The Species of Rhodochorton from Japan I.

By

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Since 1938 the present writer has been studying systematically the Japanese species of the genus *Rhodochorton* under the direction of Prof. Y. YAMADA, in the Botanical Institute, Faculty of Science, Hokkaidō Imperial University. The following eight species have been studied using the specimens preserved in alcoholic or formalin solutions.

Sincere thanks are expressed to Prof. YAMADA for his kind guidance during the course of this work and for the use of the valuable material of the genus *Rhodochorton* in his collection, gathered from many places in Japan, in America and in Europe. Thanks are also due to Messrs. T. KANDA and T. TANAKA who gave me access to their own collection.

Rhodochorton catenulatum (HOWE) comb. nov. Text-fig. 1.

Acrochaetium catenulatum HOWE, Mar. Alg. of Peru, 1914, p. 84, Pl. 31, figs. 12–18; KYLIN und SKOTTSBERG, Zur Kenntn. der subantarkt. und antarkt. Meeresalg. II, 1919, p. 3, fig. 1; WEBER VAN BOSSE, Liste des Alg. du Siboga, II, 1921, p. 193; G. HAMEL, Recher. sur Acrochaetium et Rhodochorton, 1927, p. 80.

Chantransia catenulata (HOWE) DE TONI, Syll. Alg. VI, 1924, p. 44.

Hab.: Naha, Ryūkyū.

Distr. Peru; Tierra del Fuego; Celebes; Sunda Il.

Plant epiphytic, minute, mostly 80–160μ high; single basal cell subglobose, scarcely different from the other cells, undivided, 6–10μ diam., giving rise to one erect filament; single main axis suberect or ascending, 9–11μ diam., usually 10–20 cells long, commonly arcuate and with a secund series of mostly simple and often successively shorter branches along the convex side of the main axis, branched at the basal cell or mostly several cells higher; branchlets short, mostly secund, often irregularly alternate or rarely opposite, 6–8μ diam.; cells mostly as long as broad, often slightly shorter than broad, rarely twice as long, now and then discoid, occasionally biconcave or concavo-convex, cell wall rather thick and gelatinous especially in basal and median parts, mostly 1–2μ thick; chromatophores parietal

laminate, apparently occupying nearly the whole cell except for a few small irregularly disposed vacuoles; hairs apparently wanting; monosporangia 7–8μ long, 5–6μ wide, thinner walled than the vegetative cells, finally terminating the main axis and most of the branches, commonly also sessile and secund along the outer face of the arcuatehamate upper half of the main axis, emptied sporangia sometimes refilled by the subjacent cells, two successive terminal cells of axis or branch often converted into sporangia simultaneously.

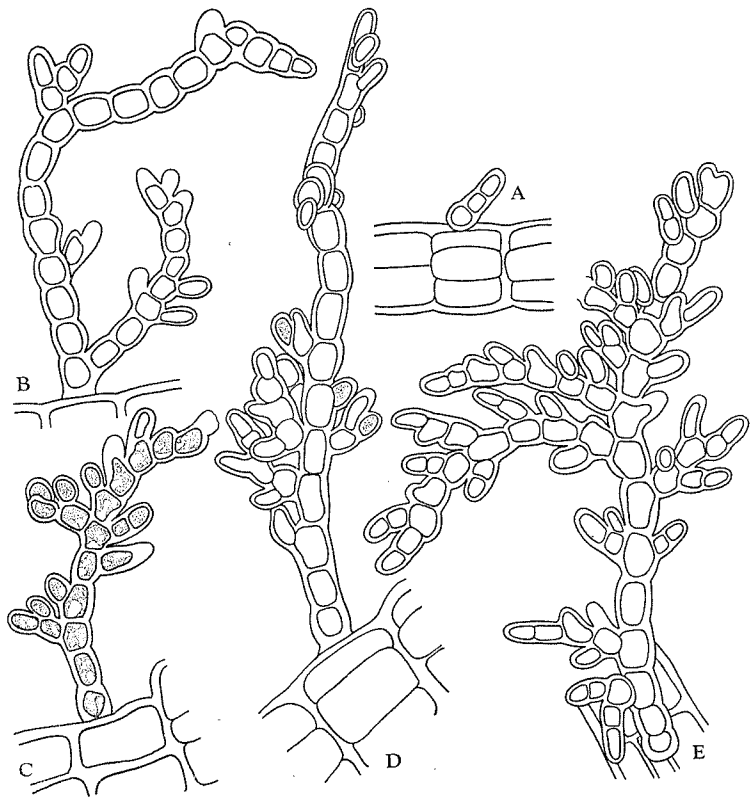

Fig. 1. *R. catenulatum* (HOWE) comb. nov. A. Young plant. ×500. B,D,E. Plants showing the mode of branching and monosporangia-bearing branchlets. ×500. C. Monosporic plant showing form of cells and chromatophores. ×500.

This species has been found upon *Sphacelaria* growing on *Turbinaria ornata,* associated with *Rhodochorton ryukyuense* spec. nov. and *Goniotricum* sp. Materials at hand agree well with a detailed description of *Acrochaetium catenulatum* HOWE given by HOWE, except only for the

dimension of sporangia. The sporangia of the present material are 5–6μ wide and 7–8μ long instead of being 5.5–7.0μ wide and 9–11μ long. The shape of chromatophores in our formalin-preserved material is a little more definite than HOWE's Peruvian plant and it seems to be parietal laminate as far as could be observed.

Rhodochorton ryukyuense spec. nov. Text-figs. 2–3.

Thallo epiphytico, ad 300–500μ alto; cellula basali singula subglobosa vel rarius leviter depressa, diametro 8–12μ, 1–2 fila erecta emittente; filo primario suberecto ascendenti, 6–8μ lato, 10–30-articulato, frequenter plus minus arcuato; cellula cellulae basali finienti, ramos oppositos procreante; ramis sparsis, simplicibus aut ramulosis; ramulis plerumque secundatis, saepe irregulariter alternis aut oppositis; cellulis cylindricis, 6–8μ latis, diametro 2–3-plo longioribus, chromatophorum parietale, pyrenoide centrali instructum continentibus; pilis hyalinis nullis; monosporangiis ovoideis, 8×10μ, ad apicem acutis, pariete incrassato instructis, uniseriatis aut sparsis, sessilibus aut pedicellatis, pedicello unicellulari, lateralibus aut terminalibus; antheridiis numerosissimis, breviter ellipsoideis, 4×5μ, in fasciculo triangulari terminalibus, in eodem pedicello plerumque binis aut rarius singulis.

Hab.: Naha, Ryūkyū.

