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SYMBOLS USED

° is used after figures to indicate feet.

′ is used after figures to indicate inches.

″ is used after figures to indicate lines, or twelfths of an inch.

ˊ over syllables indicates the accent, and the *short* English sound of the vowel.

ˋ over syllables indicates the accent, and the long, broad, open or close English sound of the vowel.

IN THE METRIC SYSTEM.

The metre = 39.37 inches, or 3 feet 3.37 inches.
The decimetre = 3.94 inches.
The centimetre = ⅖ of an inch, or 4⅘ lines.
The millimetre = 1/25 of an inch, or ½ a line.
2½ millimeters = 1 line.

} very nearly.

spores in a black mass over the flowers of its host, one of the grasses. On account of the large size of the spores, the fungus is very beautiful and the large masses of spores render it a very attractive species.

Order 17. SPHAEROPSIDÀLES.

Among the fungi of this order are the leaf-spots, a number of which have been collected. Some of the species are: *Septoria oleandrina* Sacc., *Phyllosticta Opuntiae* Sacc. & Speg., *Phoma Musarum* Cooke and *Pestallozzia Guepini* Desm.

In addition to these a number of Hyphomycetes have been collected among which are: *Macrosporium Solani* Ellis & Martin, *Sclerotium Semen* Tode and *Helicoma larvula* Morgan.

In order to make a careful survey of the fungi of any region, it is necessary to study the region not only through the season but for several seasons, since many of the fungi are not persistent as are the higher plants. Many of them last for only a few days at most, and in some cases may not appear again for years. The best means of securing a complete knowledge of the fungi of Bermuda is for some permanent resident to take up a study of the group and continue it indefinitely. Such a study would not only furnish interesting occupation, but would extend our local knowledge of the fungi and doubtless result in adding many species to those already known.

Class 3. ALGAE.*

CONTRIBUTED BY MARSHALL A. HOWE.

The shores of Bermuda and the adjacent sea-bottoms offer wider areas and doubtless more diversified conditions for the growth and development of plants than do the parts of Bermuda that are permanently above the sea. It is probable that thorough investigations will show that, even when the microscopic diatoms, not especially numerous here, are excluded, the number of species of marine plants of Bermuda and vicinity is equal to that of the seed-bearing plants of the dry land. Many of the organisms that first attract the eye in the famous "sea gardens" of Bermuda, such as the corals, the sponges, and their relatives, are members of the animal kingdom, though it is not surprising that the earlier naturalists, observing these organisms to be attached, like the undoubted plants of the land and sea, were inclined to look upon them as plants. And it is not surprising that this idea, as regards some of these organisms, has now and then persisted, with those who have never made a special study of such things, even down to the present day.

Of the marine plants that wash ashore in Bermuda, especially after a severe storm, and that are commonly referred to as "seaweeds," a few are seed plants belonging to such genera as *Thalassia*, the Turtle Grass; *Zostera*, the Eel Grass; and *Cymodocea*, the Manatee Grass. However, most of the plants found in the beach drift or seen growing near the line of the low tide or in deeper water, are less highly organized, non-vascular plants, and are representatives of the large and much diversified group known to botanists as the algae. Probably by reason of the more scorch-

* Chiefly marine, as represented in Bermuda and as here treated.

ing effects of the sun's rays, the algae are less conspicuous between the tide lines in the warmer parts of the earth than in many of the colder parts. In this respect, as also in the genera and species that are represented, Bermuda has more in common with Florida and the West Indies than with the northern United States and Great Britain. The direct physical connection with more southern shores by the northward-flowing Gulf Stream and the more or less similar conditions as to illumination and water temperatures are doubtless the main factors in determining the obviously marked affinity between the marine flora of Bermuda and that of the Antillean region. A certain number of species of marine algae—a number that seems to increase rather than diminish as a result of critical study—is, so far as is now known, peculiar to Bermuda; other species occur also on the North Atlantic coasts of the American continent; others, again are found also on the shores of Europe, the Azores, the Canary Isles, etc.; but to still larger degree the algae of Bermuda appear to be identical in species with those of the Bahamas, southern Florida, and the Greater Antilles.

The marine algae of Bermuda have received a considerable amount of attention from naturalists. One species and one variety reached the hands of Dawson Turner and were described by him in the first volume of his classic Historia Fucorum, published in 1808. Four principal lists of Bermudian algae have been published up to the date of writing, all of which are referred to in the general bibliography. In the first of these, by Alexander F. Kemp, published in 1857, seventy-one species of marine algae are named and others are referred to the genus only. In the second, by Johannes Justus Rein, published in 1873, the number enumerated is one hundred and nine. In the third, published in the report of the Challenger Expedition in 1884 and based in a considerable part on the two lists already mentioned, one hundred and thirty-two species are named as occurring in these islands.

But by far the most complete list of Bermuda algae ever published is contained in a paper on "The Algae of Bermuda" by F. S. Collins and A. B. Hervey, which has appeared just as the present work is going to press and in which 410 species are recognized. Collections of algae have been made in Bermuda by one or both of the authors of this recent important paper at all seasons of the year, and 250 numbers of dried specimens of Bermuda algae have been distributed by them in the Phycotheca Boreali-Americana of Collins, Holden & Setchell. In the following discussion of the marine flora these specimens are often cited under the abbreviation "Phyc. Bor.-Am." In addition to these specimens, the writer has had access to a considerable amount of material, both dried and in fluid, generously supplied to the New York Botanical Garden by Mr. Collins, and also to a collection of 329 numbers, both dried and in fluid, made by the writer during a single four weeks' visit to Bermuda in the summer of 1900, as well as to a number of specimens collected and distributed by Professor W. G. Farlow, Professor Herbert M. Richards, and others. In view of the very recent appearance of the Collins & Hervey list and in view of the more limited material at the disposal of the present writer, no attempt to offer a complete list of species will be made in the following pages. An effort will be made, however, at least to mention the more common and more conspicuous algae occurring in the islands, with remarks,

sometimes diagnostic or semi-diagnostic, on some of the more characteristic species.

Among the algae as a whole, as the term is commonly restricted by modern writers, three great sub-classes are recognized, known as the Chlorophyceae or the Green Algae, the Phaeophyceae or Brown Algae, and the Rhodophyceae or Red Algae. The algae in general possess more or less chlorophyl, the green pigment characteristic of most of the higher plants, and in the sub-class Chlorophyceae, the chlorophyl is as a rule comparatively free from admixture with other coloring matters, so that the plants impress one as being more or less grass-green in color. In the sub-class Phaeophyceae, the chlorophyl is accompanied by one or more brownish or yellowish pigments and the resulting color is commonly a brownish green or an olive-green. In the sub-class Rhodophyceae, the chlorophyl is ordinarily masked or obscured by a red pigment, so that the plants usually exhibit some shade of red, pink, violet, or purple, though in certain kinds the shade is so dark as to be almost black. Associated with these color differences as exhibited by these three sub-classes, and perhaps of more fundamental import, are certain differences in structure and in modes of reproduction. But the determination of these characters involves, as a rule, the use of the higher powers of the microscope and they have been referred to only occasionally in the discussion that follows.

Sub-class CYANOPHYCEAE.

In addition to the three classes of plants mentioned in the preceding paragraph, the term algae is very often extended to include also another, somewhat simpler class known as the Cyanophyceae or Myxophyceae, commonly referred to as the Blue-green Algae, a group that exhibits points of contact, on the one hand, with the Bacteria and, on the other hand, with the simplest Red Algae. In this group, the chlorophyl is associated with another pigment which commonly gives the cell contents a bluish-green shade, though in mass, to the naked eye, the plants very commonly appear nearly black. They are usually plants of small size but when associated in colonies as is their ordinary habit, they form masses that may readily attract the eye. In many of them reproductive processes are so little differentiated from those of ordinary vegetative growth that it is difficult to say just what should be considered an individual plant and what an aggregation of individuals. In some of them the single microscopic cell is more or less obviously the individual; in certain others it is a filament, made up usually of a single row of cells. The Cyanophyceae are wholly non-sexual in their modes of multiplication. In the simpler forms the multiplication of individuals occurs through simple division or fission; in the higher, certain cells, known as spores or resting cells, differentiated from the ordinary vegetative cells in size and other characters, take upon themselves the function of originating new individuals. The Cyanophyceae may form gelatinous or slimy dark scums on rather stagnant water or somewhat similar films or crusts on rocks or on the larger aquatic plants,

either between the tide lines or permanently submerged. They are not confined to the sea, but are perhaps even more common in brackish or fresh water. They also occur on moist ground and even on trunks of trees and rocks where rains and atmospheric moisture are their only sources of water-supply. A few of the species of Cyanophyceae that have been found in Bermuda may be mentioned:

Family CHROOCOCCÀCEAE.

Chroococcus turgidus (Kütz.) Naeg., a minute one-celled, more or less colonial plant, occurs in brackish pools, commonly associated with other small Cyanophyceae.

Chroothece Richteriana Hansgirg, forms verdigris-green or dark blue-green gelatinous cushions or crusts on rocks, sometimes at a considerable distance from the sea, as in Church Cave.

Chroothece cryptarum Farlow, of somewhat similar appearance to the naked eye, also forms crusts or films on rocks in caves, as at Agar's Island.

Gloeothece rupestris (Lyngb.) Bornet, another unicellular form, occurs as a dark or bluish olive-green gelatinous film on moist ground, as at Spanish Point.

Family OSCILLATORIÀCEAE.

Oscillatoria amphibia Ag., a filamentous plant, forms gelatinous masses in brackish pools, often associated with other species of the same genus or class. Several other species of the genus occur in Bermuda. This genus receives its name from the fact that the filaments in a living condition show slow swaying movements, visible under a compound microscope.

Lyngbya majuscula (Dillw.) Harv., sometimes known as Mermaid's Hair, forms conspicuous slimy intricate mats or tufts that may vary in color from bluish green to blue-black. The individual threads are easily visible to the unaided eye and seem sometimes to attain a length of several inches. It flourishes best in salt water that is little disturbed, as in the ponds of Walsingham and in the tide-pools of St. David's Island.

Lyngbya confervoides violacea Collins, has been found by Collins to occur in a small pond near Harrington Sound, where it forms a reddish film on decaying algae, in company, it is said, with *Lyngbya lutea* (Ag.) Gom. and *L. semiplena* (Ag.) J. Ag.

Microcoleus chthonoplastes (Mert.) Thuret, representing a genus in which numerous filaments occur in bundles enclosed in a common sheath, forms a bluish green turf or film on littoral soil, on wooden piers, on borders of tide-pools, etc.

Hydrocoleum comoides (Harv.) Gom. has been found on rocks near low-water mark at Cox's Bay, Devonshire. In this, as in the *Microcoleus*, there is a number of threads inside a common sheath, but the number is less.

Family NOSTOCÀCEAE.

Nostoc commune Vauch. is not uncommon both on moist ground and on ground that is apparently dry a good deal of the time. It forms a conspicuous olive-green or nearly black membranous crust that is gelatinous when moist and rather brittle when dry. It often, especially when dry, appears to lie loose on the ground, without attachments of any sort. The more or less confluent thalli sometimes appear to be several inches broad and show elevated lobes and bullae and very irregular pits and lacunae on the upper surface. Under a compound microscope, the cells, imbedded in a gelatinous matrix, look like chains of beads, with occasional yellowish usually larger cells known as heterocysts.

Family SCYTONEMATÀCEAE.

Scytonema ocellatum (Dillw.) Thuret, forms a dark almost black turf of minute intricate or suberect threads on the sand dunes of Paget. In the Scytonemataceae the sheaths of the filaments are firm and are scarcely gelatinous even when wet; the filaments often show a so-called "false" branching; and, as in most of the other genera of the family, there are heterocysts somewhat like those of *Nostoc*.

Scytonema myochrous Ag., which, like the former, can hardly be considered a marine species, forms a short nap or felt on rocks, as about Harrington Sound.

Scytonema junipericola Farlow, forms dark velvety patches on the bark of the Bermuda cedar.

Family STIGONEMATÀCEAE.

Hapalosiphon intricatus W. & G. S. West, a delicate fresh-water filamentous species, has been reported by Collins from the Devonshire marshes, where it occurs in ditches, with *Sphagnum*. In this genus the filaments show "true" lateral branching and intercalary heterocysts are present.

Family RIVULARIÀCEAE.

Rivularia polyotis (Ag.) Born. & Flah. forms small blackish green sinuose-bullate gelatinous cushions on rocks and other objects between the tide lines. In the Rivulariaceae there is a distinct differentiation of base and apex of the filament, the apex running out into a thin hair. In *Rivularia*, the filaments have a more or less radial arrangement and there is a heterocyst at the base of each filament.

Calothrix scopulorum (Web. & Mohr) Ag. has been found by Mr. Collins at Shelly Bay, where it formed a blackish green layer on a rock near the high-water mark.

Polythrix corymbosa (Harv.) Grun. forms a turf on rocks just below the low-water mark. The erect subdichotomously branched fastigiate blue-green

threads seem coarser than those of most Cyanophyceae, but the microscope shows that each thread is a cylindric bundle of closely compacted filaments of the *Rivularia* or *Calothrix* type. Mangrove Bay (*Hervey.*)

Sub-class **CHLOROPHŸCEAE.**

The affinities of the marine algae of Bermuda with those of southern Florida and the West Indian region are nowhere more clearly shown than in the order Siphonales of the sub-class Chlorophyceae, more particularly in such genera as *Caulerpa, Avrainvillea, Udotea, Penicillus, Halimeda, Codium, Valonia, Batophora, Dasycladus, Neomeris, Acicularia,* and *Acetabulum,* all of the species of which seem identical with those from farther south. It is probable that systematic dredging operations in waters from 50 to 300 feet deep would materially increase the number of species of Siphonales that Bermuda shares with Florida and the West Indies. Some of the larger Green Algae that have been found are the following:

Family **ULVÀCEAE.**

Ulva Lactuca L., the Sea Lettuce, in various forms, is not uncommon, especially in sheltered places. The thallus consists of a thin flat green membrane, which is shown by the microscope to be two cells thick.

The genus **Monostroma,** in which the thallus is outwardly rather similar to that of the Sea Lettuce, but consists in the main part at least of only one layer of cells, is represented by one or more species.

The genus **Enteromorpha,** in most of the species of which the thallus is tubular with the walls one cell thick, is represented by several species growing in shallow water or on rocks or other objects between the tide lines. **Enteromorpha intestinalis tenuis** Collins, **E. flexuosa** (Wulf.) Ag., **E. flexuosa submarina** Collins & Hervey, **E. plumosa** Kütz., and **E. minima** Naeg. are the names employed by Collins for the species issued in the Phycotheca Boreali-Americana. **E. plumosa** Kütz., the branches of which commonly terminate in a single row of cells, has been found by Collins, attached to floating wood.

Family **VALONIÀCEAE.**

Valonia ventricosa J. Ag., Sea Bottles, one often finds washed ashore on South Beach. The plant is essentially an ovoid, pyriform, or subglobose membranous sac filled with protoplasm and attaining a diameter of one or two inches. When living it is dark green and more or less iridescent. On being killed and bleached it becomes beautifully pellucid and is as attractive then as when living.

Valonia macrophysa Kütz. In this species the vesicles are smaller than in the preceding and they often branch copiously, forming clumps as large as a man's fist or even head. It occurs in shaded sheltered places, as in mangrove swamps, and has an extraordinary development in the ponds near Walsingham, where it forms large beautifully iridescent masses attached to

submerged rocks and logs. (Phyc. Bor.-Am. *1867;* Alg. Exs. Am. Bor. *171,* as *V. utricularis* Ag.)

Ernodesmis verticillata (Kütz.) Børg. This plant was formerly considered to be a *Valonia,* to which genus it is closely related. The plant is repeatedly branched, the slender club-shaped branches or vesicles occurring in whorls of 4 to 12. The species has been found in Harrington Sound and in a shallow tidal stream flowing into Hungry Bay. (Phyc. Bor.-Am. *1907.*)

Dictyosphaeria favulosa (Ag.) Decaisne, has been found at Harris Bay by Hervey (Phyc. Bor.-Am. *2015*). It forms hollow membranous thalli that are at first subglobose or lightly wrinkled or lobed, becoming later irregularly torn or somewhat cup-shaped, the thallus often as large as one's fist. The surface of the thallus shows numerous hexagonal facets, mostly a half line or less in diameter, suggesting a miniature honeycomb. The plant grows attached to rocks in shallow water.

Siphonocladus tropicus (Crouan) J. Ag. has lateral flagelliform branches 0.5–2 inches long, clothed with irregular often crowded proliferations mostly $\frac{1}{12}$–$\frac{1}{4}$ inches long.

Siphonocladus rigidus M. A. Howe, has, for the most part, a dichotomous or subdichotomous mode of branching, though short, irregular or subsecund, mostly unicellular, lateral proliferations are of occasional occurrence. The cell walls are thick and under a microscope conspicuously lamellate, and the septa are often mammillate or tuberculate on their upper faces. It grows on rocks and pebbles in shallow water or at the low-tide line. Agar's Island (*Collins*). (Phyc. Bor.-Am. *2169.*)

Petrosiphon adhaerens M. A. Howe, forms closely appressed slightly calcified light green crusts or cushions in tide-pools or on limestone rocks near the low-water mark. It has a radially striate or sulcate appearance owing to its radio-marginal growth. The plant is actually attached to the rock by boring rhizoids and can not well be removed without use of hammer and chisel. The species was originally described from the Bahamas, but has recently been found in the Bermudas by Hervey. (Phyc. Bor.-Am. *2073.*)

Anadyomene stellata (Wulf.) Ag. is not uncommon on rocks, growing mostly in 1–20 feet of water. It forms a membranous bright green subsessile thallus usually 1–3 inches high or broad and looking a little like a young *Ulva* but crisper and more rigid to the touch. Under a hand-lens or even to the naked eye it shows an elegant system of venation, with the principal veins radiating in a palmate, flabellate, or semicircular fashion from radially successive foci. (Phyc. Bor.-Am. *1906.*)

Struvea ramosa Dickie, was originally described from the Bermudas from material dredged in deep water by the Challenger Expedition and has since been reported from the Canary Islands. The plant is two or three inches tall, more than half of which consists of the slender simple or oppositely branched stipe, which is rugose-annulate near the base or also at the base of its branches.

Terminating the stipe or each of its branches is a plane elliptic or ovate network of opposite or substellate cohering branches and branchlets. The plant is easily distinguished from *Anadyomene* by its long slender stalk and by the less solid or more lacunose network. In this *Struvea* the vacant spaces among the united branchlets occupy an area that is in the aggregate fully equal to that occupied by the branchlets themselves, while in *Anadyomene* the membrane is very nearly solid and continuous.

Boodlea struveoides M. A. Howe, sp. nov. Thallus weakly stipitate, the stipe simple or dichotomous, 5–30 mm. (1–4 cells) long, 200–450 μ in diameter, its cells 4–40 times as long as broad; branches variously disposed, often mostly opposite and developing in a single plane, their branchlets cohering frequently by tentacula and forming a flat uniaxial frond often 1 cm. long and wide (4–16 meshes wide), these fronds, in turn, cohering with others of their kind and forming dense spongy confervoid cushions 2–4 cm. in diameter; or, branches subpalmate, palmately subdistichous, subverticillate, or emerging irregularly and in all directions; cells of the main axes 150–320 μ in diameter, mostly 2–5 times as long as broad, becoming scarcely longer than broad above; branches and branchlets numerous, patent or divaricate, the ultimate cells 60–80 μ in diameter, 2–4 times as long as broad, often recurved.

On rocks in about 3 dm. of water, Harrington Sound (type, *Howe 131*, in herb. N. Y. Bot. Gard.).

This species is somewhat intermediate between *Boodlea siamensis* Reinb. and *Struvea anastomosans* (Harv.) Piccone, but can not be accurately identified with either. Its nearest relatives are doubtless the East Indian *B. siamensis* Reinb. and *B. paradoxa* Reinb., from both of which it apparently differs in the development of a weak stipe (sometimes as much as 3 cm. long) and in the commonly more *Struvea*-like development of its upper parts. It is also more rigid and somewhat coarser in all its parts than *B. siamensis*, a type duplicate of which has been compared with it. The frequent irregular development of the branches in all planes makes the plant a *Boodlea* rather than a *Struvea*. Of the Bermudian algae, this plant is perhaps most likely to be confused with small pulvinate Cladophoras or with *Cladophoropsis membranacea*, but examination with a hand-lens or attempts to disentangle the mats disclose the cohesions of the branchlets and the net-like meshes of the *Boodlea*. Apparently endemic.

Family CLADOPHORÀCEAE.

Cladophoropsis membranacea (Ag.) Børg. occurs on rocks near the low-water mark, on roots of mangroves, and in pools, forming bright green attached cushions or loose irregular detached clumps. In structure it resembles a *Cladophora*, but the branches are, usually at least, without a septum at the base. (Phyc. Bor.-Am. *1866.*)

Cladophora fuliginosa Kütz. Somewhat similar to *Cladophoropsis membranacea* and possibly a derivative of it, is the composite organism described and figured by Harvey as *Blodgettia confervoides*, which occurs in Bermuda in similar places, though often in more agitated water. This turns blackish on being killed and is often blackish when found growing. There is present

in the cell walls a peculiar filamentous fungus, to which E. P. Wright has restricted the generic name *Blodgettia*, with the new specific name *Bornetii*. Whether this algicolous fungus is to be considered a lichenogenous one or simply a parasite is possibly a matter of definition of terms, though it seems to conform better to the usual conception of a parasite. The cell walls of the host are commonly more rigid and the branches more commonly have a septum at the base than is the case in *Cladophoropsis membranacea*. The combination of fungus and alga was apparently first described by Kützing under the name *Cladophora fuliginosa*, a name recently revived by Collins and by Børgesen. (Phyc. Bor.-Am. *2012*.)

Cladophora catenifera Kütz. was originally described from the Cape of Good Hope. The name has been applied by Collins to a Bermudian plant that is somewhat similar, but has shorter, more fasciculate-divaricate ramuli. It is one of the largest and coarsest of the Cladophoras. In a sheltered place in Red Bay, St. David's Island, it forms stiff erect dark green tufts that are sometimes nearly a foot and a half high.

Cladophora crystallina (Roth) Kütz. is the name under which Collins has distributed (Phyc. Bor.-Am. *1865*) Bermudian specimens from pools on the South Shore and at Harrington Sound. The plant has fine soft copiously branched filaments and has a glossy appearance on being pressed and dried.

Cladophora Howei Collins forms compact yellowish green mats or tufts about half an inch high on rocks in tide pools on Gibbet Island. Endemic.

Cladophora fracta (Vahl) Kütz. is a widely distributed and variable species of fresh or brackish water. It has been found by Hervey in a reservoir near Spanish Rock. (Phyc. Bor.-Am. *2013*.)

Cladophora corallicola Børg. is a name that has been adopted by the editors of the Phycotheca Boreali-Americana (*2010*) for a plant collected at Tucker's Town by Dr. Hervey. The name was first proposed for a Danish West Indian plant, dredged from a depth of about 100 feet, where it formed a dense covering on dead corals and shells.

Cladophora crispula Vickers, was originally described from Barbados, where it forms dense, closely interwoven, spongy, olive-green or dusky green masses, lobes of which sometimes grow out as irregular rope-like strands an inch or so long. Under a lens the ultimate branchlets are seen to be curved and inflexed, giving a densely crisped or curled appearance to the matted surface. The name has been applied in the Phycotheca Boreali-Americana (*2011*) to a lighter-colored, much less crisped and spongy plant from Harrington Sound.

