

UNRECORDED MARINE ALGAE FROM KOREA IV

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Six species of marine algae new to Korea are described. Among them, five species belong to the Rhodophyta: *Galaxaura clavigera* Kjellman, *G. hystrix* Kjellman, *Chrysymenia grandis* Okamura, *Delisea okadai* (Yamada) Chihara et Yoshizaki and *Webrella micans* Hauttfleisch, and one to Phaeophyta: *Saundersella saxicola* Inagaki. *Chrysymenia grandis* and *Delisea okadai* are collected on the seashore after heavy storm, while the other four are from the upper part of sublittoral zone.

Introduction

This is the fourth report dealing with unrecorded marine algae from Korea by the author (Lee, 1977; 1984a; 1984b). He described seven species of marine algae from Cheju island, Korea. The present paper deals with the new records on six species of marine algae. The author has attentively collected marine algae from Cheju island since 1971, and the present study is based on those specimens accumulated.

Materials and Methods

Materials were collected from several regions along the coast of Cheju island (Fig. 1). All species described here were collected by scuba diving on the upper part of sublittoral zone except for two species, *Chrysymenia grandis* and *Delisea okadai*, which were collected as cast ashore materials. Cross-sections of fronds were cut at 10~20 μm using a freezing microtome, and stained with methylen blue and mounted on a slide glass in 50 % corn syrup with 5% formalin added as a preservation. Drawings were made with the aid of a microscopy drawing tube. Collected samples have been deposited in Cheju National University.

Descriptions

Galaxaura clavigera Kjellman

Floride-slagtet *Galaxaura* (1900), p.76, tab.13, fig.25; Tanaka, 1936. p.163. text-figs. 28~29. pl.41(1); Okamura, 1936. p.448.

Fig. 2, A; pl. 1, upper.

Morphological characters: Frond arborescent, 5~10cm high, dichotomous regular in 4~5 times with long stipitate about in 3cm; stipe cylindrical, villose, consisting of rhizoidal filaments; internodes subcanaliculate, 4~20mm long 1.5~3mm wide. 450~500 μm thick, broader in distal end than proximal; assimilating filament having a unicellular pedicle, rarely branched, ca. 1.5 μm long; epidermal cell polygonal; papillae apiculate, round, rarely elongated round rectangular, 20~25 μm wide, ca. 40 μm long; tetrasporangia decussate or cruciate, about 40 μm diameters. Color reddish brown.

Habitat: Growing on rocks in the sublittoral zone

Materials: Kangjiong (Tetrasporophyte)

Korean name: 민둥이갈라가라 (nom. nov.)

Galaxaura hystrix Kjellman

Floride-slagtet *Galaxaura* (1900) p.79, tab. 16, figs. 1~10. tab. 20, fig. 34; Tanaka, 1936. p.167, text-figs. 32~33, pl. 43(2); Okamura, 1936. p.449.

Fig. 2, B; pl. 1, lower.

Morphological characters: Frond arborescent, dichotomous 4~5 times, and more or less 6cm high; stipe verticillately villose, consisting of rhi-

zoidal filaments; internodes very faintly transversely annulate, 5~30mm long, 2~4mm wide, about 500 μ m thick, cuneate or linear cuneate; peripheral tissue consisting of three layers, rounded polygonal, ca. 40 μ m broad, ca. 30 μ m high; cells of middle layer spherical to rectangular, ca. 30 μ m in diameter; epidermal cells polygonal in cross section, containing well developed chromatophores, as a rule bearing papilla; papillae clavate, apiculate, 20~30 μ m wide. Color reddish brown.

Habitat: Growing on rocks in the sublittoral zone

Materials: Songsan, Kimnyoung, Samyang, Dong-gwi

Korean Name: 외꼭지갈라가라 (nom. nov.)

The foregoing two species, though profusely common in the southern parts of the Cheju coast. Both species are very similar, in body size, appearances, color, etc., thus barely distinguishable. However, the microscopic structure of the papilla is remarkably different. *G. clavigera* has one or two (more common) round papillae and are rarely apiculate at the tip, whereas in *G. hystrix* pedicle bears a single papilla.

Chryssmenia grandis Okamura

Nippon Kaisei-Shi. 1936. p. 1. pl. 301 ;

Okamura, 1937, p. 668

Fig. 2, C-E; pl. II.

