Three Species of Delesseriaceae (Rhodophyta) from Southern Japan

HIROSHI ITONO[1]

Abstract

Three species of the Delesseriaceae (Rhodophyta) from southern Japan are described. They are *Taenioma nanum* (Kütz.) Papenfuss, *Platysiphonia parva* Silva & Cleary and *Cottoniella amamiensis* spec. nov. The former species has already been reported by Okamura (1929–1932) as *T. perpusillum* J. Ag. in part, while the latter two, one of which is described here as a new species, are newly recorded from the southern part of Japan.

INTRODUCTION

J. G. Agardh (1863) includes *Sarcomenia, Taenioma, Vanvoorstia,* and *Claudea* as members of the *Sarcomenia* group and placed them under the Family Rhodomelaceae. However, Schmitz (1889), Schmitz and Hauptfleish (1897), and Falkenberg (1901) regarded this group as belonging to the Family Delesseriaceae. After a detailed study of this group, Womersley and Shepley (1959) transferred the *Sarcomenia* group from the Delesseriaceae to the Rhodomelaceae. Papenfuss (1961), not agreeing with the opinion of Womersley and Shepley, suggested that the group be placed akin to the *Claudea* and *Caloglossa* groups in the Delesserioideae. Thus, the taxonomic position of this group is now retained under Delesseriaceae (Papenfuss, 1961; Wynne, 1969).

Papenfuss (1937) treated the genera *Claudea, Vanvoorstia,* and *Caloglossa* as members of the *Claudea* group. Kylin (1956) recognized the genera *Taenioma, Cottoniella, Platysiphonia, Sarcomenia,* and *Sonderella* as members of the *Sarcomenia* group. Later, the genus *Sonderella* was transferred to the *Amansia* group in the Rhodomelaceae (Womersley, 1965) and the genus *Taenioma* to the *Caloglossa* group in the Delesseriaceae (Papenfuss, 1961). The genera comprising the *Sarcomenia* group, currently recognized by several workers (Papenfuss, 1937, 1961; Kylin, 1956; Womersley and Shepley, 1959), are as follows: *Malaconema, Dotyella, Cottoniella, Sarcotrichia, Platysiphonia,* and *Sarcomenia.*

In reference to the Japanese species in the *Sarcomenia* group, a single genus, *Platysiphonia* (Segawa, 1949) has been described. Other genera of this group, currently and rightly recognized, have not been described from Japan.

In this paper, two southern Japanese species of the *Sarcomenia* group and one species of the *Caloglossa* group are described. They are *Taenioma nanum*

[1] Department of Botany, Faculty of Fisheries, Kagoshima University, Kagoshima, Japan.

Micronesica 8(1-2):51-61. 1972 (December).

(Kütz.) Papenfuss, *Platysiphonia parva* Silva & Cleary, and *Cottoniella amamiensis* (spec. nov.).

DESCRIPTION OF SPECIES

Taenioma nanum (Kütz.) Papenfuss

Fig. 1 A, B

Notes South Afr. Mar. Alg. III, (1952) p. 167; Desikachary and Balakrishnan, *Taenioma* from India, (1957) p. 336.

Plants minute, epiphytic, 0.5 cm high, consisting of horizontally creeping, branched, cylindrical, ecorticate, polysiphonous axes; indeterminate axes 120–140 μ in diameter, attached to the substrate by unicellular rhizoids below; rhizoids non-septate, arising from the ventral pericentral cells; indeterminate parts consisting of central cells each with 4 pericentral cells; erect flattened determinate blades arising from the indeterminate parts, determinate blades with 2 flanking cells from the respective lateral pericentral cells; erect indeterminate parts giving rise to alternate bilateral determinate blades with short cylindrical base and flat ligulate blades; blades 110–140 μ broad and 16–20 segments long, lower 2–3 segments lacking flanking cells, terminating always in two long terminal hairs; tetrasporangia disposed in two rows along the axes of determinate blades; sexual plants not seen.

JAPANESE NAME: Nankai himezuta (nom. nov.)

HABITAT: HI #19721. Yoron Island, Amami Islands. Growing on coral reef associated with other minute algae at the depth of about 10 m. Collected by the present author on August 29, 1969.

DISTRIBUTION: Naples (Falkenberg, 1901); Canary Is. (Boergesen, 1930); Virgin Is. (Boergesen, 1919); Brazil (Joly, 1965); Japan (Okamura, 1929–1932); India (Desikachary and Balakrishnan, 1957); South Africa (Papenfuss, 1952); Solomon Is. (Womersley and Bailey, 1970).