Plant epiphytic, mostly 300–500μ high; single basal cell subglobose, somewhat flattened on the side toward, distinguishable from the other cells, 8–12μ diam., giving rise to 1–2 erect filaments; erect main filament suberect or ascending, 6–8μ diam., usually 10–30 cells long, commonly more or less arcuate; opposite branches given off mainly from the adjacent cell of the basal cell; branchlets short, mostly secund, now and then irregularly alternate or often opposite; cells of the filaments cylindrical, 6–8μ broad, 2–3 times as long as broad (14–20μ long), not constricted at the transverse walls; chromatophores parietal laminate with a central pyrenoid; hyaline hairs apparently wanting; monosporangia ovoid, usually 8μ wide, 10μ long, thicker walled than the vegetative cells, with a small thickening at the summit of a sporangium, mostly seriate on the inner side of the branches or scattered on the main filaments, lateral or terminal, sessile or on the unicellular pedicel, emptied sporangia sometimes refilled by the subjacent cells; antheridia abundant, 4μ wide, 5μ long, in usually more or less triangular clusters consisting of 2-to 6-celled branchlets branched mostly on the inner side, usually two antheridia on each terminal cell of the antheridial clutsers.

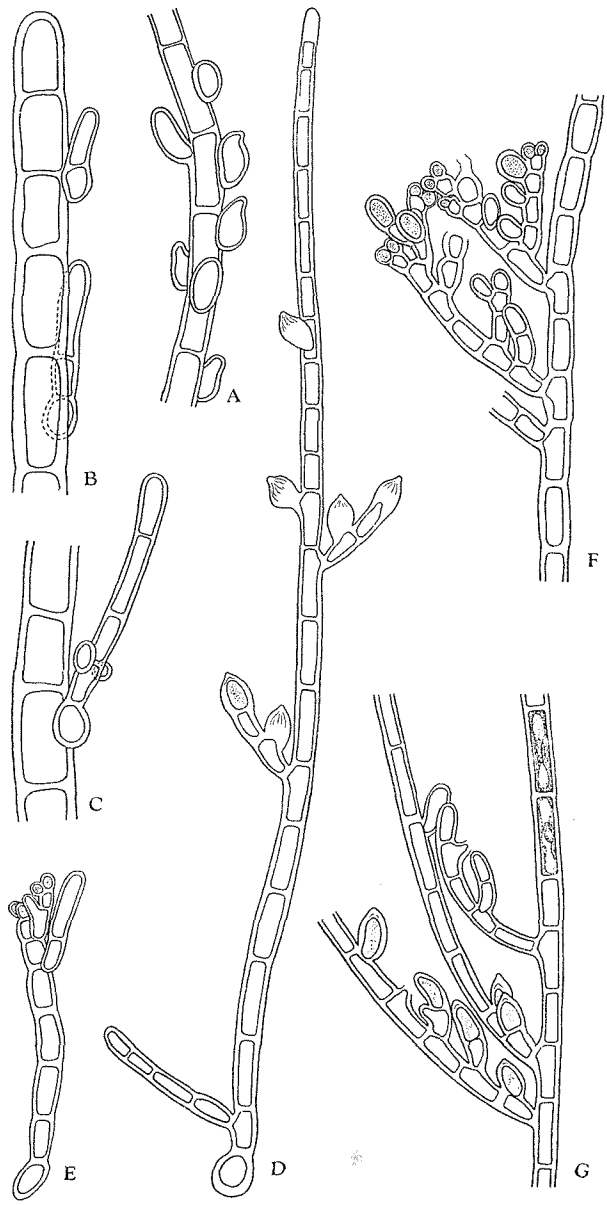

Fig. 2. *R. ryukyuense* spec. nov. A. Germinating spores showing epiphytic their own mother filament. ×500. B–C. Young plants growing on hairs of *Galaxaura fruticulosa*. ×500. D. Simple plant with five emptical and one filled monosporangia. ×500. E. Dwarf plant with antheridia. ×500. F. Branch with antheridial branchlets. ×500. G. Branches with monosporangia showing small thickenings at the summit of sporangia and parietal chromatophores with a single central pyrenoid. ×500.

This species has been found upon *Sphacelaria* growing on *Turbinaria ornata,* associated with *Rhodochorton catenulatum,* and also upon hairs of *Galaxaura fruticulosa.*

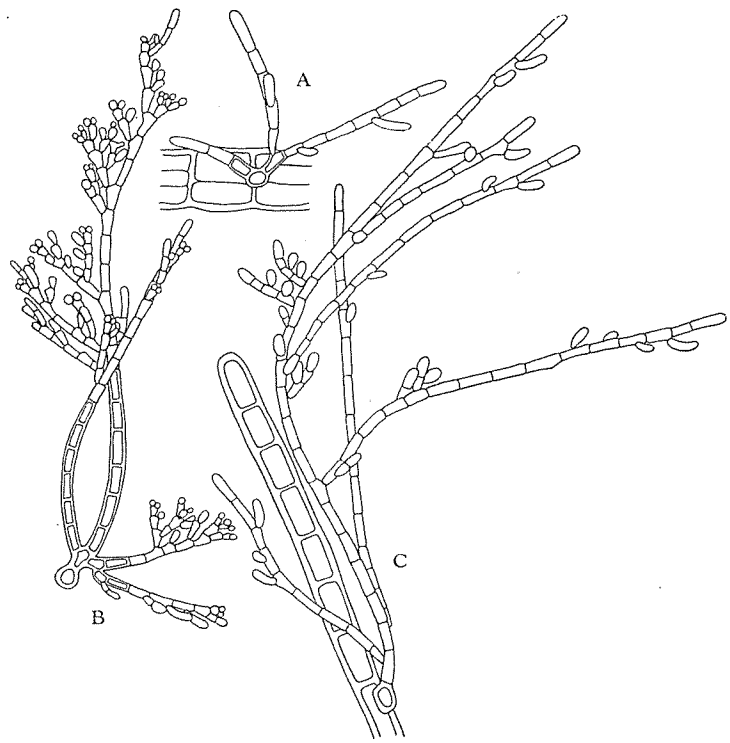

Fig. 3. *R. ryukyuense* spec. nov. A. Young plant with two erect filaments. ×260. B. Plant bearing antheridial clusters and opposite branches given off from the adjacent cell of the basal cell. ×260. C. Monosporic plant growing on hair of *Galaxaura.* ×260.

The spores of this plant often germinate directly upon their own mother filaments, in such a case, the new filaments appear like branches from their mother filaments. The germinating spores give off mostly one erect filament and often 2 erect ones. In the former case, two comparatively long opposite branches, are given off from the adjacent cell of the original spore cell.

Rhodochorton ryukyuense spec. nov. is very similar to *R. arcuatum* DREW and *R. simplex* DREW. It has many characters in common with the first species but differs from it in the fact that the cells are not barrel-shaped, the chromatophores are parietal laminate instead of being stellate,

and there is a small thickening at the summit of the sporangium. On almost all the sporangia of *R. ryukyuense*, this characteristic thickening may be observed.

The antheridial clusters of the present plants differ also from those of DREW's *R. arcuatum* and are rather similar to those of *R. rhypidandrum* (ROSENV.) DREW, although the ramuli with antheridia of our plants are not branched in one plane like *R. rhypidandrum*. The antheridia-bearing ramuli developed from the apical cell of the main filament, are often found in the present material, especially in not much branched dwarf plants, however, these antheridial ramuli do not form a whorl like *R. arcuatum*. These above mentioned differences have been taken as sufficient reason for describing this plant as a new species.