Morphological Characters: Frond tubular elongated, shortly stipitated with a subcylindrical of teretial stem, simple, oblong or ovate when young, irregularly branched afterwards, more than 10cm high, 4~12cm wide; cells singly layered, transversely stretched, almost hollow; inner large cells ovate; cystocarp scattered, small but not prominent, about 400 μ m in diameter, roundish in form with a slightly elevated ostiole. Color pinkish red when young, gradually changing into brownish red afterward. Frond adherent firmly to paper when dried.

Habitat: Growing on rocks, especially on sunny places near sandy areas in sublittoral zone.

Materials: Songsan, Shinchang.

Korean Name: 주머니큰꼭이 (nom. nov.)

One of the most notable features of this plant is its fragility and easiness to tear when handled or made into preparing dried specimens. The border of gelatinous material on the fronds disappears as the plants aged.

Delisea okadai (Yamada)

Chihara et Yoshizaki

1978. p. 382.

Ptilonia okadai Yamada, 1933. p. 284. pl. XIII, fig. 2

Fig. 2, F-G; pl. III.

Morphological Characters: Frond 15cm high, about 3mm wide at the widest part of main branch, about 100 μ m in thick portion of main branch and 50 μ m in thin portion not costate in upper part, dimly costate in lower part of dry specimens, decomposite-pinnate; pinnae alternate, becoming narrower upwards, with short pinnules on the margins; pinnules alternate, with a spine-like ending by sight, with a spatular-like ending under microscopy of low magnification in acute apex, usually divided into 2~3 parts; cystocarp spherical or shortly elliptical, about 100 μ m long, 45 μ m wide, found on top of pinnules, with stichia of 20~80 μ m length. Frond light red to pale brownish red, incompletely adherent to paper when dried.

Habitat: Growing on rocks in a sublittoral zone

Materials: Buckchon(carposporophyte)

Korean Name: 제주나도평포리 (nom. nov.)

Only one complete specimen was collected. The anatomical character of the plant could not be examined, because the thallus dissolved instantly when soaked in water.

Webrella micans Hauptfleisch

in Weber van Bosse, Liste de Alg. 1928. p. 463 ;

Yamada, 1932. p. 275, pl. IX

Fig. 2, H; pl. IV

Morphological Characters: Frond flat, dorsiventral, ca. 320 μ m thick, lobes irregularly round, bran-

ched, about 8cm wide and 6cm high, tightly adherent to a substratum, short hapter-like holdfast on the lower hidden side; the upper side cells elongated; cystocarp and tetraspore on the upper side; tetraspore elliptical, decussate or cruciate, 11~16 μ m wide, 26~36 μ m long, and embeded in cortex layer.

Habitat: Growing in rock in the sublittoral zone

Materials: Samyang, Songsan, Shinsan.

Korean Name: 바위버섯 (nom. nov.)

In this species the manner of attachment is unique, becoming strongly adherent in winter when young, but becoming weakened and slightly elevated from the substratum in summer. Only tetrasporangial plants observed.

Saundersella saxicola (Okamura
et Yamada) Inagaki

Sust. Study. 1958. p. 161, fig. 64.

Gobia saxicola Okamura et Yamada.

Okamura, 1936. p. 203.

Fig. 2, 1; pl. V

Morphological Characters: Frond simple filiform, elastic, often twisted near base, 20~80cm high, about 3mm in diameter, decidedly clavate at apex, solid in juvenile stage, soon becoming hollow except at base, attached by a small discoidal holdfast; central filaments loose, colorless, anastomosing freely, 25~30 μ m in diameter; cortical filament straight, perpendicular to main axis; terminal segment composed of 2~4 or occasionally 5 cells, with large chromatophores; zoo-sporangium ovoid to elliptical, 40~65 μ m broad, petiolate with 1~2 cells at basal cells of assimilating filaments; hairs dense comparatively. Frond darkish brown, slightly adhering to paper when dried.

Habitat: Growing on rocks or gravels in the upper part of sublittoral zone

Materials: Donggwi, Oedo.

Korean name: 외가지말 (nom. nov.)

As shown in Table 1, both species, *S. simplex* and *S. saxicola*, are not particularly different with exception of the sizes of terminal cell and zoosporangia.

