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Some Marine Algae from Batan and Camiguin Islands, Northern Philippines-I

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Abstract

A biological expedition of the Batan Islands and Babuyan Islands, Northen Philippines was executed in November, 1964, under the joint auspieces of the Kagoshima University, Japan and the National Museum in Manila, Philippines, with the cooperation of the Kagoshima-maru, training ship of the Fisheries of Kagoshima University.

The writer and Dr. G. T. Velasquez, Prof. of the University of Philippines and other workers were jojnted in this investigation as the members of the section of Marine Botany. Concerning the marine algae around the both islands of Batan and Camiguin Islands, Philippines, there have been quite few, if any, scientific reports, which will make any report more or less significant; then here, a preliminary report shall be presented about six species deemed to be comparatively noteworthy. Of these six species, three are new species and other three species seem to the writer new to Philippines.

Here, sincere gratitude is to be offered for their kind and gracious aid and guidance to Dr. Tokushi Fukuda, President of the Kagoshima University and Dr. G. B. Ocampo, Director of the National Museum, Philippines.

Phaeophila dendroides (Crouan) Batters

Fig. 1.

Batters, Catalogue, p. 13; Boergesen, Some Mar. Alg. Mauritius (1940) p. 7; Taylor, Mar. Alg. Eastern Trop. and Subtrop. Gaost of America (1960) p. 48, pl. 2, fig. 4.

Ochlochaete dendroides Grouan, Florule (1867) p. 128.

Phaeophila floridearum Hauck, Meeresalg. (1885) p. 464.

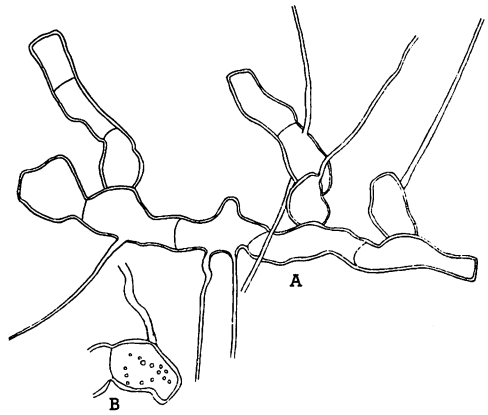


Fig. 1. *Phaeophila dendroides* (Crouan) Batters
A. B. Part of the frond. ×320

Habitat. Plants epiphytic or endophytic on the frond of *Brachytrichia quoi* Born. et. Flah. San Pio Quinto, Camiguin Island. Col. 20 Nov., 1964.

Distribution. Florida; Hispaniola; Mauritius; Canary Islands; Philippines.

The frond of this species consists of frequently branching uniseriate filaments. The cells of the filaments are generally cylindrical and somewhat irregular in shape, 10–18 μ in diameter, 24–45 μ in length, having the lobed parietal chromatophores and several pyrenoids.

The cells of the filaments very often bear one or two hairs, being neither separated by a wall from the supporting cells nor swollen at the base. The hair is abourt 135 μ long and about 3 μ broad.

Avrainvillea capituliformis spec. nov.

Figs. 2–3. and Pl. I, B.

Frons 2.5–10 cm alta, solitaria, capitata, brunneo-viridis vel atrovirens, e stipite et capitula composita; stipes cylindricus, ca. 8 cm. longus, 0.7–1.8 cm. latus; capitulum globosum aut irregulariter semisphericum, 1.2–2 cm. diam.; filamenta frondis in partibus capitata cylindrica aut subcylindrica, saepe undulata et constricta, clavata in partibus apicem, 70–80 μ crassa. Planta typica in loco dicto San Pio Quinto, Camiguin Insula, Philippines, legit Tanaka, No. 19671, 19 Nov., 1964.

Habitat. Plants growing on solitary in the intertidal zone in sand or sandy-mud. San Pio Quinto, Camiguin Island, Philippines. Col. 19 Nov. 1964.

Fig. 2. *Avrainvillea capituliformis* Tanaka. Habit of the plant. Slightly reduced.

Plant 2.5–10 cm. tall, solitary, dull green or brownish dark green, capitate, cylindrical stipe topped by a big head of large diameter, stipe portion of the frond usually cylindrical throughout, about 8 cm. high, 0.7–1.8 cm. in diameter; capitulum nearly globular or irregular semisphrica, 1.2–2 cm. in diam.; filaments of the capitulum cylindrical or semicylindrical, 70–80μ diam, often undulate and constricted and clavate at apices, somewhat brownish in colour, forking strongly divaricate with constrictions just above each; filaments of the lower stipe portion of the frond subcylindrical and undulate and irregular membrane, 22–45 μ in diam., irregularly ramified.

