

New Marine Algae to Taiwan

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ABSTRACT: Five species of marine algae are newly recorded from Taiwan and its offshore islands. These include 2 species of Chlorophyta and 3 species of Rhodophyta. They are *Siphonocladus tropicus*, *Avrainvillea riukiensis*, *Gibsmithsia hawaiiensis*, *Zellera tawallina*, and *Gracilaria canaliculata*. Of these, *Siphonocladus*, *Avrainvillea*, *Gibsmithsia* and *Zellera* are new genera for Taiwan.

KEY WORDS: Marine algae, New records, Taiwan, Phytogeography.

INTRODUCTION

The marine algal flora of Taiwan has been studied by several workers (Okamura, 1931; Shen and Fan, 1950; Chiang, 1960, 1962a, b, 1973a, b; Wang and Chiang, 1977; Chiang and Chou, 1980; Chou and Chiang, 1981; Yang and Chiang, 1982; Chiang and Wang, 1987; Lewis and Norris, 1987; Chen, 1991; Huang, 1990, 1991; Wang *et al.*, 1993; Wang and Chiang, 1994; Yang *et al.*, 1994; Huang, 1997, 1998, 1999a, b). Most of these researches have dealt with only the intertidal algal communities. However, with the increasing usage of SCUBA diving in the field investigation, algal surveys have been extended to the subtidal population. From collections of algal species in the subtidal zone, we reported five taxa that were not previously recorded in Taiwan.

MATERIALS AND METHODS

Collections were made by skin diving and SCUBA diving at different localities of Taiwan, Hsiao-Liuchiu and Orchid Island (Fig. 1) on several occasions from March 1995 to October 1998. Specimens were preserved in 10% formalin in seawater for 12 hours, then mounted on herbarium paper. For taxonomical studies both mounted herbarium specimens and formalin-preserved materials were used. Sections were made by hand using razor blades, then stained with 1% aniline blue. Voucher specimens of all taxa listed are kept in the herbarium of Taiwan Museum.

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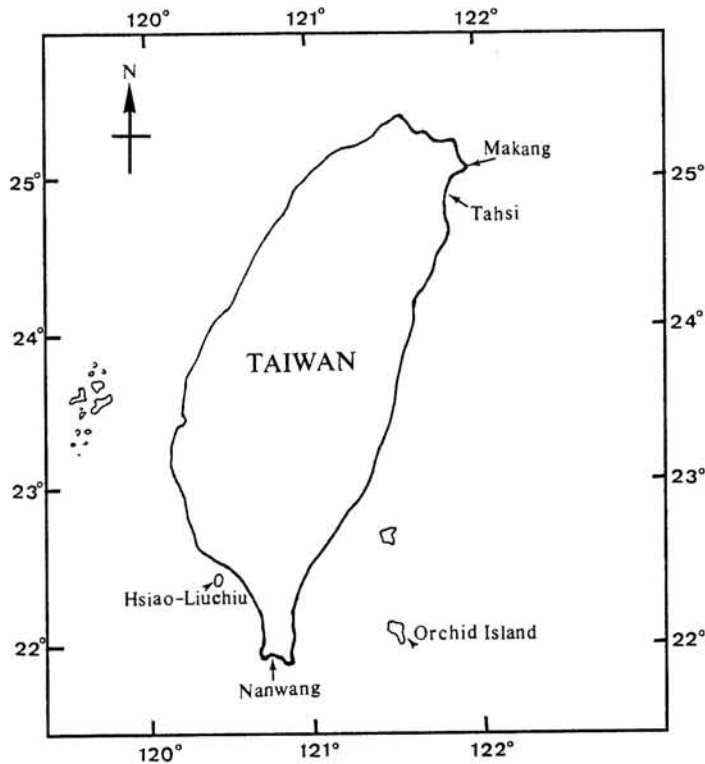


Fig. 1. Map showing the collecting localities in Taiwan, Hsiao-Liuchiu and Orchid Island.

RESULTS

In this paper, we have listed 5 species of marine algae which are newly recorded from Taiwan and its offshore islands. These include 2 species of Chlorophyta and 3 species of Rhodophyta. They are *Siphonocladus tropicus*, *Avrainvillea riukiensis*, *Gibsmithsia hawaiiensis*, *Zellera tawallina*, and *Gracilaria canaliculata*. Of these, *Siphonocladus*, *Avrainvillea*, *Gibsmithsia* and *Zellera* are also new genera for Taiwan.