Cladophora utriculosa Kütz. is a name under which a plant from Harrington Sound has been distributed in the Phycotheca Boreali-Americana (*2014*). The cells of this Bermudian plant, however, seem to be on the average much shorter than those of the original plant from the Adriatic Sea. It is very difficult, if not impossible, to define the limits of currently recognized species of *Cladophora* and the interpretation of the species and their range of varia-

tion is a subject of widely varying treatment by phycological writers. *Cladophora,* in fact, seems to be a genus in which clearly defined species do not exist. Other species, as currently recognized, certainly occur in Bermuda.

Chaetomorpha Linum (O. F. Müll.) Kütz. occurs in quiet water, as in Harrington Sound, the ponds of Walsingham, Hamilton Harbor, and at Hungry Bay. It forms unattached tangled mats of delicate unbranched threads (diam. $\frac{1}{10}$–$\frac{1}{8}$ of a line) made up of a single row of cells. (Phyc. Bor.-Am. *1863,* as *C. aerea,* forma *Linum.*)

Chaetomorpha crassa (Ag.) Kütz. is a species with coarser filaments ($\frac{1}{8}$–$\frac{3}{4}$ of a line in diameter) that is found in tide pools, fish ponds, mangrove swamps, etc. (Phyc. Bor.-Am. *1864.*)

Chaetomorpha brachygona Harv., collected at Walsingham by Collins, has filaments of $\frac{1}{4}$–$\frac{1}{2}$ the diameter of those of *C. Linum* and *C. crassa,* with cells scarcely longer than broad.

Chaetomorpha minima Collins & Hervey, is a name under which the editors of the Phycotheca Boreali-Americana (*2007*) have distributed a slender plant found by Hervey, attached to *Cladophora, Codium,* etc. in Harrington Sound. Endemic.

Rhizoclonium hieroglyphicum (Ag.) Kütz., a widely distributed species, has been reported (Phyc. Bor.-Am. *2009*) as occurring in Bermuda in reservoirs and in fresh-water rock-pools.

Rhizoclonium crassipellitum W. & G. S. West, originally described from Portuguese West Africa, has been reported from a fresh-water pool near Ely's Harbor (Phyc. Bor.-Am. *2008*).

Rhizoclonium Hookeri Kütz., or something close to it, occurs associated with a moss, *Eucladium verticillatum,* on the walls of Smuggler's Cave, near Castle Harbor. The filaments are apparently more robust than those of plants from Kerguelen's Island to which the name was first applied.

Rhizoclonium tortuosum Kütz., which is perhaps an untenable name, may be used for the present for a plant that is found in tangled mats on rocks at the high-tide line on the Paget shore of Hamilton Harbor.

Rhizoclonium Kerneri Stockmayer, is a name that has been applied by Collins to a plant that forms a dark green film on branches and roots of the mangroves, accompanying *Caloglossa Leprieurii.* Its filaments are somewhat coarser than those of the type of this species.

Family **DASYCLADÀCEAE.**

Dasycladus vermicularis (Scop.) Krasser, a dirty-yellowish-green cylindric or club-shaped plant, mostly 1–3 inches high and $\frac{1}{8}$–$\frac{1}{4}$ inch broad, with densely compacted whorls of branches, which are in turn two or three times verticillately ramulose, has been found on pebbles in a shallow bay on Cooper's Island by Collins. In this genus the gametangia are terminal on the primary branches. (Phyc. Bor.-Am. *1868,* as *Dasycladus clavaeformis.*)

Batophora Oerstedi occidentalis (Harv.) M. A. Howe, is usually a smaller plant than the foregoing, with more widely spaced whorls of primary branches. The sporangia, containing large firm-walled aplanospores are lateral at the distal ends of the primary or secondary branches. It occurs on old shells, old shoes, pebbles, etc. at Spanish Point, etc. (Phyc. Bor.-Am. *1910* and *2016*.)

Neomeris annulata Dickie, is a light green or whitish lime-encrusted, worm-like plant scarcely one inch high, with a cortex that shows under a hand lens numerous small hexagonal facets in regular transverse rows. It grows on stones in shallow water on White's Island in Hamilton Harbor and in Harrington Sound, maturing in the month of July. The strongly calcified sporangia cohere laterally and form transverse rings in the lower half of the plant. (Phyc. Bor.-Am. *1909*.)

Acetabulum crenulatum (Lamour.) Kuntze, the dainty Mermaid's Wine Glass, is not uncommon on pebbles, shells, pieces of dead coral, etc. in shallow water, growing especially in rather protected places. Particularly attractive specimens are found, in the summer at least, in the tidal stream that forms the outlet of one of the ponds in the Walsingham region. The plants are 1–4 inches high and are terminated by a disc or cup ½–⅝ inch broad. Practically the whole plant is usually strongly coated with lime and it becomes a chalky white soon after being taken from the water and exposed to the light, though in the living state the cup part, at least, is commonly a light green. Each of the 35–60 radial chambers of which the cup is composed is in large part a sporangium, containing in the present species 200–500 subglobose firm-walled aplanospores, which are not calcified. (Phyc. Bor.-Am. *1908*, as *Acetabularia crenulata*.)

Acicularia Schenckii (Möb.) Solms, looks a little like the preceding but is smaller in every way and is less common. The disc or cup is very nearly flat, is only about ½ in. broad, and has only 30–42 radial chambers, and the aplanospores are embedded in a coherent mass of lime. It was found late in the month of June, growing on stones in a tidal creek flowing from a mangrove thicket at Hungry Bay. The species was originally described from Brazil and is of occasional occurrence in the West Indies.

Family **BRYOPSIDÀCEAE.**

Bryopsis hypnoides Lamour., a species with repeatedly compound irregular ramification, almost suggesting an *Ectocarpus* or certain Cladophoras in the tenuity of its branches and general habit, occurs in shallow water in Hamilton Harbor, Harrington Sound, etc. (Phyc. Bor.-Am. *1870*.)

Bryopsis Harveyana J. Ag., a much coarser plant than the preceding, with the main branches interruptedly pectinate-plumose towards the apices and the ultimate ramuli subsecund and often glomerate-fascicled, occurs in shallow water at Tobacco Bay (*Howe 268*).

Bryopsis pennata Lamour., a plant with long naked stalks and simply pinnate terminal plumes (a plant more slender and delicate than the type of the species), has been found growing on a rock at the low-water line at Castle Harbor by Mr. Collins. (Phyc. Bor.-Am. *1871*, *2166* and *2167*.)

Family **CAULERPÀCEAE.**

Caulerpa prolifera (Forsk.) Lamour. has a particularly luxuriant development in 3–10 feet of water in the ponds of the Walsingham region, where its stolons, 2–3 feet long, send up stalked occasionally proliferous dark green laminae that are 5–8 inches high and ¾–1 inch broad. (Phyc. Bor.-Am. *1872*.)

Caulerpa sertularioides (S. G. Gmel.) M. A. Howe, though not uncommon elsewhere, is particularly well developed in the locality just mentioned. Its erect branches are regularly pinnate, with the numerous sharp-pointed subterete ultimate ramuli scarcely coarser than bristles. (Phyc. Bor.-Am. *1873*.)

Caulerpa crassifolia (Ag.) J. Ag. also has pinnate branches, but its pinnules are broader ($\frac{1}{20}$–$\frac{1}{10}$ in. wide), and less numerous, distinctly flattened, linear-oblong or subfalcate, slightly overlapping or free and spaced. The species grows on rocks, stones, roots of mangroves, etc. in rather sheltered places, as in Port Royal Bay, Hungry Bay, the ponds of Walsingham, Harrington Sound, Castle Harbor, etc. (Phyc. Bor.-Am. *1919*.)

Caulerpa cupressoides (West) Ag. has, in the Bermuda forms, the short small sharp-pointed ramuli in several ranks. It is an extremely variable species, originally described from the Danish West Indies. The prevailing Bermuda form is the forma *ericifolia* (Turn.) Web. v. Bosse, which was described and figured from Bermuda by Turner in 1808. (Phyc. Bor.-Am. *1920*.)

Caulerpa racemosa occidentalis (J. Ag.) Børg. is common in 1–20 feet of water on rocks and piers in Hamilton Harbor. Its pyriform-clavate ultimate ramuli, which are commonly rather abruptly swollen at the rounded-obtuse apices, are in several or many irregular ranks. The largest specimens seen came from Castle Harbor. In these the main branches are nearly two feet long. Other varieties, also, of this species have been reported from Bermuda. (Phyc. Bor.-Am. *2020*, *2021* and *2022*.)

Caulerpa verticillata J. Ag. has been found by Hervey at St. George's and what we take to be a form of it also at Harris Bay.* The latter, which grew in a tide pool, appears to be a reduced or poorly developed condition of forma *charoides* (Harv.) Web. v. Bosse. It has a creeping rhizome an inch or more long, from which arise erect dark green composite branches a line or two high. Under a lens these erect branches are seen to bear numerous short hair-like branchlets which are rather irregularly arranged and several times

* *C. pusilla* Collins, Holden & Setchell, Phyc. Bor.-Am. *2019*—perhaps not *C. pusilla* Martens & Hering, which seems to be certainly known only from Pernambuco. If it should be found impossible to maintain *C. pusilla* and *C. verticillata* as distinct species, the rules of nomenclature would seem to require the conservation of the name *pusilla*, as it probably had a slight priority, perhaps of only a few weeks or days, in actual printed publication.

dichotomous. In its typical condition, *C. verticillata* is a plant of lagoons and of the mangrove association, being often found attached to the roots of *Rhizophora* near the low-water mark. Its erect branches may then attain a height of 1–6 inches and the dichotomous ramuli occur in a more or less clearly defined succession of whorls or tufts.

Family CODIÀCEAE.

Avrainvillea nigricans Decaisne, occurs on rocks just below the low-water mark, as at Gibbet Island and Harris Bay. It is spongy and blackish and the flabelliform, cuneiform, or oblong upright part is in the Bermuda specimens mostly only 2 or 3 inches high. Under the compound microscope the filaments of the flabellum are found to be moniliform. (Phyc. Bor.-Am. *2171.*)

Avrainvillea longicaulis (Kütz.) Murr. & Boodle, occurs in the ponds of Walsingham, where it gets to be more than a foot tall. It here has a long stalk, finally terminated by an irregular flabellum that is sometimes several inches long or broad. In external form, however, this species and *A. nigricans* often resemble each other closely and the best distinguishing characters are found in the form of the filaments of the flabellum, which in *A. longicaulis* are commonly cylindric with a strong constriction at the base of each branch. From the Udoteas, the Avrainvilleas are distinguished by their lack of calcification, by their softer more spongy texture, and by their blackish or dusky brown color. (Phyc. Bor.-Am. *2170.*)

Udotea Flabellum (Ell. & Soland.) M. A. Howe, is a more or less fan-shaped calcified light yellowish green or dark olive-green plant, mostly 2–10 inches high, and showing concentric zonations. The flabellum has a compact firm cortex. Forms occur in which the flabellum is variously lobed and laciniate. The species is rather common in 1–50 feet of water, growing mostly on a sandy or muddy bottom. (Phyc. Bor.-Am. *1914.*)

Udotea conglutinata (Ell. & Soland.) Lamour. is usually a smaller lighter green plant, the flabellum of which is destitute of a highly specialized cortex. Under a hand lens the surface of the flabellum appears spongiose or longitudinally strigose. With a higher magnification each of the flabellum filaments is seen to be enclosed in a porose calcareous sheath. This species has been found on South Beach in Paget by Farlow and at Harris Bay by Hervey. (Phyc. Bor.-Am. *1913.*)

Penicillus capitatus Lamarck, the Merman's Shaving Brush, is common, usually on a sandy or muddy bottom in shallow water. It has a subterete and strongly calcified stalk and a commonly subglobose head, the free dichotomous filaments of which are each enclosed in a porose calcareous sheath. The plants are usually from 1 to 9 inches in height. (Phyc. Bor.-Am. *1911* and *1912.*)

Penicillus pyriformis A. & E. S. Gepp, has a more pyriform-obovoid or obconic head and usually a shorter stalk and the filaments of the head are more intertangled. The best distinguishing characteristics are, however, found in

cortex of the stalk, which, under a hand lens, appears spongiose or velutinous-tomentulose, while that of *P. capitatus* is compact, indurated, and smooth. Under higher magnification, the ultimate branchlets of the corticating filaments are seen to be elongate and taper-pointed, while in *P. capitatus*, they are short-oblong, obtuse, truncate, or capitate. *P. pyriformis* has its best development in the Bahamas, but it has been found in Ely's Harbor and Harris Bay and doubtless occurs elsewhere in the Bermudas. (Phyc. Bor.-Am. *2075.*)

Halimeda Tuna (Ell. & Soland.) Lamour. occurs on rocks in shallow water, as at Spanish Point, Gibbet Island, inlet of Harrington Sound, Achilles Bay, etc. In this, as in all the Halimedas, the thallus is calcified and jointed. In *H. Tuna*, the segments are discoid, mostly reniform or semi-orbicular. The filaments of the central strand fuse in twos or threes at the nodes but are otherwise commonly free. (Phyc. Bor.-Am. *1918.*)

Halimeda tridens (Ell. & Soland.) Lamour. grows usually on a sandy or muddy bottom and in 1–100 feet of water. It is more shrubby in its habit than *H. Tuna* and the segments are typically flattened and 3-lobed or 3-dentate, though variable as to this character, as also in the shape of the segments, which range from subquadrate-orbicular, with the long axis transverse, to obovate, deltoid-obovate, cuneiform, or occasionally subcylindric. When decalcified the cells of the cortex are found to measure 49–77 μ in average maximum diameter in surface view.

Halimeda Monile (Ell. & Soland.) Lamour. differs from *H. tridens* chiefly in having its segments mostly subcylindric and in having its surface cells only 30–44 μ in average maximum diameter. (Phyc. Bor.-Am. *1915;* also *1917*—as *H. tridens*—in the one copy examined.)

Halimeda simulans M. A. Howe, imitates *H. Tuna* in its discoid usually subentire or crenate segments, but it is really more akin to *H. tridens* and *H. Monile*, as is shown by the fact that the filaments of the central strand, as in these two, form a single coherent inter-communicating mass at each node. The surface cells are small, as in *H. Monile*. *H. simulans* has recently been found near Tucker's Town by Hervey. (Phyc. Bor.-Am. *1916.*)

Halimeda Opuntia (L.) Lamour. This species was reported from Bermuda by Rein, but we have seen no Bermudian specimens. It is, however, very common in the Bahamas, southern Florida, and the West Indies, and its existence in the Bermudas is not improbable. It often occurs in rather deep water (10–100 ft.) and may be brought to light in Bermuda by dredging operations. It differs from the other species in forming large tangled mats or cushions. It is strongly calcified, and the discoid segments are clearly or obscurely nerved. The branches and their segments are very often turned or twisted at various angles, and in its more luxuriant development its branches form long tangled chains. Certain naturalists claim to have experienced a prickling sensation as of a slight electric shock when handling plants of this species, either with bare hands or with metal implements.

The late Sir John Murray in reporting the results of the Challenger Expedition intimates that calcareous seaweeds and their broken down fragments were the dominating elements in three out of four analyzed samples of so-called "coral" sand or mud from Bermuda and Dr. Henry B. Bigelow in a paper on "The Shoal-water Deposits of the Bermuda Banks" has named *Halimeda* as a genus that has contributed an important part to the formation of such sand or mud. If this determination is correct, it might be taken as an indication of the existence of *Halimeda Opuntia* in Bermudian waters, for the other species of the genus, both here and in the West Indies, would hardly seem to occur in sufficient masses to be an important factor in the making of sand and mud.

Codium intertextum Collins & Hervey, forms spongy dark green, closely adherent or repent, irregularly lobed or branched, mats or cushions under shelving rocks or in rock crevices near the low-water mark, as at Gibbet Island and Bailey's Bay. (Phyc. Bor.-Am. *2018.*) Also West Indian.

Codium tomentosum (Huds.) Stackh. is not uncommon on rocks near the low-tide line, forming spongy masses that are mostly from four inches to two feet long. Its branches are cylindric or slightly flattened and repeatedly dichotomous.

Codium isthmocladum Vickers, is much like *C. tomentosum*, but is more flaccid and more nitent when dry and its branches are often constricted at their bases. Under a microscope, the utricles forming the superficial layer are seen to be about twice as broad as those of *C. tomentosum*. (Phyc. Bor.-Am. *1869*, as *Codium tomentosum.*)

Codium decorticatum (Woodw.) M. A. Howe (*C. elongatum* Ag.) is perhaps not always distinct from *C. tomentosum* but is usually recognizable by being more elongate, more sparingly branched, by flattened expansions under the dichotomies, and by the much larger utricles. Some remarkable specimens collected in Tobacco Bay, St. George's, late in June were 2–4 feet long, with flattened expansions ½ to 8 inches broad. (Phyc. Bor.-Am. *2017.*)

Family VAUCHERIÀCEAE.

Dichotomosiphon pusillus Collins, forms a dark green felt of slender intertangled filaments on sand-covered rocks or in rock crevices near low-water mark, as at Shelly Bay (Phyc. Bor.-Am. *2023*) and on roots of mangroves, in company with *Bostrychia Montagnei*. Under a compound microscope its usually dichotomous or trichotomous filaments are seen to be constricted here and there and there is nearly always a strong constriction at the base of each branch. A complete constriction or an imperforate septum is, however, of a very rare occurrence. The mode of reproduction has not been observed and there is accordingly some doubt as to the generic and family affinities of the plant. In its vegetative characters it shows resemblances to the Codiaceae. The type locality is on the island of Jamaica.

Family CHARÀCEAE.

Chara foliolosa Muhl., a common stonewort of the West Indian region, has been reported from the Pembroke Marsh (*Farlow*) by H. & J. Groves (in Urban, Symb. Antill. 7: 43. 1911), under the name *Chara zeylanica* Willd. forma *curassavica* Braun. What is doubtless the same thing, with same locality and collector, is listed by Collins and Hervey as *Chara gymnopus* var. *Berteroi* A. Braun.

Sub-class PHAEOPHŸCEAE.

Family ECTOCARPÀCEAE.

Ectocarpus Mitchellae Harv., a species originally described from Nantucket, but since found to be widely distributed, has been reported from Bermuda (Phyc. Bor.-Am. *1921*), but the specimen distributed does not seem to the writer to belong to this species. The plurilocular sporangia in *E. Mitchellae* are sessile, ellipsoid-oblong, and very obtuse. In the genus *Ectocarpus* the thallus consists of delicate copiously branched filaments made up of a single row of cells.

Ectocarpus siliculosus arctus (Kütz.) Kuck., collected at Harris Bay by Hervey (Phyc. Bor.-Am. *1922*) has more pointed, ovoid, not always sessile, plurilocular sporangia.

Ectocarpus confervoides (Roth) Le Jolis, with spindle-shaped, sessile or short-stalked plurilocular sporangia, has been found in Bermuda by Hervey. Other species of *Ectocarpus* certainly occur in Bermuda, but their determination awaits more critical study.

Ascocyclus orbicularis (J. Ag.) Magnus, has been reported by Collins from Cooper's Island (Phyc. Bor.-Am. *1878*), where it forms minute olive-green spots on the leaves of the Turtle Grass (*Thalassia*).

All of the four Ectocarpaceae mentioned above are species of wide distribution and are best known from more northerly waters.

Family SPHACELARIÀCEAE.

Sphacelaria tribuloides Menegh. forms brownish tufts of fine sparingly branched filaments about ½–1 inch high in tide pools and in rock pockets and crevices between the tide lines, especially on the South Shore. The younger terminal branches consist of a single row of cells, but the older parts of the filaments are made up of bundles of parallel cells. The apical cells in this genus are commonly somewhat enlarged, are especially rich in protoplasm, and, often somewhat blackened, are usually conspicuous under a hand-lens in the preserved specimen. In the present species, the filaments commonly bear small multicellular stalked gemmae which in form suggest the fruits of certain species of *Tribulus* and *Trapa*.

Family ENCOELIÀCEAE.

Colpomenia sinuosa (Roth) Derb. & Sol., a widely distributed plant of warm temperate and tropical waters, forms brownish hollow often irregularly

lobed or wrinkled cushions, sometimes as large as a man's fist, on rocks just below the low-water marks, as on White's Island, in Hamilton Harbor, etc. (Phyc. Bor.-Am. *2024.*)

Hydroclathrus cancellatus Bory, is somewhat similar to the above in color, habit and distribution, but it has a perforate or net-like thallus. Spanish Rock. (Phyc. Bor.-Am. *2078.*)

Scytosiphon Lomentaria (Lyngb.) J. Ag. is one of the few algae of the North Atlantic that occur also in Bermuda. It has a hollow, unbranched, cylindric or slightly flattened, brownish or olive-green thallus, often constricted at intervals, and commonly 2–10 inches long, and $\frac{1}{12}$–$\frac{1}{4}$ inch in diameter. (Shelly Bay, *Hervey*—Phyc. Bor.-Am. *2079.*)

Rosenvingea intricata (J. Ag.) Børg. has a tubular very irregularly branched thallus. Single plants form flattened tangled olive-green mats mostly 1 to 5 inches broad. The main branches attain a diameter of 1 or 2 lines, this diameter being much reduced at the dichotomo-palmate extremities. (Harris Bay, *Hervey*—Phyc. Bor.-Am. *2173.*)

Family MESOGLOIÀCEAE.

Castagnea Zosterae (Mohr?) Thuret (?) is a name that may be applied with considerable doubt to a brownish gelatinous irregularly branched plant that grows attached to leaves of the Turtle Grass (*Thalassia testudinum*) in Castle Harbor and doubtless elsewhere in the Bermudas. It grows to be from four to eight inches long, with its larger branches about $\frac{1}{15}$ in. in diameter and the smaller about $\frac{1}{30}$ in. It is a larger, more copiously branched plant than those from more northern waters to which the above name is currently applied. There is doubt not only as to its specific identity, but even more as to the legality of the nomenclature here provisionally adopted. It is probable that a thorough-going revision of the Mesogloiaceae, accompanied by a critical study of the type specimens on which various genera and species have been based, may show that the legal generic name for this plant is *Aegira*, proposed in 1825 by Elias Fries for the *Linckia Zosterae* of Lyngbye. The various genera proposed later for members of this group seem to be distinguished from each other by characters of uncertain value and constancy and it is probable that one or more of the names *Myriocladia* J. Ag., *Cladosiphon* Kütz., *Castagnea* Derb. & Sol., and *Eudesme* J. Ag. may be found to be generic synonyms of *Aegira*. The Bermuda plant has been distributed in the Phycotheca Boreali-Americana (*1879*) as *Castagnea mediterranea* (Kütz.) Bornet, but it is a more slender, more freely branched, and more gelatinous plant than the original *Cladosiphon mediterraneus* Kütz. and has longer peripheral filaments. Moreover, *C. mediterraneus* is the monotype of *Cladosiphon* and the current rules of nomenclature would forbid its transfer to the later-published *Castagnea*.

Family SPOROCHNÀCEAE.

Sporochnus Bolleanus Mont. is found washed ashore on the South Beach. It is a brownish freely branched plant a foot or more in height. The main

branches and the lateral branchlets each end in a subglobose or pyriform enlargement bearing a dense tuft of delicate filaments. The lateral tuft-bearing enlargements are sessile in the younger parts, but a stalk for each develops and lengthens with age until the plant is terminated and fringed by a great number of small brush-like structures. The enlargements also elongate with age and together with the stalks form club-shaped ramuli ¼ inch or more long in the older parts, finally becoming naked by the disappearance of the crown of filaments. When the living plant is suspended in the water and properly lighted the terminal tufts appear luminous and iridescent, the whole suggesting some sort of miniature candelabrum of small torches. *S. Bolleanus* was originally described from the Canary Islands, but has since been reported from Porto Rico. (Phyc. Bor.-Am. *2174.*)

Family TILOPTERIDÀCEAE.

