

New records of marine algae from southern parts of Japan

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Rhipilia orientalis A. et E. S. GEPP, *Zellera tawallina* MARTENS and *Bostrychia calliptera* (MONTAGNE) MONTAGNE are reported from the southern Ryukyu Island and represent new records in Japan.

Key Index Words: *Bostrychia calliptera*; *Chlorophyta*; *Claudea-group*; *Hypoglossum-group*; *Rhipilia orientalis*; *Rhodophyta*; *Zellera tawallina*.

As further collections of marine benthic algae are made in the southern Ryukyu Islands, species which were not previously known from the past literatures (YAMADA and TANAKA 1938; SEGAWA and KAMURA 1960, TANAKA and ITONO 1972, AKATSUKA 1973, KAMURA 1977, OHBA and ARUGA 1982) are now being documented from these waters. This paper describes three species from the southern Ryukyu Islands and two of them, *Rhipilia orientalis* and *Zellera tawallina*, represent genera not previously known from Japan. The specimens are deposited in the Herbarium of the Kagoshima University, Department of Biology.

***Rhipilia orientalis* A. et E. S. GEPP** Siboga Exped. Monogr. 62: 57. f. 134-136. 1911. (Fig. 1A-H)

Japanese name: Nise-hauchiwa.

Specimens examined: HI19851, collected by H. ITONO from Oogami island, May 26, 1984. The habitat of this species is on holes of the reef and the plants were found just below the low-tide level down to 4.5 m deep. Distribution in literature: Borneo Bank, Fau Is. (GEPP and GEPP 1911); Bikini Atoll, Rongerik Atoll (TAYLOR 1950); Arno Atoll (DAWSON 1956); Eniwetok Atoll (DAWSON 1957); Truk Is. (TRONO 1968); Solomon Is.

(WOMERSLEY and BAILEY 1970).

Remarks: Present southern Japanese specimens agree well with the original account (GEPP and GEPP 1911), but are rich green when alive and have a spongy texture which can hardly be described as translucent. In this respect the present specimens agree more closely to the description of TAYLOR (1950) based on the materials from the northern Marshall Islands.

The structure of thallus filaments (Fig. 1E) and the form of tenacula (Fig. 1 F-H) are in excellent agreement with the original descriptions and illustrations, and the differences in color and the texture of the blade in the present materials seem to contribute insufficient differences to preclude them from *Rhipilia orientalis*. *Rhipilia orientalis* varies considerably in its external features of thalli (Fig. 1A-D).

***Zellera tawallina* MARTENS** Bot. Th. Die Tange. 33, Pl. 8, f. 3. 1866. (Figs. 2A-B, 3A-B, 4A-E)

Japanese name: Beni-hauchiwa.

Specimens examined: HI19852, collected by H. ITOHO from Kabira, Ishigaki island, May 28, 1984. Growing on the submarine terrace in water about 5 m deep below low-tide level near the reef rim. A single collection of a