Systematic List of Species Chlorophyta Siphonocladaceae

Siphonocladus tropicus (P. Crouan & H. Crouan) J. Agardh, 1887: 105 Figs. 2, 3
Boergesen, 1946: 14; Littler *et al.*, 1989: 54; Magruder and Hunt, 1979: 31; Silva *et al.*, 1996: 797; Yoshida, 1998: 88, fig. 1-4.

Valonia chlorocladus Hauck, 1886: 221.

Type locality: Guadeloupe, West Indies.

Character: This alga has many branches that radiate outward from a central stalk, with each branch covered by many small spinelike projections. Reaching a height of 2 -3 cm, it is usually green but often collects fine sediment and may appear whitish.

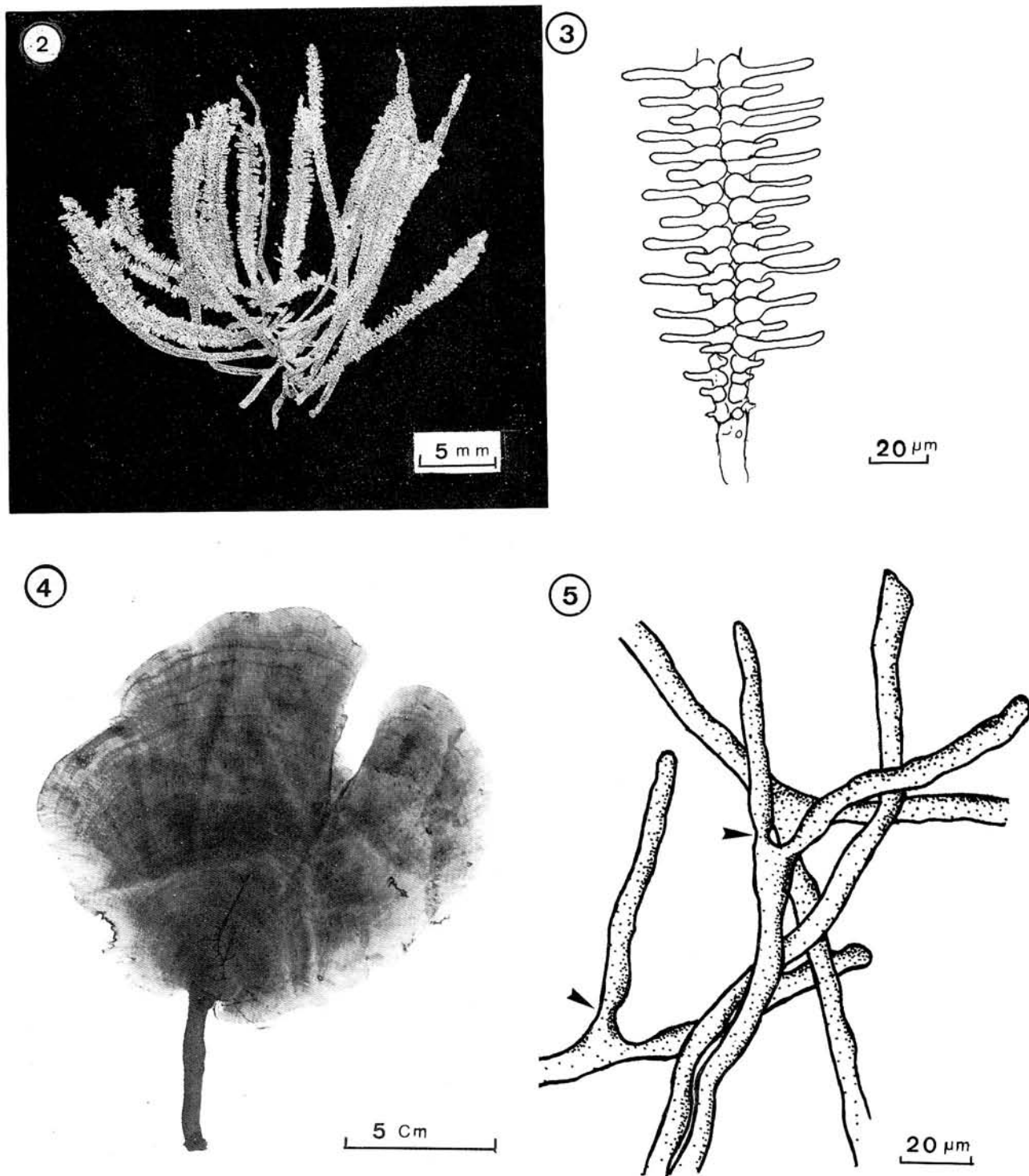


Fig. 2. Outline of *Siphonocladus tropicus*. Fig. 3. Part of *Siphonocladus tropicus*, showing the irregularly branched filaments formed internally in a uniseriate arrangement. Fig. 4. Habit of *Avrainvillea riukiensis*. Fig. 5. Part of filaments from flabellum of *Avrainvillea riukiensis*, showing the supra-dichotomous branching and constrictions (arrows).

