, 1975; Rho & Huh, 1984).

Material examined: Söngsanp'o, Jul. 9, 1986 (J.I. Song).

Remarks: The specimens are 9 to 11mm in length. When alive, the test is salmon buff in color. Branchial sac has 4 folds on each side and inner longitudinal vessels are arranged as follows in the 10mm longitudinal specimen (D = dorsal, V = ventral):

Left D 0 (6) 4 (5) 4 (4) 3 (3) 3 V

Right D 0 (5) 4 (5) 4 (5) 3 (3) 4 V

The dorsal tubercle is a U shaped slit. Stomach is marked by 20 longitudinal plications. Parastigmatic vessels present. Tentacles are 36 in number and a small one and a large one are arranged alternately. Two large gonads exist on the left side and 3 small gonads on the right of the body.

37. *Dendrodoa aggregata* Rathke, 1806 가지멍게

Supsöm (Rho & Huh, 1984); Udo (Rho & Huh, 1984).

38. *Styela esther* Hartmeyer, 1906 세출미더덕

Sögwip'o (Rho, 1975); Supsöm (Rho & Huh, 1984).

Material examined: Sögwip'o, Jan. 1970 (Korea uni.); Sögwip'o, Apr. 13, 1975 (B.J. Rho); Sögwip'o, Feb. 5, 1976 (B.J. Rho); Hallim, Oct. 9, 1987 (J.W. Lee).

Remarks: The specimen from Sögwip'o (13/IV/1975) is 11mm × 7mm in extent. Branchial sac has 4 folds and 5~6 stigmata in a mesh. Parastigmatic vessel present. There are 22 tentacles of alternating sizes. The margin of anus is 12 lobed. The ciliated groove is rather simple. These specimens are smaller than preceding specimens in the number of inner longitudinal vessels.

39. *Styela clava* Herdman, 1881 미더덕

Sögwip'o (Rho, 1971; Rho, 1975).

Material examined: Hallim, Oct. 9, 1987 (B.J. Rho & J.W. Lee).

Remarks: The specimen is 50mm × 15mm in extent. They are provided with many mammillary protuberances all over the surface of the club-shaped body. Mantle is yellowish brown in color. Branchial sac has four folds and inner longitudinal vessels are arranged as follows (D = dorsal V = ventral):

Left D 4 (40) 5 (38) 4 (32) 5 (29) 4 V

Right D 4 (38) 5 (36) 4 (34) 5 (29) 4 V

There are 25 tentacles and ciliated groove forms a simple rosette. Anus finely lobed. Stomach has 36

longitudinal plications on the surface. The present specimens are similar to Tokioka's (1953) except that the former is smaller than the latter both with respect to size and the number of tentacles.