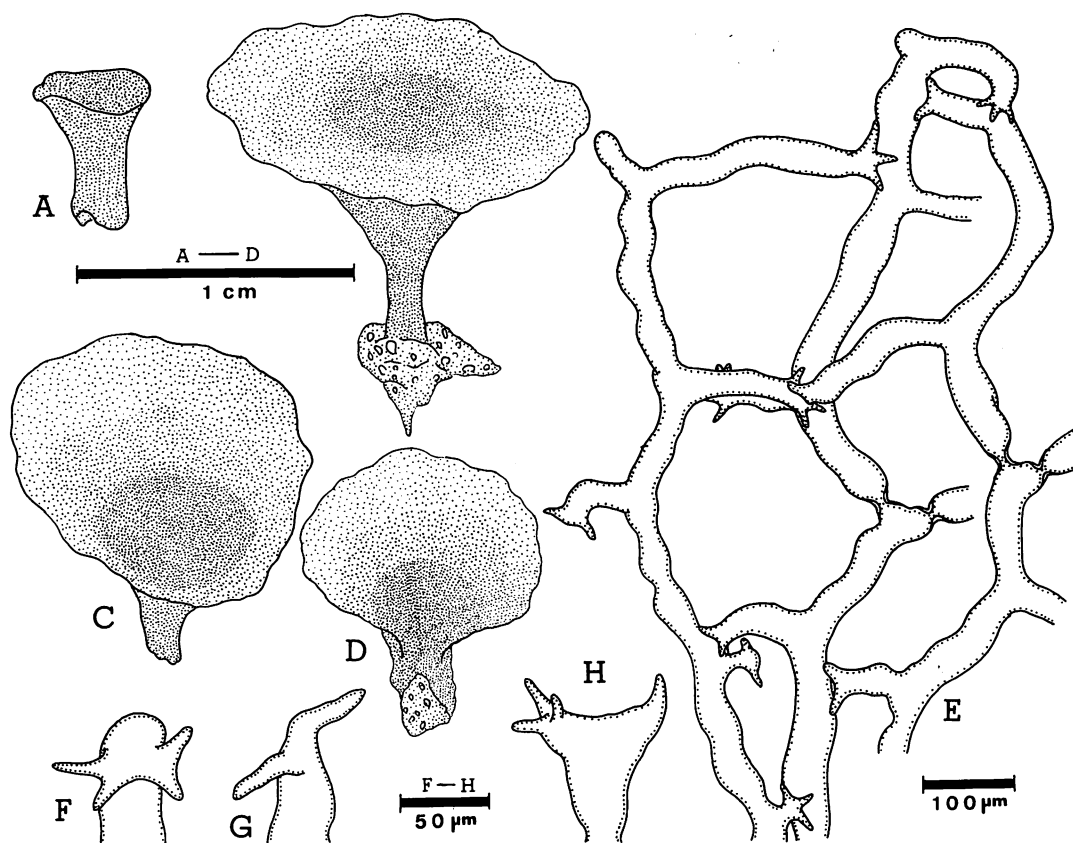


Fig. 1. *Rhipilia orientalis* A. et E. S. GEPP, A-D. habit of plants of both infundibuliform and flabellar types. E. vegetative filaments from the blade, showing the constrictions above the dichotomies and the hapteral connections of the lateral branches with other filaments. F-H. tenacula.

number of plants reveals that all plants are sterile.

Distribution in literature: Tawalli Is. (MARTENS 1866), Waigeo Is. and Tiur Is. (WEBER VAN BOSSE 1923); Sulu Sea (WOMERSLEY 1965); Solomon Is. (WOMERSLEY and BAILEY 1970).

Remarks: The *Claudea*-group consist of two genera, *Zellera* and *Claudea*, (WYNNE 1983) and the major differences between these two genera are generally thought as follows (KYLIN 1956, WYNNE 1983): 1) In *Zellera* the fronds are the incomplete networks, while in *Claudea* they are complete; and 2) Branching of all orders of blade is abaxial in *Zellera*, whereas in *Claudea* it is adaxial. In plants habit (Fig. 2B), the present specimens agree well with *Claudea*

multifida from the Philippines (CORDERO 1977, pl. 25-B) and *Claudea batanensis* from the Xisha Islands, China (ZHANG and XIA 1979, pl. I-8; XIA, XIA and ZHANG 1983, pl. 71, fig. 4). However, the structure of the frond in the present southern Japanese specimens is characterized by abaxial branching (Fig. 2 A-B) with the formation of nets by the blades of the fourth and fifth orders. Such characteristic is typical of the genus *Zellera*, and neither *Claudea multifida* nor *Claudea batanensis* agrees with the present southern Japanese species.

Up to now, two species of the genus *Zellera* have been described, *Zellera tawallina* (type of the genus) from the western tropical Pacific (MARTENS 1866) and *Zellera boekei* from the Atlantic (SLUITER 1908). The