Setchell and Gardner (1925) identified *S. simplex* with a length of 80 μ m from Vancouver Island, 40~50 μ m from Sitka and 20~35 μ m from other place. The result of measurement of *S. saxicola* by Inagaki (1958) and Okamura (1936) was very different from that of the fronds obtained in the present study. The specimens of the present study are much larger. Further careful studies on *S. saxicola* from the coast of Cheju Island will be necessary. *S. saxicola* often grows in association with other members of Chordariaceae, e.g., *Tinocladia crassa*, and *Sphaerotruchia divaricata*, etc., and shows road-like tips among the old fronds because of the diatoms covered with gelatinous materials in sheltered places by water disturbance.

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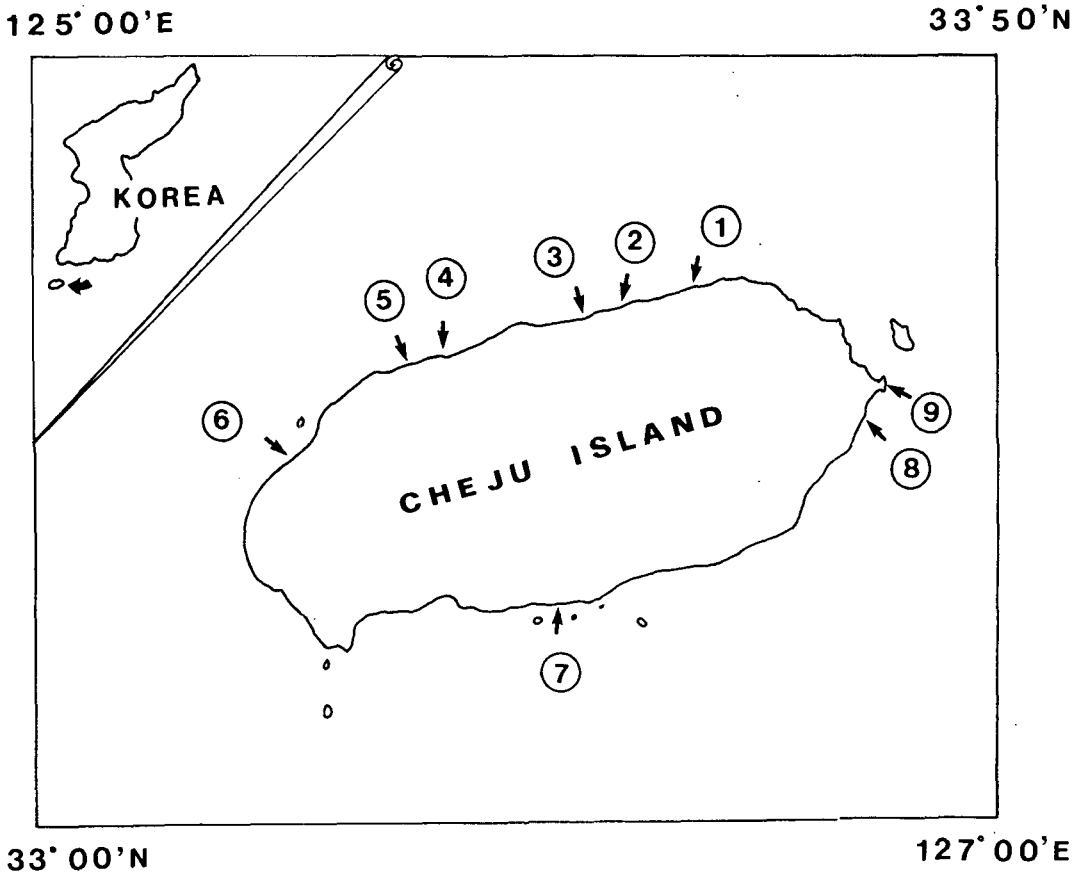


Fig. 1. Cheju Island. Numbers in circle indicate sampling areas ; 1, Kimnyoung; 2, Bukchon; 3, Samyang; 4, Oedo; 5, Donggwi; 6, Shinchang; 7, Gangjong; 8, Shinsan; 9, Songsan.