Among the genus *Avrainvillea*, the outer appearance of the present species is very characteristic on account of the cylindrical stipe and mashroom-like form, the upper portion of the frond being somewhat irregularly capitate. The present species shows some likeness to *Avrainvillea rawsonii* Howe, but it differs from the latter in its having characteristic capitate-head and solitary growing habitat.

The filaments of the capitulum are usually cylindrical

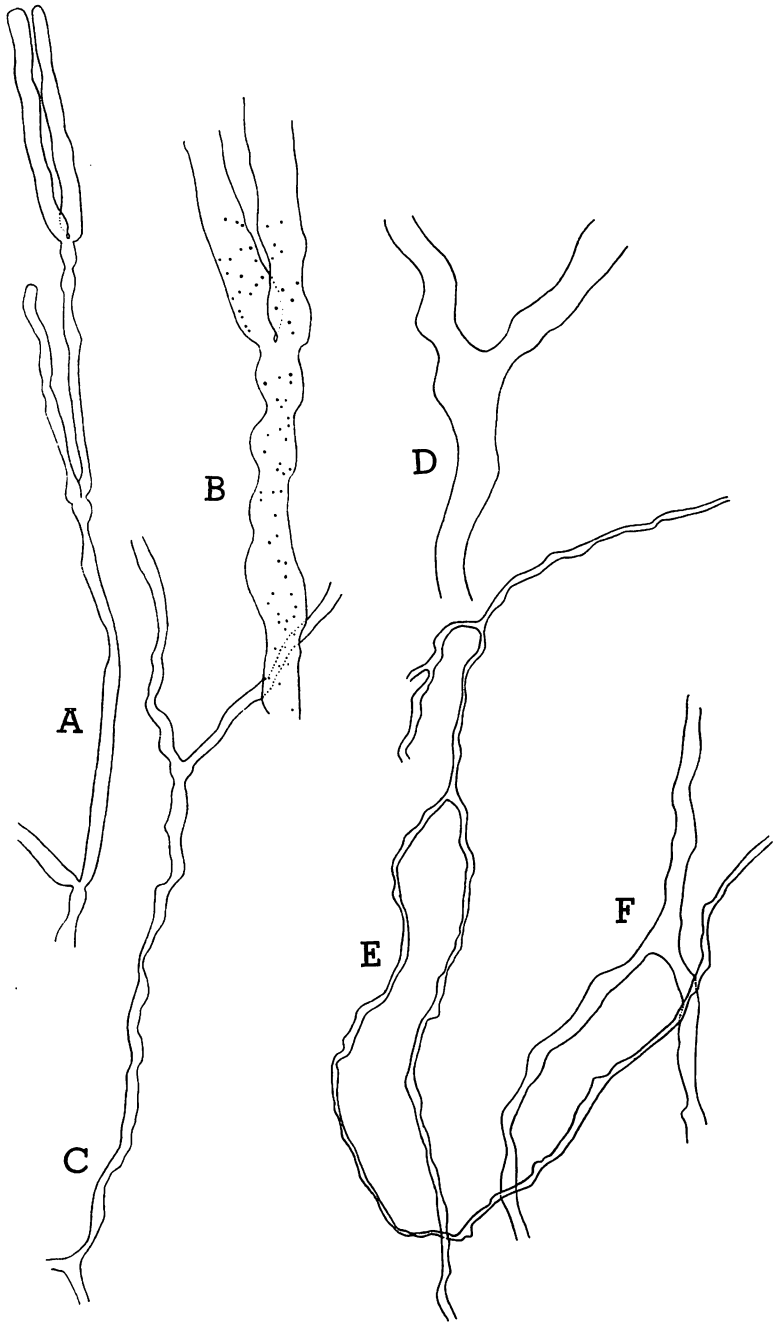


Fig. 3. *Avrainvillea capituliformis* Tanaka.
A-B The filaments of the upper part of the capitulium.
C-D The filaments of the upper part of the stipe.
E-F The filaments of the lower part of the stipe.
A. C. E. ×15, B. D. F. ×35

or subcylindrical, and often having undulate membrane, about 70–80 μ in diameter, rather strongly constricted above the dichotomy and towards the apices the growing tip is thicker and is clavate at apices. As to the structural filaments of the stipe of the frond, the present plant is likely to be allied to *A. erecta* Gepp, but it differs from the latter in its rather thicker filaments. The internode of the filaments of the capitulum of this species seems to show some constriction, while in *A. erecta*, this is not the case.