Material examined: HG-087061031, Nanwang (Southern Taiwan), June 10, 1998. This alga was growing on reef flats at depth of 5 m.

Geographical distribution: Taiwan, Ryukyu Island, Hawaii, Australia, Mauritius, Mozambique, Seychelles, Somalia, South Africa, Yemen.

Udoteaceae

Avrainvillea riukuensis Yamad, 1932: 267 Figs. 4, 5
Yamada, 1932: 267, f. 1, pl. III; Okamura, 1936: 110, f.56, 57; Silva *et al.*, 1996: 878; Yoshida, 1998: 111, fig. 1-10a.

Avrainvillea gracillima Borgesen, 1940: 52-53

Type locality: Nawa, Ryukyu-retto, Japan.

Character: Thallus brownish green, solitary, fan-shaped, spongy, composed of many fine filaments, up to 17 cm high, 16 cm wide. Its stipe reaches a length of a little more than 4 cm. The fan-shaped thin flabellum is reniform, not zonate, the margin is rounded or lobed. The filaments is cylindrical, 11-25 μm in diam., supra-dichotomical constrictions distinctly.

Material examined: HG-087020132, Lan Yu (Orhid Island), February 25, 1998. This alga was growing on sandy bottom of subtidal habitats at depth of 15m.

Geographical distribution: Taiwan, Ryukyu Islands, Indian Ocean (Bahrain, Mauritius)

Rhodophyta Dumontiaceae

Gibsmithsia hawaiiensis Doty, 1963: 458, fig. 1-17 Figs. 6, 7
Itono, 1971: 94; Magruder and Hunt, 1979: 70; Kraft, 1986: 423; Yoshida *et al.*, 1990: 292; Silva, *et al.*, 1996: 185; Yoshida, 1998: 670.

Type locality: Waikiki, Oahu, Hawaii.

Character: Thallus purplish red, gelatinous, erect, 8 cm high, 6 cm broad. It has one to twice subdichotomous branches from a tough central stalk. Branches are tubular or slightly compressed, 5-8 mm wide, 10-15 mm long. Cross sections of the thalli are densely filamentous throughout. Filaments of the gelatinous fronds are dichotomously branched, 3-12 μm in diameter, and 2-10 diameters long.

Material examined: HG-086070019, Makang (northeastern Taiwan), July 15, 1997. This alga was growing on outer reef margin at depth of 8 m.

Geographical distribution: Taiwan, Ryukyu Islands, Hawaii, Philippines, Papua New Guinea, New Caledonia, Australia, Seychelles, Polynesia.

Gracilariaceae

Gracilaria canaliculata Sonder, 1871: 56 Figs. 8, 9
Silva *et al.*, 1996: 157; Callumpong *et al.*, 1997: 179.