Heterospora Vidovichii (Menegh.) Kuck. has been reported as occurring on the walls of the inlet near the Hotel Frascati [Phyc. Bor.-Am. *2026*, as *Haplospora Vidovichii* (Menegh.) Bornet]. It forms long tufts of delicate brownish green threads. *Heterospora* resembles *Ectocarpus* in general habit, but differs in mode of reproduction. *H. Vidovichii* was first described from the Adriatic Sea.

Family FUCÀCEAE.

Ascophyllum nodosum (L.) LeJolis, one of the commonest rockweeds of north-temperate coasts, has been found floating in Bermudian waters, by Collins.

Turbinaria tricostata E. S. Barton, which is perhaps not always distinct from *Turbinaria turbinata* (L.) Kuntze (*T. trialata* Kütz.), grows on surge-swept rocks near the low-water mark or in low tide-pools on the South Shore, as at Hungry Bay. Its ultimate branches are peltate or subturbinate, about half an inch long, consisting of a suborbicular dentate-margined terminal expansion supported by a 3-winged or 3-angled stalk. (Phyc. Bor.-Am. *1877.*)

Sargassum natans (L.) Meyen [*S. bacciferum* (Turn.) Ag.], the Gulf Weed, is common, washed ashore, especially on South Beach. The species of *Sargassum* have a thallus that is differentiated into parts resembling the stem and leaves of the higher plants and most of them have a branching basal holdfast suggesting roots, but the present species is known only in a free-floating or pelagic condition and is destitute of a holdfast. It is, however, doubtless derived as a species, if not as individuals, from attached forms that are known under another specific name or possibly under two or more specific names. Its alliances seem to be with attached plants known as *Sargassum Filipendula, S. foliosissimum,* or *S. vulgare.* In the genus *Sargassum* there are, in the mature state, stalked air-vesicles of about the size of a pea or often smaller. The leaf-like parts are more or less distinctly unicostate and in most species show to the naked eye or under a hand lens small dark spots or pits (cryptostomata) from which minute hairs arise. In *S. natans* such spots are wanting or few and obscure. (Phyc. Bor.-Am. *2180.*)

Sargassum fluitans Børg. is also found in a free-floating condition and is another inhabitant of the "Sargasso Sea." It is a coarser plant than *S. natans*, with broader leaves, these with shorter and proportionally broader teeth and often with more obvious cryptostomata; its air-vesicles are shorter-stalked, more numerous, often more nearly spherical, and they lack the apical appendage which is often a conspicuous feature of *S. natans;* its stem is roughened by short spinules or outgrowths, which are commonly lacking in *S. natans*. (Phyc. Bor.-Am. *2177*.)

Sargassum Filipendula Ag. In the ponds of Walsingham and doubtless elsewhere. The leaves show conspicuous cryptostomata and the stems are smooth or nearly so. (Phyc. Bor.-Am. *2176*.)

Sargassum lendigerum (L.) Ag. is a name that has been applied by J. Agardh and others to a Bermuda plant that is not uncommon on rocks a little below low-water line. The lowest or first leaves are often forked and rarely subpinnate, but most of them are simple, oblong or linear-oblong and dentate, the cryptostomata are conspicuous, and the lower parts of the stem are often much roughened by short irregular outgrowths; vesicles are often wanting. The Linnaean type of the species was from Ascension Island, lying in the Atlantic south of the Equator, and the current identification of the Bermuda specimens is open to question. (Phyc. Bor.-Am. *2178*.)

Sargassum linifolium (Turn.) Ag., a name originally given to a Mediterranean and Adriatic plant, has been used for a somewhat similar Bermudian form. It is related to the foregoing species, but apparently differs in the linear commonly subentire leaves, the upper of which as well as the lower are sometimes forked. (Phyc. Bor.-Am. *2179*.)

Family DICTYOTÀCEAE.

Spatoglossum Schroederi (Mert.) Kütz. occurs in the ponds of Walsingham, in Hamilton Harbor, etc. The thallus in well-developed conditions reaches a height or length of 5–8 inches; it is irregularly dichotomous, and its main segments, which show no costa, are ¼–¾ of an inch wide. Its margins are irregularly toothed and often proliferous. The color of the younger parts is an olive-green; of the older, a fuscous or fuliginous brown. Small irregularly scattered dark spots indicate the position of hair-clusters or of reproductive organs. (Phyc. Bor.-Am. *2027*.)

Zonaria zonalis (Lamour.) M. A. Howe. (*Fucus zonalis* Lamour. Diss. 38. *pl. 25. f. 1.* 1805; *Dictyota zonata* Lamour. Nouv. Bull. Sci. Soc. Philom. 1: 331. My 1809; Jour. de Bot. 2: 40. 1809; *Zonaria lobata* Ag. Syst. Alg. 265. 1824; *Stypopodium lobatum* Kütz. Tab. Phyc. 9: 25. *pl. 63. f. 1.* 1859.) This is common on rocks in shallow water in rather exposed places along the South Shore, where it is often found washed up on the beach. It grows in large masses and is more or less bluish-iridescent when living and submerged. The plants attain a height or length of about one foot; the thallus is repeatedly cleft or lobed in a somewhat dichotomo-palmate fashion, the ultimate lobes being cuneate, cuneate-oblong, or cuneate-flabelliform, and ¼–¾ inch in greatest

width; the lobes are marked by conspicuous dark slightly curved transverse lines, these forming the boundaries of zones, which are mostly ½–¼ inch broad; the color of the younger parts is a brownish olive-green, occasionally verging towards red; the older parts are dark brown, becoming nearly black on drying. More ragged and dissected forms also occur, with lobes or laciniae scarcely more than ⅛ inch broad. This typically West Indian species was first described from Santo Domingo, but what seems to be the same thing occurs also in the Canaries. (Phyc. Bor.-Am. *1876*, as *Zonaria lobata.*)

Zonaria variegata (Lamour.) Ag. occurs on rocks, Udoteas, Halimedas, and other objects that may be reached by wading at low tide, as at Gibbet Island, Harrington Sound, Castle Harbor, Hungry Bay, and St. David's Island, and is also found washed ashore from deeper water, as on South Beach. It is a much smaller, less stalked, less lobed, and less distinctly zonate plant than *Z. zonalis.* The thallus is semiorbicular or flabelliform, mostly 1–3 inches broad, nearly entire or showing a few flabelliform segments; the margins are subentire or crenate-lobed; the color is olive, brownish olive, fuscous brown, or now and then reddish. It sometimes suggests a *Padina* but the apical margins are not inrolled as in that genus. This typically West Indian species has been reported also from the Canaries and elsewhere. *Zonaria collaris* Ag. is probably a synonym. (Phyc. Bor.-Am. *2028.*)

Padina is a genus of the Dictyotaceae that is represented in Bermuda by three species growing on rocks near the low-tide mark, or in shallow water. The three species have been more or less confused with each other and all have been identified with the *Padina pavonia* of southern Europe, with which only one of the three, and that the rarest, appears to be identical. The three often resemble each other very much in outward habit. In all, the thallus is distinctly zoned, and, as in nearly all Padinas, the apical margins are narrowly inrolled.

Padina Sanctae-Crucis Børg., which is probably the commonest, has, in Bermuda, a semi-orbicular, fan-shaped, or occasionally reniform thallus, mostly 1½–3 inches broad, subentire or sparingly divided or lobed, and is conspicuously encrusted with lime on the ventral surface; when living, it is commonly concave in such a fashion as to be a little suggestive of the human ear or of certain bivalve shells; sections, examined microscopically, show that the thallus is only two cells thick except at the extreme base, where it is three cells thick. The tetrasporic sori occur just above every second piliferous line and are provided with an evanescent indusium. (Phyc. Bor.-Am. *2082.*)

Padina pavonia (L.) Gaill. has been found on Gibbet Island by Hervey (Phyc. Bor.-Am. *2081*). It resembles the preceding but has a more cuneiform thallus or thallus-lobes, the thallus is mostly 3 cells thick, the tetrasporic sori commonly border each side of every second piliferous line, and the indusium is conspicuous and rather persistent.

A third species [*Padina variegata* Hauck, *Zonaria variegata* Kütz., not *Zonaria variegata* (Lamour.) Ag.], for which Dr. W. D. Hoyt is soon to publish a valid name, has ultimately a larger thallus than the two preceding,

reaching a height of five or six inches, is rather more lobed, the fan-shaped lobes mostly 1½–3 inches broad, and is less whitened by lime on its ventral surface. Sections show that the thallus is 3–6 cells thick except for a narrow zone at the apical margin, where it is but 2 cells thick. The tetrasporic sori are mostly in the form of compact dot-like clusters scattered irregularly in each interpilar zone or forming a narrow irregular line a little above the middle of the zone; indusium subpersistent. (Phyc. Bor.-Am. *2083*, as *Padina variegata*.)

Neurocarpus delicatulus (Lamour.) Kuntze [*Dictyopteris delicatula* Lamour.; *Haliseris delicatula* (Lamour.) Ag.] occurs on rocks in shallow water in well-shaded and sheltered places, as at Red Bay, St. David's Island. The species of this genus are distinguished from other members of the family by possessing a thallus with a distinct midrib. In the present species the thallus is of thin delicate texture and is several times regularly and somewhat divaricately forked. It reaches a length of 2 or 3 inches and the thallus segments are ½ to 2 lines broad. Dried specimens are a brownish or yellowish olive-green, but when living and immersed it often shows brilliant iridescent blue-green hues. The species was first described from Santo Domingo and is typically West Indian in its distribution. (Phyc. Bor.-Am. *1924*, as *Dictyopteris delicatula*.)

Neurocarpus Justii (Lamour.) Kuntze [*Dictyopteris Justii* Lamour.; *Haliseris Justii* (Lamour.) Ag.] is a much larger plant that grows on rocks in more exposed places, mostly in 1–20 feet of water. The thallus is costate and several times dichotomous, as in the last, but it reaches a length of 8–12 inches and its segments are ½–1½ inches broad. Its color is a dark olive or a fuscous brown. It is often found washed up on the South Shore. Like the last, it was first made known from Santo Domingo and is a typically West Indian species. (Phyc. Bor.-Am. *1925*, as *Dictyopteris Justii*.)

Dictyota Bartayresii Lamour. (*Dictyota crispata* Lamour.; *Dictyota pardalis* Kütz.) occurs in shallow water, as at Spanish Point, in the ponds of Walsingham, and at St. David's Island. It forms loosely intertangled mats 3–6 inches high. The thallus is repeatedly dichotomous and its segments are mostly 1–3 lines broad, with margins entire or irregularly proliferous. The species of *Dictyota* are difficult to define. The form of the thallus, width of the segments, etc. evidently vary greatly according to conditions of growth, and it is probable that more species are currently recognized than may be reasonably assumed to exist in nature. (Phyc. Bor.-Am. *1874*.)

Dictyota dichotoma (Huds.) Lamour. is less common in Bermuda than the preceding species. It is more regularly and less divaricately dichotomous and has a broader thallus, with segments mostly 2–4 lines wide. (Phyc. Bor.-Am. *2175*.)

Dictyota ciliolata Kütz. (*Dictyota ciliata* J. Ag.—not *D. ciliata* Lamour.; *Dictyota crenulata* Collins in Phyc. Bor.-Am. *1875*—not *D. crenulata* J. Ag.) occurs in Harrington Sound, in pools on the South Shore, etc. The thallus has few or many small simple teeth or short cilia on its margins; its segments

are mostly 1–2 lines wide; and its texture is rather more rigid than in *D. Bartayresii.*

Dictyota linearis (Ag.) Grev. is a name that seems applicable to a very narrow repeatedly dichotomous plant with segments only about one quarter of a line wide that occurs attached to stones, Halimedas, etc. in shallow water, as at Spanish Point.

Dictyota dentata Lamour. [*Dictyota Brongniartii* J. Ag.; *D. Mertensii* (Mart.) Kütz.; *D. subdentata* Kütz.] is, like *D. Bartayresii*, typically a species of the West Indies and northeastern South America. It has been found by Mr. Collins floating in Hungry Bay (Phyc. Bor.-Am. *1926*). In this species, the thallus is less dichotomous and more pinnatifid than in the other Bermudian species of the genus. The apices of the lobes vary from sharply acuminate to obtuse.

Dilophus guineensis (Kütz.) J. Ag. grows near low-water mark on rocks that are well exposed to surf action, as at Hungry Bay. The thallus is rather regularly dichotomous and is commonly 1½–3 inches high with segments ½ to 1 line broad. In a cross section, examined microscopically, the medulla is seen to consist of two layers of cells (or more in the basal parts), while in the genus *Dictyota* the medulla, normally at least, consists of a single layer of large cells. (Phyc. Bor.-Am. *2080.*)

Sub-class **RHODOPHYCEAE.**

Family **BANGIACEAE.**

Bangia fuscopurpurea (Dillw.) Lyngb., which forms a soft fleece of fine dark purple unbranched filaments ¼–1 inch long on rocks and wharves between the tide-lines, has been found in Harrington Sound by Dr. Hervey.

Bangia compacta Zanard., which also occurs on rocks in Harrington Sound (*Howe 129*), appears to differ from the foregoing in having filaments that are only ½–1 line long and in its cells in the uniseriate vegetative parts (except base) being discoid, mostly 2–4 times as broad as long, closely compacted and *Lyngbya*-like, instead of being mostly as long as broad, as is the case in the Bermuda specimens referred to *B. fuscopurpurea.* In spite of their small size the filaments are often fertile and evidently mature.

Porphyra atropurpurea (Olivi) De-Toni (*Porphyra leucosticta* Thuret) has been reported by Collins as growing on mangroves (presumably close to the low-water mark) near the Flatts Bridge and Ely's Harbor (Phyc. Bor.-Am. *1927* and *2085*). It forms a thin oblong membranous pink thallus only one cell in thickness. The species is monoecious; the antheridia form decolorate patches among the darker sporocarps, both appearing first near the margins of the thallus.

Erythrotrichia carnea (Dillw.) J. Ag. forms a commonly sparse and inconspicuous fringe of exceedingly delicate rose-colored or reddish filaments on other marine algae (*Polysiphonia, Hypnea,* etc.) and on marine spermatophytes.

The filaments are usually only a line long or less. Under a compound microscope they are seen to be unbranched and to consist commonly of a single row of cells, which are mostly about as broad as long. In older conditions the filaments may become more than one cell broad.

Family NEMALIONÀCEAE.

Acrochaetium crassipes Børg. This species was originally described from the Danish West Indies. It is a very minute plant, only a few cells high, with a few branches 1–6 cells long. It occurs as a microscopic epiphyte on *Centroceras clavulatum* at St. David's Island. (Phyc. Bor.-Am. *2033*.)

Acrochaetium infestans Howe & Hoyt, is a microscopic filamentous plant, of which the vegetative parts are chiefly endozoic, creeping in the gelatinous or chitinous stalks and stolons of hydroids and of filamentous bryozoa. The interior filaments are freely and irregularly branched, usually in a loose rambling intricate fashion, but occasionally forming a sort of pseudoparenchyma with shorter, more compacted cells. The monosporangia are borne on external filaments, which are commonly very short and few-celled, simple or with a few short branches, or occasionally reduced to a single exserted monosporangium. [Phyc. Bor.-Am. *2194*, as *Rhodochorton membranaceum*.]

Acrochaetium (*Chantransia*) is a genus of small, filamentous, chiefly epiphytic, endophytic, epizoic, or endozoic red algae. It is doubtless represented in Bermuda by several other species, the determination of which awaits critical study. One of these, in and on *Dudresnaya crassa*, has been distributed by Collins as **Chantransia corymbifera** Thuret* (Phyc. Bor.-Am. *1880*.)

Trichogloea Herveyi Setchell (Phyc. Bor.-Am. *2034*) is a more or less calcified, very lubricous, irregularly branched plant, reaching a length of four or five inches. No diagnosis of the species has been published up to the date of writing. It occurs at or below low-water mark, as at Cooper's Island. Endemic.

Helminthocladia Calvadosii (Lamour.) Setchell, more commonly known as *Helminthocladia purpurea* (Harv.) J. Ag., appears to occur in the spring months at Long Bird Island (*Collins*, Phyc. Bor.-Am. *2035*) and at Bailey's Bay (*Wadsworth*). Though not calcified, it is rather firmer in texture and a little less lubricous than the *Trichogloea Herveyi* and is more brownish red or greenish red (less pink) in color. The Bermuda plant differs somewhat in habit from the European, but in other respects seems to offer little or nothing to distinguish it.

Liagora valida Harv. grows on surf-swept rocks between the tide lines, as at Hungry Bay, Cox's Bay, Achilles Bay, and St. David's Island. In this

* To a French plant, hemi-endophytic in *Helminthocladia Calvadosii* and described and figured by Bornet and Thuret under the name *Chantransia corymbifera* Thuret, the Bermudian plant in *Dudresnaya* bears considerable resemblance. However, the original description of *C. corymbifera* apparently confused two species, though only one of them, an epiphyte on *Ceramium rubrum*, was actually cited. This epiphyte on *Ceramium*, which has been renamed [*Chantransia Thuretii* (Bornet) Kylin], should manifestly be considered the type of *Chantransia corymbifera* Thuret.

genus the thallus is usually terete, repeatedly forked, or sometimes subpinnate or laterally proliferous, more or less calcified, and is usually lubricous when living, at least in the younger parts. Some of the species of *Liagora* bear a superficial resemblance to certain Corallinaceae, but the Liagoras are more lubricous and when examined under a microscope after decalcification with an acid the thallus is seen to be more distinctly and loosely filamentous in structure, with a more sharply defined central strand of filaments. *L. valida* forms dense tufts or clusters, mostly 2–5 inches high or long; the thallus is many times forked, the numerous branches being about half a line in diameter; the older parts are solidly encrusted with lime, are white, and become transversely cracked or irregularly jointed; the color of the younger parts varies from pink to brownish red. Small superficial spots, less calcified, usually concave and waxy in the dried condition, and easily visible under a hand-lens, mark the position of the immersed cystocarps. (Phyc. Bor.-Am. *1929.*)

Liagora ceranoides Lamour. is more slender, more lubricous, and more divaricately dichotomous than the preceding. The calcification appears under the hand-lens to take the form of scaly or mealy flakes instead of a more or less continuous crust. The plant occurs on rocks near the low-water line in Castle Harbor, etc. The type of the species was from the island of St. Thomas in the Danish West Indies. The later-described *Liagora pulverulenta* Ag. as currently (and, with little doubt correctly) interpreted is apparently the same species. (Phyc. Bor.-Am. *1928*, as *Liagora pulverulenta.*)

Species of *Liagora* other than the two mentioned certainly occur in Bermuda, but their determination awaits critical study. A not uncommon species has been referred sometimes to *Liagora elongata* Zan., originally described from the Red Sea, and sometimes to *L. Cheyneana* Harv., originally described from western Australia. Possibly *L. farinosa*, a name applied by Lamouroux in 1816 to a plant from the Red Sea, will be found to be available for it. This plant is less regularly dichotomous than either *L. valida* or *L. ceranoides* and commonly shows numerous lateral proliferations. The peripheral filaments project more or less beyond the zone of calcification and form a reddish nap on the surface. The plant is coarser than *L. ceranoides* and much less calcified and less rigid than *L. valida.* Under the microscope it differs from both in the broader cells of the less moniliform peripheral filaments, in the dense globose tufts of antheridia, etc.

Family **CHAETANGIÀCEAE.**

Galaxaura is a genus of more or less calcified algae, the plants, however, being less thoroughly calcified and more flexible, at least when fresh, than plants of the family Corallinaceae. They are, for the most part, coarser plants than the Liagoras and usually have a firmer more obvious cortex.

Galaxaura subverticillata Kjellm. is a shaggy, reddish brown or sordid green plant with its longer assimilatory filaments in more or less distinct whorls, especially toward the apices. It apparently represents the tetrasporic phase of *G. rugosa* (Ell. & Soland.) Lamour., not yet reported from Bermuda. It has been found on rocks in shallow water at Red Bay, St. David's Island.

Galaxaura flagelliformis Kjellm. is similar to the foregoing, but has more elongate branches and the longer assimilatory filaments are tufted, crowded, or irregularly disposed without any obvious tendency to a whorled arrangement. It probably represents the tetrasporic phase of *G. squalida* Kjellm., with which it occurs at Bethel's Island (*Collins 8186*). In the West Indies, *G. subverticillata* and *G. flagelliformis* seem sometimes to intergrade, as do also their probable sexual phases, *G. rugosa* and *G. squalida.*

Galaxaura squalida Kjellm. has usually a smooth firm cortex, though parts of the surface often bear few or numerous free assimilatory filaments. It occurs on rocks and washed ashore at Hungry Bay, Gravelly Bay, Bethel's Island, etc., forming greenish, reddish green, or finally whitening tufts or clusters mostly 2–4 inches high. It has terete, regularly dichotomous branches, about $\frac{1}{16}$ in. wide or a little more, commonly collapsing or flattened towards the apices on drying. (Phyc. Bor.-Am. *1882.*)

Galaxaura marginata (Ell. & Soland.) Lamour. has a dark red, grayish red, or greenish red thallus that is for the most part strongly flattened even when living. Its sexual phase (*G. occidentalis* Børg.) has a firmer cortex and often a more shiny surface than the tetrasporic plant, and from certain parts of its epidermis, especially at or near the margins, there grow out few or numerous papilla-like cells, making darker roughened areas, barely visible under a hand-lens. (Phyc. Bor.-Am. *1930*, as *Brachycladia marginata.*)

Galaxaura obtusata (Ell. & Soland.) Lamour. has a coarse, terete, smooth dichotomous thallus 2–5 inches long, its segments $\frac{1}{16}$–$\frac{3}{16}$ inches in diameter, usually constricted and jointed at either end, and often tapering towards either end. It is more rigid and fastigiate than *G. squalida*, and its forkings are wider-angled. It occurs unattached in fish-ponds, etc. near Tucker's Town, where it is often less calcified than when growing under normal conditions in deeper water, as met with in the West Indies. (Phyc. Bor.-Am. *1881.*)

Family GELIDIÀCEAE.

Wrangelia penicillata (Ag.) Ag. is one of the delicate feathery or "mossy" red seaweeds. Its tufts reach a height or length of 2 to 6 inches. Its usual color is a dull red or brownish red, becoming blackish with age or partial decay. The thread-like, almost microscopic, branchlets are in regular whorls, as may be determined with a hand-lens, and towards the sometimes subcircinate apices of the main branches they are often tufted or subsecund. The species occurs in warm shallow bays, as at Spanish Point, Ely's Harbor, Achilles Bay, and Harrington Sound. (Phyc. Bor.-Am. *1883.*)

Naccaria corymbosa J. Ag. bears some resemblance to the above in general habit, but is a rather smaller plant, mostly 1 to 2 inches high, is less likely to darken on drying, and the branch system is alternate throughout. The ultimate branchlets are so short, minute, and crowded as to be demonstrable only with a compound microscope. The larger branchlets that are visible with a hand-lens are slender and taper-pointed, and do not have the tufted-plumose appearance of the corresponding branchlets of *Wrangelia*

penicillata. *N. corymbosa* was originally described from Key West, but it has recently been found in Bermuda by Hervey (Buildings Bay, Phyc. Bor.-Am. *2036*) and by Collins (St. George's).

Gelidium crinale (Turn.) J. Ag., like other species of *Gelidium*, has none of the exceedingly delicate, almost microscopic filaments that characterize the two preceding genera. It forms dark red or blackish mats 1 to 3 inches high, the lower parts terete or slightly flattened, scarcely coarser than a bristle, the numerous mostly flattened branches and branchlets irregularly two-ranked, the ultimate often spatulate, becoming ¼–½ of a line broad. It occurs on stones and rocks near low-water mark, as at Walsingham and at Dingle Bay. (Phyc. Bor.-Am. *2089*.)