UNRECORDED MARINE ALGAE FROM KOREA IV

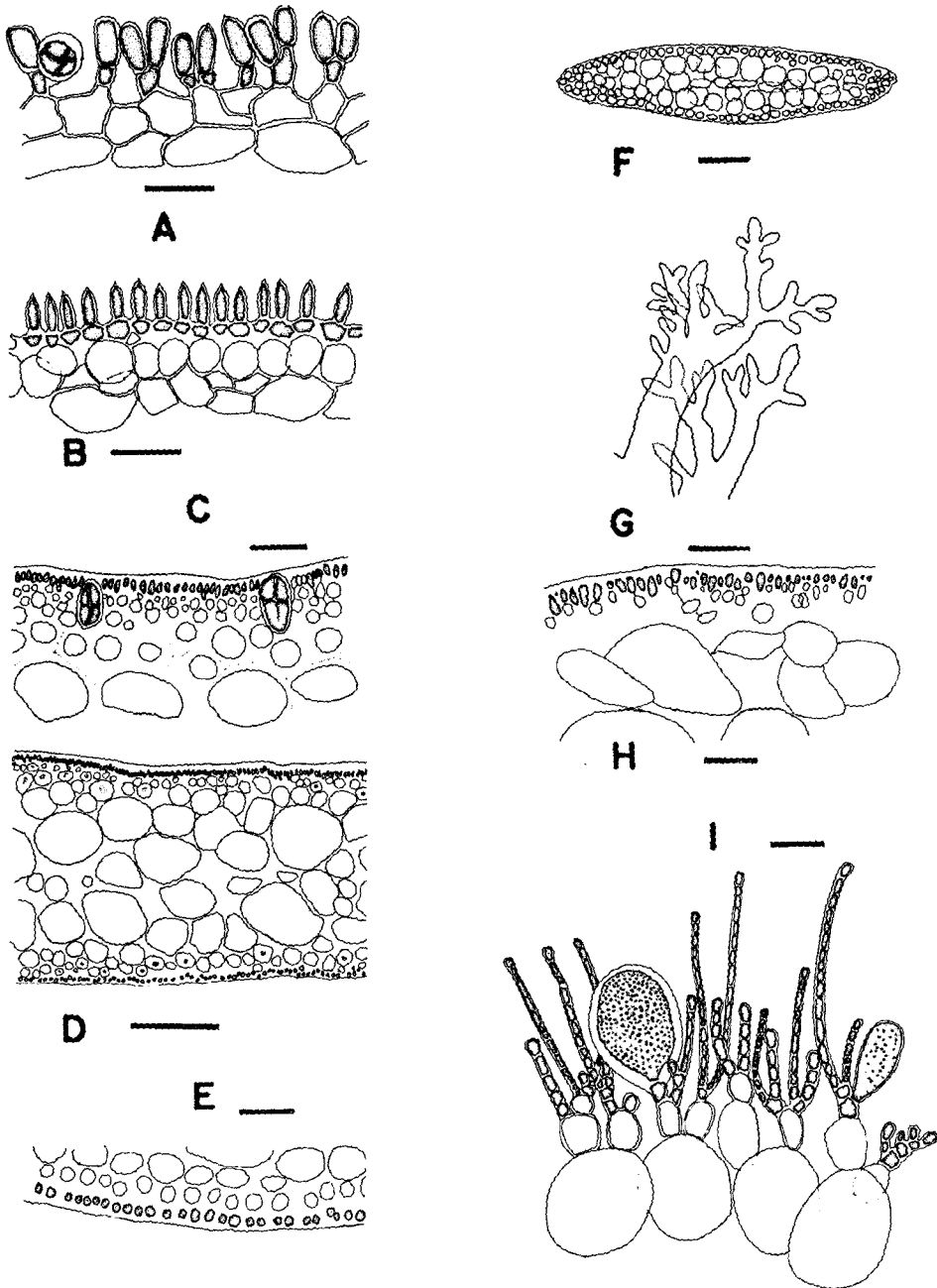


Fig. 2. Newly recorded marine algae Cheju Island, Korea. A. *Galaxaura clavigera* Kjellman. Cross section of a part of a frond, showing the characters of the papillae and decussate tetrasporangium. B. *G. histrix* Kjellman. Cross section of a part of a frond, showing the characters of a apiculate papillae on each pedicle. C-E, *Webrella micans* Hauptfleisch; C. Cross section of thallus, showing cell arrangement of upper side. D. Inner portion of a frond in cross section, showing arrangement of inner large cells. E. Back side portion of frond, showing round epidermal cell arrangements of which are consisted loosely. F. *G. Delisea okadai* (Yamada) Chihara et Yoshizaki; F. Cross section of frond, showing auxiliary cell (arrow). G. Terminal portion of frond bearing spatular-like branchlets. H. *Chrysomenia grandis* Okamura, showing the characters of the epidermal cells and inner large cells. I. *Saundersella saxicola* (Okamura et Yamada) Inagaki. View of internal filaments extending longitudinally and surface filaments showing hairs, paraphyses, and zoosporangia. Scale: A, B, 8 μ m; C-E, H and I, 40 μ m; F, 10 μ m; G, 1mm.

Table 1. Morphological Characters of *Saundersella simplex* and *S. saxicola*

Species	Author	Habitat	Frond Form	Frond Length	Frond Diam.	Terminal Cell	Terminal Segments	Zoosporangia
<i>S. simplex</i>	Setchell & Gardner (1925)	epiphytic (discoidal base)	filiform, cylindrical	5~12cm	2~3.5mm	pyriform, 30~35 μ m \times	3~4 cells	obovoid-ellipsoidal, 30~38 μ m \times 40~50 μ m
	Inagaki (1958)	epiphytic (discoidal base)	cylindrical	5~20cm	2~5mm	oviform, larger than other	3~4 cells	ellipsoid or oviform, 30 \times 60 μ m
	Okamura (1936)	epiphytic (discoidal base)	cylindrical, simple	5~20cm	2~3mm	oviform, 18~20 μ m \times 32~37 μ m	2~4 cells	oviform to ellipsoid, 23~30 μ m \times 50~55 μ m
<i>S. saxicola</i>	Okamura (1936)	epilithic (discoidal base)	cylindrical, fasciculation, simple	15cm	3mm	pyriform, 11~14 μ m \times 17~24 μ m	2~4 cells	obovoid-ellipsoidal, 18~21 μ m \times 27~30 μ m
	Inagaki (1958)	epilithic (discoidal base)	filiform, simple	15cm	3mm	phriform, 10~15 μ m \times 15~25 μ m	2~4 (5) cells	obovate or elliptical, 18~20 μ m \times 30~35 μ m
	This Paper	epilithic (discoidal base)	filiform, simple	20~80cm	3mm	pyriform	2~4 (5)	ovoid to elliptical, 35~45 μ m \times 40~65 μ m

UNRECORDED MARINE ALGAE FROM KOREA IV

Plate I. Upper, *Galaxaura clavigera* Kjellman (bar 5cm)