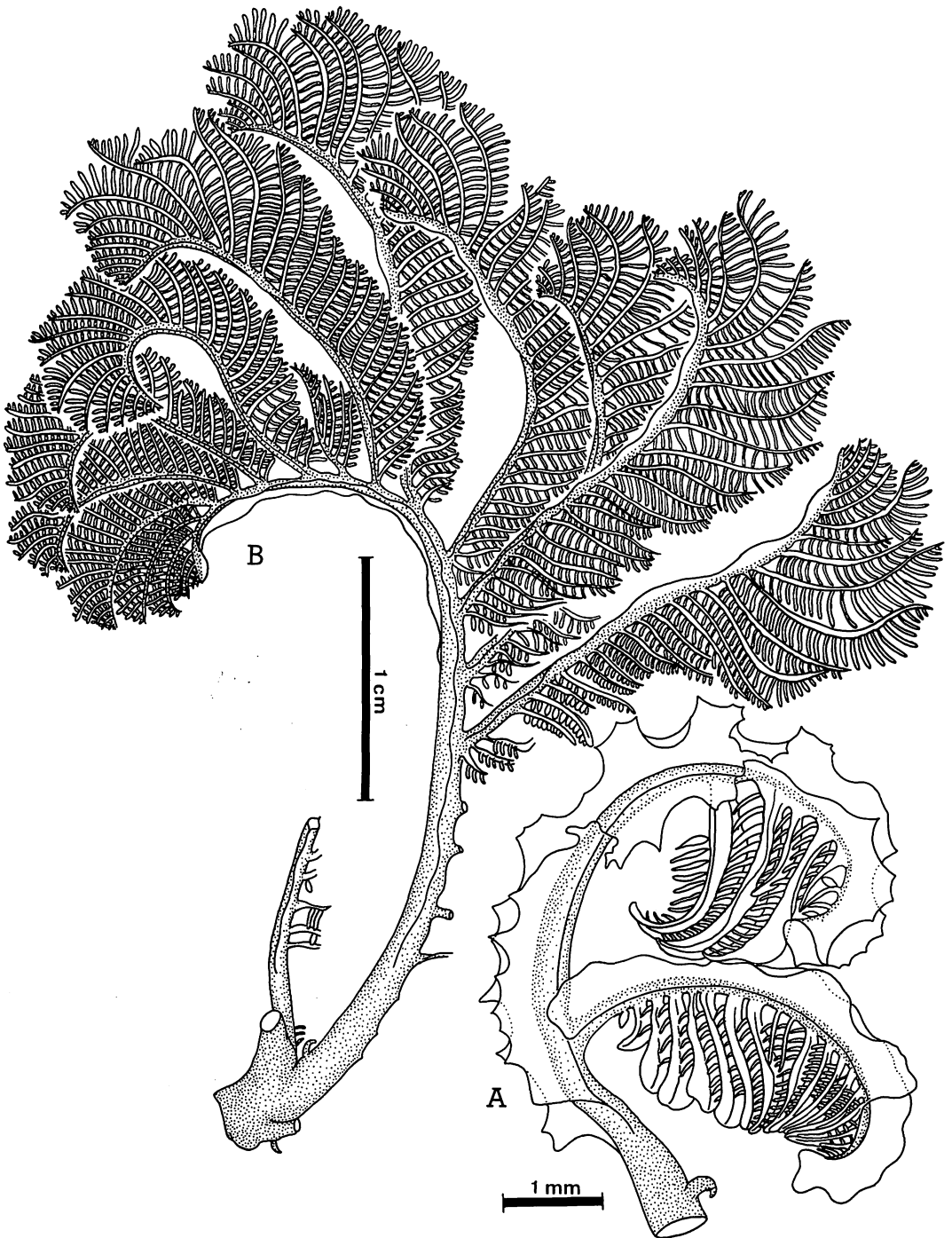


Fig. 2. *Zelleria tawallina* MARTENS. A. frond of the young plants, showing the abaxial branching and undulate margin of blades. B. habit of the mature plant. Blades of the fifth order are not indicated.