Chlorodesmis hildebrandtii A. et E. S. Gepp

Fig. 4. and Pl. II, C.

Codiaceae of the Siboga Exped. (1911) p. 16, figs. 74–75; Weber van Bosse, Liste des Algues du Siboga, 1 (1913) p. 114; Egerod, An analysis of the Siphonous Chlorophycophyta (1952) p. 377, pl. 34, a, fig. 9. a. b. d.; Dawson, Marine plants in the vicinity of Nha-Trang, Viet-Nam (1954) p. 394, fig. 11, f. g.

Habitat. Growing on sandy coral rock in the lower littoral belt. San Pio Quinto, Camiguin Island. Col. 20 Nov., 1964.

Distribution. Viet-Nam; Hawaiian Islands, Comoro Isls.; Indian Ocean.

Our materials at hand from Camiguin Island, seem to agree well with the descriptions and figures of Dawson, (1954) and our plant bears not a small resemblance to the Vietnamese plant. According to Egerod, the Hawaiian plant of this species has numerous nodule constrictions in the membrane of the filaments, while in our present specimens, such is not the case. The filament is about 50 μ in diameter, and in most cases there was bifurcation of the filaments below the articulation of the branches. (Fig. 4. b).

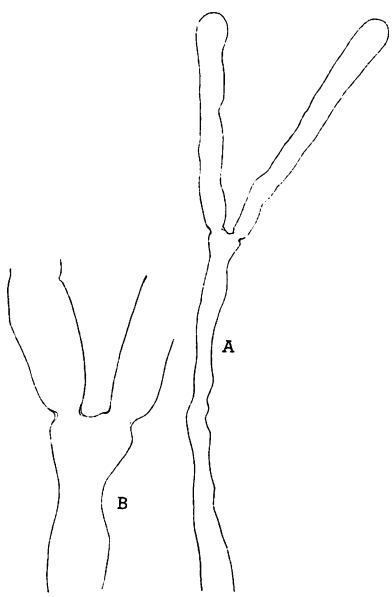


Fig. 4. *Chlorodesmis hildebrandtii* A. et E. S. Gepp.
A. Terminal portion of a plant. ×20
B. Outline of a dichotomy to show characteristic equal constrictions. ×50

Dictyopteris camiguinensis spec. nov.

Fig. 5, and Pl. 1, A.

Frons erecta, membranacea, 6–10 cm. alta, 3–5 mm. lata, stipitata, brunnea-vel olivaceo-fusca, dichotomo-flabellata vel irregulaliter ramosa, coasta plus minus inconspicua, membranacea in supra parte ca. 5–6 stratosa, 110–135 μ crassa, in infra parte stipitem 7–8 stratosa, 170–200 μ crassa; marginalibus crenulatis vel laceratis in parte inferioribus, undulatis vel obtusis ad apicem ramulis; tetrasporangiis aggregatis, in utraque superficie promiscue sparsis, obovata,

34–40 × 50–56 μ. Planta typica in loco dicto San Pio Quinto, Camiguin, legit Tanaka, no. 19672, 19 Nov., 1964.

Habitat. Growing on the coral in the lower littoral belt. San Pio Quinto, Camiguin Island, Philippines. Col. 19 th, Nov., 1964.