Rhodochorton sessile spec. nov. Text-fig. 4.

Thallo epiphytico, minuto, ad 60–170μ alto (sine pilis), parte basali e filis repentibus constructa; spora germinante ellipsoidea, 7–8×11–12μ, in duas cellulas aequales, in planta adulta inconspicuas, divisa; cellulis his fila repentia, in directiones oppositas crescentia, procreantibus; filis his primariis lateraliter fila repentia et sursum fila erecta parce procreante; articulis filorum repentium 6μ latis, 10μ longis, plus minus ramosis et non confluentibus; filis erectis 12μ latis, 8–12-articulatis, arcuatis, parce ramosis; ramulis 8μ latis, plerumque secundatis latus convexum vel saepe oppositis instructis; cellulis more diametro aequilongis aut paullum brevioribus, raro duplo longioribus, 10–14μ latis, plerumque in sectione optica quadrato-orbicularibus, pariete crassiusculo et gelatinoso 1–2μ crasso; chromatophoro stellato (?); pseudopilis longis, hyalinis, 3–4μ latis, 200μ longis aut parum ultra; monosporangiis ovatis, 10×16μ, ad fila erecta primaria vel ad ramulos laterales semper lateralibus sessilibus.

Hab.: Muroran, Hokkaidō.

Plant epiphytic, minute, 60–170μ high exclusive hairs; germinating spore ellipsoid, 7–8μ broad, 11–12μ long, divided into two equal cells; daughter cells of spore giving rise to creeping filaments in the opposite direction; creeping filaments more or less branched and not coherent together; cells of the creeping filaments somewhat irregular in shape, about 6μ broad, 10μ long; erect filaments developing from cells of the creeping filaments, often directly from daughter cells of the original spore, usually about 8–12 cells long, commonly arcuate, seldom branched; branchlets short, 1–2-celled, mostly secund along the convex side of the filaments, rarely opposite; cells of the main filaments swollen slightly in the middle

or at their upper ends, rather thick-walled, 12μ broad decreasing to 8μ at the apex of the filaments, 10–14μ long; chromatophores stellate (?); both main filaments and branches ending in hair-like prolongations composed of several colourless elongated cells, 3–4μ broad, 200μ or more long; monosporangia sessile on both main filaments and branches, ovate, 10μ by 16μ.

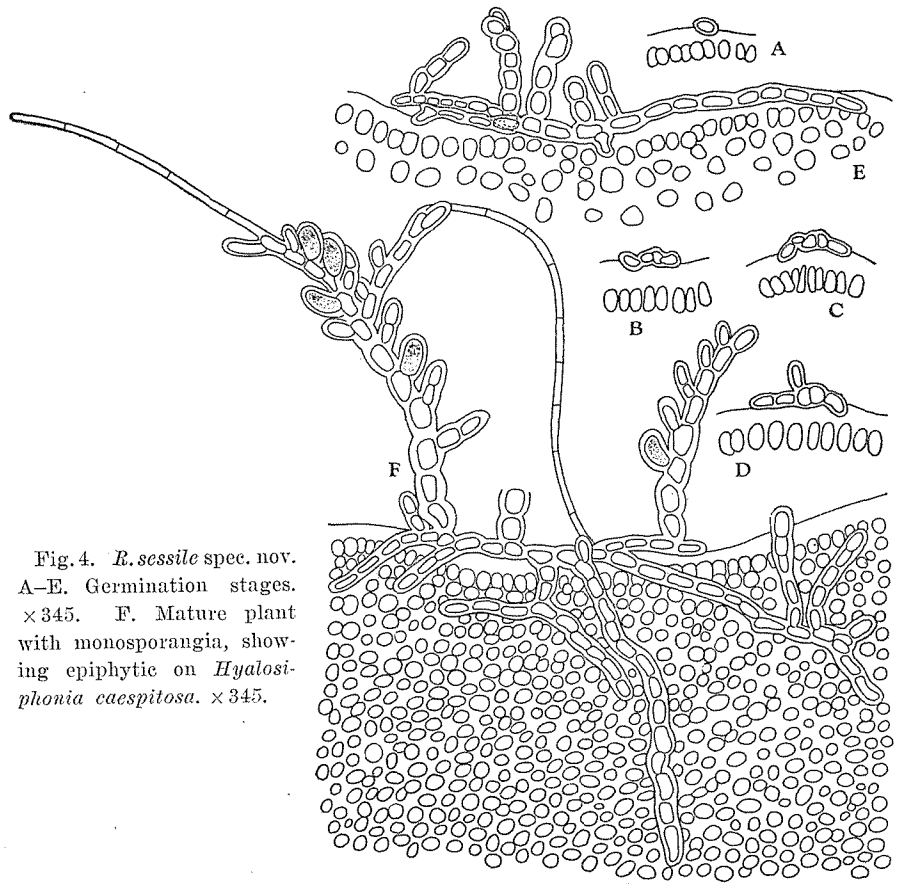

Fig. 4. *R. sessile* spec. nov. A–E. Germination stages. ×345. F. Mature plant with monosporangia, showing epiphytic on *Hyalosiphonia caespitosa*. ×345.

This minute species was found upon the apex of the ramuli of *Hyalosiphonia caespitosa,* associated with *Rhodochorton Hyalosiphoniae* spec. nov. The germinating spore divides into two equal cells which grow out at their opposite ends into epiphytic creeping filaments. These two equal cells are easily recognized in young plants, but in well developed individuals, become less distinguishable from the other cells. The basal creeping filaments are sparsely branched and are not coherent together.

The erect filaments are given off from the daughter cells of the spore and also from the cells of the creeping filaments. The erect ones bear no branch or 1–2 branches, though with a mostly secund series of branchlets along the convex side of the main filaments.

In the lower parts of the erect filaments, the cell is irregular in shape and more or less swollen at its upper end or in the middle. The chromatophore could not be clearly observed in the formalin-preserved material at hand, however, it seems to be stellate. The monosporangia are always sessile on both main filaments and branches.

In general appearance, *R. sessile* closely resembles *R. catenulatum*, but the method of germination of this plant is apparently different from that of *R. catenulatum*. The method of germination and the basal structure of *R. sessile* show a great similarity to those corresponding characters of *R. Porphyrae* DREW, but in *R. sessile* the basal filaments are epiphytic whereas in *R. Porphyrae* are endophytic. Furthermore, *R. sessile* differs from *R. Porphyrae* in the presence of long hair-like prolongations, in the cell structure and in the arrangement and size of the monosporangia.

Rhodochorton Sancti-Thomae (BÖRGESEN) comb. nov. Text-figs. 5–7.