SYNONYMS: *Taenioma macrourum* Thuret as interpreted by Falkenberg (1901); Papenfuss (1944); Taylor (1960).

Taenioma perpusillum J. Ag. as interpreted by Okamura (1929–1932 in part) and by Boergesen (1919, 1930).

Polysiphonia nana Kützing (1863).

Polysiphonia nana was described first by Kützing (1863) and was considered by Falkenberg (1901) as synonymous to *T. macrourum* and by Boergesen (1919) as synonymous to *T. perpusillum*. Papenfuss (1944) considered *Polysiphonia nana* as a representative of *Taenioma* and he also alluded that it seemed more likely that the species belonged to the rhodomelaceous family. Having examined Kützing's type material, Papenfuss (1952) transferred *P. nana* to *Taenioma* under the name of *T. nanum* (Kütz.) Papenfuss. He also considered *T. macrourum* and *T. nanum* to be identical, and on the basis of priority accepted *T. nanum* to be valid as the binomial rather than *T. macrourum*.

In reference to the Japanese species of *Taenioma*, a single species, namely

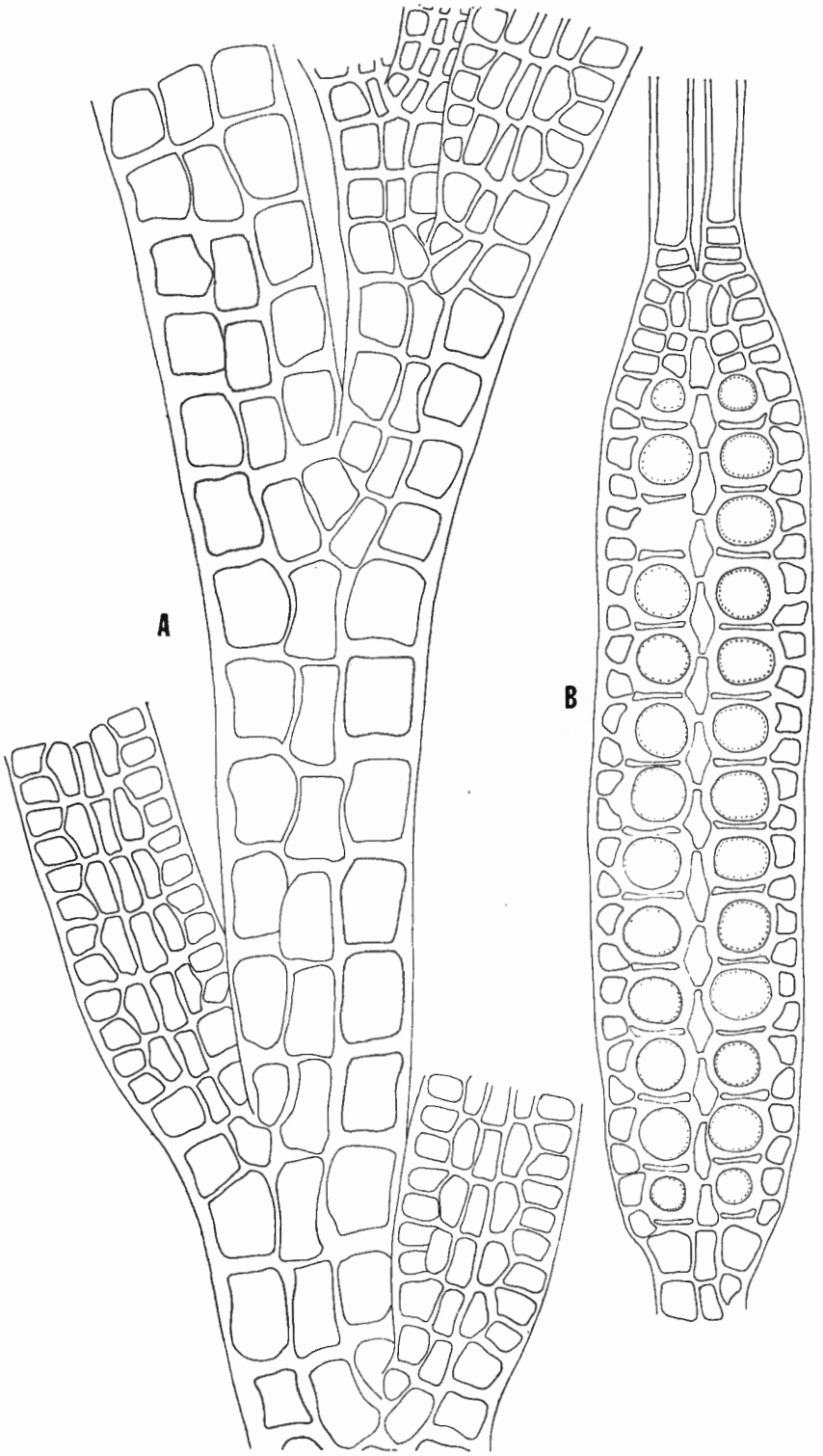

Fig. 1. *Taenioma nanum* (Kutz.) Papenfuss
A. Indeterminate axes with alternate bilateral determinate blades. (×200)
B. Determinate blade with tetrasporangia. (×200)