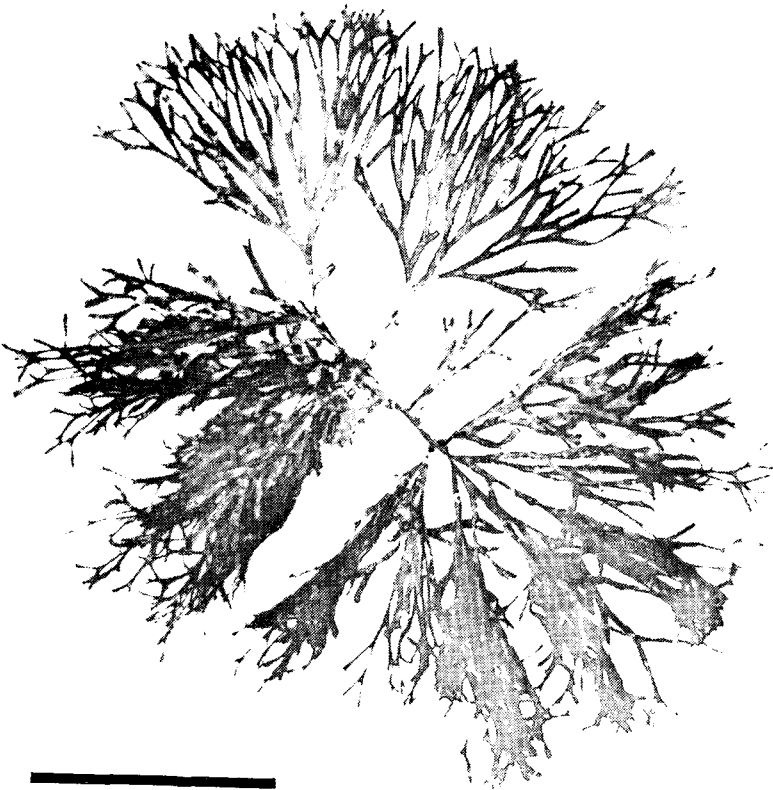
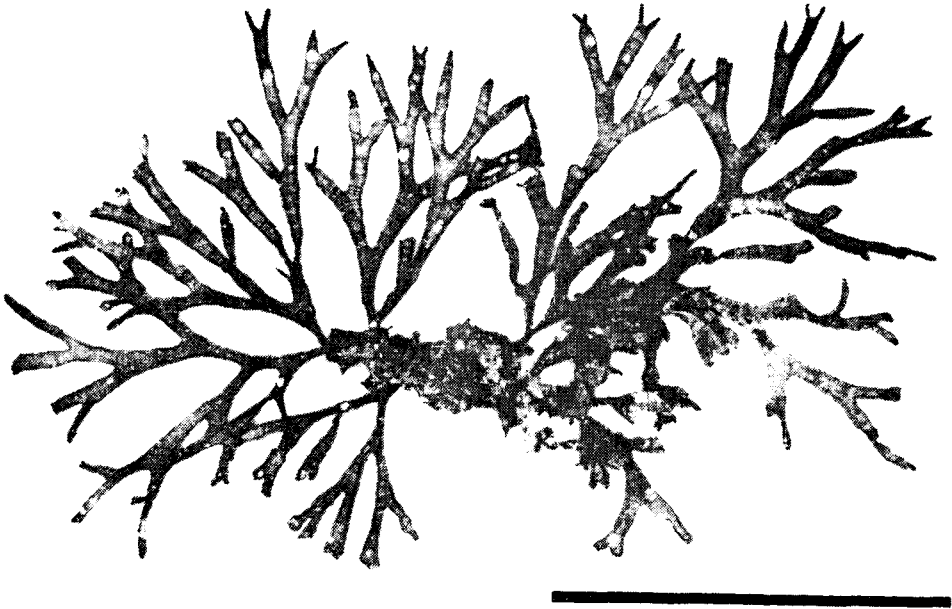