Acrochaetium Sancti-Thomae BÖRGESEN, Mar. Alg. D. W. Indies, 1915, p. 30, figs. 23–24; G. HAMEL, Recher. sur Acrochaetium et Rhodochorton, 1927, p. 101.

Chantransia Sancti-Thomae (BÖRG.) DE TONI, Syll. Alg. VI, 1924, p. 53.

Hab.: Hayama, Sagami Prov. (Herb. Biol. Labor., Imp. Palace, Tokyo).

Distr. St. Thomas, West Indies.

Plant epiphytic, about 300–700μ high; basal creeping filaments irregularly ramified and more or less fusing together into a parenchymatous disc, basal disc unistratose; cells of the basal disc usually quadrate in shape, 6μ diam.; erect filaments arising from most of the cells of the basal creeping filaments, constricted at the transverse walls, slightly attenuated towards both the base and the apex, mostly branched sparingly or often simple; branches and sporangia-bearing branchlets given off mostly in the upper half of the filaments, alternate or opposite; cells of the erect filaments dolioform, rather thick-walled, 7–10μ broad, 12–20μ long; chromatophores large parietal laminate; hyaline hairs present; reproduction by monospores, monosporangia mostly sessile, often pedicellate (unicellular pedicel), arranged in series or opposite on the filaments, mostly solitary or often two on the same pedicel, oval-obovate in shape, 8–9μ wide,

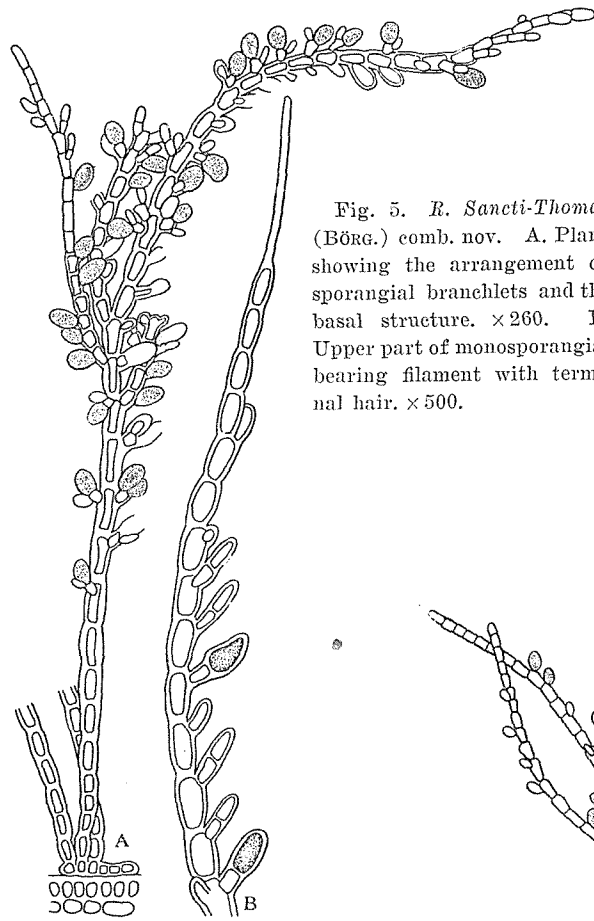

Fig. 5. *R. Sancti-Thomae* (BÖRG.) comb. nov. A. Plant showing the arrangement of sporangial branchlets and the basal structure. ×260. B. Upper part of monosporangia-bearing filament with terminal hair. ×500.

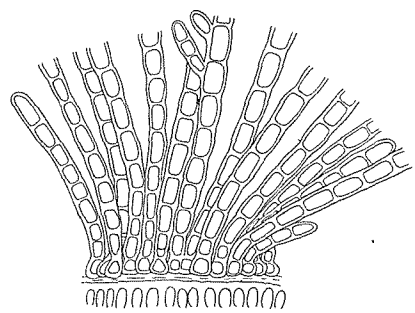

Fig. 6. *R. Sancti-Thomae* (BÖRG.) comb. nov.
Basal disc in transverse section. ×385.

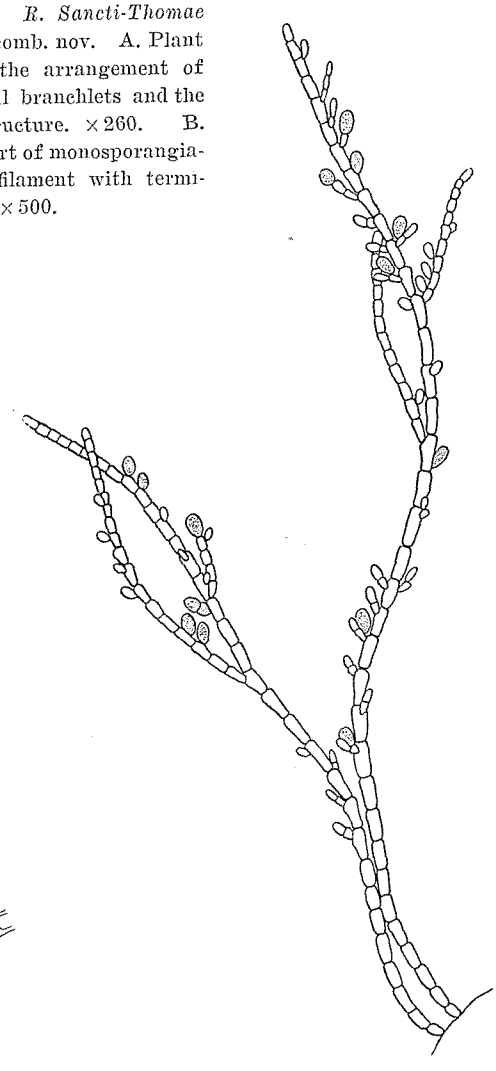

Fig. 7. *R. Sancti-Thomae* (BÖRG.) comb. nov.
Plant with monosporangia. ×220.

12–14μ long.

This species was found together with several other species upon the thallus of *Ecklonia cava,* forming small tufts. The pyrenoid could not be observed, and the terminal hyaline hairs were found only once in the available formalin-preserved materials.

This plant agrees well with *Acrochaetium Sancti-Thomae* BÖRG. in the descriptions and figures given by BÖRGESEN (1915).

On the plants at hand, it is not rare to find the cell immediately below the sporangium resembling a sporangium both in shape and in the nature of its cell contents as in *R. arcuatum* DREW and *R. densum* DREW. This cell acts apparently as a second sporangium, replacing the first one after the liberation of the spore.

Rhodochorton Rothii (TURTON) NÄGELI Text-figs. 8–9.