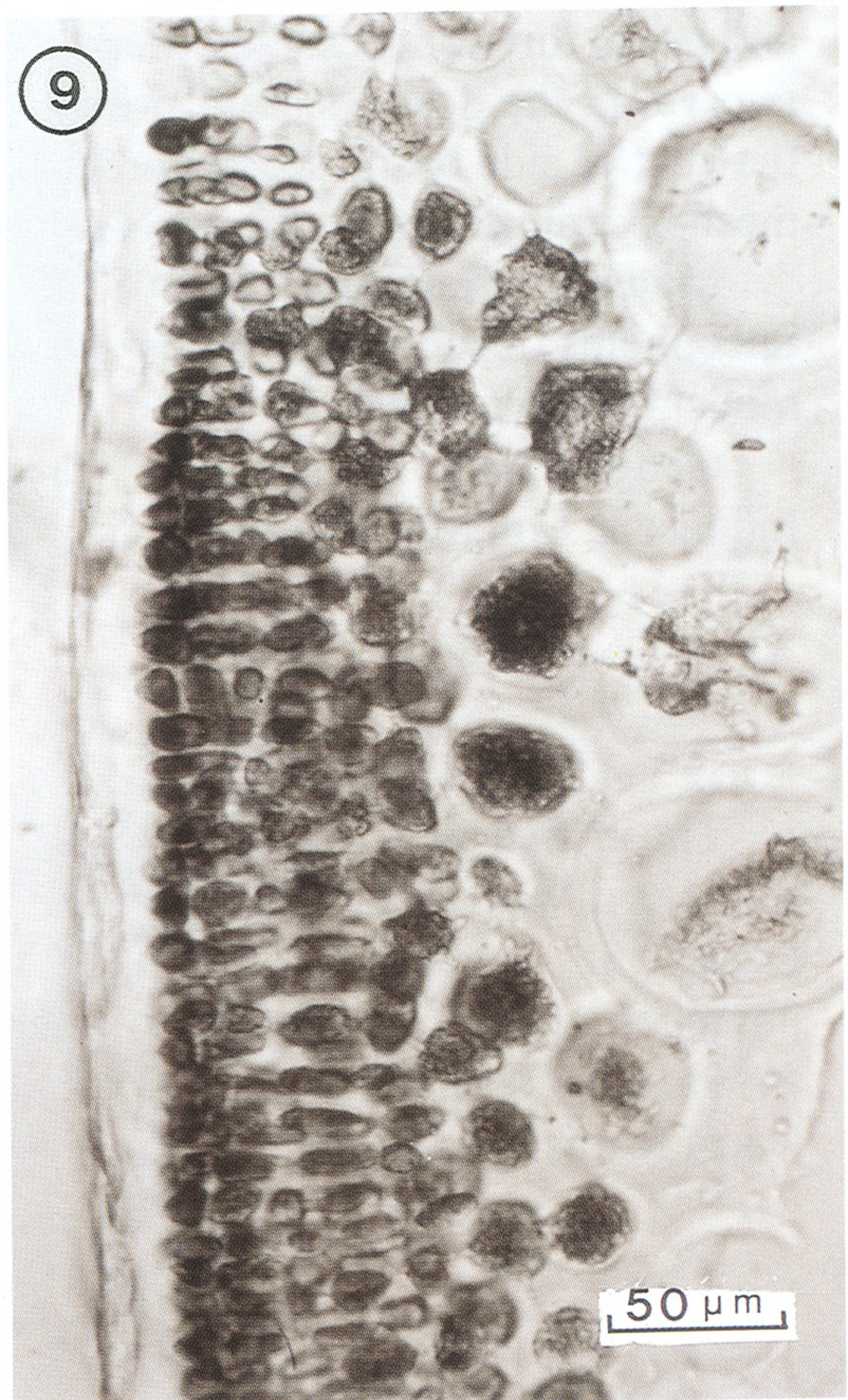
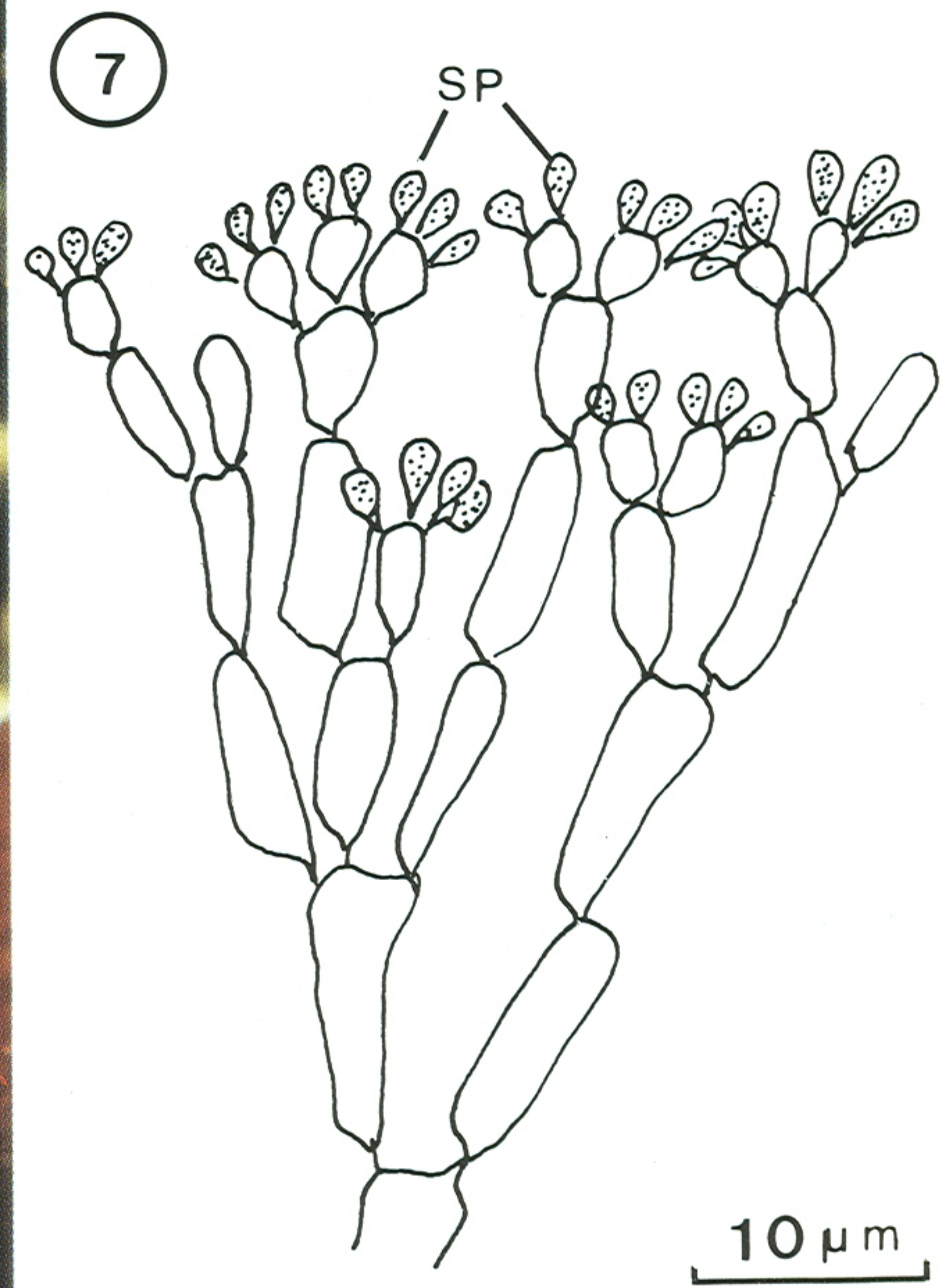