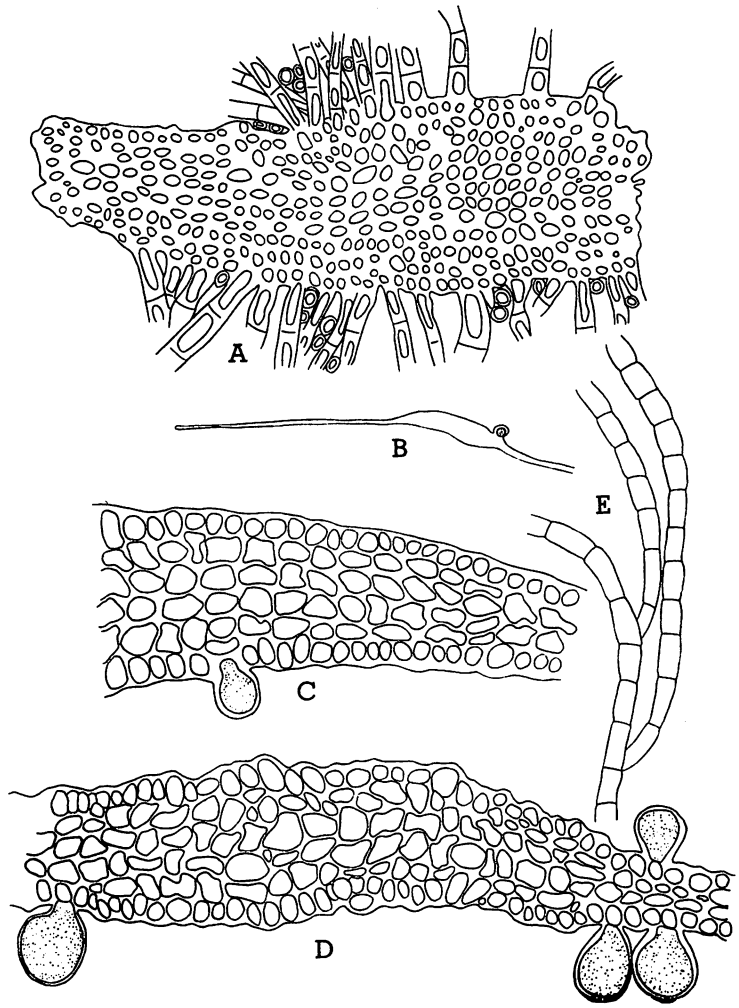


Fig. 5. *Dictyopteris camiguinensis* Tanaka.
A. Transverse section of the stipe. ×30
B. C. D. Transverse section of the upper branches with sporangia.
B. ×10, C. ×75, D. ×75
E. Rhizoidal filaments of the stipe. ×20

Frond erect, 6–10 cm. high, 3–5 mm. wide, stipitate, deep brown or olive brown, attached to the substratum by means of rather small conical disc with brownish hairs, dichotomo-flabellately or irregularly dichotomous branched, with narrow and inconspicuous midrib;

stipe rather long, subcylindrical, 3–6 cm. long, and 1–1.5 mm. broad, 3–4 times ramified, with very patent and round axils; midrib relatively not so broad, inconspicuous in the middle part of the frond; margin of the segment of the branch usually crenulate or lacerate and not smooth in the lower portion of the frond, but undulate or obtuse at the ultimate branches; stipe portion of the frond issuing numerous relatively large monosiphonous rhizoidal filaments; midrib consists of about six layers of cells, together measuring 110–135 μ in thickness, stipe portion usually consists of 7–8 layers of cells, and measuring 170–200 μ in thickness; sporangia usually obovate, 34–40 × 50–56 μ, promiscuously scattered on both sides of the midrib and also lying close along the both side of the ramuli; substance membranaceous.

Among the genus *Dictyopteris*, the present species seems to be closely related to *D. undulata* Holmes, but it is distinguishable from the latter by its slender frond and also by not having a robust midrib, and also by the shape of the margins of branches. On the other hand, *D. johnstonei* Gardner, according to the descriptions, appears to have some resemblance to the present species, but in the new species the shape of margins of segments is so different that we can easily distinguish one from the other.

Claudea batanensis spec. nov.

Figs. 6–8, and Pl. II, B.

Frons 2–3 cm. alta, caespitosa, stipitata, membranacea, stipe filiforme, 1 cm. alta, 0.2–4 mm. diam., mox in costam marginalem reticuli plani; ramis recurvis et unilateralis, pinnaeformibus hinc reticulo ornatis; reticuli trabeculis triseriatis aut quadriseriatis rectangule anastomosantibus; stichidiis inter triseriatis reticuli seriata; tetrasporas triangule divisas, ellipticas vel elongato-sphericas, 50–60 μ diam., irregulariter transversim ordinatas foventia; colore laeto-roseo. Planta typica in loco dicto Basco, Batan Isl., legit Tanaka, no. 19673, 10 Nov., 1964.

Habitat. Growing on the tube of Polychaete associated with other algae.

Basco, Batan Island, Philippines. Col. 10 Nov., 1964.

Distribution. Garanbi, Kashoto, Formosa; Batan Islands and Babuyan Islands, Northern Philippines.

Frond stipitate, 2–3 cm. high, caespitose, light red colour, forming net-like structure, unilateral; stipes about 1 cm. long and 0.2–4 mm. in diam., filiform; net-like portion of the frond forming by three or four successive orders of blades as follows: firstly, distal part of primary blade gives rise to a series of secondary blade on the ventral surface, and secondary blades forming on the midrib by successive segments of the primary blade, a series of tertiary blades forming, in a similar manner, in the ventral surface of each secondary blade; union of tertiary blades forming ia a similar manner of each tertiary blades, with the secondary blades bringing about the net-like structure of the frond; formation of quaternary blades is in a similar manner as that of the tertiary blades; interstices of the net are more or less rectangular in shape, as the blades of the same order are parallel to one another, and issue more or less at right angles to those of the preceeding order; longer