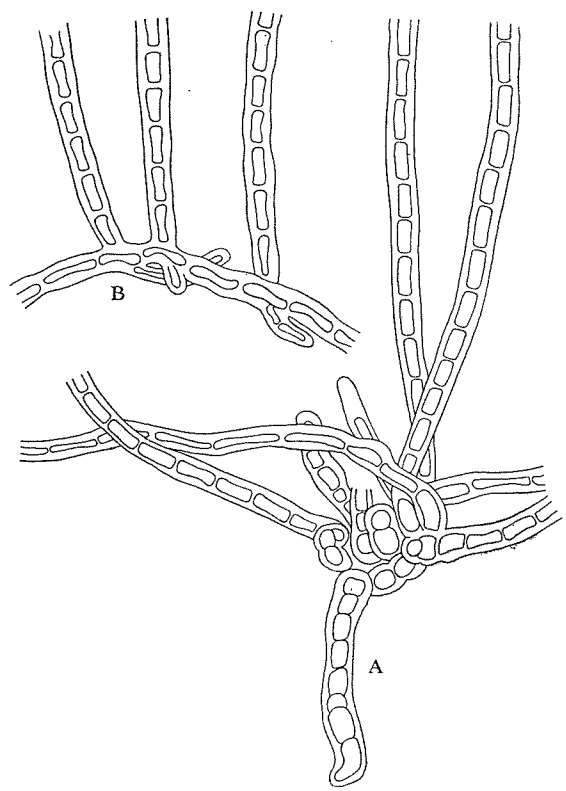

Fig. 8. *R. Rothii* (TURTON) NÄGELI. A. Basal part of the plant. × 220. B. Creeping filament transformed from erect filament. × 220.

"Beitr. Morph. und Syst. Ceram., 1861, p. 121, figs. 1–3"; HAUCK, Meeresalg. 1885, p. 68, fig. 23; H. GIBSON, Developm. of sporang. in Rhodochorton Rothii (Journ. Linn. Soc. Bot. Vol. 28, 1891) p. 201, t. 34, figs. 6–11; ROSENVINGE, Groenl. Havalger, 1893, p. 791; KUCKUCK, Beitr. zur Kenntn. der Meeresalg., 1897, p. 21, fig. 5; JÒNSSON, Mar. Alg. of Iceland, 1901, p. 146, fig. 3; BÖRGESEN, Mar. Alg. of Faeroes, 1902, p. 390; SETCHELL et GARDNER, Alg. N. W. America, 1903, p. 347; YENDO, Notes on Alg. new to Japan IV. (Bot. Mag. Tokyo, XXX, 1916) p. 65; ROSENVINGE, Mar. Alg. of Denmark, 1923–24, p. 390, figs. 328–330; G.

HAMEL, Recher. sur Acrochae. et Rhodochor., 1927, p. 54, fig. 38 et p. 106; DREW, Revision of Chantransia, Rhodochorton and Acrochaetium, 1928, p. 117; OKAMURA, Nippon Kaisōsi, 1936, p. 406. *Conferva violacea* ROTH, Cat. Bot., pt. 1, 1797, p. 190. *Conferva Rothii* TURTON, "Syst. Nat., vol. 6, 1806, p. 1809." *Callithamnion Rothii* LYNGBYE, Hyd. Dan., 1819, p. 129, Tab. 41, A; HARVEY, Man. Brit. Alg., ed. 1, 1841, p. 115, ibid., ed. 2, 1849, p. 183, Phyc. Brit. 1847, pl. 120, b; KÜTZING, Sp. Alg., 1849, p. 640, Tab. Phyc., Vol. 11, 1861, pl. 621, b; J. AGARDH, Sp. Alg., 1851, p. 17. *Ceramium Rothii* BERKELEY, "Gleanings Brit. Alg." *Trentepohlia Rothii* ARESCHOUG, "Enum. Phyc. Scand., 1846, p. 116." *Thamnidium Rothii* (TURTON) THURET, in LE JOLIS, Liste, 1863, p. 111, pl. 5.

Hab.: Muroran, Hokkaidō.

Distr. Cosmopolitan.

Plant forming deep red velvety expansions on rocks at high-tide level; base consisting of very intricate creeping rhizoidal filaments, 16–18μ broad, 1½–3 times as long as broad, cell wall 4.0–4.5μ thick; erect filaments reaching a height of 1 cm and a breadth of 14–16μ, decreasing to 10μ broad

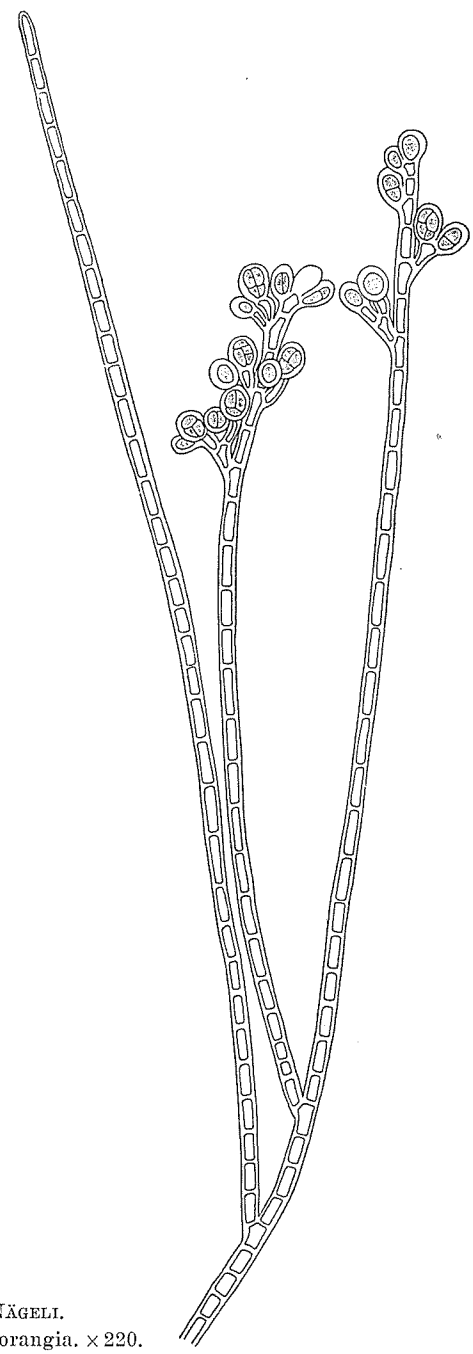

Fig. 9. *R. Rothii* (TURTON) NÄGELI.
Upper part of filament with tetrasporangia. × 220.

at the apex of the filaments; filaments sparsely branched; branches almost equaling main axis in length; cells of the erect filaments cylindrical, about twice as long as broad (from 1½–3 times), cell wall very thick and gelatinous, especially at the base of the filaments, often up to 4μ thick; chromatophores parietal, dissected into several smaller pieces; hairs apparently wanting; tetrasporangia in clusters, borne both terminally and laterally on much ramified branchlets, ovoid, 15–18μ broad, 23–25μ long, crusiately divided; tetrasporangial clusters more scattered in the upper half of the filaments.

This species grows on the under side of overhangnig rocks forming deep red velvety extensive expansions and is found in places where it can be reached only by very high tides or spray from the waves. The creeping filaments are much interwoven and are composed of thick-walled colourless cells of various lengths. The erect filaments are usually given off from the middlemost parts of the cells of the creeping filaments, and are sparsely branched and commonly without branches in the lower parts of the filament.