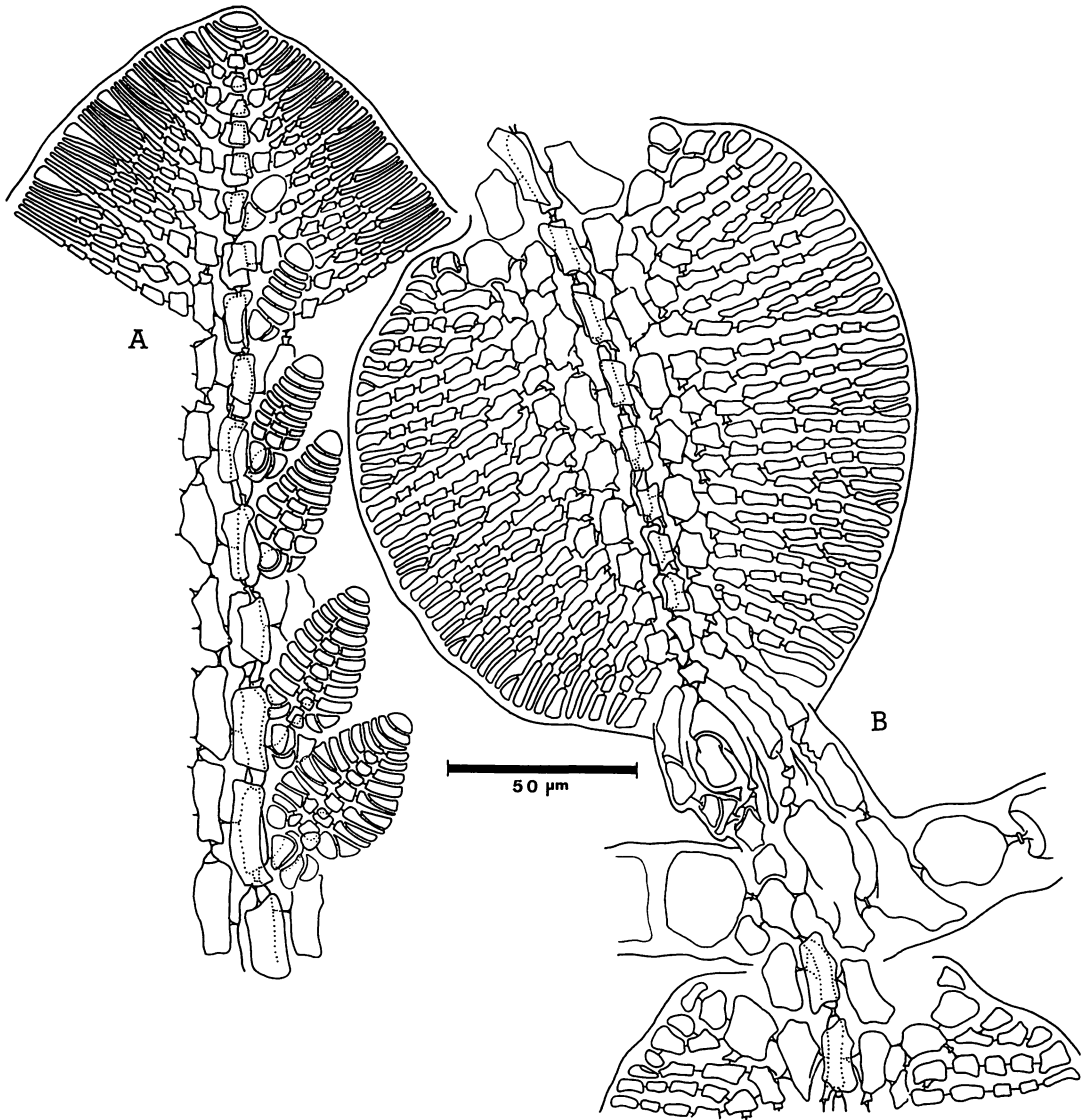


Fig. 3. *Zelleria tawallina* MARTENS. A. mature blade with juvenile blades on abaxial side. B. surface view of a short blade, showing the elongation of distal cells and the union with the cells of an adjoining blade.

latter was considered to be synonymous with *Hypoglossum involvens* by TAYLOR (1960). The present southern Japanese species agrees well with *Zelleria tawallina* in all respects of its vegetative structures.

Present observation reveals that in the structures of blade *Zelleria tawallina* provides some features in common with those that were observed by PAPPENFUSS (1937) in *Claudea multifida* and *Vanvoorstia spectabilis*.

Zelleria tawallina agrees with *Claudea multifida* in the following features: 1) The lateral pericentral cells are formed earlier than transverse ones (Fig. 3A); 2) Blades are formed as a rule by successive segments (Fig. 3A); and 3) The interstices of the nets are four sided making always more or less rectangular meshes. The features which combine *Zelleria tawallina* with *Vanvoorstia spectabilis* are as follows: 1) Blades are

formed by the characteristic abaxial branching (Fig. 2A-B); 2) One or more of the cells at the distal part of a short blade usually elongate and precede the apical cell in establishing connections with the cells of

the adjoining blades (Fig. 3B); and 3) Basal segment of blade forms three pericentral cells, an abaxial and two lateral pericentral cells (Fig. 3A). These features, however, may not have so significant taxonomic im-