T. perpusillum, was reported (Okamura 1929–1932). However, judging from Okamura's figures and descriptions, *T. nanum* should be presently associated with *T. perpusillum*.

Most of the recent workers regarded the genus *Taenioma* to be monospecific (Bornet, 1892; De Toni, 1903; Howe *In* Thompson, 1910; Boergesen, 1919, 1930; Okamura, 1929–1932). However, Falkenberg (1901) and Schiffner (1931) recognized two species, *T. perpusillum* and *T. macrourum* (currently recognized as *T. nanum*). Papenfuss (1944) made an intensive study of *Taenioma* and asserted the separation of the two species. His proposal was entirely supported by Desikachary and Balakrishnan (1957), but Hollenberg (1967) was suspicious of whether *T. nanum* was superficially distinct from *T. perpusillum*.

According to Papenfuss (1944), the major differences between these two species are (1) the determinate branches in *T. perpusillum* end in three hairs while in *T. nanum* they invariably end in two; and (2) the determinate branches in *T. perpusillum* form regularly adaxial indeterminate branches near the base, while in *T. nanum* such branches are rare. The latter characteristic is of systematic value, and hence the branching is much sparser in *T. nanum* than in *T. perpusillum*. In the former, it is insufficient to have us accept the number of terminal hairs as a basis for distinguishing it from the latter species; because, although the number of terminal hairs in *T. nanum* is constantly two, the number of terminal hairs is unstable and 1–3 terminal hairs are formed in *T. perpusillum* (Dawson, 1962; Desikachary and Balakrishnan, 1957; Okamura, 1929–1932). In the present southern Japanese specimens no blade ending in 1 or 3 hairs has been found. Hence, the stability in number of terminal hairs is worthy of our notice as a reliable basis but only in connection with the latter characteristic described above.

The present southern Japanese species described here agree quite well with that of Kützing (1863), Falkenberg (1901), Papenfuss (1944, 1952), and Desikachary and Balakrishnan (1957). The present writer prefers to retain the two species as distinct.

Platysiphonia parva Silva and Cleary
Fig. 2 A–D, Fig. 3 A–B

Struc. Repro. *Platysiphonia*, (1954), p. 259, figs. 1–37; Dawson, Mar. Red Alg. Pacif. Mexico, (1962) p. 82, Pl. 39 figs. 2–3.

Plants epiphytic, to 1.4 cm high, consisting of ligulate acuminate blades and prostrate polysiphonous parts; prostrate parts attached to substrate by multicellular rhizoids arising from the anterior flanking cells; lateral branches 100–110 μ broad, arising endogenously from the central cells, branching dorsiventral; blades consisting of central cells each flanked by two cells; each flanking cell elongates to half the length of the lateral pericentral cells; basalmost segment or rarely basal 2–3 segments lacking flanking-cells; tetrasporangia produced in ultimate blades in two longitudinal rows, one sporangium by each lateral pericentral cell bordered by only two flanking cells; flanking cells in stichidia undivided; sexual plants not seen.