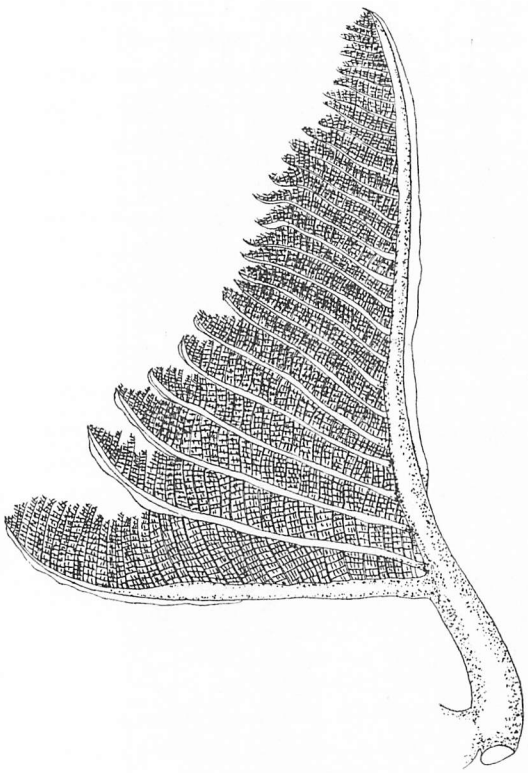


Fig. 6. *Claudea batanensis* Tanaka. Habit of a plant. ×7

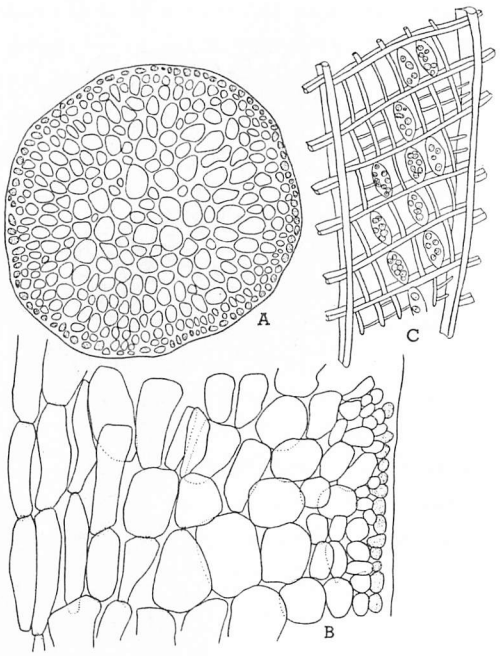


Fig. 7. *Claudea batanensis* Tanaka.
A. Cross section of the stipe portion of the plant. ×20
B. Longitudinal section of the stipe. ×50
C. Diagram illustrating the direction of the successive order of blades. ×17

sides of an interstice are bounded by entire tertiary blades while the shorter sides are bounded by the equivalent of one segment of a secondary blade; tetrasporangia forming in the tertiary blades of the younger part of the frond, elliptical or elongate-spherical, 50–60 μ in diameter; male and female organs unknown; substance being very soft and membranaceous.

The present plants grow always on the tube of Polychaete associated with *Acanthophora aokii* Okamura in rather deep sea.

In the outer appearance and anatomical structure of the frond, this new species has much likeness to *C. multifida* Harvey, however, this differs from *C. nultifida* in its long stipe and in its tetrasporangia bearing blades. The portion of the cortication of the tetrasporangia bearing blades is not so broad and large as that of *C. multifida*, and the number of the tetrasporangia of each tetrasporangia bearing blades is rather small.

Fig. 8. *Claudea batanensis* Tanaka.

A. B. C. Surface view of tetrasporangia bearing tertiary blades. A. ×50, B. ×35, C. ×75.

D. Interstice of an almost mature portion of the thallus showing primary, secondary, tertiary, quaternary blades. ×50

1. primary blades, 2. secondary blades, 3. tertiary blades, 4. quaternary blades.

Bostrychia kelanensis Grunow

Figs. 9–10, and Pl. II, A.

in Post, Syst. und Pflanzengeo. Notizen zur *Bostrychia-Caloglossa*-Association (1936) p. 1–84, Weitere Daten zur Verbreitung des Bostrichietum IV (1955) p. 356, V (1955) p. 207, Zur verbreitung und Okologie der *Bostrychia Caloglossa*-Association (1963) p. 64; May, Supp. to the Key to Genera of Rhodophyceae hitherto record from Australia (1965) p. 377.