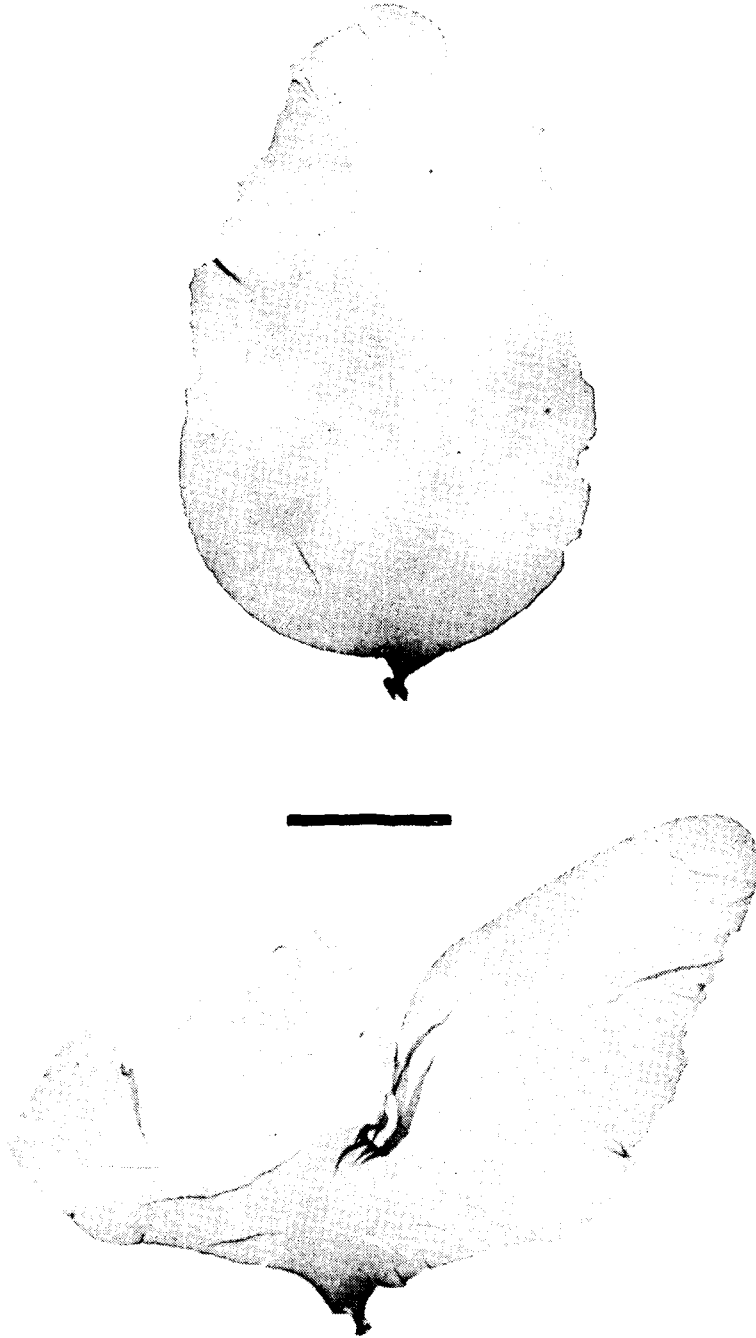