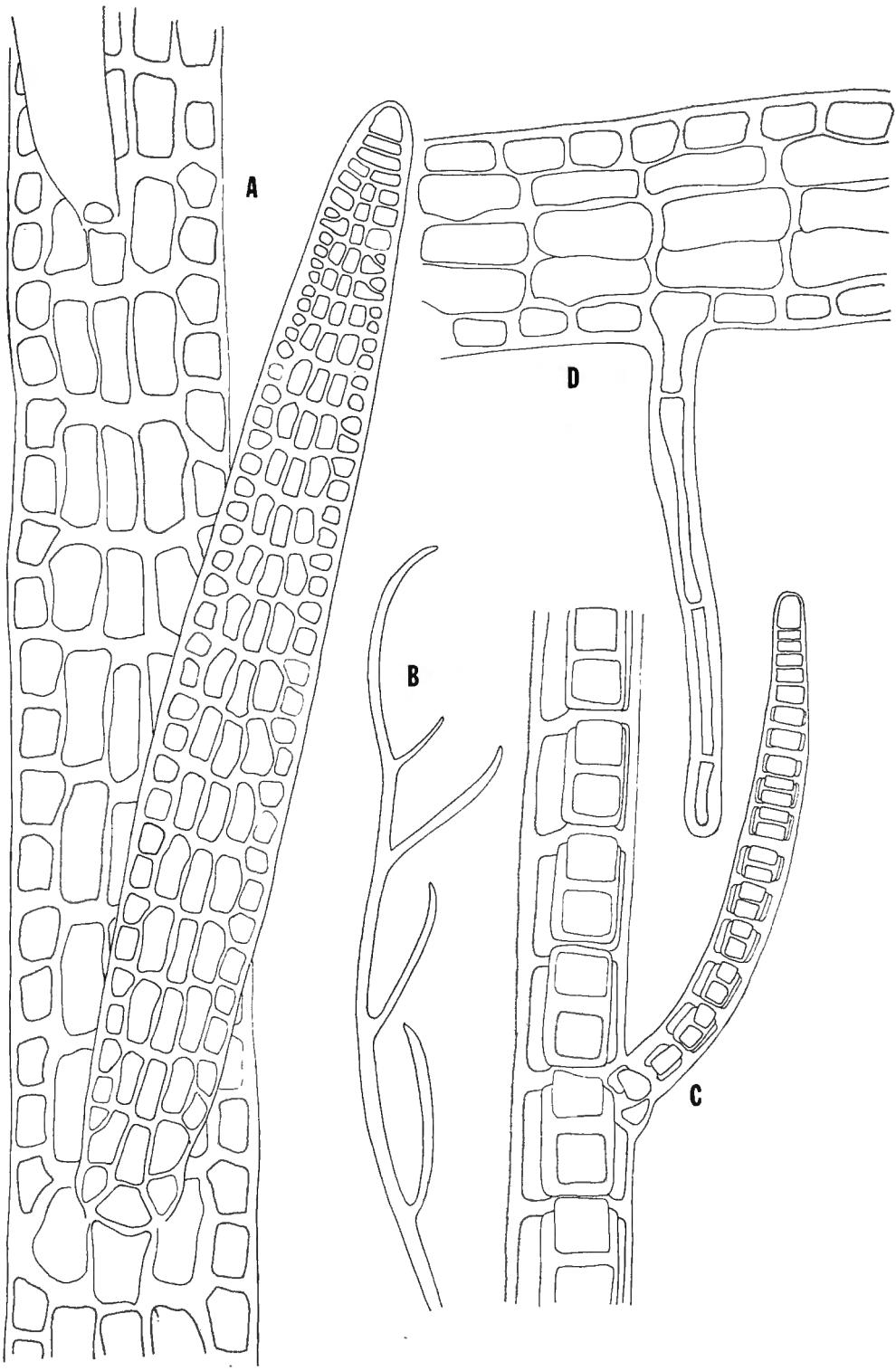

Fig. 2. *Platysiphonia parva* Silva & Cleary
A. Details of blades. (×400) B. Branching habit. (×40) C. Latera view of blade. (×200) D. Prostrate part with rhizoid. (×200)