Gelidium caerulescens Kütz. (?). The type of this species came from New Caledonia in the South Pacific, but a more or less similar plant occurs in Bermuda and the West Indies. Its branches are broader (¼–½ line) than those of the preceding and are rather more regularly disposed, and the color of the plant is more red-purple and often iridescent.

Gelidium pusillum conchicola Piccone, creeps on shells of mussels, etc., its linear or spatulate ascending branches being usually only ⅛ of an inch high or less, and ¼–½ of a line broad. (Phyc. Bor.-Am. *2183*.)

Gelidium rigidum (Vahl) Grev. [*Gelidiopsis rigida* (Vahl) Web.-v. Bosse] is a rather coarse rigid cartilaginous plant with a repent base and regularly or often very irregularly pinnate or bipinnate erect branches 1–3 inches high. It has been placed by most recent writers in the genus *Gelidiopsis* of the family Sphaerococcaceae, though in absence of known cystocarps its generic position is not wholly clear. In the character of its apical cell and of its usually indistinct central axis it does not seem very different from *Gelidium cartilagineum*, which is allowed to remain in this genus, but it diverges from typical species of *Gelidium* in having a thallus that is essentially terete throughout and in the often irregularly disposed, not always two-ranked branches. The tetrasporangia occur on somewhat enlarged conic or conic-terete apices of some of the ultimate branchlets, easily recognizable under a hand-lens. It has been found in tide-pools and on stones in shallow water, as at Harris Bay, in the Walsingham region, etc. (Alg. Exs. Am. Bor. *142*, and Phyc. Bor.-Am. *2090*.)

Family GIGARTINÀCEAE.

Gigartina acicularis (Wulf.) Lamour. forms tangled tufts 1½–3 inches high. It has a dark red, subterete or slightly flattened, freely and irregularly branched thallus, mostly ¼–½ line broad, with awl-shaped or taper-pointed, often recurved, ultimate branchlets. This widely distributed species has been found by Collins on flat rocks overhung by a cliff at Tucker's Town. (Phyc. Bor.-Am. *1884*.)

Family RHODOPHYLLIDÀCEAE.

Catenella Opuntia pinnata Harv. is a small red-purple plant, mostly ½–1 inch long, dichotomous, trichotomous, or subpinnate, more or less narrowed or

constricted at the nodes, subterete in lower parts and strongly flattened above, the ultimate segments mostly ⅛–¼ of a line wide, lanceolate, oblong, spatulate, obovate, or linear. It is commonly found creeping on the roots of mangroves near the high-water mark, making solid mats or more often intertangled with *Caloglossa, Bostrychia* and other algae, as at Walsingham and Hungry Bay. (Phyc. Bor.-Am. *1885.*)

Eucheuma isiforme (Ag.) J. Ag. is a coarse, spiny, much-branched, coralline-red seaweed, forming shrubby tufts from six inches to a foot or more in diameter, with the main axes ½–¼ inch in diameter when fresh. Its more or less whorled ultimate ramuli may be elongate and awl-shaped or short, thick, and merely acute or sometimes blunt. In weathering and fading its color may become scarlet, or yellowish before it reaches its final whitish or translucent condition. The plant has a firm horn-like consistency on drying. It is frequently found growing on rocks or washed ashore in shallow bays, as at Hungry Bay, Bailey's Bay, Tobacco Bay, Tucker's Town, etc. (Phyc. Bor.-Am. *1886.*)

Eucheuma Gelidium (J. Ag.) J. Ag. is somewhat similar to the foregoing in size, color, cartilaginous consistency, and spiny habit, but the main axes are decidedly flattened and the branches are pronouncedly two-ranked. It has been found at Harris Bay and on St. David's Island by Hervey. (Phyc. Bor.-Am. *2184.*)

Wurdemannia setacea Harv. forms densely intertangled dark red mats on rocks, on the stalks of Gorgonians, and among the larger algae. The thallus has about the diameter of a horse-hair, is very irregularly branched, and the branches usually cohere and anastomose freely, so that the filaments are not readily separated. Under a hand-lens the rather short ultimate branchlets are mostly acute. On drying, the plant is rather rigid and it does not adhere very well to paper when dried under pressure. It has been found in Hamilton Harbor, at Walsingham, and in Harrington Sound. (Phyc. Bor. Am. *1887a.*)

Family SPHAEROCOCCÀCEAE.

Gracilaria ferox J. Ag. has a copiously branched thallus, with main axes mostly ½–½ a line broad. These axes are usually distinctly flattened and the branching manifestly disticho-dichotomous, but conditions occur in which the axes are very slightly if at all flattened and in which the branches emerge in nearly all directions. In the latter case the plants bear some resemblance to *Hypnea musciformis,* but may be distinguished microscopically by the scattered instead of localized tetrasporangia. The ultimate branchlets are acute or taper-pointed. The species is rather common in shallow bays. (Phyc. Bor.-Am. *1932.*)

Gracilaria mammillaris (Mont.) M. A. Howe (*Rhodymenia mammillaris* Mont. Ann. Sci. Nat. II. 18: 252. 1842) has a flat deep red flabellately subdichotomous thallus with segments mostly 1–4 lines broad and the ultimate lobes usually rounded-obtuse. It is of occasional occurrence on rocks in

shallow water on St. David's Island, in the bays of St. George's, and on the South Shore. (Phyc. Bor.-Am. *1931*—as *Gracilaria dichotomo-flabellata* Crouan.)

Gracilaria horizontalis Collins & Hervey, is a thick, tough, fleshy, cartilaginous plant, expanding horizontally from a central irregular disc, with short thick crowded scarcely attenuate branches, and closely adherent to the substratum or its overgrown parts by coarse haptera. The plant seems, from the authors' description, to be closely related to *Gracilaria crassissima* Crouan (J. Ag. Sp. Alg. 3[1]: 78. 1901—type from Guadeloupe), if not identical with it.

Hypnea musciformis (Wulf.) Lamour. is a copiously and somewhat virgately branched dusky red plant with terete main axes about ½ of a line in diameter. Its longer filiform branches are often hooked or incurved at the apex and act somewhat like tendrils in grasping other algae or other branches of its own kind. Its shorter branchlets are taper-pointed and sometimes a little spine-like. It occasionally resembles the narrower more terete conditions of *Gracilaria ferox*, but the tetrasporangia, as in other species of *Hypnea*, are confined to somewhat swollen spear-like branchlets instead of being scattered through the cortex in general, and under a compound microscope the tetraspores are seen to be arranged in rows of four (zonate) instead of in collateral pairs (cruciate). (Phyc. Bor.-Am. *2185*.)

Hypnea spinella (Ag.) Kütz. forms low densely intertangled dark red or scarlet mats or cushions on rocks in shallow water in Hamilton Harbor. Its main axes are terete, angular, or slightly flattened, about ½ of a line in diameter, and it has numerous short sharp-pointed branches that become rigid and spiny on drying, giving the plant somewhat of the aspect of a miniature *Eucheuma*. The tetrasporangia are borne on spool-shaped or conic, usually rostrate, enlargements of short branchlets.

Family RHODYMENIACEAE.

Cordylecladia irregularis Harv. is a rather rigid irregularly branched thread-like plant (about ¼–⅓ of a line in diameter) that forms dense mats or creeps among other algae near the low-water mark. When living its color is a greenish or brownish red with touches of a steel-blue iridescence. Its branching is usually very irregular but often shows a tendency to a secund arrangement; occasionally opposite branches are found. The tetrasporangia occur on pod-like enlargements of the ends of certain branchlets. The species sometimes bears a slight resemblance to *Wurdemannia setacea*, but it is coarser, the branches are less acute and apparently do not anastomose; and the filaments are hollow, as may be determined by examination of cross-sections with a hand-lens. It scarcely adheres to paper on drying. [Phyc. Bor.-Am. *2186*, as *C. rigens* (Ag.) Collins & Hervey.*]

Chrysymenia uvaria (L.) J. Ag. may be recognized by its suggestiveness of elongate, branched, usually lax clusters of red or brownish-red grapes. In

* The type of *Sphaerococcus rigens* Ag. is a Japanese plant different in structure from the Bermudian and West Indian.

form it is slightly suggestive of conditions of *Caulerpa racemosa* (both occur under one name in the Linnaean herbarium), but the *Chrysymenia* is red, unless decolorate, while the *Caulerpa* is green. The plant is commonly 3 to 8 inches tall and the subglobose, obovoid, or occasionally subpyriform hollow vesicles that form the ultimate branchlets are mostly 1½–3 lines long. The American plants appear to be larger in all respects than those of the Adriatic and Mediterranean seas. This species occurs in Harrington Sound and in Castle Harbor. (Alg. Exs. Am. Bor. *150;* Phyc. Bor.-Am. *1933.*) It usually inhabits rather deep water.

Chrysymenia pyriformis Børg. resembles the foregoing, but is a smaller plant (1–2 inches high) with vesicles that are larger (½–¾ inch long) and more uniformly pyriform. It has been found at Tucker's Town by Collins.

Lomentaria uncinata Menegh. [*Hooperia Baileyana* (Harv.) J. Ag.] is a hollow, thread-like, irregularly branched plant, sometimes slightly resembling *Cordylecladia irregularis,* but is deeper red and always softer, more gelatinous, and adheres firmly to paper on drying. It is also usually more slender and delicate, its branches being mostly ⅛ to ¼ of a line in diameter. Its longer branches or axes are often arched or recurved, with the branchlets in a more or less secund series on the convex side. Both the generic position of the American plant and its identity with the little-known Adriatic and Mediterranean species with which it is currently associated have been called in question and both points deserve further study. The plant has been found at Hungry Bay by Collins and in the Walsingham region by Hervey.

Champia parvula (Ag.) Harv. forms subglobose tufts 1–4 inches in diameter on *Thalassia, Zostera,* the larger algae, and on rocks. Its main axes are mostly ¼–½ a line in diameter and its branches are irregularly and variously disposed, being alternate, opposite, or sometimes whorled. The plant is obviously jointed-nodose throughout, the barrel-shaped internodes in the older parts being mostly 1½ times as long as broad; microscopic examination shows that the internodes are hollow, with a septum or diaphragm at each node. The plants are somewhat gelatinous and adhere firmly to paper on drying, yet they do not collapse when taken from the water. The species has been found in Harrington Sound. (Phyc. Bor.-Am. *1934.*)

Coelarthrum Albertisii (Picc.) Børg. has a jointed, hollow, septate thallus, somewhat like that of *Champia,* but the branching is dichotomous, the constrictions are deeper, the internodes or segments are more ellipsoid or obovoid, and the consistency is more gelatinous. It is also, so far as known, a smaller plant, attaining a height of scarcely more than one inch, with broader segments, these mostly 1–3 lines broad. The type of the species was from the Canary Islands. It seems that the species was first found in Bermuda by Farlow who got it in 1881 at Ducking Stool near Hamilton and at Cooper's Island. Hervey has since found it at Buildings Bay (Phyc. Bor.-Am. *2091*) and at Bailey's Bay.

Family **DELESSERIÀCEAE.**

Nitophyllum Wilkinsoniae Collins & Hervey (Phyc. Bor.-Am. *2037*) is a recently published species apparently related to *N. ocellatum* (Lamour.) Grev. It was found growing on rocks below low-water mark at Dingle Bay. Endemic.

Caloglossa Leprieurii (Mont.) J. Ag. creeps on rocks, wooden piles, mangrove roots, and other solid objects between the tide-lines, mostly near the high-water mark (Phyc. Bor.-Am. *2038*). It has a thin, purple, membranous, costate, dichotomous, rather regularly constricted thallus that commonly reaches a length of 1 or 2 inches, with segments mostly ½–1 line in maximum width. The segments of the terminal forkings, which are commonly unequal at first, are lanceolate or elliptic and are acuminate. The segments in general are constricted at the base, either gradually or abruptly. A tuft of root-hairs is usually to be found on the ventral surface at each forking of the costa. Although typically an inhabitant of salt or brackish water, this species is found also in mountain streams in Porto Rico at an elevation of 1200 or 1500 feet.

Taenioma perpusillum (J. Ag.) J. Ag. has been reported from Bermuda (Phyc. Bor.-Am. *1935*), but the writer has seen no Bermuda specimen. The one copy of Phyc. Bor.-Am. *1935* that has been examined shows a small Rhodomelaceous plant bearing some slight resemblance to the *Taenioma*.

Family **RHODOMELÀCEAE.**

Laurencia obtusa (Huds.) Lamour. The species of *Laurencia* as currently recognized appear to intergrade. Although many of the alleged species are different enough in their typical conditions, individual specimens are often difficult to place. Of the six Bermudian species or forms, *L. obtusa* is perhaps the commonest, growing in tide-pools or in shallow water on rocks and reefs. It forms conic, subpyramidal, or subglobose tufts, mostly 2–7 inches high, and when living is often greenish with pink tips. Pressed specimens sometimes have the appearance of being 3–6 times irregularly pinnate, but the branches and branchlets are in various planes and for the most part alternate, though at times apparently opposite or verticillate. The plants have well-developed main axes that are mostly ¼–½ a line in diameter. (Phyc. Bor.-Am. *2092*.)

Laurencia intricata Lamour. (*L. implicata* J. Ag.) is perhaps a variety of the foregoing, differing chiefly in the lax, weak intertangled habit of growth and the lack of clearly defined leading axes. It occurs unattached or loosely attached to other algae or to rocks, as at Gibbet Island and Tobacco Bay.

Laurencia microcladia Kütz. (*L. glomerata* Suhr, not *L. glomerata* Kütz.) also is possibly a variety of *L. obtusa* but the two occur near each other in Bermuda and maintain a considerable degree of distinctness. *L. microcladia* is distinguished by the narrowly virgate habit of the plant as a whole or of its principal branches and by its minute, numerous, often clustered clavate or clavate-turbinate ultimate ramuli. It occurs on rocks between the tide-lines at Achilles Bay, at Spanish Rock, and at Hungry Bay and other points along the South Shore (Phyc. Bor.-Am. *1888*, as *L. obtusa*, var. *gelatinosa*). It is a small plant, 1–3 inches high.

Laurencia Poitei (Lamour.) M. A. Howe (*Fucus Poitei* Lamour. Diss. 63. *pl. 31. f. 2, 3.* 1805; *Laurencia Chauvini* Bory, Dict. Class. Hist. Nat. 9: 239.

1826; *L. tuberculosa* J. Ag. 1852; *L. gemmifera* Harv. 1853; *L. mexicana* Kütz. 1865.) This much-named species is usually easily recognizable, though its slenderer more freely branched conditions sometimes approach forms of *L. obtusa*, while its simpler conditions may sometimes bear a superficial resemblance to *L. papillosa*. It is coarser than *L. obtusa* and its branches are more inclined to be distichous. Its numerous short tubercle-like branchlets, which are less crowded than in the following species, are one of its characters. The Bermuda specimens seen are not wholly typical. Specimens that seem to belong here have been collected at Red Bay, St. David's Island, and at Tobacco Bay, St. George's.

Laurencia papillosa (Forsk.) Grev. is a widely distributed species that is common on rocks near the low-water mark in Bermuda and the West Indies. It ordinarily grows 1–5 inches high, is sparingly and irregularly branched or once or twice subpinnate, the main branches bearing usually crowded wart-like, button-like, subglobose, or short-truncate-clavate ramuli, which are irregularly disposed on all sides or somewhat 4-ranked and are simple or bear still smaller similar branchlets. Not only do the plants as a whole seem to the naked eye to be papillate or adorned with numerous pegs, but in certain individuals, especially in those growing in exposed positions between the tide-lines, the younger superficial cells, under a compound microscope, are seen to be strongly aculeate-papillate.

Laurencia Corallopsis (Mont.) M. A. Howe (*Sphaerococcus corallopsis* Mont. in Sagra, Hist. Cuba. Bot. Pl. Cell. 49. 1842 (French ed.); in Sagra, Ic. Pl. Fl. Cuba, *pl. 3. f. 1.* 1863; *Laurencia cervicornis* Harv. Ner. Bor.-Am. 2: 73. pl. 18. *f. C.* 1853). This species appears to be the most distinct of any of the West Indian forms of *Laurencia*, differing from the others in its dichotomo-cormybose or cervicorn habit of branching, with few or numerous lateral proliferations. It grows 2–6 inches tall and its main axes are mostly ½–1 line in diameter. It occurs on rocks in shallow water at Buildings Bay, Red Bay, Tobacco Bay, etc. (Phyc. Bor.-Am. *2187*, as *L. cervicornis* Harv.)

Laurencia perforata Mont., a species originally described from the Canary Islands, has been recently reported from the Bermudas (Phyc. Bor.-Am. *1889*), but the specimen distributed under that name in the one set of the Phycotheca examined has not the apical vegetative structure of a *Laurencia* or of any other member of the Rhodomelaceae.

Chondria curvilineata Collins & Hervey, is a straggling, rather inconspicuous, irregularly branched plant, scarcely more than an inch long, that forms tangled mats in shallow water, as at The Flatts, Heron Bay (Phyc. Bor.-Am. *2039*), and in a mangrove swamp near Hamilton. Its ultimate ramuli are long-clavate and obtuse. The most remarkable character of the species, determinable with the aid of a compound microscope, is found in the thickened crescentic transverse septa separating the members of the polysiphonous axis, these crescents, with their convexities towards the plant-apex, being easily visible through the overlying cortex. The species of *Chondria* may usually be distinguished from those of *Laurencia* under a hand-lens by the much narrowed often decolorate necks of the commonly more slender ultimate ramuli, and in Bermuda the species of *Chondria* are more slender, less

succulent, more irregularly branched, and more intricately intertangled than are those of the genus *Laurencia*. Apparently endemic.

Chondria polyrhiza Collins & Hervey, is somewhat like the foregoing in general habit, but is rather larger, more dusky red, even more irregular in its branching, more intertangled in habit of growth, and its ultimate ramuli are taper-pointed. It lacks the conspicuous thickened crescentic transverse internal septa of *C. curvilineata*, though it often shows somewhat similar longitudinal or irregularly disposed thickenings, and it develops frequently ventral or latero-ventral multicellular haptera, indicating a creeping habit. (Phyc. Bor.-Am. *2040*.) Apparently endemic.

Acanthophora spicifera (Vahl) Børg. is common in shallow bays, tidal streams, and tide-pools (Phyc. Bor.-Am. *1938*). It grows usually 3 to 8 inches tall, is a dusky red or purple when living, often blackens on drying, is irregular and often sparing in its main ramification, and the wand-like main branches are clothed with more or less 4-ranked subulate ramuli, mostly ½–2 lines long, which are beset with minute, single or clustered, patent or reflexed spines.

Digenea simplex (Wulf.) Ag. is a shaggy, rigid, tawny- or dingy-red, rather unattractive, irregularly dichotomous plant that commonly grows 1–4 inches high, being found especially in tide-pools and on sand-covered rocks near the low-water line, as along the South Shore (Phyc. Bor.-Am. *1939*). The branches, particularly in their upper parts, are more or less densely clothed with mostly simple rigid filaments that are usually 1–4 lines long and that appear transversely segmented under a hand-lens. The main branches, thus clothed, are sometimes suggestive of fox-tails or of *Lycopodium Selago*.

Polysiphonia ferulacea Suhr, is probably the most common of the several Bermudian Polysiphonias that have four pericentral siphons. Its filaments are more or less rectangular-prismatic and its segments are often shorter than broad. The plant is commonly 1–4 inches high, tufted in habit, rather sparingly branched, subpellucid when living, and brownish red or fuscescent on drying. It grows in tide-pools and on rocks and stones just below the low-water line. It prefers somewhat agitated water, as on the rocks at Hungry Bay. (Phyc. Bor.-Am. *1940*.)

Polysiphonia havanensis Mont. is also a 4-siphoned species. It is more slender, softer, and more gelatinous than the preceding, and its segments are more terete and are relatively longer, the median and lower being often 2–3 times as long as broad. It is usually found in association with mangroves, near the low-water mark. (Phyc. Bor.-Am. *1941*.)

Polysiphonia macrocarpa Harv. is a name that has been adopted in the Phycotheca (Phyc. Bor.-Am. *2093*) for an extremely slender and delicate 4-siphoned species found coating the roots of mangroves between the tide-lines at Hungry Bay. It differs specifically, however, from the Irish plant to which Harvey gave this name in its more slender, more sparingly and more dichotomously branched filaments, its shorter segments, its violet-red color, etc. The only specimen examined was apparently sterile.

Polysiphonia foetidissima Cocks, has 7–9 pericentral siphons and segments mostly 1–2 times as long as broad. It is commonly 2–5 inches high and

of a brownish- or violet-red color. It has been found in Hamilton Harbor and near Hotel Frascati. (Phyc. Bor.-Am. *1890.*)

Polysiphonia opaca (Ag.) Zan. has 14–20 pericentral siphons and the median segments mostly 1–1½ times as long as broad. It is commonly 2–5 inches high and is of a brownish color, darkening with age. It grows in tide-pools on the South Shore, on rocks at Tucker's Town, etc. (Phyc. Bor.-Am. *1891.*)

Herposiphonia tenella (Ag.) Ambronn, is rather common, creeping on *Halimeda, Udotea, Sargassum,* etc. and on roots of *Rhizophora.* In habit, due chiefly to the length of its "short" branches, it varies greatly according to habitat, these branches being 20–50 segments long in the form on *Rhizophora* and mostly 12–25 segments long in the forms on algae, but intermediates apparently occur. The Herposiphonias differ from the Polysiphonias in their creeping habit, dorsiventral organization, the dorsally recurved and inrolled apex, and the "short" branches alternating in two regular dorsal rows. In both this species and the next, the segments show 8–10 pericentral siphons and are mostly 1–2 times as long as broad. In the present species there is a branch of some sort at nearly every node of the main axes, complete regularity being interfered with occasionally by suppression or abortion. (Phyc. Bor.-Am. *1943.*)

Herposiphonia secunda (Ag.) Ambronn, like the preceding, usually creeps on various algae (*Sargassum, Laurencia,* etc.). It is best distinguished by the less frequent branches, these commonly occurring at every third or fourth node. The "short" branches are usually shorter than in the preceding, being mostly 7–20 segments long. (Phyc. Bor.-Am. *2041.*)

Lophosipsonia obscura of current writers [not *Hutchinsia obscura* Ag.,* which is *Lophosiphonia subadunca* (Kütz.) Falkenb.] is rather common, forming dense felted mats about half an inch deep on rocks near the high-water mark. The primary axes creep, somewhat as in *Herposiphonia,* but the branches are less regular in their origin and development; the branches are endogenous in origin and are not laid down in a regular exogenous series at the apex of the main axis as in *Herposiphonia.* The Bermuda plant commonly has 10–12 pericentral siphons and its segments are mostly about as long as broad. The current specific name, though invalid, is here used, pending further studies of its synonymy. (Phyc. Bor.-Am. *1892.*)

Lophosiphonia Saccorhiza Collins & Hervey, is a new name that has recently been given (Phyc. Bor.-Am. *2042*) to a minute 4-siphoned plant that creeps on and among the utricles of *Codium.* It occasionally shows free parts that suggest the genus *Polysiphonia* rather than *Lophosiphonia. Polysiphonia codiicola* Zan. is perhaps a close relative.