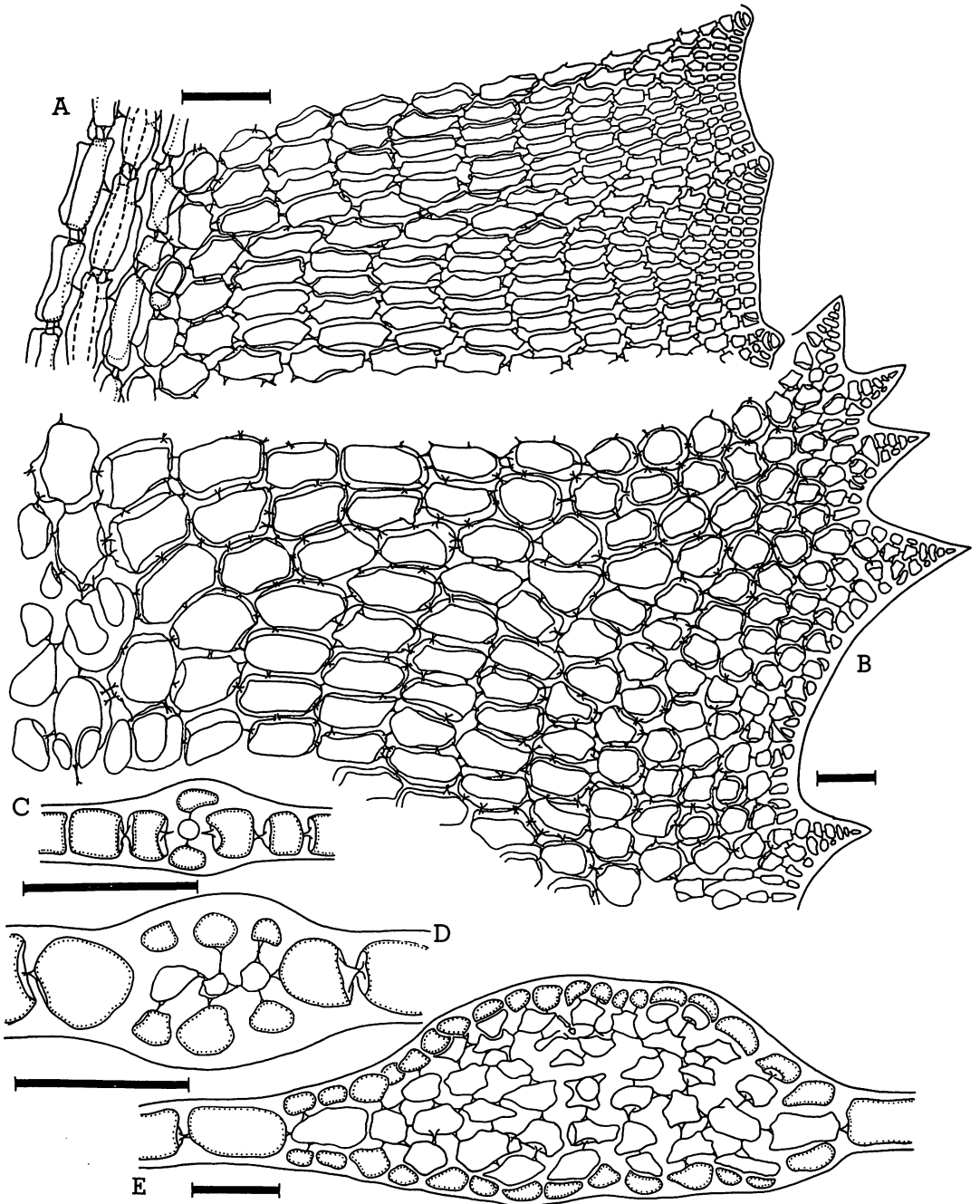
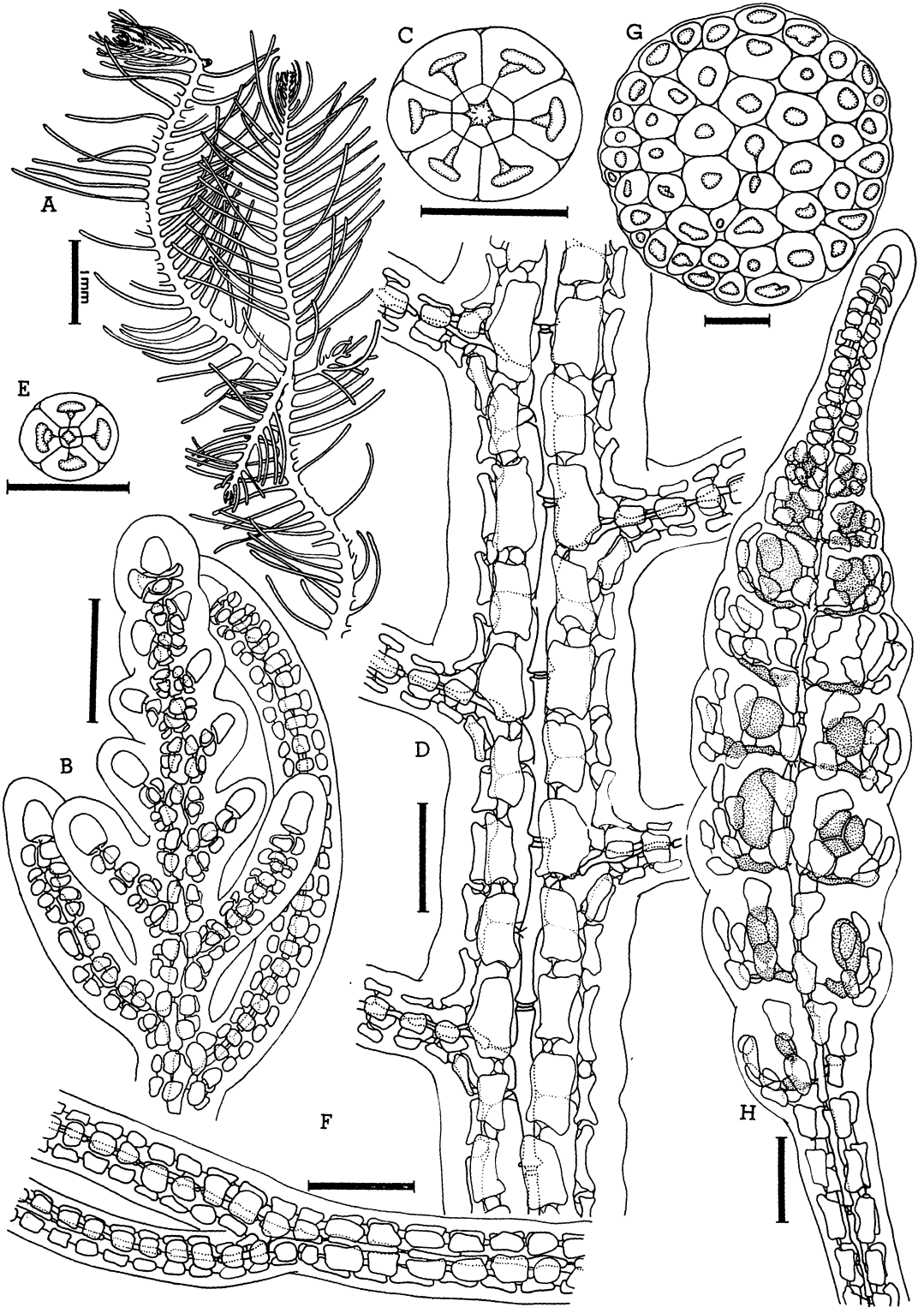