The erect filament sometimes changes into a creeping filament, thus from its cells erect filaments and creeping ones are given off, transitional forms often being found. The cell contains a number of parietal small chromatophores without pyrenoid. The plant under discussion agrees very well with *Rhodochorton Rothii* (TURTON) NÄGELI which is known to be distributed throughout the world.

Text-figs. 10–13.

Rhodochorton robustum (BÖRGESEN) comb. nov. et emend.

Acrochaetium robustum BÖRGESEN, Mar. Alg. D. W. Indies ,II, 1915–20, p. 40, figs. 38–40, et p. 449, fig. 418; "HOWE et HOYT, Notes on some Mar. Alg. from Beaufort, N. Carolina, 1916, p. 118"; G. HAMEL, Recher. sur Acrochaetium et Rhodochorton, 1927, p. 86.

Chantransia robusta (BÖRG.) DE TONI, Syll. Alg. VI, 1924, p. 39.

Acrochaetium sargassicola BÖRGESEN, in Kew Bulletin, 1932, No. 3, p. 115, figs. 3–5.

Hab.: Naha and Isigakizima, Ryūkyū.

Distr. St. Thomas, W. Indies; Bombay, India; Beaufort, N. Carolina.

Plant 1.0–1.5 mm high; germinating spores persistent and undivided, subglobose, ellipsoid or subpyriform in shape, thick-walled, 10–16μ diam.; obtuse or truncate cylindrical process growing downwards from the germinating spore and penetrating into the tissues of the host, 8–12μ broad, 20–30μ long; base composed of epiphytic, commonly branched, short creeping

filaments given off from the germinating spore, and so forming the small basal disc, sometimes single basal cell persistent, sometimes one or more small accessory cells given off from the germinating spore; basal disc composed of more or less thick-walled cells, about 10μ thick; erect filaments arising from the original spore and from the cells of the basal disc, forming a dense tuft; branches beginning near the base and more or less frequent above, but on the whole not much branched; branching irregularly on all sides, though with a tendency of being unilateral; cells of the filaments cylindrical, becoming gradually thinner and at the same time longer from the base to the apex of the filaments, 6–8μ broad, 1½–2(3) times as long as broad (15–26μ long) at the base, 5–6μ broad, 5–7(–10) times as long at the apex; chromatophores parietal, lobed, with a large pyrenoid; hairs apparently wanting; monosporangia scattered along the filaments, mostly with 1–2 celled pedicel or often sessile, terminal or lateral, borne on the same plant and even the same branch as the sexual organs, oval-ovate in shape, 10–12μ wide, (13–)17–18μ long, provided with thick walls, often up to 2μ thick; antheridial branchlets mostly unilateral, often alternate or rarely opposite on both branches and main filaments; ultimate ramuli with antheridia arranged in secund series on the inner side of the branchlets, composed of (2–)4–5 short cells; antheridia spherical in shape, 5.0–5.5μ diam.; carpogonia terminal on the 1–3 celled lateral branchlets,

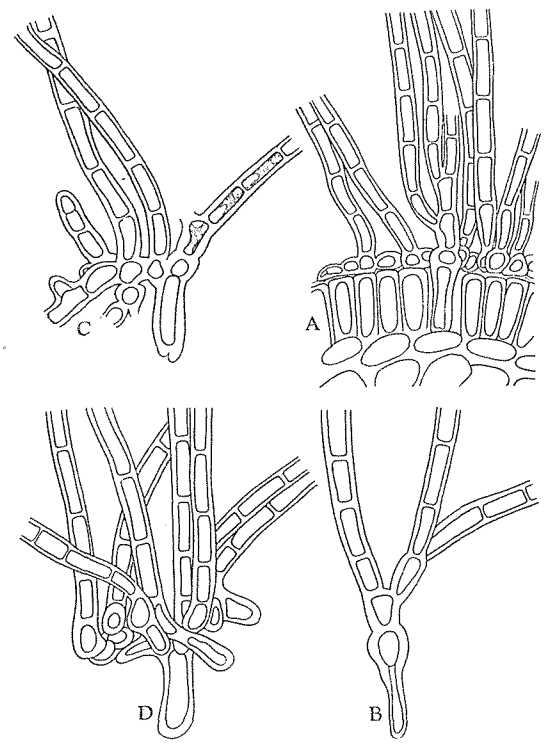

Fig. 10. *R. robustum* (BÖRG.) comb. nov. et emend. A. Transverse section of the thallus of the host (*Turbinaria ornata*), showing the basal disc with a cylindrical process penetrating into the tissues of the host. ×308. B. Unicellular base. ×400. C–D. Multicellular base. ×400.

rarely lateral directly on both branches and main filaments, bottle-shaped, containing the homogenous cell contents, 6μ wide and inclusive of trichogyne 12μ long; carpospores terminal on the sporogenous filaments, forming dense corymbose clusters, ellipsoidal in shape, 11–14μ wide, 18–20μ long.

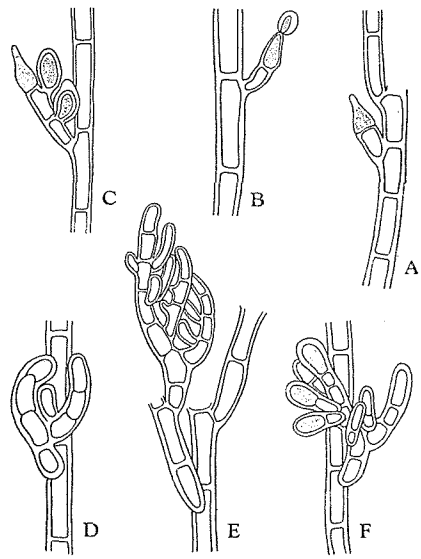

Fig. 11. *R. robustum* (BÖRG.) NAKAMURA. A. Branch with branchlets bearing a carpogonium. ×400. B. Carpogonium with adhering spermatia. ×400. C. Branchlet bearing one carpogonium and two monosporangia. ×400. D–F. Young cystocarps in various stages. ×400.

This species was found on *Turbinaria ornata,* associated with several other species. The monosporangia of the present material occur on the same plant and also on the same branch as the sexual organs. The carpogonium is mostly terminal on the short branchlets, or often lateral directly on both branches and main filaments, and is bottle-shaped with a short trichogyne. To find fertilized carpogonia with adhering spermatia is not rare. The two sporogenous filaments, composed of 4–6 cells, are given off from a fertilized carpogonium, then begin to branch off on all sides and finally form dense clusters. Each terminal cell of this cluster is converted into a carpospore. The cystocarps are composed of 7–10 carpospores forming dense corymbose clusters.