Dipterosiphonia rigens (Schousb.) Falkenb. (*Lophosiphonia bermudensis* Collins & Hervey). This is a minute plant that creeps on *Sargassum, Lau-*

* Diatoms that coated Agardh's type specimen and obscured its structure are apparently responsible for this specific name.

rencia, Halimeda, and other algae, growing near the low-water mark, as at Hungry Bay. Its main axes have 5 or 6 pericentral siphons, its often short, divaricate, subulate or spinescent branchlets sometimes have only 4, and its tetrasporic branches often 7 or 8. The segments of the main axes are about as long as broad, sometimes longer, sometimes shorter, while those of the branches are commonly shorter than broad. The branches are 4-ranked, though occasionally they may have an illusory appearance of being 2-ranked. The branches, however, occur in alternating pairs, of which the more ventral of each pair becomes a ramified "long" branch, while the more dorsal of each pair becomes a simple "short" branch, in which respect *Dipterosiphonia* differs from *Herposiphonia* and *Lophosiphonia.* In the present species, as noted by Falkenberg, this regularity is often not manifest on account of the slight development of the "long" branches. In the free parts, also, the branches are only sparingly developed and their relations are obscure, but in the younger conditions and in creeping parts, the form and relations of the branches are manifest and the plant is a typical *Dipterosiphonia.*

Falkenbergia Hillebrandii (Born.) Falkenb. may be recognized by its having only 3 pericentral siphons, the siphons of one segment usually alternating regularly with the siphons of the next. The filaments are very slender, delicate, and flaccid and adhere firmly to paper on drying. The color is a reddish purple, tending sometimes to rose and sometimes to brown. The branching is lateral or pseudodichotomous. Not uncommon on other algae, sticks, etc., occurring particularly in association with mangroves and in the ponds of the Walsingham region. (Phyc. Bor.-Am. *2043.*)

Wrightiella Blodgettii (Harv.) Schmitz, is of occasional occurrence near low-water mark, as at Harris Bay and elsewhere along the South Shore. It is commonly 4–7 inches high, with a few plumose main axes that have the appearance of being distichously pinnate when dried and pressed, though the branches and branchlets are in reality spirally alternate in four ranks. The numerous short branches are mostly about ⅛ inch long and are beset with minute conic or awl-shaped ramuli that are visible with a hand-lens. Filamentous monosiphonous branchlets that soon fall off also occur, alternating with the stouter ones. Except for these the plant is corticated throughout, a section showing four pericentral siphons. The tetraspores occur on the monosiphous branchlets. The cystocarps are short-stalked and urceolate and are conspicuous when present. (Phyc. Bor.-Am. *1942.*)

Wrightiella Tumanowiczi (Gatty) Schmitz. The types of both this species and the preceding came from Key West, Florida, where the two differ rather markedly in habit, *W. Tumanowiczi* being more flaccid, having more persistent monosiphonous branchlets and being almost destitute of the short branches (about ⅛ inch long) that are responsible for the distichous-pinnate appearance of the main branches of dried specimens of *W. Blodgettii. W. Tumanowiczi* resembles slender conditions of *Dasya pedicellata,* while *W. Blodgettii* is slightly suggestive of lax forms of *Bryothamnion Seaforthii.* Under a microscope the texture of *W. Tumanowiczi* is rather more translucent

and the minute pointed ramuli are rather smaller, more slender, and more aculeate-subulate. The Bermuda specimens that have been referred (Phyc. Bor.-Am. *2095*) to this species show some of the indicated differences, yet it seems difficult to distinguish them with certainty from *W. Blodgettii*.

Murrayella periclados (Ag.) Schmitz, occurs on the roots of mangroves and in rock caverns between the tide-lines, commonly associated with species of *Bostrychia*. Its main axes are 1 or 3 inches long, free, erect or pendent, from rhizomatous bases, and are plumose with spirally alternating branches of various kinds. The main axes have 4 undivided and uncorticated pericentral siphons throughout, differing in this respect from species of *Bostrychia*. Some of the branches are simple and monosiphonous, others are branched and monosiphonous, others are short, branched, and polysiphonous at base, and monosiphonous above, and others are long and polysiphonous like the main axes. (Phyc. Bor.-Am. *2096*.)

Bostrychia tenella (Vahl) J. Ag. creeps on the walls of caverns, on shaded rocks, on roots of mangroves, and other objects, mostly near the high-water line or a little above it, often forming a dense, though usually thin, turf in the older parts of the colonies. The main axes are mostly ½–1 inch long and are twice or thrice pinnately branched, the somewhat palmato-pinnate ultimate branchlets ending in monosiphonous prolongations that are usually 10–40 cells long. The main axes and principal branches of this and of the other Bermudian species of *Bostrychia* are densely corticated. The tetraspores occur in cylindric-rostrate or lanceolate swellings (stichidia) of the primary or secondary corticated branches, these stichidia being 4–10 times as long as broad and moderately decurved. (Alg. Exs. Am. Bor. *137*, as *B. calamistrata;* Phyc. Bor.-Am. *1894a, b, c*—all more or less mixed with other species of *Bostrychia* in the set examined.)

Bostrychia Sertularia Mont. is found chiefly on the roofs of caverns above the ordinary high-water line. It is closely related to *B. tenella*, with which it is sometimes associated, but is apparently distinct. It is more slender and delicate in all its parts, the main axes are regularly and pectinately bipinnate, the ultimate branchlets are mostly 6-15 cells long, sometimes monosiphonous except at base, sometimes irregularly polysiphonous except for one or two cells at apex; in the monosiphonous parts, the cells are mostly broader than long, while in *B. tenella*, the reverse is true; when, as occasionally happens, the monosiphonous apices are more prolonged, the prolongations are commonly decolorate, which is rarely the case in *B. tenella*. The stichidia are ovoid or short-cylindric-clavate, mostly 2–4 times as long as broad, and are acute, obtuse, or apiculate. The color of the plant is a blue- or violet-purple, while that of *B. tenella*, even when growing with it, is a more brownish purple. (Alg. Exs. Am. Bor. *138;* Phyc. Bor.-Am. *2094*.) *Bostrychia Mazei* Crouan, at least as represented by Mazé & Schramm, Alg. Guad. *390* in herb. Mus. Paris. is this species.

Bostrychia Montagnei Harv. is a much larger plant than either of the two preceding species, being 1½–4 inches long, and, with its tri-quadripinnate

ramification, spreading about equally broad. Its branches are more widely spaced and not so obviously two-ranked. The apices are conspicuously inrolled; monosiphonous prolongations of the ultimate branchlets occur in the younger parts. The stichidia are cylindric-lanceolate, rostrate, and usually 4–6 times as long as broad. The blackish or violet-brown plants are ascending, or pendent rather than creeping. The species occurs in caverns and under shelving rocks, but is at its best on roots of mangroves, growing just below the high-tide mark, mostly at a lower level than *B. tenella*. (Alg. Exs. Am. Bor. *136;* Phyc. Bor.-Am. *1893.*)

Heterosiphonia Wurdemanni (Bail.) Falkenb. is a small plant, mostly ½–1 inch long or high, growing on other algae and on Gorgonians. The main axes have 4–6 (usually 5) pericentral siphons and are uncorticated throughout. These axes bear, usually at intervals of two segments, minute rather rigid branchlets which are monosiphonous throughout or polysiphonous at base and are several times divaricately dichotomous. These branchlets are primarily 2-ranked and alternate, but this regularity is sometimes interfered with by the development of adventitious or secondary branchlets. The cells of the branchlets are mostly a little longer than broad. The stichidia are ovoid-conic or obpyriform, about twice as long as broad, provided with a one-celled apiculus, and subsessile on a pedicel that is unicellular, at least as to its basal segment. (Phyc. Bor.-Am. *2097.*)

Dasya corymbifera J. Ag. is usually 1½–2½ inches long and grows under shelving rocks near the low-water mark. In the pressed and dried condition it shows a vaguely pinnate mode of branching. The main branches, together with their small, spirally alternate, monosiphonous, several times dichotomous, fasciculate-corymbose branchlets, are ½–1 line broad. The branchlets taper decidedly and the ultimate divisions are, for the most part, strongly incurved or subfalcate. The main axes are strongly corticated, and in the uncorticated upper parts the segments are a little longer than broad, the individual pericentral siphons being usually 3–6 times as long as broad. Cells of the branchlets are 2–5 times as long as broad. The stichidia are conic-subulate, on monosiphonous pedicels 1 or 2 (rarely 3) cells long.

Dasya Collinsiana M. A. Howe, sp. nov. Plants dingy red, often yellowish on drying, forming rather dense subhemispheric tufts 1–3 cm. high, 5–8 times subdichotomous, the branches corymbose or somewhat fastigiate, the terminal (with branchlets) alopecuroid, and 1–1.5 mm. in diameter; main axes 0.5–0.75 mm. in diameter near base, densely but rather pellucidly corticated up to the last two or three dichotomies; segments of upper uncorticated or lightly corticated parts often poorly defined owing to overlapping of siphons, varying from one half as long as broad to slightly longer than broad, the five pericentral siphons translucent, conspicuous, varying from slightly longer than broad to 2–3 (rarely 4) times as long as broad, often subquadrate; branchlets monosiphonous, patent, divaricate, or subsquarrose, 0.5–0.9 mm. long, 4 or 5 times divaricately dichotomous, the lower rigid and slightly tapering, those of the terminal coma softer, connivent, more tapering and often short-piliferous; basal cells of the branchlets 100–130 μ in diam., commonly shorter than broad, the terminal and subterminal cells mostly 45–55 μ in diam. (except in apical coma), about twice as long as broad; stichidia alopecuroid, acuminate-

apiculate, 300–350 μ long, 90–130 μ broad, 2–4 times as long as broad, subsessile on a very short one-celled pedicel.

Growing on rocks and on *Sargassum*, near low-water mark. Type from Red Bay, St. David's Island (*Howe 293*, in herb. N. Y. Bot. Gard.). This species is most nearly related to the Adriatic and Mediterranean *Dasya rigidula* (Kütz.) Ardiss. (which apparently has been sometimes confused with *Heterosiphonia Wurdemanni*), and to the European species that currently bears the invalid name *Dasya Arbuscula*,* but it differs from both in the dichotomo-corymbose arrangement of its main branches and in the short, broad, pericentral siphons, which commonly appear almost quadrate. Bermuda specimens have recently been referred, sometimes to *D. Arbuscula* and sometimes to *D. ramosissima* Harv. From the latter it differs in its small size, dichotomo-corymbose habit, mostly shorter pericentral siphons, more rigid, and more divaricately forked branchlets, etc. In its rigid divaricately forked branchlets, the species suggests *Heterosiphonia Wurdemanni*, but is readily distinguished by the cortication of its main branches and by the spirally alternate instead of distichous ramification. Its nearest Bermuda relative is *D. corymbifera* J. Ag., from which it is best distinguished by the dichotomo-corymbose arrangement of its main branches, its shorter pericentral siphons, its more crowded, more divaricately forked, less tapering branchlets, which show little or no tendency to be incurved or falcate at their apices, and by its more sessile, more apiculate stichidia. Apparently endemic. The species is dedicated to Mr. F. S. Collins, the well-known American phycologist and co-author of the recently published treatise on "The Algae of Bermuda."

Dasya pedicellata Ag. [*D. elegans* (Mart.) Ag.] is the largest of the Bermudian members of the genus, being commonly from six inches to two feet long, with long unequal irregular branches, which may remain simple or may be again branched. The main axes are mostly ½–2 lines in diameter. All parts, with the occasional exception of the oldest, are densely clothed with tufts of dichotomous monosiphonous ramelli 1–4 lines long. The plants are flaccid and are reddish purple or lake-red. Cystocarps conspicuous, urn-shaped, borne on the main branches on pedicels of about half their own length. Tetrasporic stichidia ovoid-rostrate to lanceolate-subulate, often slightly curved, borne on the monosiphonous ramelli.

Dasya spinuligera Collins & Hervey, resembles small, slender, delicate, much-branched, less villous conditions of *D. pedicellata*, but most of the monosiphonous ramelli are borne on rather rigid subulate branchlets, such as are wanting or of rare occurrence in the typical *D. pedicellata*. And the species differs markedly in the much elongate, cylindric, often clustered stichidia, which are 5–10 times as long as broad. (Phyc. Bor.-Am. *2188*.) Endemic.

Family CERAMIACEAE.

Ptilothamnion bipinnatum (Collins & Hervey) M. A. Howe (*Gymnothamnion bipinnatum* Collins & Hervey, Proc. Am. Acad. Arts & Sci. 43: 139. *pl.*

* The type of *Conferva Arbuscula* Dillw., on which *Dasya Arbuscula* Ag. was based, is evidently a *Callithamnion*.

4. f. 26. Au 1917), is an exceedingly minute, almost microscopic plant that creeps on rocks in caverns in company with other algae. It is monosiphonous and uncorticated throughout. The creeping parts are attached by discs or manifest rhizoids; the erect, ascending, or semiprostrate, flexuous main branches are less than a line long, and have a more or less elongate naked stipe above which they are regularly and oppositely pinnate or somewhat bipinnate, the pinnae patent or somewhat divaricate, mostly 4–12 cells long, usually a pair from the upper part of each internode. In the more or less bipinnate conditions, the pinnules, 1–4 cells long, are chiefly confined to a secund row along the upper (inner) side of the pinna. Occasionally a pinna will develop more luxuriantly, like one of the main suberect branches. Cells of the rhizome are mostly 1½–4 times as long as broad, those of the main suberect axes 1½–2 times as long as broad. Tetrasporangia occur at the ends of the pinnae and are tetrahedrally divided (tripartite). The nearest relative of this species is perhaps the Irish cave-inhabiting *Ptilothamnion lucifugum* Cotton, from which, however, it is amply distinct. The Bermuda plant was found by F. S. Collins in a cave by the Ducking Stool. (Phyc. Bor.-Am. *2190*, as *Gymnothamnion bipinnatum* Collins & Hervey.) Apparently endemic.

Spermothamnion gorgoneum (Mont.) Bornet, is a name that may be used tentatively for a plant that forms a delicate red-purple plush on the surface of species of *Codium* (Bethel's Island, *Collins 8488*). The plant is monosiphonous and uncorticated throughout, sending up erect somewhat flexuous branches less than a line long from a creeping basal filament, the erect branches simple or rather sparingly laterally or subdichotomously ramified, the branchlets often subsecund, very rarely opposite or 3-verticillate. The cells are mostly 3–7 times as long as broad. The Bermuda specimen examined seems to be sterile, as was also, apparently, the African type of the present species. The Bermuda plant is manifestly different from the cystocarpic and polysporic codiicolous plants from Jamaica ((Phyc. Bor.-Am. *441*) and Barbados (Vickers, Alg. Barb. *179*) that have been distributed as *Spermothamnion gorgoneum*.

Spermothamnion macromeres Collins & Hervey, forms soft cushions about half an inch high on sand-covered rocks near the low-water mark, with Polysiphonias and other small algae, as at Pink Bay and Gravelly Bay (Phyc. Bor.-Am. *2044*). Like other members of the genus, the plant is monosiphonous and uncorticated and sends up erect branches from a creeping base. The erect branches are simple, sparingly subdichotomous, or provided with a few lateral branchlets. The cells are mostly 4–10 (–15) times as long as broad, often curved, and commonly contracted at the septa. The tripartite tetrasporangia are loosely clustered, sessile or pedicellate. Apparently endemic.

Griffithsia globulifera Harv. (*G. Bornetiana* Farl.). The Griffithsias are delicate, monosiphonous, uncorticated, cespitose plants, the filaments mostly erect and regularly dichotomous, or, in some species laterally branched. The tetrasporangia, in the Bermuda species, are borne on minute branchlets forming whorls at the upper nodes. The cystocarps also occur at the nodes and are furnished with an involucre. In *G. globulifera*, the antheridia densely

cover the apical half of the obovoid or subglobose terminal cells. The male, female, and tetrasporic plants in this species have each their characteristic habit and form of cell, the male plant being smaller, 1–3 inches high, with lower cells cylindric-obovoid, the upper pyriform, obovoid, or subglobose. In the female and tetrasporic plants the cells vary from cylindric to cylindric-clavate, cylindric-obovoid, or ellipsoid; they are mostly 4–10 times as long as broad in the lower parts and 1–4 times as long as broad in the upper, and are moderately contracted at the septa. In all forms of *G. globulifera* the branching is dichotomous or subdichotomous. The only Bermuda specimens seen are sterile and their determination is not wholly certain.

Griffithsia Schousboei Mont. is a smaller plant than *G. globulifera*, with shorter and broader cells that are very strongly contracted at the septa, giving the filaments a moniliform habit. The cells vary from cylindric-clavate below to pyriform, ellipsoid, subglobose, and oblate-spheroid above, the septal isthmi being only ½–⅓ the maximum diameter of the cells. At the apices the filaments often diminish in diameter abruptly or gradually to cells ½–⅒ the diameter of the larger subjacent cells. The writer has not seen antheridia in the Bermuda plants, but the species is said to have the antheridia, like the tetrasporangia, in verticils at the nodes.

Griffithsia tenuis Ag. may be recognized by its straggling habit and its irregular, mostly lateral, patent or divaricate branching. The plants are usually about two inches long, and most of the branches, which are commonly rather few, spring from near the middle, or below the middle, of an internode. In the youngest parts there are often, also, nodal verticils of very short, exceedingly delicate branchlets. The cells in the younger parts are 1–4 times as long as broad; in the older, 3–6 times. In the younger parts the filaments are often lightly contracted at the septa; in the older, they are often swollen at the septa. All specimens seen by the writer have been apparently sterile. (Phyc. Bor.-Am. *1895.*)

Callithamnion corymbosum (Sm.) Lyngb. This species forms delicate gelatinous rose-colored or brownish rose tufts mostly 1–3 inches high. The main axes are corticated in the basal parts, the main branches are several times irregularly ramified, the secondary branches are alternately pinnate with dichotomo-multifid ramuli, the ultimate ramelli corymbose-fastigiate. The cells of the main axes are variable in length but are mostly 3–8 times as long as broad and are often more or less enlarged just above the septum. The writer is inclined to refer here specimens (sterile so far as seen) collected by A. B. Hervey on various other algae at the mouth of Harrington Sound and distributed (Phyc. Bor.-Am. *1896*) as *Callithamnion Halliae* Collins, from the Key West type of which (Phyc. Bor.-Am. *698*) they differ in the corticated main axes, the longer cells, the much more corymbose-fastigiate ramelli, the frequent presence of terminal hairs, etc.

Callithamnion cordatum Børg. is a name that has been recently applied (Phyc. Bor.-Am. *2189*) to a dingy red plant 1–2 inches high found at Buildings Bay. Its ultimate ramelli are corymbose-fastigiate, somewhat as in the

foregoing species, but it differs from that and the other Bermudian species of *Callithamnion* here mentioned in having the main axes essentially uncorticated, though the extreme base of the Bermudian plant is more or less felted with both adherent and free rhizoids. The cells in the basal parts are short, being about as broad as long. The type of the species was from the Danish West Indies and the specific name was given in allusion to the cordate geminate cystocarps. The Bermudian plants seen by the writer are apparently sterile. The ultimate ramelli would seem to be stouter and less abruptly tapering than in the type as figured by Børgesen.

Callithamnion Herveyi M. A. Howe, sp. nov. Plants dingy purple, subfuscous in age, gelatinous, forming tufts or cushions 2–4 cm. high, ramification densely and repeatedly decompound, for the most part irregular or obscurely tetrastichous, the ultimate ramelli more or less subdistichous or dichotomo-distichous; main axes with rhizoidal corticating for three fourths or more of their length, 0.3–0.35 mm. in diameter at base and in older parts loosely hirto-tomentulose with simple or irregularly branched rhizoidal ramelli; cells of the largest uncorticated branches 40–80 μ in diameter, subcylindric, mostly 1½–2 times as long as broad, their walls 12–25 μ thick; antepenultimate ramuli cylindric-plumose, mostly 0.8–1.5 mm. long, and, with the patent or erecto-patent ramelli, 0.3–0.6 mm. broad; cells of the ultimate ramelli 1½–2 (rarely 3) times as long as broad, the terminal obtuse, 8–12 μ in diameter, occasionally piliferous; dioicous; antheridia subglobose or subhemispheric, 30–50 μ in diameter, usually crowning a short but manifest one-celled pedicel; cystocarps subglobose, 100–220 μ in diameter, scarcely lobed, often geminate; tetrasporangia lateral, mostly solitary, irregularly scattered or occasionally subsecund, obovoid or subglobose, mostly 38–40 μ in maximum diameter, tetrahedrally divided or spores sometimes subdecussately paired; monosporangia terminal, frequent on cystocarpic plants, occasional on antheridial and tetrasporic plants, scattered or irregularly clustered, solitary, sometimes concatenate in twos (very rarely in threes), obovoid, ellipsoid, pyriform, or subglobose, 36–65 μ in longer liameter. [Phyc. Bor.-Am. *2046* as *Callithamnion Hookeri* (Dillw.) Ag.]

Type from Smith's Bay, December, 1913, communicated by F. S. Collins as no. *8005*, and preserved in the herbarium of the New York Botanical Garden. The species is named in honor of Rev. Dr. A. B. Hervey, author of the popular book, "Sea Mosses," and successful investigator of the marine flora of Bermuda.

Callithamnion Herveyi is perhaps most nearly related to the European *C. Hookeri*, but manifestly differs in its smaller size, in its denser, more cylindric-plumose or tetrastichous, less distichous ramification, in its more hirtulous-tomentulose main axes, in its more slender and delicate ultimate ramelli (terminal cells averaging about one half the diameter of those of *C. Hookeri*), in its much smaller tetrasporangia (averaging about one half the diameter of those of *C. Hookeri*), in the frequent presence of monosporangia, etc. The plants are often much encrusted with diatoms of various kinds, and even when virtually free from diatoms, the plants collect and hold quantities of fine sand, indicating the presence of a remarkable amount of mucus. The cystocarp has no involucre and conforms to the *Callithamnion* type—not to that of *Seirospora*. All of the cells except the youngest appear to be plurinuclear. The species is endemic so far as known.

Seirospora purpurea M. A. Howe, sp. nov. Plants purple-lake or dahlia-carmine, forming dense, more or less felted, pulvinate tufts 1–2½ cm. high, ramification repeatedly decompound, for the most part obscurely quinquefarious, the ultimate ramelli dichotomo-subdistichous and often subfastigiate; main axes 0.15–0.25 mm. in diameter at base, rather sparingly corticated for one half or more of their length by narrow-celled rhizoids, and in basal parts clothed in addition by free sometimes spirally entwined rhizoids, occasional cells of the upper ramuli also sending out elongate, free, long-celled, simple or sparingly branched rhizoids; largest uncorticated cells of the main axes 40–95 μ in diameter, subcylindric or slightly enlarged at the nodes, 1½–2½ times as long as broad, their walls 8–20 μ thick; cells of the ultimate ramelli mostly 2–4 times as long as broad, the terminal obtuse, 6–13 μ in diameter, hairs apparently wanting; dioicous; antheridia ovoid, lance-ovoid, dimidiate-ovoid, or ellipsoid, occurring singly at the nodes, erecto-patent, often incurved, 48–65 μ high, 26–40 μ broad; cystocarps somewhat hemispheric, 0.3–0.4 mm. broad, composed of free, erecto-patent, moniliform, sporogenous filaments, the ellipsoid or ovoid carpospores 35–40 μ long; tetrasporangia scattered, solitary at the nodes, obovoid or ellipsoid, 50–65 μ in maximum diameter, tetrahedrally divided. (Phyc. Bor.-Am. *2045*, as *Callithamnion byssoideum jamaicense* Collins.)

Type from a cave, Gravelly Bay, *A. B. Hervey* (Phyc. Bor.-Am. *2045*) in the herbarium of the New York Botanical Garden.

Seirospora purpurea bears some resemblance in habit to small dense conditions of *Callithamnion corymbosum* and *C. byssoides*, but is easily distinguished by the sheathing of the basal parts of the main axes by free rhizoids in addition to the cortications, by the frequently rhiziniferous cells of the smaller branches and the consequent more or less felted condition of the tufts, and more especially by having the cystocarp of a *Seirospora*, with its free sporogenous filaments, instead of the solid cystocarp of a *Callithamnion* with its common enclosing wall. The European *Seirospora? Gaillonii* (Crouan) De-Toni is possibly a nearer relative. The Jamaican *Callithamnion byssoideum jamaicense* Collins (Phyc. Bor.-Am. *443*) is manifestly a different thing. The cells of *S. purpurea* are apparently all uninucleate. Endemic.