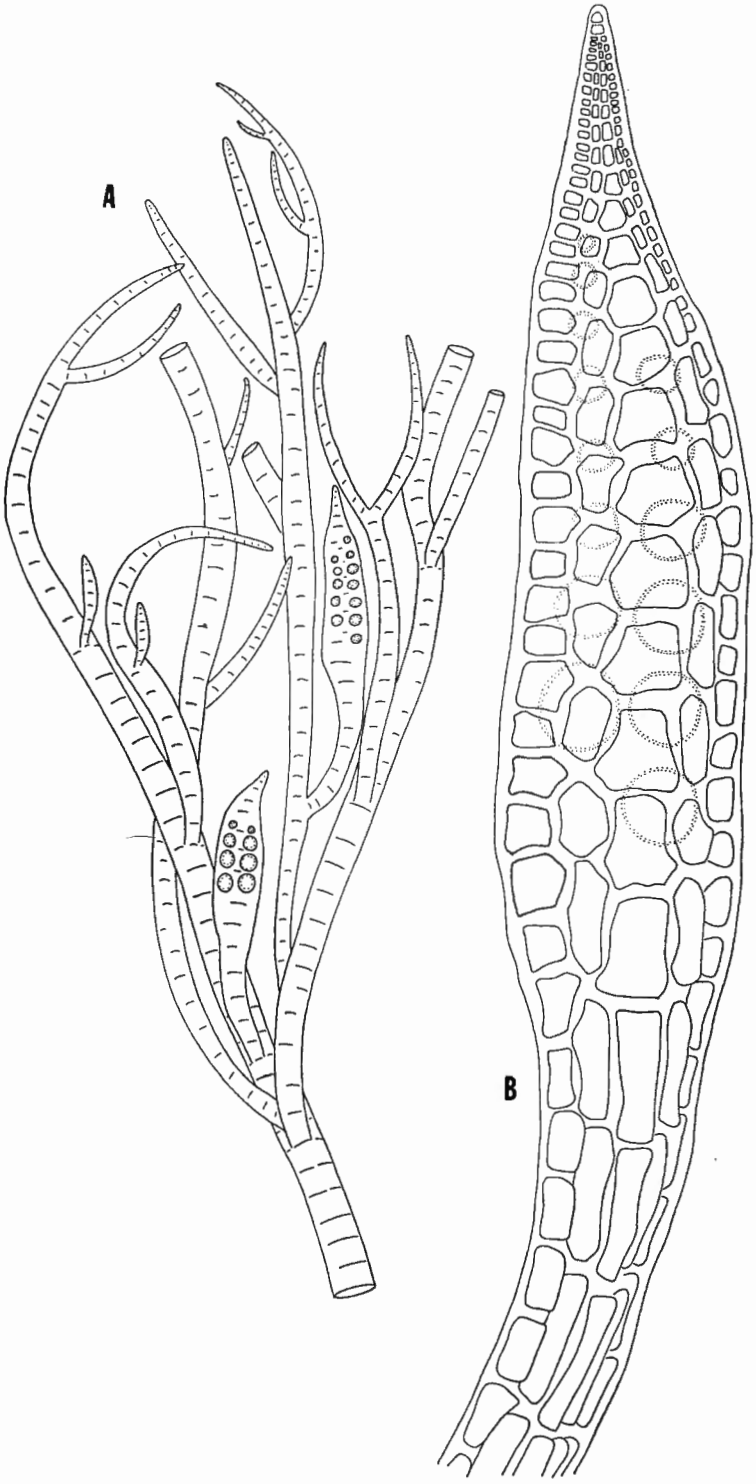

Fig. 3. *Platysiphonia parva* Silva & Cleary
A. Habit of tetrasporangial plant. (×40)
B. A stichidium, showing tetrasporagia, covef cells, and flanking cells. (×200)

JAPANESE NAME: Nankai higeusuba (nom. nov.)

HABITAT: HI #19722. Uji Islands. Dredged from about 40 m deep. Collected on May 8, 1965. Additional materials were collected from Koniya, Amami Island (HI #19723, June 29, 1970) and from Mage Island (HI #19724, June 22, 1971). All of the materials used for the present study were collected by the present author.

Up to now, 10 species are included within the genus *Platysiphonia*. Two species, *P. intermedia* (Grunow) Boergesen (1931) and *P. parva* Silva & Cleary (1954), show the stichidium-formation in which the flanking cells are not divided. The stichidium-formation in the present southern Japanese specimens is most closely related to the above-mentioned two species. Furthermore, a closer examination of the present southern Japanese materials shows that it is conspecific to *P. parva* in both vegetative and tetrasporangial structures.

Dawson (1962) mentioned the importance of the flanking cell in distinguishing *P. parva* and *P. clevelandii*, viz. in *P. clevelandii* the two lowermost segments of a branch lack the flanking cells, while in *P. parva* only basalmost segment lack them. In the present southern Japanese materials, all of the basalmost segments lack the flanking cells. However, the 2–3 basalmost segments lack the flanking cells, especially in the materials from Uji Islands. Hence, the present southern Japanese materials seem to comprise a new member of this genus. However, the present author prefers to retain the present materials as *P. parva*, since it is doubtful at least in *P. clevelandii* and *P. parva* whether the flanking cells in the lower segments of branches bear the taxonomic value as mentioned by Dawson (1962).

Segawa (1949) reported the presence of *Platysiphonia sp.* from the Central Pacific coast of Japan. The present southern Japanese materials are quite similar to his descriptions and illustrations.

Cottoniella amamiensis n. sp.