40. **Styela clava symmetrica* Tokioka, 1959 상칭미더덕
Sögwip'o (Rho, 1975); Supsöm (Rho & Huh, 1984).
41. **Styela partita* Stimpson, 1852 두줄멍게
Sögwip'o (Rho, 1966).
Family Pyuridae Hartmeyer, 1908 멍게 과
42. *Pyura vittata* Stimpson, 1852 끈멍게
Material examined: Munsöm, Dec. 28, 1987 (H.S. Han).
43. **Pyura lepidoderma* Tokioka, 1949 비늘가죽멍게
Sögwip'o (Rho, 1975; Rho & Huh, 1984).
44. **Pyura sanderi* Traustedt & Welther, 1894 매 끈이멍게
Sögwip'o (Rho, 1975).
45. ***Herdmania momus* Savigny, 1816 분홍멍게
Sögwip'o (Rho, 1971; Rho, 1975; Rho & Huh, 1984).
Material examined: Pömsöm, Dec. 15, 1969 (B.J. Rho).
Remarks: The largest specimen is 30mm × 28mm in size, while the smallest one is 12mm × 12mm in size.
46. ***Herdmania siphonalis* Oka, 1933 주둥이분홍멍게
Sögwip'o (Rho & Huh, 1984).
Material examined: Sögwip'o, Feb. 19, 1971 (B.J. Rho).
Remarks: The largest specimen is 55mm × 55mm in extent. Atrial siphon is very prominent and maybe as long as the length of the body. Test is covered with some foreign matters such as hydroids, sea anemones and sand grains. Mantle is pale orange in color. Branchial sac has 9 to ten folds on each side and inner longitudinal vessels are arranged as follows in the 55mm long specimen (D = dorsal V = ventral):
Left D 1 (14) 2 (17) 2 (15) 2 (16) 2 (13) 1 (14) 1 (12) 1 (10) 1 (8) 1 V
Right D 1 (14) 2 (13) 2 (17) 2 (19) 2 (19) 2 (17) 1 (15) 1 (13) 1 (10) 1 (7) 1 V
Tentacles are sixteen and each tentacle is composed of several side-branches.
47. *Microcosmus multitentaculatus* Tokioka, 1953 두줄멍게
Sögwip'o (Rho, 1975).
Material examined: Piyangdo, Dec. 12, 1988 (J.E. Lee).
Remarks: Two specimens are 45mm × 35mm, 40mm × 32mm in size. Test is pink in color. There are 11~12 tentacles and each tentacle is composed of many side-branches. Ciliated groove is u shaped and the anterior part is opened. Branchial sac have seven folds on each side and inner longitudinal vessels are arranged follows in the 45mm long specimen (D = dorsal V = ventral):
Left D 1 (25) 3 (23) 4 (20) 4 (18) 3 (14) 4 (13) 3 (8) 1 V
Right D 1 (26) 3 (21) 4 (20) 5 (17) 4 (19) 4 (16) 3 (11) 1 V

About six to eight stigmata are arranged in a mesh. Anterior and posterior liver are made of lobules with many papillae. Testicular follicles are spread over the attachment side of the gonad.

48. **Boltenia echinata* Linnaeus, 1767 칩명게
Sögwip'o (Rho, 1975).

49. **Hylocynthia cactus* Oka, 1932 선인장명게
Munsö'm (Rho, 1971).

50. *Halocynthia ritteri* Oka, 1906 리테르게명게
Material examined: Chigwido, Dec. 8, 1988 (J.E. Lee).

Remarks: The specimen is 60mm in length and 8~10mm thick. Branchial sac has 8 folds on each side. Six to 8 thinner transverse vessels are located between the thick one and four to 6 stigmata are arranged in a mesh. This specimen is smaller than the one previously described by Rho (1975) with respect to the number of tentacles and folds.

ABSTRACT

In order to carry out a systematic study of ascidians in Cheju Island, the authors identified and classified specimens collected from 11 sites around Cheju Island from December 1969 to January 1989. Using the information gathered from this study as well as previous studies, the authors prepared a detailed list of the ascidians of Cheju Island.

As a result of this study, the ascidians of Cheju Island are 50 species in 10 families. Among them, 3 species (*Didemnum apersum*, *Didemnum translucidum*, *Botrylloides perspicuum*) had not previously been known to exist in Korean waters. Description and drawings of these three species are presented in this report. It was also discovered that ten of the fifty species are found only in the Cheju Island area. The fifty species recorded in the Cheju Island area account for 68% of the seventy three species recorded from all Korea. Classifying them by the temperature of the water where they are found, the authors found the following: one cold water species (2% of the total), seven cold-temperate water species (14%), thirty eight warm-temperate water species (76%) and four tropical water species (8%).