Antithamnion cruciatum (Ag.) Naeg. is a delicate rose-colored or dingy red plant, mostly 1–2 inches high. Its main axes are rather few, its secondary branches are comparatively short and four-ranked, being opposite and decussately paired or in whorls of four. It is monosiphonous and uncorticated throughout. At the apices of the main axes, the branches and branchlets are very densely crowded, more or less incurved, more intensely colored, and, when pressed and dried, the effect is often slightly suggestive of the terminal "eye" of a peacock's tail-feather. St. George's (*Hervey*). (Phyc. Bor.-Am. *2191*.)

Crouania attenuata (Bonnem.) J. Ag. is a very gelatinous, much branched, filiform, monosiphonous, and uncorticated plant 1–4 inches long, varying in color from light rose to dingy purple. The main branches are irregular and they bear at their nodes pairs or whorls of fastigiate, erecto-patent or slightly incurved, several times dichotomous or trichotomous short branches, the successive whorls close-set and confluent in the younger parts, often separate and giving a beaded or moniliform appearance in the older parts. The general habit of the plant is very suggestive of certain species of the fresh-water genus *Batrachospermum*. The younger main branches are

attenuate at the apex and often also at the base. The tetrasporangia are tetrahedrally divided and are borne near the bases of the whorled short branches. The Bermuda plants are larger, coarser, and more gelatinous than the European type and the ultimate cells of the ramelli are more obtuse, but the occurrence of apparently intermediate forms in the West Indies makes it doubtful if they may be satisfactorily distinguished from the European species. (Phyc. Bor.-Am. *2048.*)

Spyridia filamentosa (Wulf.) Harv. is a common plant growing attached to rocks in shallow water in warm bays and tide-pools, or found floating and unattached, often in loose tangled mats. It is commonly 3–6 inches high, with main branching subdichotomous or irregularly lateral, the principal axes ¼–½ line in diameter. As in the other species of the genus the branches are clothed, sometimes sparingly, with very delicate hair-like ramelli about ½ a line long, which under a hand-lens are seen to be transversely zoned, hyaline zones alternating with narrower colored ones. Under a compound microscope, the main branches are found to be corticated, the corticating cells in regular transverse zones in the younger parts, bands of narrower longer corticating cells regularly alternating with bands of broader shorter cells. This species is distinguished from the following by its looser more straggling habit and, microscopically, by the fact that the capillary ramelli are merely acute or apiculate, without recurved hooks. (Phyc. Bor.-Am. *1897.*)

Spyridia complanata J. Ag. grows on exposed rocks between the tide-lines or near low-water mark, as at Hungry Bay, Red Bay, and Spanish Rock. It is more densely branched, more plumose in habit, and usually a smaller plant than the preceding, growing 2–4 inches high, with tufted compact feathery fronds mostly ¼–½ inch broad. The main axes are slightly flattened and the branches are predominantly distichous. Many of the ramelli, besides having an apiculus, are provided with one or more minute retrorse one-celled subapical barbs or hooks. (Phyc. Bor.-Am. *1947.*)

Spyridia aculeata (Ag.) Kütz. is similar to *S. complanata,* but the branches issue in all directions, showing little tendency to be distichous. However, this character seems variable and it is doubtful if these two species can be satisfactorily distinguished, at least so far as concerns the Bermuda plants. The ends of the main branches are often enlarged and hooked, circinate, or tendril-like, as in the genus *Hypnea,* constituting the var. *hypneoides* J. Ag. (Phyc. Bor.-Am. *1946.*)

Ceramium nitens (Ag.) J. Ag. is an attractive deep red, brownish red, or yellowish red, copiously branched, thread-like plant that occurs in Hamilton Harbor, in the Inlet to Harrington Sound, etc. It forms soft rather lubricous tufts, mostly 3–5 inches high. The main branching is subdichotomous, with one or several somewhat zigzag leading axes. The smaller branches are lateral, subdivaricate or patent, and occasionally secund, and the apices are straight. Under a microscope the plant is seen to be corticated throughout and more or less nodose, with the transverse septa of the large-celled monosiphonous axis visible through the cortex. The Bermuda specimens seen are sterile. (Phyc. Bor.-Am. *1949.*)

Ceramium tenuissimum J. Ag. is a name that may be employed, temporarily at least, in accordance with current usage, for a variable, perhaps aggregate species that occurs in Bermuda. However, the proper application of the name (first used by Roth, as a varietal name) is in doubt, and, moreover, the Bermuda plants do not agree quite accurately with European plants that currently bear this name. As in the following species of the genus, the corticcation is confined to a band at each node, the colored corticated nodes alternating and contrasting with the naked usually hyaline internodes, giving a transversely zoned appearance to the plant when viewed under a hand-lens. The filaments are very delicate, repeatedly dichotomous, fastigiate, mostly 1–2 inches high, $\frac{1}{18}$–$\frac{1}{15}$ of a line in diameter, the apices strongly forcipate or nearly straight and erect. The mostly cylindric internodes are 2–4 times as long as broad, becoming shorter above; nodal bands slightly protuberant, 2–6 cells wide (high), their cells irregular in form, size, and direction, 8–14 cells measuring the width of the filament. The Bermuda specimens examined are mostly sterile, but the tetrasporangia appear to be erumpent in a single extrorse secund series and are somewhat irregularly divided, sometimes resembling the so-called tetrahedral or tripartite mode and sometimes approaching the decussate-paired arrangement. (Phyc. Bor.-Am. *1898* and *2098*.)

Ceramium cruciatum Collins & Hervey, creeps on *Galaxaura squalida* on the South Shore. The erect or ascending parts are only about a line high. The filaments are several times dichotomous, and about $\frac{1}{14}$ of a line in diameter, with forcipate apices. The hyaline uncorticated internodal cells are thick-walled, often bulging, scarcely longer than broad, shorter than broad in upper parts; nodal bands hardly protuberant when sterile, 2–5 cells wide (high), their cells irregular in form and size, their long axes mostly lengthwise of the filament, 8–16 cells measuring its width. The tetrasporangia immersed, becoming erumpent, subsecund or subverticillate, the spores in decussate pairs.

Ceramium byssoideum Harv. (*C. transversale* Collins & Hervey) is an exceedingly delicate flocculent plant, reaching a length of 1–2 inches. The filaments are $\frac{1}{70}$–$\frac{1}{85}$ of a line in diameter, are repeatedly subdichotomous, the branches somewhat fastigiate or corymbose, and the apices straight and erect or slightly forcipate. The hyaline uncorticated internodal cells are cylindric below, and mostly 2–6 times as long as broad, becoming shorter above and short-fusiform, ovoid, or obovoid; nodal bands protuberant, especially above, bitruncate, 3–5 cells wide (high), their cells mostly with their longer axes running transversely of the filament, 2–6 cells measuring its width. The tetrasporangia are subsecund, protuberant, and lightly corticated in basal half, the spores irregularly tetrahedral. (Phyc. Bor.-Am. *2049*, as *Ceramium transversale* Collins & Hervey.)

Ceramium leptozonum M. A. Howe, sp. nov. Plants delicate, Indian lake or deep purplish-vinaceous, cespitose, dichotomous, fastigiate, 1½–3 cm. high; main filaments 40–72 μ in diameter, lightly corticated at nodes only, the dichotomies acute, the apices slightly forcipate or suberect; internodal cells cylindric below and 1½–4 times as long as broad, becoming ovoid and shorter above, all provided with conspicuous fibrillar chromatophores, becoming decol-

orate below; nodal bands of corticating cells very narrow, slightly protuberant, mostly only one cell wide (high); the cells with their longer axes (20–40 μ) usually directed lengthwise of the filament, about four cells measuring the diameter of the filament, irregular smaller cells sometimes forming an imperfect second (upper) row; tetrasporangia solitary or 2 or 3 at a node, mostly secund along the outer side of the filament, occasionally subverticillate, 50–65 μ in maximum diameter, the primary wholly naked, the secondary (formed by regeneration) subtended by 2–4 small sterile cells and thereby often much exserted or substipitate, the tetraspores somewhat tetrahedrally disposed.

Type from a pond at Walsingham, having subterranean communication with the sea, (*Howe 99*, in herb. N. Y. Botanical Garden).

Ceramium leptozonum is related to *C. byssoideum* and the plants currently known as *C. tenuissimum*, but seems to be amply distinct in having ordinarily only a single row of corticating cells at the nodes, these cells nearly always elongate in the direction of the filament, and in the naked primary tetrasporangia. In the narrow nodal zones, the regenerating tetrasporangia, and the rather persistent coloring of the protoplasts of the large internodal cells, the species is slightly suggestive of *Ceramothamnion Codii*, from which it is easily distinguished by the apparently non-repent habit, the dichotomous stouter and taller filaments, the usually single instead of double row of nodal cells, which are also more elongate, the relatively smaller naked primary tetrasporangia, etc. *Ceramium cruciatum* and *C. tenuissimum* also sometimes show persistently colored fibrillar chromatophores in the internodal cells. In soaked-out dried specimens, the nodal cells often appear to be more numerous than they really are, owing to the segregation of chromatophores or to the purely optical cutting of these cells by the nodal diaphragm. The tetraspores sometimes germinate *in situ*, giving rise to small proliferations. The species is apparently endemic.

Ceramothamnion Codii Richards, is a small plant epiphytic on species of *Codium* along the South Shore and on Cooper's Island. It creeps along the surface of the *Codium*, sending down rhizoids among the utricles of its host and sending up erect filaments less than a line high and $\frac{1}{30}$–$\frac{1}{52}$ of a line in diameter, which are unbranched except in connection with the formation of the so-called polysporangia, the apices remaining straight and erect. The uncorticated internodal cells are mostly 1½–3 times as long as broad, and show persistently colored fibrillar chromatophores, somewhat as in *Ceramium cruciatum* and *C. leptozonum*. The nodal bands of corticating cells are 2 (3) cells wide (high), these cells with their longer axes variously directed, 3 or 4 cells measuring the width of the filament. The tetrasporangia are solitary at the nodes, subsecund, broader at maturity than the filament, subtended in the basal half by an involucral cup of sterile cells, and regenerating, the spores arranged in decussate pairs. Antheridia form compact, small-celled, subglobose, sometimes confluent enlargements of the nodes of different individuals from those that bear the tetraspores. Supposed polysporangia or parasporangia, of non-sexual origin, irregularly ovoid, subglobose or ellipsoid, occur on the erect filaments, usually in pairs, and subtended by three or four short branches similar in structure to the filaments. *Ceramothamnion* appears to differ from *Ceramium* in scarcely anything but in the occurrence of alleged polysporangia of non-

sexual origin where one would naturally expect cystocarps of sexual origin. The resemblance of the vegetative characters of *Ceramothamnion* to those of undoubted species of *Ceramium*, the occurrence of antheridia, the failure to find proved procarps and cystocarps, and the resemblance of the supposed polysporangia to the cystocarps of *Ceramium*, form a combination of circumstances that suggests the possibility that the alleged polysporangia of *Ceramothamnion* are in reality cystocarps. (Phyc. Bor.-Am. *845* and *1899*; *2193*, as *Ceramium tenuissimum pygmaeum*.)

Centroceras clavulatum (Ag.) Mont. is the commonest and perhaps the most variable Bermudian representative of the Ceramiaceae, growing on rocks and on various larger algae in shallow water, or, in surf-beaten places between the tide-lines. Its capillary brownish red or dingy red dichotomous fastigiate filaments form tufts or loose mats commonly 0.5–4 inches high. The filaments are corticated throughout and may be distinguished from corticated species of *Ceramium* by having the somewhat rectangular cortex cells in regular longitudinal rows. In the younger parts at least, each node bears a whorl of teeth or short mostly 2-celled spines, by which character also it is easily distinguished from its Bermudian relatives. In the length, shape, and abundance of these spines, the plant varies greatly according to habitat, and distinctions of species based on these characters have been attempted. (Phyc. Bor.-Am. *1948*, as *Ceramium clavulatum*.)

Family GRATELOUPIÀCEAE.

Halymenia bermudensis Collins & Howe, has a membranous, violet-red, rather firm or slightly gelatinous, usually stipitate frond that is variable in form, mostly suborbicular, cordate, or obovate, and 2–10 inches broad, subentire or sparingly or copiously lobed or proliferous, the lobes ovate or conformable. Under a microscope, the medullary filaments viewed through the cortex are seen to be interspersed with a few coarser filaments, having more homogeneous refringent contents and radiating from substellate, ganglion-like enlargements. (Phyc. Bor.-Am. *2050*.) Apparently endemic.

Halymenia pseudofloresia Collins & Howe, has a membranous deep red or violet-red frond that is gelatinous in younger parts, becoming firmer with age, suborbicular, ovate, cuneate-obovate, or commonly very irregular in general outline, 3–10 inches long, deeply, irregularly, or subpalmately lobed, or often showing cuneate-based substipitate marginal proliferations, the main expansion or axes ½–3 inches broad, the lobes or proliferations commonly lanceolate, serrate, biserrate, or subpinnately lobulate or bilobulate, the teeth mostly acuminate-deltoid, the medulla, under a microscope, occasionally showing a few inconspicuous stellate ganglia. (Phyc. Bor.-Am. *2099*.) Apparently endemic.

Halymenia echinophysa Collins & Howe, has a membranous lilac or grayish vinaceous gelatinous frond that is suborbicular in general outline and 4–7 inches wide, deeply, irregularly or subpalmately lobed or divided, the lobes irregularly obovate or suborbicular, mostly 1–2½ in. broad, their margins sinuate- or erose-dentate or sparingly sublobulate. Under a microscope, some

of the inner cells of the subcortex are seen to be enlarged, subglobose, echinate-stelliform, projecting into the medullary cavity, and showing when detached 15–40 rather rigid subspinescent processes. Known only from a specimen dredged in "31 fathoms, off Bermuda" by members of the Challenger Expedition in 1873. Apparently endemic.

Halymenia Agardhii De-Toni, has, in its Bermuda forms, a soft, dark red, subterete, repeatedly dichotomous, more or less gelatinous frond that is 3–4 inches long (commonly longer in Florida and the West Indies), with segments ⅛–¼ of an inch broad. The only known Bermuda alga with which it might possibly be confused is a species of *Nemastoma*, from which it differs in its darker red color, in its more regular dichotomy, in being less lubricous, and, microscopically, in its firmer, more pseudoparenchymatous, less obviously filamentous cortex, and the frequent anastomoses or small nodal ganglia among the medullary filaments. The plant has been found washed ashore on South Beach and growing attached to rocks near low-water mark at Gibbet Island.

Cryptonemia crenulata (J. Ag.) J. Ag. apparently occurs in Bermuda (on sand-covered rocks in a cave, Gravelly Bay, *Hervey*) in a small reduced form, and possibly better-developed conditions are yet to be found in deeper water, where it may be expected on the bases of sea-fans, dead-men's-fingers, etc. As thus far found, it has a sparingly dichotomous rose-purple membranous frond 1–2 inches long, from a subterete stipe. The main divisions are about ⅛ of an inch wide, strap-shaped or cuneate-ligulate, often stipitate, subentire, occasionally with small ovate or suborbicular stipitate innovations. In normal forms of the species, the segments are ¼–¾ inch broad and have crenulate-denticulate margins, the teeth often bifid or trifid or furnished with a small crown of secondary teeth. (Phyc. Bor.-Am. *2100*.)

Cryptonemia luxurians (Ag.) J. Ag. differs from the foregoing in having a caulescent, costate-alate frond, the costa vanishing towards the apices. The only Bermuda specimen seen is about 4 inches tall, several times dichotomous, the segments ¼–½ inch broad. On rocks in shallow water at Red Bay, St. David's Island (*Howe 287*).

Family **DUMONTIÀCEAE.**

Dudresnaya crassa M. A. Howe, is a flaccid extremely lubricous densely ramose dioicous plant that is 2–6 inches high or long and rose-colored when living, though commonly dingy purple or brownish red on drying. In the pressed and dried condition, the branching appears to be irregularly 2–3-pinnate, though the branches really emerge in all directions; branches and branchlets are vermiform, of nearly uniform diameter throughout; the ultimate branchlets are obtuse or subobtuse and mostly ½–¾ of a line in diameter. Under a microscope the very soft gelatinous cortex is seen to be made up of essentially free, 4–6 times dichotomous, beautifully fastigiate cylindric filaments, the more peripheral cells of which are 2–5 times as long as broad. In the younger parts, the central axis, consisting of a single row of cells, bearing the crowded whorls of peripheral filaments may be readily seen; in the older

parts this axis is clothed and obscured by numerous decurrent rhizoidal filaments. In the female plants, auxiliary-cell branches are numerous, consisting of 5–9 enlarged subspherical cells near base, the special auxiliary cell occupying the middle of this enlarged portion and having little more than half the diameter of the two immediately adjacent inflated cells. In the male plants, the antheridia form subglobose tufts or clusters at or near the ends of the peripheral filaments. The usually numerous cystocarps form granules $\frac{1}{20}$–$\frac{1}{10}$ of a line in diameter, easily visible under a hand-lens. The plant grows on rocks in about ten feet of water in Castle Harbor and has been found washed ashore at Spanish Point, Buildings Bay, and Shelly Bay. (Phyc. Bor.-Am. *1900* and *2196*.) Apparently endemic.

Dudresnaya bermudensis Setchell, is readily distinguished from the foregoing by its much finer taper-pointed branchlets and more slender main axes, these rarely more than $\frac{1}{3}$ of a line in diameter, and by the moniliform, rather than cylindric peripheral filaments, the outer cells subspheric, or ovoid or ellipsoid and only slightly longer than broad. The cystocarps are many-spored and $\frac{1}{18}$–$\frac{1}{15}$ of a line in diameter. Cooper's Island (*Farlow*) and Building's Bay (*Hervey*). (Phyc. Bor.-Am. *2195*.) Apparently endemic.

Dudresnaya caribaea (J. Ag.) Setchell, often resembles *D. bermudensis* in habit, but is, generally speaking, a larger plant, 4–15 inches long, is more obviously complanate-distichous, and its main axes are often 1–2 lines broad. Microscopically, it shows moniliform peripheral filaments, much resembling those of *D. bermudensis*, but the specialized auxiliary cell is enlarged, subspheric, and terminal on the special auxiliary-cell branch, this consisting otherwise chiefly of discoid cells, instead of being intercalary and scarcely distinguishable from its neighbors. The cystocarps are few-spored and have about one-half the average diameter of those of *D. bermudensis*. Found floating at Cooper's Island (*Farlow*). Type from the Tortugas, Florida.

Family **NEMASTOMATÀCEAE.**

Calosiphonia verticillifera (J. Ag.) Setchell, has been reported by Setchell and by Collins as having been collected at Cooper's Island by Farlow in 1881. The present writer has not seen the Bermuda plants that have been given this name, but the single type specimen of *Helminthiopsis verticillifera* J. Ag., on which the name rests, appears to have the auxiliary-cell branches of a *Dudresnaya* and, in fact, to be distinguishable by no reliable character from *Dudresnaya caribaea* (J. Ag.) Setchell, the type of which also was from the Tortugas, off the coast of southern Florida.

Platoma cyclocolpa (Mont.) Schmitz (type from the Canary Islands), or an apparently sterile plant resembling it in general habit, is of occasional occurrence in Bermuda. Its soft gelatinous flattened rose-purple thallus is 1–5 inches broad and high, irregularly dichotomo-multifid, or irregularly palmatifid from a plane base that is often 1–2 inches wide, the margins crenate-dentate, irregularly lobulate or bilobulate, or incised-dentate, the teeth mostly obtuse and often subterete, the plane faces occasionally showing teeth or short proliferations. In narrower forms, the main segments are sometimes irregularly subpinnate or bipinnate. From the species of *Halymenia*, it is readily distinguished by the more obviously filamentous cortex and subcortex and by the absence of anastomoses and stelliform cells. The Bermuda plants differ from

Mediterranean specimens referred to this species in their bright red color and in their softer looser cortex, its constituent filaments being more readily separable.

Nemastoma gelatinosum M. A. Howe, sp. nov. Thallus very soft, gelatinous, and lubricous, light purplish-vinaceous, forming a subhemispheric or somewhat flattened shrub-like tuft 6–13 cm. high, subterete or here and there complanate, repeatedly (5–9 times) and in general closely subdichotomous, the branching mostly in one plane or occasionally, especially toward the apices, in all directions, often crowded-subpalmate, now and then subpinnately distichous, the branches unequal, mostly 3–6 mm. in diameter or in flattened parts sometimes 10 mm. broad, slightly tapering, obtuse or subacute, occasionally terminating in a pair of small subdivaricate teeth about 1 mm. broad; medullary filaments 7–12 μ in diameter; cortex of 5 or 6 times di(tri)chotomous submoniliform fastigiate filaments 80–140 μ long, loosely imbedded in mucus and easily separable, the forkings rather wide-angled, the cells mostly obovoid, those of the surface usually 3–9 $\mu \times$ 3–6 μ; other parts unknown.

On rocks in about 3 m. of water, in Castle Harbor near Tucker's Town (type, *Howe 316*, in herb. N. Y. Bot. Gard.). Also collected in Bermuda by Faxon (in herb. Farlow). *Nemastoma gelatinosum* may possibly include the plants somewhat doubtfully referred above to *Platoma cyclocolpa*, to which it bears much resemblance in structure, but, if so, the species is remarkably protean in habit. *N. gelatinosum* is a softer, more gelatinous, usually lighter-colored, suffrutescent plant, with all parts predominantly subterete, while the so-called *Platoma cyclocolpa* is a plane membranous plant, with a marginal fringe of lobules or crenations. In its mucosity and its tenuity when pressed and dried, *N. gelatinosum* suggests the Mauritian *N. coliforme* J. Ag., to which it seems closely related, but it manifestly differs from this in its compact suffrutescent habit. Apparently endemic.

Family SQUAMARIÀCEAE.

Peyssonnelia rubra (Grev.) J. Ag. forms dark red or pinkish red, reniform or cuneate-orbicular, thin and rather fragile, loosely attached, membranous, often lobed crusts ½–1 inch broad, on the bases of the larger algae and Gorgonians in deep water or on rocks near low-water mark in littoral caverns. The ventral surface is whitened with lime, mostly coating a very short tomentum of rhizoids. Superposed imbricated lobes are often developed. The cells of the upper surface, viewed from above, are polygonal, in regular radial lines. In a cave at Gravelly Bay (*Collins*).

Other species of the genus and family doubtless occur. The Squamariaceae in general have a horizontally expanded crustaceous thallus, often more or less calcified. They may usually be distinguished superficially from the crustaceous forms of the Corallinaceae by the lighter calcification, the deeper red or yellowish color, the more obvious margins, and by the absence of definite cavities or conceptacles in which the reproductive organs occur, such organs being either scattered or aggregated in superficial sori or nemathecia.

Family CORALLINÀCEAE.

The members of this family show a great variety in outward form, but the known Bermudian representatives of the family agree in having a strongly

calcified thallus—often so hard and rock-like as to cause them to be overlooked by the uninitiated botanical collector as being simply "calcareous concretions" or at least as not belonging to the plant kingdom. For the proper collection of many of the crustaceous forms, one needs to be equipped with a hammer and chisel, a fact that accounts in a measure for the poor representation of this family of plants even in most of the larger herbaria. In the genera *Amphiroa* and *Corallina*, the plant body is erect and regularly jointed; in the other Bermudian genera it is wholly unjointed and may be horizontally expanded and crustaceous, or lifted into dome-like or tuber-like elevations, or may be erect, subterete, ramose, and shrub-like. In our forms the reproductive bodies occur in special cavities or conceptacles, appearing usually as dome-shaped or mammilliform superficial elevations visible to the unaided eye.