Fig. 6. Habit of *Gibsmithsia hawaiiensis*. Fig. 7. Part of filaments of *Gibsmithsia hawaiiensis*, showing the locations of spermatangia (SP). Fig. 8. Habit of *Gracilaria canaliculata*. Fig. 9. Cross-section of the filament of *Gracilaria canaliculata*.

Sphaerococcus canaliculatus Kutzing, 1868: 29

Type locality: Wagap, New Caledonia

Character: Thalli are purplish, cartilaginous, cylindrical, 5-10 cm high, 2-3 mm in diameter, dichotomous branching. Structurally, cells of the cortex are 10 μm long, 5-8 μm broad. Medullary region consists of large, thin walled, and loosely arranged cells..

Material examined: HG-085060045, Hsiao-Liuchiu, June 23, 1996. It was occasionally found on the rocks of sublittoral zone at the depths of 3-16 m.

Geographical distribution: Taiwan, Philippines, Indonesia, Malaysia, Singapore, Australia, Srilanka, India, Madagascar, Mauritius, Seychelles, South Africa.

Delesseriaceae

Zellera tawallina Martens, 1868: 33, pl. 8, fig. 3.

Figs. 10, 11

Womersley and Bailey, 1970; Itono, 1986: 75; Silva *et al.*, 1987; Yoshida *et al.*, 1990; Silva *et al.*, 1996; Trono, 1997: 253; Yoshida, 1998: 1001.

Type locality: Klein Tawalli Island, Halmahera, Indonesia.

Character: Thalli erect, purple red or deep orange, soft and membranaceous, stipitate, forming clumps, up to 6 cm high. Primary blades arise from the dorsal side of the main axes and made three successive orders of subunits. The second order branchlets arise at a regular interval in the dorsal side of primary branchlets. But, the tertiary branchlets are issued from the ventral side of the second order branchlets. This way the different branches would form a mesh-like appearance. Tetrasporangia are elliptic, located on the tertiary branchlets.

Material examined: HG-087050059, Tahsi (northeastern Taiwan); May 27, 1998. Specimens occur in clumps on sandy or rocky substrates in the shallow subtidal area, under moderate wave action.