Fig. 4. *Zelleria tawallina* MARTENS. A-B. parts of blades, showing the cell lineages. C-E. sectional view, showing cortication of midrib regions of the blade. (Scale=50 μ m).



plications in discussing the relationships of *Zellera* with *Claudea* or *Vanvoorstia*, and the features in the formation of blades and the development of tertiary cell rows seem to have much weight in the taxonomic argument about *Zellera tawallina*.

Unlike the structures of *Claudea multifida* and *Vanvoorstia spectabilis*, *Zellera tawallina* is distinct in the following features: 1) The primordium of the daughter blade is initiated as an outgrowth from the posterolateral side of a central cell and lies between abaxial and one of the lateral pericentral cells that elongates to the same length as the central cell (Fig. 3A); and 2) A number of tertiary cell rows, of which all apical cells reach the thallus margins, are produced (Figs. 3B, 4A-B), and some of these continue further development giving rise to irregular spinous projections resulting from short rows of fourth order cells (Fig. 4B). These features suggest that *Zellera* is closely related to the genera of the Hypoglossum-group more closely than to *Claudea* or *Vanvoorstia*. *Claudea* and *Vanvoorstia*, as well as *Zellera*, were formerly included under *Claudea*-group (KYLIN 1956), and now *Vanvoorstia* is excluded from this group representing a sole genus in the *Vanvoorstia*-group (WYNNE 1983). The results obtained from the present observations on the vegetative structures of *Zellera tawallina* support the suggestion by WOMERSLEY (1965) that *Zellera* is closely related to the Hypoglossum-group. A study of further collections, especially those of tetrasporic and female plants of *Zellera tawallina*, would help in assessing its relationships.