Lithothamnium syntrophicum Fosl. forms firmly attached crusts $\frac{1}{10}$–$\frac{1}{8}$ of a line thick and an inch or more in diameter on stones, pebbles, and various calcareous objects at various depths. Its surface is commonly roughened by following closely the inequalities of the substratum and it may in addition develop small irregular nodules of its own. A radio-vertical section shows minute cells in obvious vertical rows, but with little or no suggestion of horizontal stratification. The tetrasporangial conceptacles are depressed, hemispheric, or somewhat irregular, about $\frac{1}{3}$–$\frac{1}{2}$ of a line in diameter, and as in other members of the genus, their roofs soon show numerous small ostioles, suggesting the cover of a pepper-box. The tetrasporangia are zonately 4-divided. The type of the species was from Bermuda, where it was first collected by Farlow. Harrington Sound (*Howe*).

Lithothamnium mesomorphum Fosl. forms thin, fragile, partially attached, irregularly lobed and proliferous crusts $\frac{1}{2}$–2 inches broad, and $\frac{1}{7}$–$\frac{1}{5}$ of a line thick, the lobes or proliferations semiorbicular or irregular and loosely imbricate. Easily distinguished from the foregoing by its partly detached, lobed or proliferous, and imbricate habit of growth. Type from Bermuda (*Farlow*).

Lithothamnium incertum Fosl. has a crustaceous base that adheres closely to rocks 1–4 ft. below the low-tide line in normally agitated water, but it soon develops erect ramified anastomosing usually flattened branches, often forming compact even-topped, sometimes subhemispheric cushions 1–2 inches high and 3–6 inches broad. The crowded terminal branches are occasionally subterete and $\frac{1}{2}$–$\frac{3}{4}$ of a line in diameter, but are more often decidedly flattened and one line or more broad, and the branching commonly shows a tendency to be confined to the plane of flattening. The conceptacles appear externally near the ends of the branches, especially the more flattened ones, as crowded depressed-hemispheric elevations $\frac{1}{7}$–$\frac{1}{5}$ of a line in diameter. A radio-longitudinal or transverse section after decalcification shows a pseudoparenchymatous structure, with the thin-walled cells in obvious strata. The general texture is rather delicate and the gases liberated in the process of decalcification commonly tear irregular lacunae in the tissues. Type from Bermuda (*Farlow*). Red Bay, St. David's Island (*Howe*).

Lithothamnium Ungeri Kjellm. has been reported from the Challenger Bank by H. B. Bigelow (Proc. Am. Acad. Arts & Sci. 40: 587. 1905), but the type of this species was from Norway and its occurrence in Bermuda is improbable.

Melobesia farinosa Lamour. forms thin, delicate, whitish, suborbicular, calcareous crusts a line or less broad (but often confluent) on various algae, such as *Padina, Dictyota, Sargassum,* etc. The crusts in sterile parts consist of only a single layer of cells. The minute hemispheric conceptacles are $\frac{1}{11}$–$\frac{1}{14}$ of a line broad, are often crowded, and show a single central ostiole.

Melobesia bermudensis Fosl., a species known to the writer from description only, is said to form crusts of irregular outline and indefinite size on limestone. The primary crusts consist of a single layer of cells and are about $\frac{1}{70}$ of a line thick, but often one crust overgrows another until five or six may be superposed, with a thickness of $\frac{1}{14}$ of a line, a habit not exhibited by *M. farinosa.* Bermuda (*Farlow*); apparently endemic.

Lithophyllum pustulatum (Lamour.) Fosl. is found in situations similar to those favored by *Melobesia farinosa,* which it often accompanies and somewhat resembles. It has, however, a larger, thicker, firmer thallus and larger conceptacles, the thalli being 1–5 lines broad and the mammilliform conceptacles $\frac{1}{7}$–$\frac{1}{4}$ of a line in diameter.

Lithophyllum bermudense Fosl. & Howe, forms crusts $\frac{1}{2}$–1 line thick on calcareous pebbles, showing occasional wart-like excrescences, most of which are caused by its following the inequalities of the substratum. With occasional foreign inclusions and its own older strata it becomes 4 lines thick in places. A vertical section of decalcified material shows numerous (usually 30–40) layers of mostly ellipsoidal and vertically elongate cells (1–6 times as high as broad), which are arranged in regular horizontal strata as well as in vertical rows. The conceptacles are little prominent and are $\frac{1}{3}$–$\frac{1}{2}$ of a line in diameter. Type from Spanish Point (*Howe*).

Goniolithon decutescens (Heyd.) Fosl. in litt. (*G.? spectabile* Fosl.) is a frutescent much branched plant, forming depressed-hemispheric cushions 2–5 inches high and 5–12 inches broad, light rose-red in younger parts when living, soon decolorate or chalky white after collection. Its branches are terete or subterete, mostly $\frac{1}{2}$–1 line in diameter, crowded, subfastigiate, mostly somewhat curved, intertangled and much anastomosed, especially in the lower parts. Originally, there is a horizontal basal crust from which the first erect or subcreet branches arise and by which it is attached, but this soon becomes overgrown and inconspicuous and is often not shown in specimens as ordinarily collected. Plants or fragments of plants primarily attached may also become free and undergo further development in an unattached condition. A thin translucent cuticle is often irregularly exfoliated, a character that suggested the first-published specific name. A radio-longitudinal section of a decalcified branch shows rather firm-walled cells in erecto-patent outwardly curved rows, those of the medullary region about twice as long as broad and in rather obvious arcuate strata. Conceptacles, which are infrequent, occur near the tips of the branches, and are hemispheric, mammiform, or conic-mammiform,

and about ½ line broad and high. Type from Bermuda (*Farlow*). In 3–6 feet of water at Tucker's Island (*Howe*).

Goniolithon intermedium Fosl. (type from Bermuda, *Wadsworth*) differs from the foregoing chiefly in its erect, nearly straight and fastigiate upper branches. In habit it is somewhat intermediate between *G. decutescens* and *G. strictum* Fosl. (type from Florida). The *G. decutescens-G. strictum* group is widely and numerously represented in the West Indian region and while the plants show great variety in form and size, specific limits, if they exist, are very difficult to define. Furthermore, the plants of this group sometimes make a close approach to the earlier-published *Goniolithon frutescens* Fosl. from the South Pacific.

Amphiroa fragilissima Lamour. In both *Amphiroa* and *Corallina*, the plant-body is more or less regularly and distinctly jointed, terete or flattened, and di-(tri-)chotomously or pinnately branched. In *Corallina*, the conceptacles are terminal; in *Amphiroa*, they are lateral, on the faces of the segments. *Amphiroa fragilissima*, as currently interpreted, has a very fragile, terete, repeatedly dichotomous thallus, forming loose or rather compact cushions 1–3 inches high and sometimes one foot or more wide. The segments are mostly $\frac{1}{15}$–$\frac{1}{7}$ of a line in diameter and are 4–10 times as long as broad; they often show annular, discoid, or genicular enlargements at the nodes. The branches sometimes taper a little towards the extremities, but the segments are commonly of a nearly uniform diameter throughout the plant. (Phyc. Bor.-Am. *2198* and *2199*). The name of the present species goes back to *Corallina fragilissima* L. (Syst. Nat. 1: 806. 1758—ed. 10), which is based essentially on a Jamaican plant figured by Hans Sloane (Hist. Jam. *pl. 20. f. 5*)—a plant, that, so far as may be judged from the description and figure, might as well be a condition of *Corallina rubens*. Gmelin (Syst. Nat. 1: 3840. 1788) modified and probably changed completely the Linnaean conception of the species, substituting another description and figure of Sloane's for those cited by Linnaeus, and this modified conception of the species is the one that has been adopted by Lamouroux and subsequent writers. The genus *Amphiroa* is probably represented in Bermuda by two or three species, but their delimitation and correct naming, as is also true of the species of *Corallina*, awaits a more critical study of their comparative anatomy and of the pertinent historic types.

Corallina rubens L. is a name in current use for a delicate, jointed, dichotomo-fastigiate plant that forms dense pale red tufts or mats ½–1½ inches high on rocks or on stalks of *Sargassum* near the low-water mark. The segments are terete throughout or slightly flattened under the dichotomies, $\frac{1}{24}$–$\frac{1}{14}$ of a line in diameter, mostly 3–5 times as long as broad, the apical often taper-pointed. The rather infrequent terminal conceptacles are somewhat flattened urn-shaped, the shoulders often produced into a pair of horn-like or antenna-like branches. (Phyc. Bor.-Am. *2200*.)

Corallina pumila (Lamour.) Kütz. is a name that has been adopted by Collins for a minute coralline that forms tufts a little more than a line high

on the fronds of *Zonaria zonalis* along the South Shore (Phyc. Bor.-Am. *1950*). Its filaments are only 2 or 3 times dichotomous and 5–7 segments long. Its segments are 3–4 times as long as broad and have about the same diameter as those of *C. rubens*. The abundant conceptacles vary in form from turbinate and flattened urn-shaped to fusiform-clavate and are $\frac{1}{10}$–$\frac{3}{4}$ of a line long. The type of the species grew on *Turbinaria* in the Red Sea.

Sub-class **BACILLARIEAE (DIATOMEAE).**

This sharply defined group of minute organisms is of uncertain affinities. By some writers it is included under the class Algae; by others, it is excluded. If included, it is here treated in a rather unnatural sequence. However, a few words in regard to the group may be here appended.

The Diatoms are microscopic one-celled organisms that contain in addition to chlorophyl a brown pigment related to that found in the Phaeophyceae, though not identical with it. The enclosing wall consists of two separable nearly equal parts, the valves, one of which fits closely inside the other. The wall is permeated with silica, which renders the valves almost imperishable, so that the Diatoms are abundantly preserved as fossils. In most Diatoms the wall is regularly and beautifully marked with pits, meshes, ridges, and furrows of various degrees of delicacy. The Diatoms are very widely distributed, inhabiting salt, fresh, and brackish water, and moist spots on the dry land. They may float free at the surface, lie more or less free at the bottom, or may be attached to the larger algae or other aquatic objects. Some species are solitary in habit of life; others are associated in colonies, which may be ribbon-like, thread-like, or zigzag, or may sometimes form branching gelatinous filaments imitating an *Ectocarpus* or other filamentous brown algae. Many of the free-living forms have the power of slow, irregular, spontaneous locomotion when in contact with a solid substratum.

The Diatoms are, as remarked, siliceous organisms and they do not appear to be particularly abundant in calcareous seas like that washing the shores of Bermuda. However, they seem to have been little collected and studied in this region. So far as known to the writer, only sixteen species of Diatoms have been attributed to Bermuda. Most of these are listed in the papers cited in the Bibliography under O'Meara and Castracane. The type of *Navicula Janischii* Castr., now considered a form of *Dictyoneis marginata* (Lewis) Cleve, was from Bermuda.

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Stirton, James. Remarks on Mr. Crombie's Paper on the Challenger Lichens. (Journ. Linn. Soc. **17**: 154, 155. 1878.)

Verrill, A. E. The Bermuda Islands. (8vo, pp. x + 548. New Haven, 1902.)
Contains much botanical information.

Verrill, A. E. The Bermuda Islands: their Scenery, Physiography, Natural History and Geology; with Sketches of their early History and the Changes due to Man. (Proc. Conn. Acad. Arts & Sci. 11^2: 1–956. 1901–2.)
Contains much botanical information.

PRINCIPAL BOTANICAL COLLECTIONS MADE IN BERMUDA.

1. **Dickenson, J.** The oldest botanical specimens collected in Bermuda are those of John Dickenson, obtained about 1699, and preserved in the Sloane collection in the herbarium of the British Museum of Natural History, representing 12 species.

2. **Lane, A. W.** A collection of somewhat over 100 species was made by Lane prior to 1845, and is preserved in the herbarium of the Royal Gardens at Kew.

3. **Holton, I. F.** Holton, who collected extensively in Colombia and elsewhere in tropical America, touched at Bermuda in 1854 and collected some botanical specimens, which are preserved in the Torrey Herbarium of Columbia University and in the Kew Herbarium.

4. **Kemp, A. F.** As a student of algae, Kemp visited Bermuda in 1856 and made considerable collections, which are preserved in his private herbarium, which is still in the possession of his family.

5. **Jones, J. M.** As an all around naturalist, Jones made zoological collections in Bermuda prior to 1859, and subsequently established a museum for these and his other collections at Halifax. Although an author of three somewhat extensive papers on the Botany, I have not been able to ascertain if his collections are preserved. They are not now in the Provincial Museum of Halifax. It is possible that he made no botanical collections.

6. **Rein, J. J.** Rein was a tutor of the son of Governor Ord in Bermuda during at least parts of the period between 1861 and 1863, at which time he made a considerable collection, both of land plants and of algae; the specimens of land plants collected by him are preserved in the University of Goettingen and a set of duplicates at the Berlin Botanical Museum. His collections of algae are preserved in the herbarium of the Senckenberg Society at Frankfurt, Germany, and there is a set of them in the Dublin Botanical Garden and some in the Berlin Botanical Museum.

7. **Moseley, H. N.** Serving as naturalist of the Challenger Expedition, 1872–1876, Moseley collected extensively in Bermuda in 1873; his specimens are to be found in the Kew Herbarium and in the herbarium of the British Museum of Natural History.

8. **Lefroy, J. H.** During the period between 1871 and 1877, Lefroy was Governor of Bermuda; he made large botanical collections, most of which are preserved in the Kew Herbarium, and there are some of his specimens in the Gray Herbarium of Harvard University.

9. **Reade, O. A.** Reade was pharmacist at the Naval Hospital about the year 1880, and made botanical collections; a few of his specimens are to be found in the Kew Herbarium and a few of his ferns are in the Underwood Fern Herbarium of the New York Botanical Garden; presumably his collections were extensive, as his "Plants of Bermuda," published in 1883, is hitherto the only descriptive flora of the islands printed; I have been unable to ascertain if his own herbarium still exists.

10. **Farlow, W. G.** Extensive collections, mostly of cryptogams, were made in Bermuda by Farlow in the years 1880 and 1881, and these are preserved in the Cryptogamic Herbarium of Harvard University, and some duplicates are in the herbarium of the New York Botanical Garden.

11. **Kemp, J. F.** Especially interested in geology, Kemp visited Bermuda in 1885, and made a botanical collection of 50 species, preserved in the herbarium of Columbia University.

12. **Gilbert, B. D.** A diligent student of ferns, Gilbert collected these plants particularly in Bermuda, in the year 1898; a set of them is preserved in the Underwood Fern Herbarium of the New York Botanical Garden, and others in the United States National Museum and in the Gray Herbarium.

13. **Millspaugh, C. F.** Accompanying a West Indian voyage of the yacht "Utowana," in the winter of 1898–99, Millspaugh touched at Bermuda and made a botanical collection, which is preserved in the herbarium of the Field Museum of Natural History; a few duplicates are in the herbarium of the New York Botanical Garden.

14. **Richards, H. M.** In the winter of 1898 Richards made collections of algae and other plants, preserved at Barnard College, and at other institutions.

15. **Small, H. B.** A resident of Bermuda for many years, and author of several documents on its flora, Small informed me in 1913 that he

made a collection of several hundred specimens prior to 1900, which was sent to England.

16. **Howe, M. A.** For the special purpose of collecting and studying algae, Howe visited Bermuda in the summer of 1900; he obtained rich collections of these plants and also many land cryptogams; a complete series is preserved in the herbarium of the New York Botanical Garden and some duplicates have been sent to students at other institutions.

17. **Moore, A. H.** Moore visited Bermuda in the summer of 1905, and collected specimens of several hundred species, which were added to his own herbarium; there is a partial set in the Gray Herbarium; a few duplicates were sent to the New York Botanical Garden.

18. **Brown, S., and Britton, N. L.** Through cooperation of the Academy of Natural Sciences of Philadelphia and the New York Botanical Garden, aided by officials of the Bermuda Agricultural Station, collection and study of the Bermuda flora were taken up in 1905, and continued at intervals up to 1913. Mrs. Britton was a member of the expedition of 1905 and of one in the summer of 1912. Brown made collections alone during the winter of 1908 and in the spring of 1909. During a second trip made in 1912, F. J. Seaver was a member and made extensive collections of fungi; during the trip of 1913, Peter Bisset, of the United States Department of Agriculture, aided in the field work. The collections made have been divided between the New York Botanical Garden and the Academy of Natural Sciences of Philadelphia; partial duplicate sets have been sent to the United States National Museum, to the Bermuda Agricultural Station, to the Gray Herbarium of Harvard University, to the Missouri Botanical Garden, to the Royal Gardens at Kew, and to the herbarium of the Field Museum of Natural History and a few specimens to other institutions.

19. **Marble, Delia W.** In 1909, Miss Marble made collections from March to May, and her specimens of 85 species are preserved in the herbarium of the New York Botanical Garden; a few duplicates have been sent to other institutions.

20. **Harris, T. J.** During 1905 and subsequent years, while serving as Superintendent of the Agricultural Station, Harris collected many botanical specimens, which form a part of the herbarium of the Station, and duplicates were sent to the New York Botanical Garden.

21. **Flynn, Nellie F.** Mrs. Flynn, Treasurer of the Vermont Botanical Club, made a collection of botanical specimens in the spring of 1910, which is part of her private herbarium; a partial set of duplicates is preserved in the herbarium of the New York Botanical Garden.

22. **Dodge, B. O.** For mycological studies, Dodge visited Bermuda in the summer of 1911, accompanied by his wife; they obtained specimens of about 40 species of fungi, which are preserved in the herbaria of Columbia University and the New York Botanical Garden.

23. **Stevens, Miss M.** The herbarium of the Bermuda Agricultural Station contains a collection of plants made by Miss M. Stevens in the spring of 1913.

24. **Collins, F. S., and Hervey, A. B.** During recent years, both Collins and Hervey have spent much time in collecting and studying Bermuda plants, more especially the algae, complete collections of which are preserved in their herbaria, and there is a nearly complete set in the herbarium of the New York Botanical Garden; the land plants collected by Collins are preserved at the Gray Herbarium of Harvard University, with a nearly complete set at the New York Botanical Garden.

25. **Wortley, E. J.** During recent years, while serving as Director of Agriculture, Wortley has collected botanical specimens, preserved in the herbarium of the Agricultural Station and at the New York Botanical Garden.

GLOSSARY OF SPECIAL TERMS.

Acaulescent. With stem subterranean, or nearly so.

Accumbent. Cotyledons with margins folded against the hypocotyl.

Achene. A dry one-seeded indehiscent fruit with the pericarp tightly fitting around the seed.

Acicular. Needle-shaped.

Acuminate. Gradually tapering to the apex.

Acute. Sharp-pointed.

Adnate. An organ adhering to a contiguous differing one; an anther attached longitudinally to the end of the filament.

Adventive. Not indigenous, but apparently becoming naturalized.

Albumen. See *Endosperm.*

Alliaceous. Onion-like, in aspect or odor.

Alopecuroid. Resembling a foxtail.

Alternate. Not opposite; with a single leaf at each node.

Alveolate. Like honeycomb; closely pitted.

Ament. A spike of imperfect flowers subtended by scarious bracts, as in the willows.

Amphibious. At times inhabiting the water.

Amphitropous. Term applied to the partly inverted ovule.

Amplexicaul. Clasping the stem, or other axis.

Anastomosing. Connecting so as to form a well-defined network.

Anatropous. Applied to an inverted ovule with the micropyle very near the hilum.

Androgynous. Flower-clusters having staminate and pistillate flowers.

Angiospermous. Pertaining to the Angiospermae; bearing seeds within a pericarp.

Annulate. Ring-shaped or showing rings.

Anther. The part of the stamen which contains the pollen.

Antherid (*Antheridium*). The male organ of reproduction in Pteridophyta, Bryophyta and certain Fungi and Algae.

Anthesis. Period of flowering.

Apetalous. Without a corolla.

Apical. At the top, or referring to the top.

Apiculate. With a minute pointed tip.

Aplanospore. A non-motile and non-sexual cell, formed endogenously or by rejuvenescence and set free for propagation.

Apothecium (*Apothecia*). The disk-shaped organ bearing spore-sacs in some lichens.

Appressed. Lying against another organ.

Arborescent. Tree-like, in size or shape.

Archegone. The female reproductive organ in Pteridophyta and Bryophyta.

Areolate. Reticulated.

Areolation. The system of meshes in a network of veins.

Areole. A mesh in a network of veins.

Aril. A fleshy organ growing about the hilum.

Arillate. Provided with an aril.

Aristate. Tipped by an awn or bristle.

Aristulate. Diminutive of aristate.

Ascending. Growing obliquely upward, or upcurved.

Ascus (*Asci*). A sac containing spores.

Asexual. Without sex.

Assurgent. See *Ascending.*

Auricled (*Auriculate*). With basal, ear-like lobes.

Auxillary cell. A specialized cell, in certain Red Algae, in which a fertilized egg or one of its descendant nuclei finds lodgment and develops into a cystocarp.

Awn. A slender bristle-like organ.

Axil. The point on a stem immediately above the base of a leaf.

Axile. In the axis of an organ.

Axillary. Borne at, or pertaining to, an axil.

Baccate. Berry-like.

Barbellate. Furnished with minute barbs.
Basifixed. Attached by the base.
Berry. A fruit with pericarp wholly pulpy.
Bilabiate. With two lips.
Bipinnate. Twice pinnate.
Bipinnatifid. Twice pinnatifid.
Blade. The flat expanded part of a leaf or a petal.
Bract. A leaf, usually small, subtending a flower or flower-cluster, or a sporange.
Bracteate. With bracts.
Bracteolate. Having bractlets.
Bractlet. A secondary bract, borne on a pedicel, or immediately beneath a flower; sometimes applied to minute bracts.
Bulb. A bud with fleshy scales, usually subterranean.
Bulblet. A small bulb, especially those borne on leaves, or in their axils.
Bulbous. Similar to a bulb; bearing bulbs.
Caducous. Falling away very soon after development.
Caespitose. Growing in tufts.
Calcified. Coated or permeated with lime.
Callosity. A small, hard protuberance.
Callus. An extension of the inner scale of a grass spikelet; a protuberance.
Calyx. The outer of two series of floral leaves.
Campanulate. Bell-shaped.
Campylotropous. Term applied to the curved ovule.
Cancellate. Reticulated, with the meshes sunken.
Canescent. With gray or hoary fine pubescence.
Canaliculate. Channelled; longitudinally grooved.
Capitate. Arranged in a head; knob-like.
Capsular. Pertaining to or like a capsule.
Capsule. A dry fruit of two carpels or more, usually dehiscent by valves or teeth.
Carinate. Keeled; with a longitudinal ridge.
Carpel. The modified leaf forming the ovary, or a part of a compound ovary.
Caruncle. An appendage to a seed at the hilum.
Carunculate. With a caruncle.
Caryopsis. The grain; fruit of grasses, with a thin pericarp adherent to the seed.
Caudate. With a slender tail-like appendage.
Caudex. The persistent base of perennial herbs, usually only the part above ground.
Caudicle. Stalk of a pollen-mass in the Orchid and Milkweed families.
Cauline. Pertaining to the stem.
Cell. A cavity, of an anther or ovary; a microscopic protoplasmic unit.
Cespitose. (See *Caespitose.*)
Chaff. Thin dry scales.
Chalaza. The base of the ovule.
Chartaceous. Papery in texture.
Chlorophyll. Green coloring matter of plants.
Chlorophyllous. Containing chlorophyll.
Chromatophore. A specialized color-bearing protoplasmic body.
Ciliate. Provided with marginal hairs.
Ciliolate. Minutely ciliate.
Cilium. A hair.
Cinereous. Ashy; ashy-colored.
Circinnate. Coiled downward from the apex.
Circumscissile. Transversely dehiscent, the top falling away as a lid.
Clavate. Club-shaped.
Cleistogamous. Flowers which do not open, but are pollinated from their own anthers.
Cleft. Cut about halfway to the mid-vein.
Clinandrium. Cavity between the anther-sacs in orchids.
Cochleate. Like a snail shell.
Coma. Tuft of hairs at the ends of some seeds.
Commissure. The contiguous surfaces of two carpels.
Conceptacle. A cavity containing reproductive cells and opening outwards.
Conduplicate. Folded lengthwise.
Confluent. Blended together.
Connate. Similar organs more or less united.