Fig. 4 A–D

Plantae epiphyticae, intricatae, rhizoidibus affixis, usque ad 1 cm alta, irregulariter ramosa, ligulate-acuminata ramis; ex cellula centrali et quatuor cellulis pericentralibus et duobus marginalibus composita, usque ad 90 μ latis, 3–5 segmenta de basis sine cellulis marginaribus; filamentis monosiphoneis saepe binis ex eodem segmento in latere ventrali ramorum ortis; filamenta 9–12 cellulis longa ex cellulis cylindraceis, in partibus mediis 2.5 plo longiore, 30 μ lata; reproductio non visa.

Plants epiphytic, entangled, ecorticate, attached to substrate by rhizoids, to 1 cm high, consisting of ligulate-acuminate blades; blades 5 cells broad or to 50 μ broad, lower 3–5 segments lacking flanking-cells, composed of a central axial cell row surrounded by 4 pericentral cells, each lateral pericentral cell flanked by two cells respectively or sometimes lacks flanking cells in the lower parts; flanking cells about half as long as the pericentral cell; provided with monosiphonous unbranched filaments placed in a single or double row along the ventral median line of blades; monosiphonous unbranched filaments 9–12 cells long, 18 μ broad at the base and 30 μ broad at the middle parts, with sharpened apex, of cells about 2.5 times as long

as broad; branches formed dorsiventrally from the center of each blade; reproduction not seen.

JAPANESE NAME: Toge konohanori (nom. nov.)

TYPE: HI #19727. Tatsugo, Amami Island. Growing on the frond of articulated corallinaceous alga forming entangled masses. Collected by Dr. T. Tanaka (August, 1963). The materials are deposited in the Herbarium of Faculty of Fisheries, Kagoshima University.

The species allied to the genus *Cottoniella* are *C. arcuata* Boergesen (1919), *C. filamentosa* (Howe) Boergesen (1920), *C. sanguinea* Howe (1905), *C. fusiformis* Boergesen (1930), *C. hawaiiensis* Doty & Wainwright (1958) and *C. triseriata* Hollenberg (1967). Womersley and Shepley (1959) studied in detail members of the *Sarcomenia* group and excluded *C. hawaiiensis* from the genus *Cottoniella*. *C. hawaiiensis* is now included under the genus *Dotyella*. Schotter (1951) regarded *C. arcuata, C. filamentosa,* and *C. fusiformis* as forms of one species, but Womersley and Shepley (1959) recognized these three as distinct species. Therefore only five species are recognized in this genus.

The sixth species described here is vegetatively similar to *Platysiphonia parva* as described above in the external features of its ligulate-acuminate blades, but is distinguished by having monosiphonous unbranched filaments along the middle of the ventral side of the blades. The presence of filaments along the middle of the blades is very distinct and characteristic of the genus *Cottoniella*.

Of the five species described previously under this genus, the present southern Japanese species is most nearly related to *C. filamentosa* in its external features. Thus, most parts of the blades, from which monosiphonous filaments form, are provided with filaments in a single row up along the median line of the blades as seen in *C. filamentosa*. A closer examination shows that the present southern Japanese specimen is quite different from *C. filamentosa*. In the southern Japanese species the paired monosiphonous filaments are found associated with a solitarily formed filament; while in *C. filamentosa* the filaments are always formed in a single row. Furthermore, Howe (1905, as *Sarcomenia filamentosa*), Womersley and Shepley (1959) and Boergesen (1920, 1930) commented that some parts of *C. filamentosa* are entirely corticated. The present southern Japanese specimens differ from the above in its entirely ecorticated axes. These two features are the most striking differences between the two species.

In *C. triseriata*, there are two kinds of segments that bear filaments, namely, the segments that bear a single filament and a paired filament. These segments are regularly arranged in *C. triseriata*, which is not the case in the species at hand.

In some parts of the axes, especially in the lower parts of the frond, the lateral pericentral cells lack flanking cells. However, this seems to be of no systematic value because of the supposition that this may be due to injuries or some other causes.