Geographical distribution: Taiwan, Ryukyu Islands, Southern China, Philippines, Indonesia, Solomon Islands, Indian Ocean.

DISCUSSION

These five new records are all tropical in nature. According to the phytogeographic studies, it was found that they are only distributed in tropical Pacific Ocean and Indian Ocean. It is well known that the current is the principal factor regulating the phytogeographical distribution of marine algae (Lobban *et al.*, 1985; Chiang, 1973a; Huang, 1999a, b). It seems that their distributions in Taiwan are closely related to the meeting of the warm Kuroshio Current.

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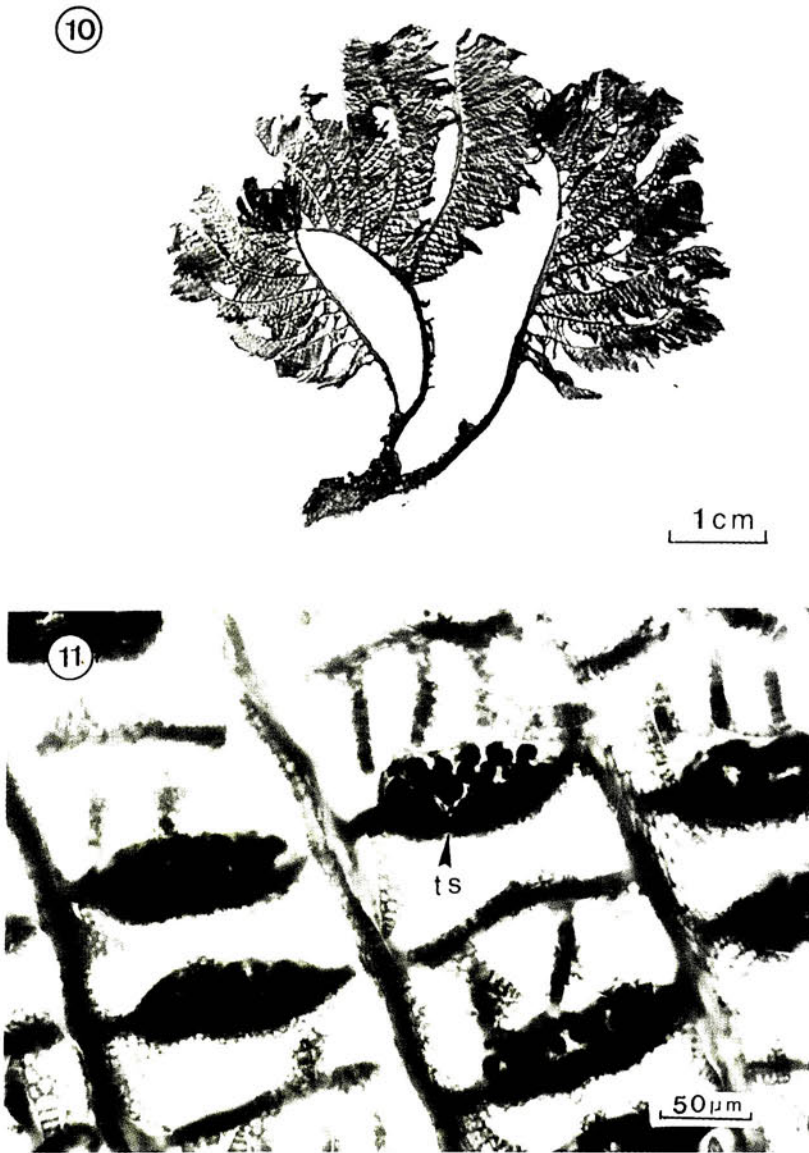


Fig. 10. Habit of *Zelleria tawallina*. Fig. 11. Enlarged view of blade of *Zelleria tawallina*, showing the tetrasporangia (ts).

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臺灣新記錄種海藻

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摘 要

本文共報導 5 種臺灣新記錄種海藻，包括 2 種綠藻和 3 種紅藻。他們是 *Siphonocladus tropicus*, *Avrainvillea riukuensis*, *Gibsmithsia hawaiiensis*, *Zellera tawallina* 和 *Gracilaria canaliculata*。其中 *Siphonocladus*, *Avrainvillea*, *Gibsmithsia* 和 *Zellera* 也是臺灣的新記錄屬。

關鍵詞：海藻，新記錄種，臺灣，植物地理。

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