Plate II. *Chrysymenia grandis* Okamura (bar 5cm) ; unbranched (upper) and branched frond (lower)



UNRECORDED MARINE ALGAE FROM KOREA IV

Plate III. *Delisea okadai* (Yamada) Chihara et Yoshizaki (bar 5cm)

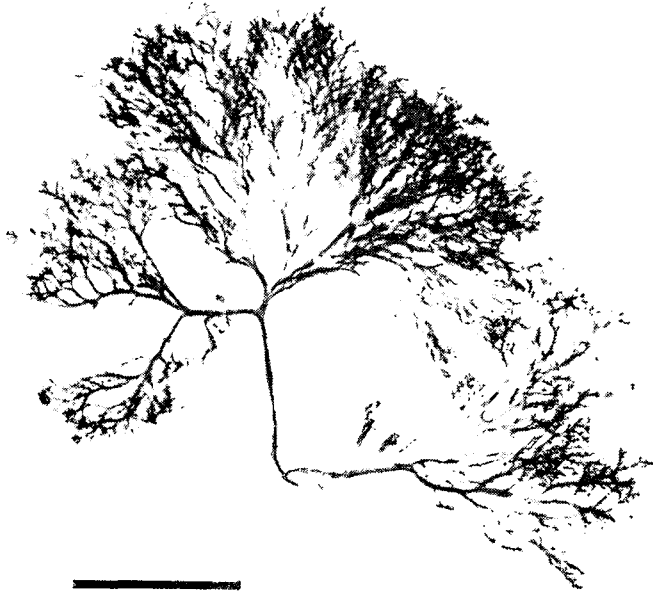


Plate IV. *Webrella micans* Hauptfleisch (bar 5cm)

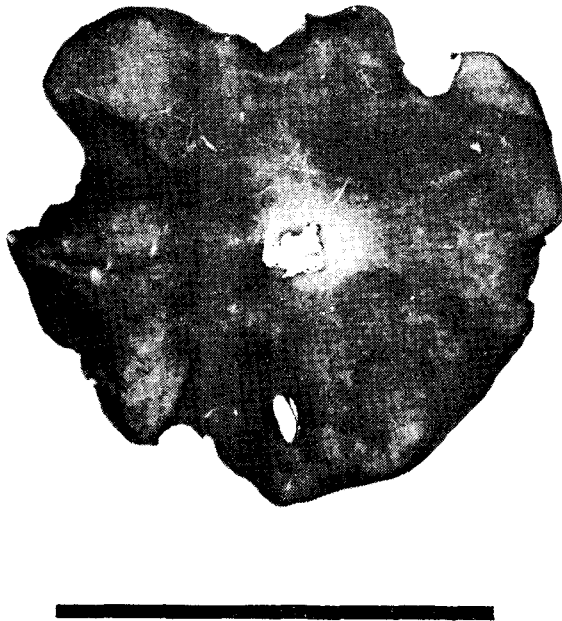


Plate V. *Saundersella saxicola* (Okamura et Yamada) Inagaki (bar 5cm)