***Bostrychia calliptera* (MONTAGNE) MONTAGNE** KUETZING Sp. Alg. 839. 1849. (Fig. 5A-H)

Japanese name: Yaeyama-kokemodoki.

Specimens examined: HI19853, collected by H. ITONO from Fukido river, Ishigaki island, May 28, 1984. Growing on the prop-roots of rhizophoracean plants in shallow and sheltered situations, or forming dense mats on damp shaded rocks in the intertidal-zone near the river mouth.

Distribution in literature: French Guiana, Brazil (TAYLOR 1960); Florida (DAWES 1974); Venezuela, Ghana (POST 1936); Galapagos Is. (POST 1963); Panama, Colombia, Ecuador (TAYLOR 1945); Singapore, Sumatra, New-guinea (POST 1936).

Remarks: In habit, the present specimens agree well with the illustrations of *Bostrychia calliptera* by KUETZING (1864, pl. 19d-g) and by FALKENBERG (1901, pl. 11, figs. 26-29). Comparison with the description of TAYLOR (1960) of this species reveals that the southern Japanese specimens agree fairly well in their vegetative structures except some features such as the size of plants and the manner of the axial cortication. According to the TAYLOR's description (1960), the plants attain the height of 6-11 cm and the main axes become corticated by rhizoidal filaments. Our southern Japanese specimens, however, are generally slender and attain less than 2 cm high, and the axial cortication of the indeterminate axes is occasionally seen only in the basal parts of the axes. In the basal parts of the indeterminate axes, some of the pericentral cells and their first derivatives initiate rhizoidal cells from their posterior ends and these rhizoidal cells extend downwards on the surface of the pericentral cells in the segment below or even along the space between the central and pericentral cells, and the axes have usually slight cortication. In the most heavily corticated axis the cortex is two or three layers

Fig. 5. *Bostrychia calliptera* (MONTAGNE) MONTAGNE. A. habit of plant. B. dorsal surface of the tip of the of the main axis. C. transverse section of the main axis, showing six pericentral cells. D. dorsal surface of the main axis, showing arrangement of pericentral cells and the lateral branches. E. transverse section of the lateral branch, showing four pericentral cells. F. part of lateral branch, showing unusual branching. G. transverse section of basal part of the main axis, showing axial cortication. H. dorsal surface of the stichidium, showing the arrangement of tetrasporangia. (Scales in B-H=50 μ m).

thick (Fig. 5G).

The structure, with the slight development of axial cortication by rhizoidal cells, is of distinctive morphology. However, in the development of the lateral branches in alternate distichous manner, the presence of six pericentral cells in the segment of indeterminate axes and four in the lateral branches, and the entire absence of monosiphonous branches, they show the essential features of *Bostrychia calliptera*, though the thalli remain small. POST (1963) recognized fifteen species of *Bostrychia*, and as contrasted with all species with axial cortication, such axial cortication by rhizoidal filaments in *Bostrychia calliptera* is very distinctive. POST (1936) already recognized that specimens of *Bostrychia calliptera* from Indo-Pacific Oceans have smaller size of thalli and have a characteristic in which the axial cortication is suppressed in most cases. In agreement with the view of Post, it appears best to regard the southern Japanese species as a dwarf variant of *Bostrychia calliptera*.

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糸野 洋：南日本新産海産藻類について

沖縄県八重山諸島で採集した海産藻類のうち、南日本新産種として *Rhipilia orientalis* A. et E. S. GEPP ニセハウチワ (新称), *Zellera tawallina* MARTENS ベニハウチワ (新称) 及び *Bostrychia calliptera* (MONTAGNE) MONTAGNE ヤエヤマコケモドキ (新称) の3種を報告した。これら3種のなかで、ニセハウチワ属 *Rhipilia* KUETZING (Udoteaceae, Chlorophyta) とベニハウチワ属 *Zellera* MARTENS (Delesseriaceae, Rhodophyta) の2属は我国の海藻フロラに新しく追加されるべき属である。(890 鹿児島市郡元1丁目21番35号, 鹿児島大学理学部系統分類学研究室)