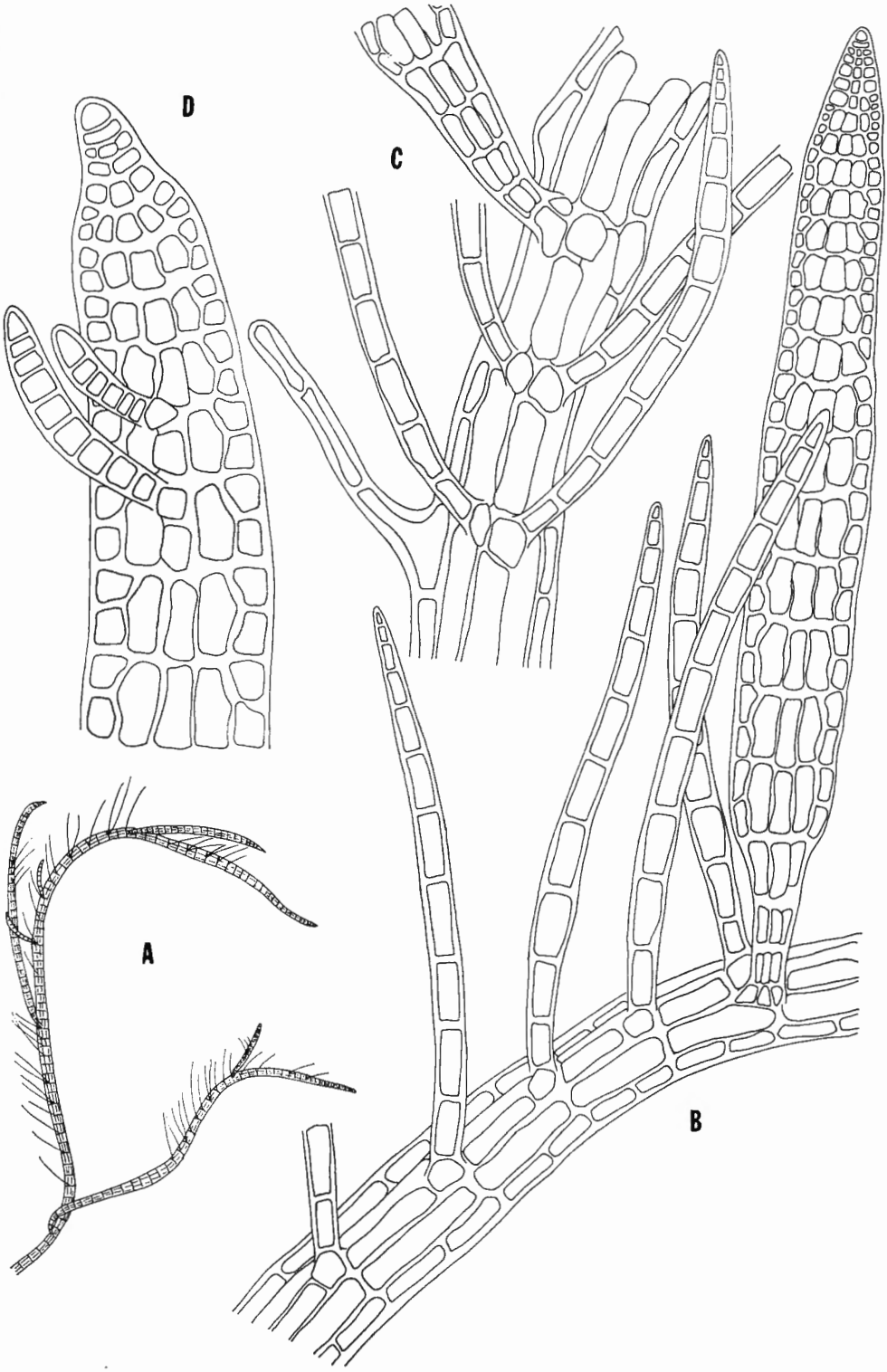

Fig. 4. *Cottoniella amamiensis* n.sp.
A. Branching habit. (×12.5) B. Part of axes with monosiphnous filaments in a single row and with blade. (×200) C. Part of axes with filaments in double row and with blade. Some of the lateral pericentral cells lack flanking cells. (×200) D. Tips of blade with two young filaments. (×400)

ACKNOWLEDGEMENTS

The writer is indebted to Dr. T. Tanaka of Faculty of Fisheries, Kagoshima University and to Dr. R. T. Tsuda of the Marine Laboratory, University of Guam for constructive criticisms of the manuscript.

LITERATURE CITED

Agardh, J. G. 1863. Species, genera et ordines algarum. 2(3):710–1291. Lund.

Boergesen, F. 1919. The marine algae of the Danish West Indies. II. Rhodophyceae. Dansk Bot. Arkiv. 3(1):305–368.

————. 1920. The marine algae of the Danish West Indies. III. Rhodophyceae. Dansk Bot. Arkiv. 3(1f):369–594.

————. 1930. Marine algae from the Canary Islands III, Rhodophyceae, Part III Ceramiales. K. Dansk Vidensk Selsk. Biol. Med. 9(1):1–159.

————. 1931. Sur *Platysiphonia* nov. gen. et sur les organes males et femelles du *Platysiphonia miniata* (Ag.) nov. comb. (*Sarcomenia miniata* (Ag.) J. Ag.). *In* Recuil de Travaux Cryptogamiques delies a Louis Mangan. 21–29. (Paris).