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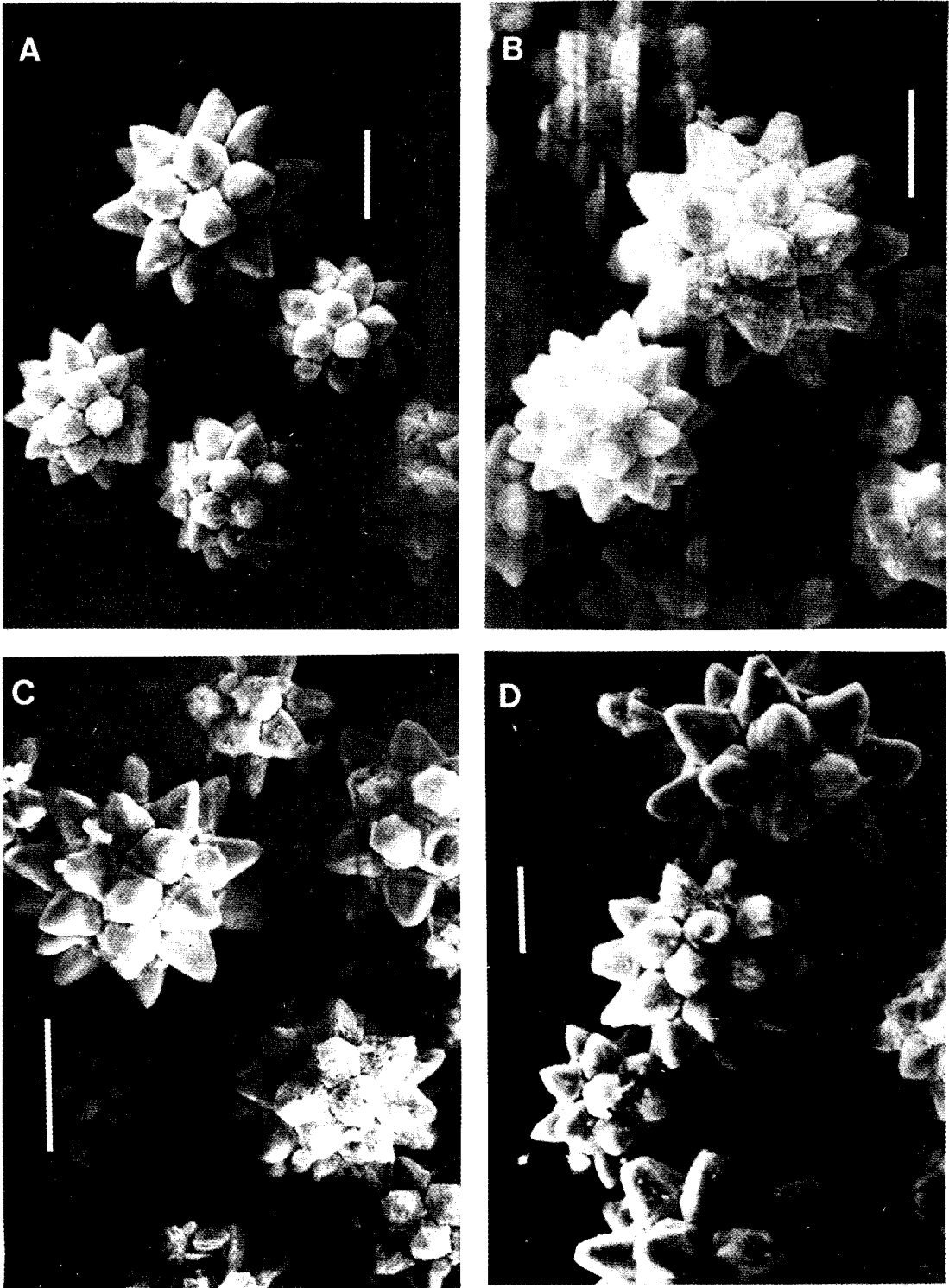


Plate I. A,B: *Didemnum moseleyi* spicules, 0.025-0.03mm (scale=0.01mm)

C,D: *Didemnum apersum* spicules, 0.02-0.03mm (scale=0.01mm)



Plate II. A,B: *Didemnum translucentum* spicules, 0.015-0.019mm (scale=0.01mm)

C,D: *Leptoclinides dubius* spicules, 0.011-0.019mm (scale=0.01mm)