The present plant agrees quite well with both *Acrochaetium robustum*

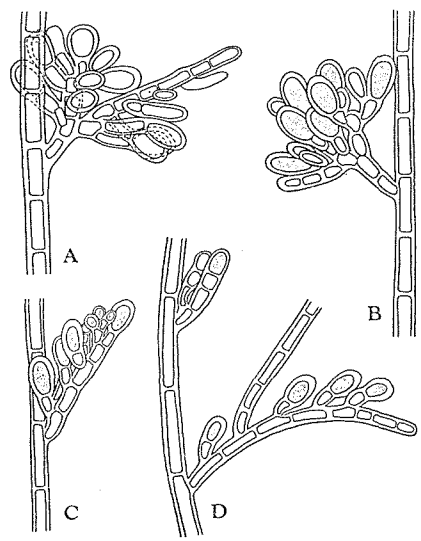

Fig. 12. *R. robustum* (BÖRG.) NAKAMURA. A–B. Cystocarps ×308. C. Branchlet bearing antheridia and monosporangia. ×308. D. Branches with monosporangia .×308.

Börgesen and *A. sargassicola* Börgesen. Judging from the descriptions and figures given by Börgesen, the distinguishable difference between *A. robustum* and *A. sargassicola* is only in the basal structure. However, it is not easy to make a distinction between these two species, because, in some cases, the basal structure of *A. robustum* is quite the same as that of *A. sargassicola* as shown in fig. 418 (in Mar. Alg. of D. W. Indies, p. 449.) and fig. 5, a (in Kew Bulletin, p. 117).

Most of the present specimens have a small basal disc with a cylindrical process, immersed in the tissues of the host, like *A. robustum,* but some of the specimens have no lateral growth throughout the life of the plant like *A. sargassicola,* although an accessory cell is rarely developed close to the original spore in *A. sargassicola.*

In the materials examined, furthermore, various intermediate basal developments between *A. robustum* and *A. sargassicola* are abundantly observed. Consequently, it is impossible clearly to delimit these two closely allied species in the writer's observations. This is what has led the writer to consider that *A. robustum* and *A. sargassicola* should be combined in one species as *Rhodochorton robustum* (Börgesen) comb. nov. et emend.

Text-figs. 14–16.

Rhodochorton Hyalosiphoniae spec. nov.

Thallo ad 0.4–1.0 mm alto, e filis brevibus horizontaliter repentibus epiphyticis, filis erectis et filis endophyticis constructo; filis endophyticis infra cuticulam hospitis horizontaliter expansis ramosis, articulis 5–7μ latis, 12–18μ longis; filis erectis parce ramosis 10μ latis, apicem versus paullo attenuatis, 6–7μ latis, articulis diametro fere 2–3-plo longioribus; ramulis numerosis, sparsis latus toto fila-

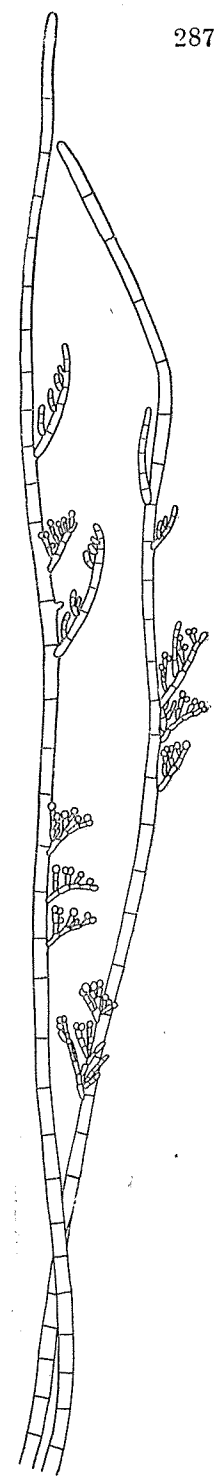

Fig. 13. *R. robustum* (Börg.) Nakamura.
Upper part of filaments bearing antheridial clusters.

mento, alternis aut secundatis, sub anglo acuto plerumque egredientibus, apicem versus in pseudopilos hyalinos attenuatis; chromatophoro parietali; monosporangiis ellipsoideis vel ovoideis, 10–12μ latis, 13–15μ longis, semper pedicellatis, terminalibus aut lateralibus, 1–3 in ramulo ad basin ramorum dispositis.

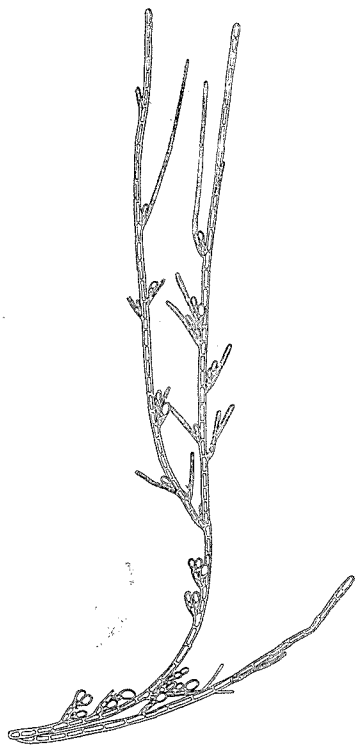

Fig. 14. *R. Hyalosiphoniae* sp. nov. Erect filaments with monosporangia. ×110.

Hab.: Muroran, Hokkaidō.

Plant endophytic, minute, 0.4–1.0 mm high; germinating spore not divided into two equal cells, 8μ wide, 12μ long; endophytic filaments and erect filaments given off from the spore in the opposite direction; endophytic filaments penetrating between and through the cells of the cortical tissues of the host, branched irregularly, and composed of somewhat sinuated cells; cells of the endophytic filaments 5–7μ broad and 12–18μ long; epiphytic creeping filaments less developed, composed of irregular cells; erect filaments seldom branched; branchlets scattered along the whole filaments, alternate or often secund, at an acute angle; both branches and branchlets, especially the latter, ending in hair-like prolongations of hyaline elongated cells, decreasing to 3μ diam.; cells of the free filament cylindrical, about 10μ broad, decreasing to 6–7μ at the apex of the filaments, 2–3 times as long as broad, cell wall 2μ thick; chromatophores parietal laminate; monosporangia ellipsoid to ovoid, terminal or lateral, 1–3 sporangia on the adaxial side of the branchlets, always pedicellate, 10–12μ broad, 13–15μ long.

This species was found growing on *Hyalosiphonia caespitosa,* associated with *Rhodochorton sessile.* The germinating spore does not divide into two cells and it seems to be persistent as far as could be observed. It gives off erect filament and descending endophytic one in the opposite direction. The endophytic filaments penetrate horizontally through the cortical cells, sending off branch filaments which now and then break through the cuticle of the host and immediately give off erect filaments. The epiphytic

creeping filaments are less developed and are composed of several cells which have been issued from the basal cells of the erect filaments. Erect filaments arise from the cells of these epiphytic creeping filaments also. The monosporangia are arranged in a series of 1–3 sporangia on the inner side of the branchlets which are scattered along the whole filament. The sporangia-bearing branchlets are often repeatedly branched, forming a fan-shaped fascicle, especially in the dwarf plants.