Bornet, E. 1892. Les algues de P. K. A. Schousboe, recoltees au Maroc et dans la Mediterranee de 1815 a 1829. Mem. Soc. Nat. Sci. Cherbourg 28:165–176.

Dawson, E. Y. 1962. Marine red algae of Pacific Mexico, VII Ceramiaceae, Delesseriaceae. Allan Hancock Pacif. Exped. 26(1):1–208.

Desikachary, T. V., and M. S. Balakrishnan. 1957. *Taenioma* J. Ag. from India. Proc. Ind. Acad. Sci. 46:336–345.

Doty, M. S., and M. R. Wainwright. 1958. Structure and reproduction of *Cottoniella hawaiiensis* n. sp. (Rhodophyta). Pac. Sci. 12(3):229–35.

De Toni, J. B. 1903. Sylloge algarum ominium hucusque cognitarum. Vol. 4 Florideae, Sec. 3, 775–1525. (Padua).

Falkenberg, P. 1901. Die Rhodomelaceen des Golfes von Neapel und der angrenzenden Meeresabschnitte. Fauna und Flora des Golfes von Neapel 26. Berlin. xvi+753 p.

Hollenberg, G. J. 1967. New marine algae from central tropical Pacific Ocean. Amer. J. Bot. 54 (10):1198–1203.

Howe, M. A. 1905. Phycological studies II. New Chlorophyceae, new Rhodophyceae and miscellaneous notes. Bull. Torrey Bot. Club 32:563–86.

Joly, A. B. 1965. Flora marinha do litoral norte do estado de San Paulo e regioes Circumvizinhas. Bol. Fac. Fil. Cienc. Letr., Univ. S. Paulo, Bot. 14:1–196.

Kylin, H. 1956. Die Gattungen der Rhodophyceen. Lund. xv+673 p.

Kützing, F. T. 1863. Tabulae Phycologicae order Abbildungen der Tange. Vol. 13. Nordhausen. 1–31.

Okamura, K. 1929–1932. Icones of Japanese algae. Vol. 6. 1–96, 251–300. Tokyo (Publ. by the author).

Papenfuss, G. F. 1937. The structure and reproduction of *Claudea multifida, Vanvoorstia spectabilis,* and *Vanvoorstia coccinea.* Symb. Bot. Upsaliensis 2(4):1–66.

————. 1944. Structure and taxonomy of *Taenioma,* including a discussion on the phylogeny of the Ceramiales. Madrono 7(7):193–214.

————. 1952. Notes on South African marine algae III. J. Afr. Bot. 17:167–88.

————. 1961. The structure and reproduction of *Caloglossa lepriurii.* Phycologia 1(1):8–31.

Schiffner, V. 1931. Neue und bemerkenswerte Meeresalgen. Hedwigia 71:193–205.

Schmitz, F. 1889. Systematische Übersicht de bishen bekannten Gattungen der Florideen. Flora 72:435–456.

Schmitz, F., and P. Hauptfleisch. 1897. Rhodophyceae, *In* Engler and Prantl, Die Naturlichen

Pflanzen Familien 1(2):481–504.

Schotter, G. 1951. Le genre *Cottoniella* Boergesen. Rev. Gen. Bot. 58:1–20.

Segawa, S. 1949. Five floridean genera new to Japan. J. Jap. Bot. 24:159–165.

Silva, P. C., and A. P. Cleary. 1954. The structure and reproduction of the red alga, *Platysiphonia*. Amer. J. Bot. 41:251–260.

Taylor, W. R. 1960. The marine algae of the eastern tropical and subtropical coasts of the Americas. Ann Arbor, Michigan. ix+662 p.

Thompson, E. I. 1910. The morphology of *Taenioma*. Bull. Torrey Bot. Club 37:97–106.

Womersley, H. B. 1965. The morphology and relationships of *Sonderella* (Rhodophyta, Rhodomelaceae). Aust. J. Bot. 13:435–450.

Womersley, H. B., and A. Bailey. 1970. Marine algae of the Solomon Islands. Phil. Trans. Royal Soc. London 259(830):257–352.

Womersley, H. B. and E. A. Shepley. 1959. Studies on the *Sarcomenia* group of the Rhodophyta. Aust. J. Bot. 7:168–223.

Wynne, M. J. 1969. *Platysiphonia decumbens* spec. nov., a new member of the *Sarcomenia* group (Rhodophyta) from Washington. J. Phycol. 5(3):190–202.