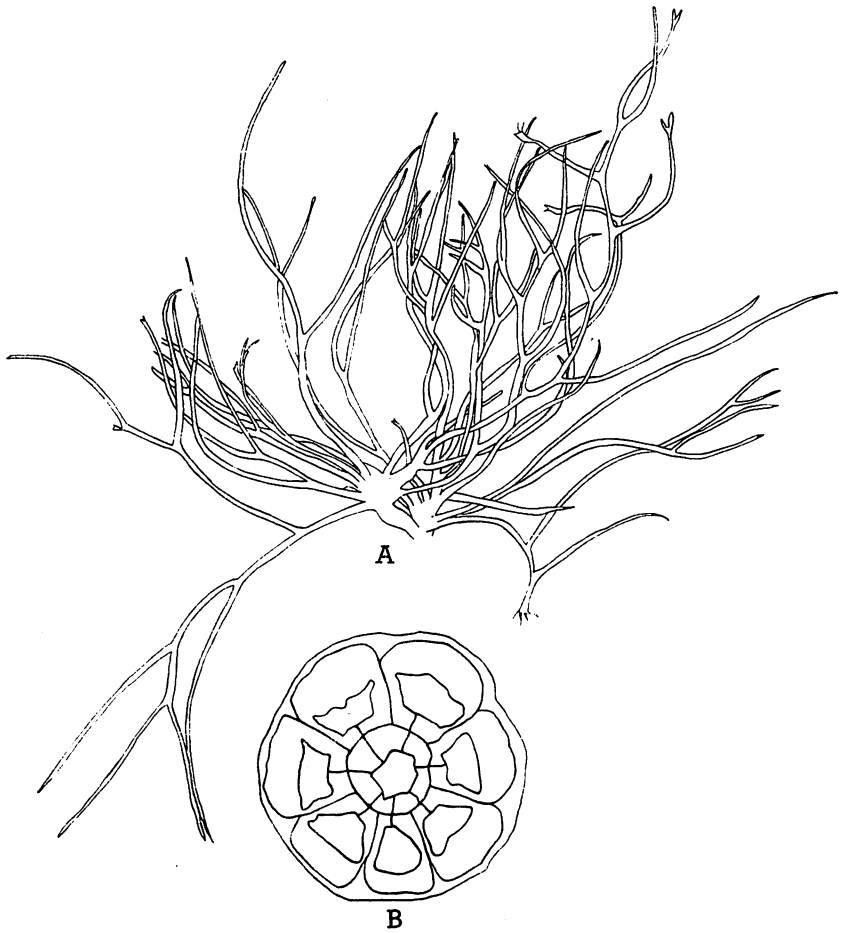


Fig. 9. *Bostrychia kelanensis* Grunow
A. Habit of a plant. ×10
B. Transverse section of a filament. ×250

Habitat. Growing on the leaf of *Nipa fruticans* W. or on the stem of Mangrove associated with *Caloglossa* sp. and *Bostrychia* sp. Plants growing on the muddy bank of the river in brackish water. San Pio Quinto, Camiguin Island, col. 20th, Nov., 1964.

Distribution. New Guinea; Australia; South China.

The plants are usually erect but often somewhat semiprocumbent, and 0.6–1 cm. in length, attached to the substratum by means of the ramified bundle of the rhizoidal filaments. The lower part of the frond forming rather big axial trunk, and several ramified bundle of rhizoidal filaments issuing from the axial trunk. The thallus is irregularly dichotomus ramified and with cylindrical filaments. The cylindrical filaments are usually 80–120 μ in diameter.

Besides the axial trunk, the plants are often attached to the substratum by the rhizoidal filaments at the apex or the intersegment of the branches. The branches are polysi-