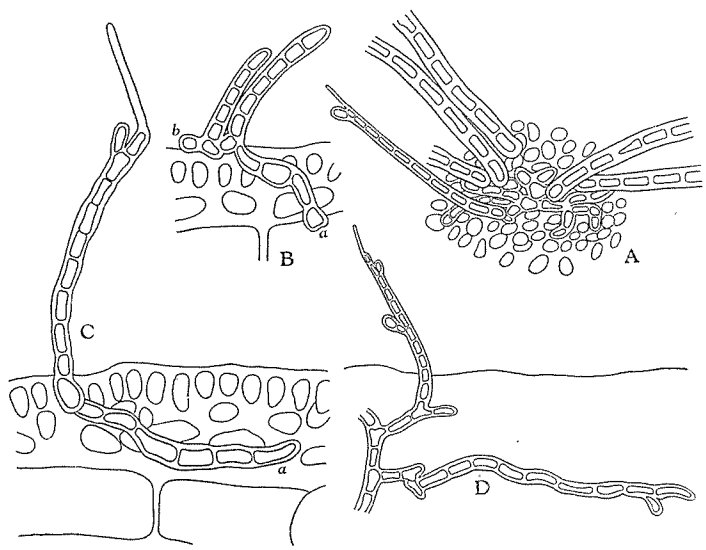

Fig. 15. *R. Hyalosiphoniae* spec. nov. A. Basal part showing short epithytic creeping filaments. ×270. B–C. Young plant, a, endophytic filament, b, epiphytic creeping filament. ×410. D. Branched endophytic filament which give rise to one erect filament breaking through the cuticle of the host. ×170.

The terminal cell bearing hair, often pushes aside its originally terminal hair and grows out sympodially in the same direction as before, and consequently, two hairs appear on the same cell.

This species is nearly related to *Rhodochorton Daviesii* (DYLLWYN) DREW and *R. magnificum* DREW, but it is smaller than those two. *R. Hyalosiphoniae* differs from *R. Daviesii* in the basal structure. *R. Hyalosiphoniae* is apparently endophytic whereas *R. Daviesii* is epiphytic.

R. Hyalosiphoniae and *R. magnificum* are both endophytic, but the former has a more extensively developed endophytic system than the latter. Other features of *R. Hyalosiphoniae* different from *R. magnificum*, are the arrangement of branchlets and the absence of sessile sporangia.

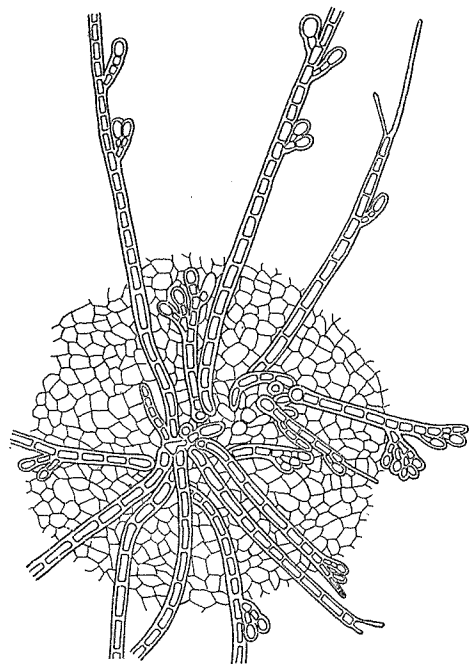

Fig. 16. *R. Hyalosiphoniae* spec. nov. Dwarf plant with monosporangia. Seen from above. × 210.

Text-fig. 17.

Rhodochorton subimmersum

SETCHELL et GARDNER

Alg. N.W. Amer., 1903, p. 347, pl. 17, fig. 12; COLLINS, HOLDEN and SETCHELL, Phyc. Bor. Amer. (Exsicc.) no. 1348; DE TONI, Syll. Alg., 1903, p. 1534; G. HAMEL, Recher. sur Acrochaetium et Rhodochorton, 1927, p. 110; DREW, Revis. of Chantransia, Rhodochorton and Acrochaetium, 1928, p. 191, pl. 47, fig. 81.

Hab.: Muroran, Hokkaidō.

Distr. From Washington, Whidbey Island to Monterey Country, California.

Plant almost entirely endophytic, forming dark red spots upon fronds of the host; endophytic filaments growing between the outer cortical cells and parallel to the surface of the host; cells of the

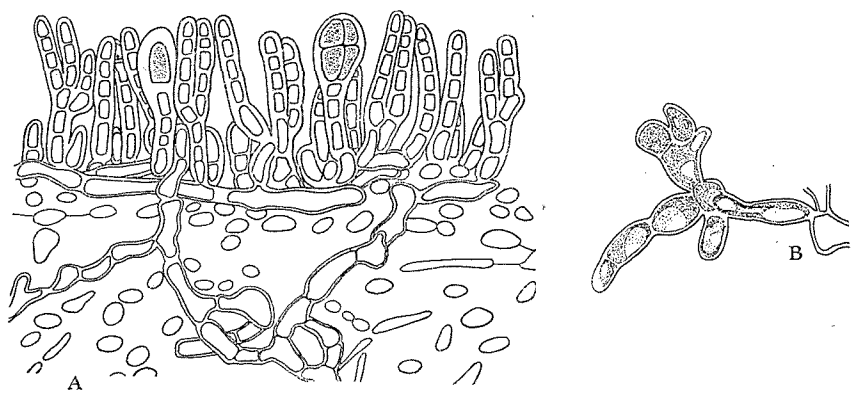

Fig. 17. *R. subimmersum* SETCHELL et GARDNER. A. Transverse section of *Grateloupia turuturu* showing endophytic filaments giving rise to branches which project beyond the surface of the host and bear tetrasporangia. × 500. B. Cells of endophytic filament showing parietal chromatophore without pyrenoid. × 500.

endophytic filaments somewhat tortuous, elongated, thin-walled, about 3–6μ diam., 3–10 times as long, giving rise to branches at right angles; erect branches growing beyond the surface of the host, usually composed of 6–7 cells (30–40μ long), branched only at the base, usually within the tissues of the host; cells of the erect filaments cylindrical, about 4μ broad, only slightly longer than broad, cell wall somewhat thicker than in the endophytic filaments; chromatophores parietal laminate, without pyrenoid; tetrasporangia ellipsoid, terminal, occasionally lateral on the erect filaments, cruciately divided, usually 12μ wide, 18μ long.

This species is very common on fronds of *Grateloupia turuturu* in the months of December to March. Its presence is easily recognized since the areas it occupies are of a darker red than the rest of the thallus of the host. These areas usually reach a diameter of 6 mm., sometimes 3 cm. The material at hand agrees quite well with the specimens of *R. subimmersum* SETCHELL et GARDNER in Phyc. Bor. Amer., determined and distributed by SETCHELL, and also agrees well with the description and figure of this species, given by DREW.