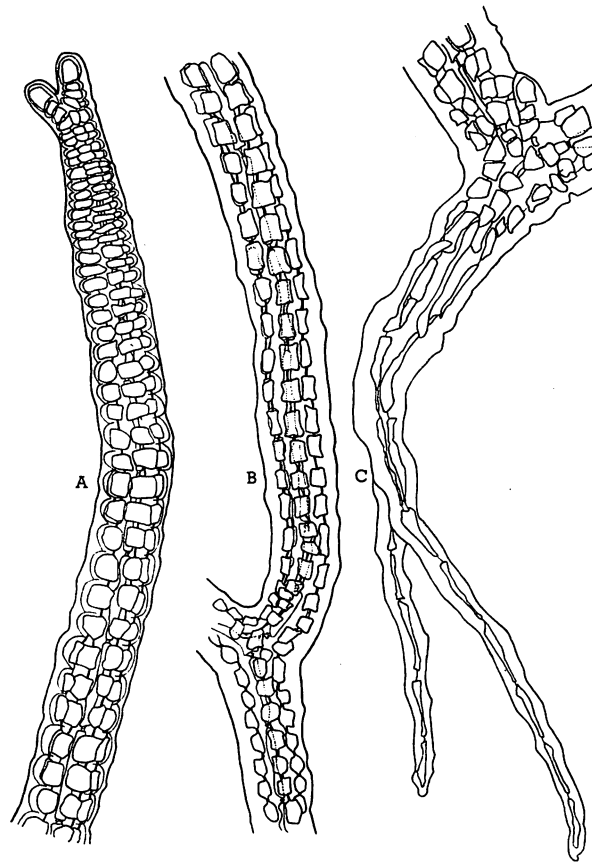


Fig. 10. *Bostrychia kelanensis* Grunow.
A. Apical portion of a branch. ×100
B. Surface view of a branch. ×70
C. Showing a rhizoidal holdfast at the intersegment of a branch. ×100

phonous, having about seven pericentral cells in the lower part and less than seven siphons in the upper portion. The cortical layer of the cells is absent. The pericentral cells are divided into three segments per length of one central cell.

The length of the pericentral cells in the upper portion of the filaments is usually less than their breadth. The apical cell of the filament is comparatively bigger than those of the other cells.

Generally, our materials at hand from San Pio Quinto, Camiguin Island, agree well with the descriptions of Post and others. The most characteristic feature of the present species lies in the fact that it is in possession of the three pericentral cells per length of one central cell.

References

BATTERS, E. A. L. (1902): A Catalogue of the British Marine Algae. *Supp. Journal of Botany.*

BOERGESEN, F. (1940): Some Marine Algae from Mauritius, 1 Chlorophyceae. *Kgl. Danske Vidensk Selsk. Biol. Meddel.* **15**(4).

CROUAN, P. L. (1885): Florule du Finistére. Paris.

DAWSON, E. Y. (1954): Marine plants in the Vicinity of Nha-Trang, Viet-Nam. *Pacific Science,* **8**(4).

EGEROD, L. (1952): An analysis of the Siphonous Chlorophycophyta. *Uni. Calif. Pub. Bot.* **25**(5).

GARDNER, N. L. (1940): New species of Melanophyceae from the Pacific Coast of North America. *Univ. Calif. Pub. Bot.* **19**(8).

GEPP, A. and GEPP, E. S. (1911): The Codiaceae of the Siboga Expedition including a monog. Flabellarieae and the Udoteae. *Siboga Exped.,* **62.**

HARVEY, W. H. (1858): Phycologia Australica, 1. London.

HAUCK, F. (1885): Die Meersalgen Deutschlands und Oesterreichs *Rabenhorsts Kryptogamen.* **2**(2). Leipzig.

HOWE, M. A. (1907): Phycological Studies III. Further notes on *Halimeda* and *Avrainvillea. Bull. Torry Bot. Club.* **34.**

KYLIN, H. (1956): Die Gattungen der Rhodophyceen. Gleerups, Lund.

OKAMURA, K. (1907): Icones of Japanese algae, 1. Tokyo.

PAPENFUSS, G. F. (1937): The structure and reproduction of *Claudea multifida, Vanvoostia spectabilis* and *Vanvoostia coccinea. Symb. Bot. Upsalienses.* **2**(4).

POST, E. (1936): Systematische und Pflanzengeographische Notizen zur *Bostrychia-Caloglossa*-Association. *Rev. Algol.,* **9.**

——— (1955): Weitere Daten zur Verbreitung des *Bostrychietum,* IV. *Archiv. fur Protistenkunde,* **100**(3).

——— (1955): Weitere Daten zur Verbreitung des *Bostrychietum,* V. *Ber. Deutsche. Bot. Ges..* **68.**

——— (1963): Zur Verbreitung und Ökologie der *Bostrychia-Caloglossa*-Association. *Int. Revue Ges. Hydrobiol.* **48**(1).

TAYLOR, R. (1960): Marine algae of the Eastern tropical and subtropical coast of the Americas. *Univ. of Michigan Studies, Scientific series,* **21.**

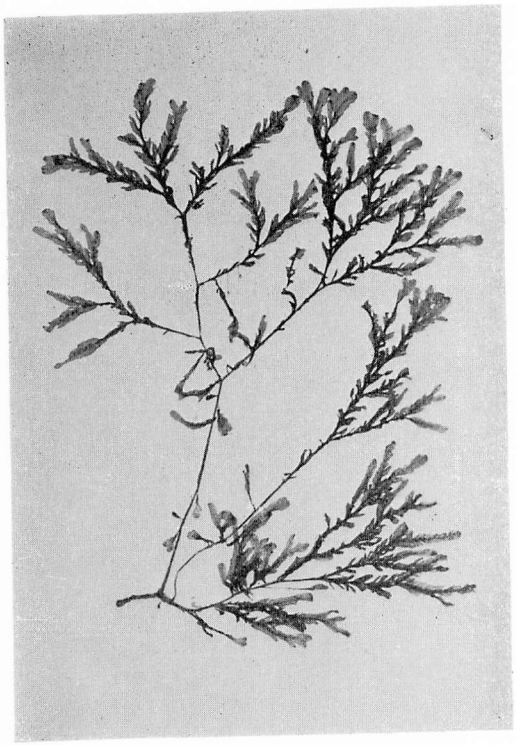
WEBER VAN BOSSE (1913): Liste des algues du Siboga, 1. *Siboga Exped.* **59**(a).

Plate I

A. *Dictyopteris camiguinensis* Tanaka. ×2/3

B. *Avrainvillea capituliformis* Tanaka. ×2/3

Plate I



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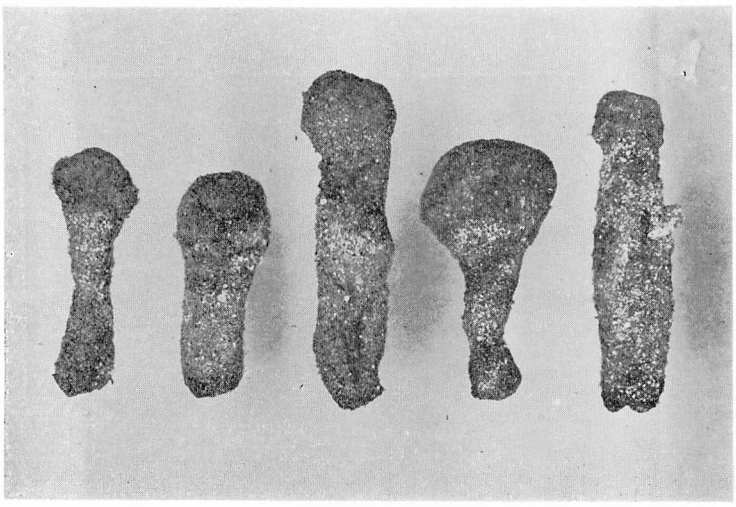


B

Plate II

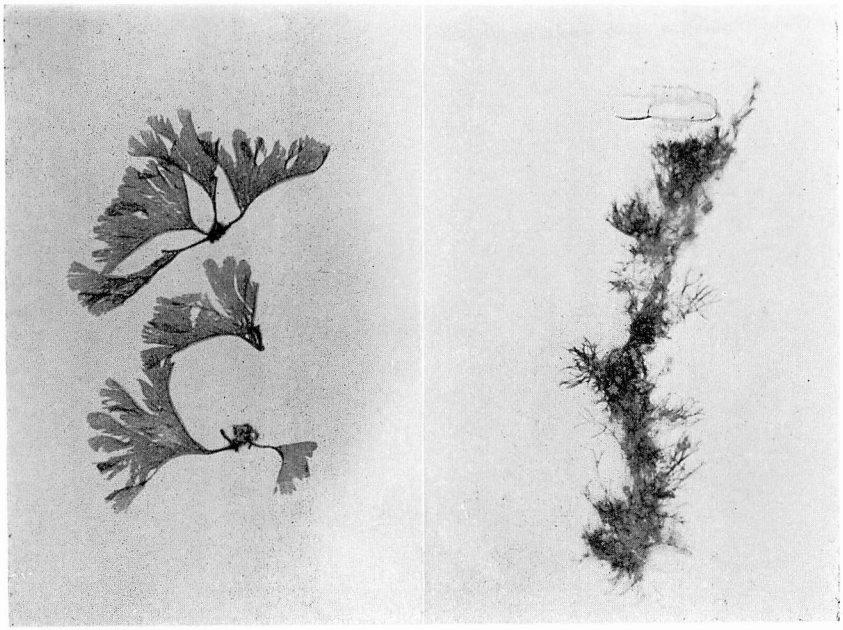
A. The *Bostrychia*-Association visible in the Mangrove zone of the river bank, near the coast of San Pio Quinto, Camiguin Island.

B. *Claudea batanensis* Tanaka. ×2/3

C. *Chlorodesmis hildebrandtii* A. et E.S. Gepp. ×1

Plate II

A



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