Connective. The end of the filament, between the anther-sacs.
Connivent. Converging.
Convolute. Rolled around or rolled up longitudinally.
Coralloid. Resembling coral.
Cordate. Heart-shaped.
Coriaceous. Leathery in texture.
Corm. A swollen, fleshy base of a stem.
Corolla. The inner of two series of floral leaves.
Corona; Crown. An appendage of the corolla; a crown-like margin at the top of an organ.
Coroniform. Crown-like.
Cortex. The bark, rind, or superficial layer of tissue.
Cortical. Pertaining to the cortex.
Corymb. A convex or flat-topped flower-cluster of the racemose type, with pedicels of rays arising from different points on the axis.
Corymbose. Borne in corymbs; corymb-like.
Costate. Ribbed.
Cotyledon. A rudimentary leaf of the embryo.
Crenate. Scalloped; with rounded teeth.
Crenulate. Diminutive of crenate.
Crustaceous. Crustose. Hard and brittle; crust-like.
Cryptostoma. A small superficial pit, bearing hairs or paraphyses, in certain Algae.
Cucullate. Hooded, or resembling a hood.
Culm. The stem of grasses and sedges.
Cuneate. Wedge-shaped.
Cusp. A sharp stiff point.
Cuspidate. Sharp-pointed; ending in a cusp.
Cyme. A convex or flat flower-cluster of the determinate type, the central flowers first unfolding.
Cymose. Arranged in cymes; cyme-like.
Cystocarp. A multicellular spore-bearing body of sexual origin, in the Red Algae.
Deciduous. Falling away at the close of the growing period.
Decompound. More than once divided.
Decumbent. Stems or branches in an inclined position, but the end ascending.
Decurrent. Applied to the prolongation of an organ, or part of an organ running along the sides of another.
Decussate. In alternating pairs, crossing at right angles.
Deflexed. Turned abruptly downward.
Dehiscence. The opening of an ovary, anther-sac or sporange to emit the contents.
Dehiscent. Opening to emit the contents.
Deltoid. Broadly triangular, like the Greek letter delta.
Dentate. Toothed, especially with outwardly projecting teeth.
Denticulate. Diminutive of dentate.
Depauperate. Impoverished, small.
Depressed. Vertically flattened.
Dextrorse. Spirally ascending to the right.
Diadelphous. Stamens united into two sets.
Diandrous. Having two stamens.
Dichotomous. Forking regularly into two nearly equal branches or segments.
Dicotyledonous. With two cotyledons.
Didymous. Twin-like; of two nearly equal segments.
Diffuse. Loosely spreading.
Digitate. Diverging, like the fingers spread.
Dimorphous. Of two forms.
Dioecious. Bearing staminate flowers or antherids on one plant, and pistillate flowers or archegones on another of the same species.
Dioicous. (See *Dioecious.*)
Discoid. Heads of Compositae composed only of tubular flowers; rayless; like a disk.
Disk. An enlargement or prolongation of the receptacle of a flower around the base of the pistil; the head of tubular flowers in Compositae.
Dissected. Divided into many segments or lobes.
Dissepiment. A partition-wall of an ovary or fruit.

Distal. Pertaining to the outer or apical part or part away from point of attachment.
Distichous. Arranged in two rows.
Distinct. Separate from each other; evident.
Divaricate. Diverging at a wide angle.
Divided. Cleft to the base or to the mid-nerve.
Dorsal. On the back, pertaining to the back.
Drupaceous. Drupe-like.
Drupe. A simple fruit, usually indehiscent, with fleshy exocarp and bony endocarp.
Drupelet. Diminutive of drupe.
Echinate. Prickly.
Ellipsoid. A solid body, elliptic in section.
Elliptic. With the outline of an ellipse; oval.
Emarginate. Notched at the apex.
Embryo. A rudimentary plant in the seed.
Embryo-sac. The macrospore of the flowering plants, contained in the ovule.
Endemic. Growing naturally only within a definite geographic area.
Endocarp. The inner layer of the pericarp.
Endogenous. Forming new tissue within.
Endosperm. The substance surrounding the embryo of a seed; albumen.
Ensiform. Shaped like a broadsword.
Entire. Without divisions, lobes, or teeth.
Ephemeral. Continuing for only a day or less.
Epigynous. Adnate to or borne on the upper part of the ovary.
Epiphytic. Growing on other plants, but not parasitic.
Equitant. Folded around each other; straddling.
Erose. Irregularly margined, as if gnawed.
Evanescent. Early disappearing.
Evergreen. Bearing green leaves throughout the year.
Excurrent. With a tip projecting beyond the main part of the organ.
Exfoliating. Peeling off in layers.
Exocarp. The outer layer of the pericarp.
Exogenous. Forming new tissue outside the older.
Exserted. Prolonged past surrounding organs.
Exstipulate. Without stipules.
Extrorse. Facing upward.
Falcate. Scythe-shaped.
Farinaceous. Starchy, or containing starch.
Fascicle. A dense cluster.
Fascicled. Borne in dense clusters.
Fastigiate. Stems or branches which are nearly erect and close together.
Fenestrate. With window-like markings.
Fertile. Bearing spores, or bearing seed.
Fertilization. The mingling of the contents of a male and female cell.
Ferruginous. Color of iron-rust.
Fetid. Ill-smelling.
Fibrillose. With fibres or fibre-like organs.
Filament. The stalk of an anther, the two forming the stamen; any thread-like structure.
Filamentous. Composed of thread-like structures; thread-like.
Filiform. Thread-like.
Fimbriate. With fringed edges.
Fimbrillate. Minutely fringed.
Fistular. Hollow and cylindric.
Flabellate. Fan-shaped, or arranged like the sticks of a fan.
Flaccid. Lax; weak.
Flexuous. Alternately bent in different directions.
Floccose. With loose tufts of wool-like hairs.
Foliaceous. Similar to leaves.
Foliolate. With separate leaflets.
Foliose. Leaf-like.
Follicle. A simple fruit dehiscent along one suture.
Follicular. Similar to a follicle.
Forcipate. Forking and connivent, like a pair of forceps.
Foveate. Foveolate. More or less pitted.
Free. Separate from other organs; not adnate.
Frond. The leaves of ferns.
Frutescent. Fruticose. More or less shrub-like.
Fugacious. Falling soon after development.

Fugitive. Plants not native, but occurring here and there, without direct evidence of becoming established.

Funicuus. The stalk of an ovule or seed.

Fuscous. Dusky, grayish brown.

Fusiform. Spindle-shaped.

Galea. A hood-like part of a perianth or corolla.

Galeate. With a galea.

Gametangium. A gamete-bearing organ.

Gamete. A unisexual protoplasmic body, commonly microscopic.

Gametophyte. The sexual generation of plants.

Gamopetalous. With petals more or less united.

Gemma. A bud-like propagative organ.

Gibbous. Enlarged or swollen on one side.

Glabrate. Nearly without hairs.

Glabrous. Devoid of hairs.

Gladiate. Like a sword-blade.

Gland. A secreting cell, or group of cells.

Glandular. With glands, or gland-like.

Glaucous. Covered with a fine bluish or white bloom; bluish-hoary.

Globose. Spherical or nearly so.

Glomerate. In a compact cluster.

Glomerule. A dense capitate cyme.

Glumaceous. Resembling glumes.

Glume. The scaly bracts of the spikelets of grasses and sedges.

Granulose. Composed of grains.

Gregarious. Growing in groups or colonies.

Gynobase. A prolongation or enlargement of the receptacle supporting the ovary.

Habit. General aspect.

Habitat. A plant's natural place of growth.

Hastate. Halberd-shaped; like sagittate; but with the basal lobes diverging.

Haustoria. The specialized roots of parasites.

Head. A dense round cluster of sessile or nearly sessile flowers.

Herbaceous. Leaf-like in texture and color, pertaining to an herb.

Heterocyst. An enlarged, commonly inert, often yellowish cell, in certain filamentous Algae.

Hilum. The scar or area of attachment of a seed or ovule.

Hirsute. With rather coarse stiff hairs.

Hispid. With bristly stiff hairs.

Hispidulous. Diminutive of hispid.

Hyaline. Thin and translucent.

Hypocotyl. The rudimentary stem of the embryo; also termed *radicle.*

Hypogynium. Organ supporting the ovary in some sedges.

Hypogynous. Borne at the base of the ovary, or below.

Imbricated. Overlapping.

Imperfect. Flowers with either stamens or pistils, not with both.

Incised. Cut into sharp lobes.

Included. Not projecting beyond surrounding parts.

Incumbent. With the back against the hypocotyl.

Indehiscent. Not opening.

Indusium. The membrane covering a sorus.

Inequilateral. Unequal-sided.

Inferior. Relating to an organ which arises or is situated below another.

Inflexed. Abruptly bent inward.

Inflorescence. The flowering part of plants; its mode of arrangement.

Integument. A coat or protecting layer.

Internode. Portion of a stem or branch between two successive nodes.

Introrse. Facing inward.

Involucel. A secondary involucre.

Involucrate. With an involucre, or like one.

Involucre. A whorl of bracts subtending a flower or flower-cluster.

Involute. Rolled inwardly.

Irregular. A flower in which one or more of the organs of the same series are unlike the others.

Isidiose. Lichenological term for wart-like excrescences.

Labiate. Provided with a lip-like organ; belonging to the family Labiatae.

Laciniate. Cut into narrow lobes or segments.

Lacunose. Showing perforations or depressions.

Lamina. The blade of a leaf, a leaf-like expansion, or a layer.
Lanceolate. Considerably longer than broad, tapering upward from the middle or below; lance-shaped.
Latex. The milky sap of certain plants.
Leaflet. One of the divisions of a compound leaf.
Legume. A simple dry fruit dehiscent along both sutures.
Lenticular. Lens-shaped.
Ligulate. Provided with or resembling a ligule.
Ligule. A strap-shaped organ, as the rays in Compositae.
Limb. The expanded part of a petal, sepal, or gamopetalous corolla.
Linear. Elongated and narrow with sides nearly parallel.
Lineolate. With fine or obscure lines.
Lobed. Divided to about the middle.
Lobule. A small lobe.
Loment. A jointed legume, usually constricted between the seeds.
Loculicidal. Applied to capsules which split longitudinally.
Lodicules. Minute hyaline scales subtending the flower in grasses.
Lunate. Crescent-shaped.
Lyrate. Pinnatifid, with the terminal lobe or segment considerably larger than the others.
Macrosporange. Sporange containing macrospores.
Macrospore. The larger of two kinds of spores borne by a plant, usually giving rise to a female prothallium.
Mammillate. Having breast-shaped or teat-like processes.
Marcescent. Withering but remaining attached.
Medulla. The pith, the axillary or middle tissue.
Medullary. Pertaining to the pith or medulla.
Mericarp. One of the carpels of the Umbelliferae.
Mesocarp. The middle layer of a pericarp.
Micropyle. Orifice of the ovule, and corresponding point on the seed.
Microsporange. Sporange containing microspores.
Microspore. The smaller of two kinds of spores borne by a plant, usually giving rise to a male prothallium; pollen-grain.
Midvein (*Midrib*). The central vein or rib of a leaf or other organ.
Monadelphous. Stamens united by their filaments.
Moniliform. Like a string of beads.
Monoecious. Bearing stamens and pistils on the same plant, but in different flowers.
Monoicous. (See *Monoecious.*)
Monosiphonous. Of a single series of cells, end to end.
Monstrous. Unusual or deformed.
Mucronate. With a short sharp abrupt tip.
Mucronulate. Diminutive of mucronate.
Muricate. Roughened with short hard processes.
Muriform. Like bricks in a wall.
Muticous. Pointless, or blunt.
Mycelium. The vegetative part of a fungus.
Naked. Lacking organs or parts which are normally present in related species or genera.
Naturalized. Plants not indigenous to the region, but so firmly established as to have become part of the flora.
Nectary. A sugar-secreting organ.
Nemathecium. A wart-like elevation, in certain Algae, containing tetraspores or other reproductive cells.
Nitent. Shining, polished, glistening.
Node. The junction of two internodes of a stem or branch, often hard or swollen, at which a leaf or leaves are usually borne.
Nodose. Similar to nodes or joints; knotty.
Nodulose. Diminutive of nodose.
Nut. An indehiscent one-seeded fruit with a hard or bony pericarp.
Nutlet. Diminutive of nut.
Obcordate. Inversely heart-shaped.
Oblanceolate. Inverse of lanceolate.
Oblong. Longer than broad, with the sides nearly parallel, or somewhat curving.
Obovate. Inversely ovate.
Obovoid. Inversely ovoid.
Obsolete. Not evident; gone, rudimentary, or vestigial.
Obtuse. Blunt, or rounded.
Ochreae. The sheathing united stipules of Polygonaceae.
Ochreolae. The ochreae subtending flowers in the Polygonaceae.

Ochroleucous. Yellowish white.
Olivaceous. Olive-green.
Oösphere. The cell of the archegone which is fertilized by spermatozoids.
Operculate. With an operculum.
Operculum. A lid.
Orbicular. Approximately circular in outline.
Orthotropous. Term applied to the straight ovule, having the hilum at one end and the micropyle at the other.
Ostiole. A little orifice.
Ovary. The ovule-bearing part of the pistil.
Ovate. In outline like a longitudinal section of a hen's egg.
Ovoid. Shaped like a hen's egg.
Ovule. The macrosporange of flowering plants, becoming the seed on maturing.
Palate. The projection from the lower lip of two-lipped personate corollas.
Palet. A bract-like organ enclosing or subtending the flower in grasses.
Palmate. Diverging radiately like the fingers.
Panicle. A compound flower-cluster of the racemose type, or cluster of sporanges.
Paniculate. Borne in panicles or resembling a panicle.
Papilionaceous. Term applied to the irregular flower of the Pea Family.
Papillose. With minute blunt projections.
Pappus. The bristles, awns, teeth, etc., surmounting the achene in the Chicory and Thistle Families.
Parasitic. Growing upon other plants and absorbing their juices.
Parietal. Borne along the wall of the ovary, or pertaining to it.
Parted. Deeply cleft.
Patent. Spreading, open.
Pectinate. Comb-like.
Pedicel. The stalk of a flower in a flower-cluster, or of a sporange.
Peduncle. Stalk of a flower, or a flower-cluster, or a sporocarp.
Pedunculate. With a peduncle.
Peltate. Shield-shaped; a flat organ with a stalk on its lower surface.
Penicillate. With a tuft of hairs or hair-like branches.
Perfect. Flowers with both stamens and pistils.
Perfoliate. Leaves so clasping the stem as to appear as if pierced by it.
Perianth. The modified floral leaves (sepals or petals), regarded collectively.
Pericarp. The wall of the fruit, or seed-vessel.
Pericentral. Surrounding the central axis.
Perigynium. The utricle enclosing the ovary or achene in the genus *Carex*.
Perigynous. Borne on the perianth, around the ovary.
Peripheral. Pertaining to the periphery.
Perithecium (*Perithecia*). An organ containing spore-sacs.
Persistent. Organs remaining attached to those bearing them after the growing period.
Petal. One of the leaves of the corolla.
Petaloid. Similar to petals; petal-like.
Petiolate. With a petiole.
Petiolule. The stalk of a leaflet.
Petiole. The stalk of the leaf.
Phyllode. A bladeless petiole or rachis.
Pilose. With long soft hairs.
Pinna. A primary division of a pinnately compound leaf.
Pinnate. Leaves divided into leaflets or segments along a common axis.
Pinnatifid. Pinnately cleft to the middle or beyond.
Pinnule. A division of a pinna.
Pistil. The central organ of a flower containing the macrosporanges (ovules).
Pistillate. With pistils; and usually employed in the sense of without stamens.
Placenta. An ovule-bearing surface.
Plicate. Folded into plaits, like a fan.
Plumose. Resembling a plume or feather.
Plumule. The rudimentary terminal bud of the embryo.
Plurilocular. Having many cells or compartments.
Podetium (*Podetia*). Stalk-like organs in certain lichens.

Pollen. Pollen-grain. See *Microspore.*

Pollinia. The pollen-masses of the Orchid and Milkweed Families.

Polygamous. Bearing both perfect and imperfect flowers.

Polypetalous. With separate petals.

Polysiphonous. Consisting of bundles of parallel cells.

Polysporangium. A sporangium containing many spores.

Pome. The fleshy fruit of the Apple Family.

Procarp. The female reproductive organ of the Red Algae.

Procumbent. Trailing or lying on the ground.

Proliferous. Producing offshoots.

Prophylla. Bractlets.

Prothallium. The sexual generation of Pteridophyta.

Proximal. Pertaining to the inner or basal part, or the part near the point of attachment.

Pseudoparenchyma. A compact tissue, in Fungi and Algae, formed by closely interlaced or united filaments.

Puberulent. With very short hairs.

Pubescent. With hairs.

Punctate. With translucent dots or pits.

Pungent. With a sharp stiff tip.

Pyriform. Pear-shaped.

Raceme. An elongated determinate flower-cluster with each flower pedicelled.

Racemose. In racemes, or resembling a raceme.

Rachilla. The axis of the spikelet in grasses.

Rachis. The axis of a compound leaf, or of a spike or raceme.

Radiant. With the marginal flowers enlarged and ray-like.

Radiate. With ray-flowers; radiating.

Radicle. The rudimentary stem of the embryo; hypocotyl.

Radicular. Pertaining to the radicle or hypocotyl.

Ramulose. Having many small branches.

Ramulus. A little branch or a branchlet of the ultimate order.

Raphe (*Rhaphe*). The ridge connecting the hilum and chalaza of an anatropous or amphitropous ovule; the ridge on the sporocarp of *Marsilea.*

Ray. One of the peduncles or branches of an umbel; the flat marginal flowers in Compositae.

Receptacle. The end of the flower stalk, bearing the floral organs; or, in Compositae, bearing the flowers; also, in some ferns, an axis bearing sporanges.

Recurved. Curved backward.

Reflexed. Bent backward abruptly.

Regular. Having the members of each part alike in size and shape.

Reniform. Kidney-shaped.

Repand. With a somewhat wavy margin.

Reticulate. Arranged as a network.

Retrorse. Turned backward or downward.

Retuse. With a shallow notch at the end.

Revolute. Rolled backward.

Rhachis. See *Rachis.*

Rhizoid. A root-like filament in the lower plants.

Rhizome. See *Rootstock.*

Rootstock. A subterranean stem, or part of one.

Ringent. The gaping mouth of a two-lipped corolla.

Rostellum. Beak of the style in Orchids.

Rostrate. With a beak.

Rosulate. Like a rosette.

Rotate. With a flat round corolla-limb.

Rugose. Wrinkled.

Runcinate. Sharply pinnatifid, or incised, the lobes or segments turned backward.

Sac. A pouch, especially the cavities of anthers.

Saccate. With a pouch or sac.

Sagittate. Like an arrow-head, with the lobes turned downward.

Samara. A simple indehiscent winged fruit.

Saprophyte. A plant which grows on dead organic matter.

Scabrous. Rough.

Scale. A minute, rudimentary or vestigial leaf.

Scape. A leafless or nearly leafless stem or peduncle, arising from a subterranean part of a plant, bearing a flower or flower-cluster.

Scapose. Having scapes, or resembling a scape.
Scarious. Thin, dry, and translucent, not green.
Scorpioid. Coiled up in the bud, or in the beginning of growth, unrolling in expanding.
Secund. Borne along one side of an axis.
Segment. A division of a leaf or fruit.
Sepal. One of the leaves of a calyx.
Septate. Provided with partitions.
Septicidal. A capsule which splits longitudinally into and through its dissepiments.
Serrate. With teeth projecting forward.
Serrulate. Diminutive of serrate; serrate with small teeth.
Sessile. Without a stalk.
Setaceous. Bristle-like.
Setose. Bristly.
Silicle. A silique much longer than wide.
Silique. An elongated two-valved capsular fruit, with two parietal placentae, usually dehiscent.
Sinuate. With strongly wavy margins.
Sinuous. In form like the path of a snake.
Sinus. The space between the lobes of a leaf.
Siphon. One of the usually elongate cells occurring in bundles and forming the thallus or its axis in certain Red Algae.
Soralium (*Soralia*). Powder-like pustules in lichens.
Soredium (*Soredia*). In lichens, small clusters of algal and fungal cells.
Sorus (*Sori*). A group or cluster of sporanges; a heap of spores; a circumscribed superficial bed or matrix, including reproductive cells.
Spadiceous. Like or pertaining to a spadix.
Spadix. A fleshy spike of flowers.
Spathaceous. Resembling a spathe.
Spathe. A bract, usually more or less concave, subtending a spadix.
Spatulate. Shaped like a spatula; spoon-shaped.
Spermatozoids. Cells developed in the antherid, for the fertilization of the oösphere.
Spicate. Arranged in a spike; like a spike.
Spike. An elongated flower-cluster or cluster of sporanges, with sessile or nearly sessile flowers or sporanges.
Spikelet. Diminutive of spike; especially applied to flower-clusters of grasses and sedges.
Spinose. With spines, or similar to spines.
Spinule. A small sharp projection.
Spinulose. With small sharp processes or spines.
Sporange (*ium*). A sac containing spores.
Spore. An asexual propagative cell.
Sporocarp. Organ containing sporanges or sori; a few- or many-celled spore-bearing body of sexual origin.
Sporogenous. Generating or bearing spores.
Sporophyte. The asexual generation of plants.
Spreading. Diverging nearly at right angles; nearly prostrate.
Spur. A hollow projection from a floral organ.
Squarrose. With spreading or projecting parts.
Stamen. The organ of a flower which bears the microspores (pollen-grains).
Staminodium. A sterile stamen, or other organ in the position of a stamen.
Standard. The upper, usually broad, petal of a papilionaceous corolla.
Stellate. Star-like.
Sterigmata. The projections from twigs, bearing the leaves, in some genera of Pinaceae.
Sterile. Without spores, or without seed.
Stichidium. A specialized branch bearing tetrasporangia, in the Red Algae.
Stigma. The summit or side of the pistil to which pollen-grains become attached.
Stipe. The stalk of an organ.
Stipitate. Provided with a stipe.
Stipules. Appendages to the base of a petiole, often adnate to it.
Stipulate. With stipules.
Stolon. A basal branch rooting at the nodes.

Stoloniferous. Producing or bearing stolons.
Stoma (*Stomata*). The transpiring orifices in the epidermis of plants.
Strict. Straight and erect.
Strigose. With appressed or ascending stiff hairs.
Stroma.
Strophiole. An appendage to a seed at the hilum.
Strophiolate. With a strophiole.
Style. The narrow top of the ovary.
Stylopodium. The expanded base of a style.
Subacute. Somewhat acute.
Subcordate. Somewhat heart-shaped.
Subcoriaceous. Approaching leathery in texture.
Subfalcate. Somewhat scythe-shaped.
Subligneous. Somewhat woody in texture.
Subsessile. Nearly sessile.
Substratum. The substance on which a plant grows.
Subterete. Nearly terete.
Subulate. Awl-shaped.
Subversatile. Partly or imperfectly versatile.
Succulent. Soft and juicy.
Suffrutescent. Almost or somewhat shrubby.
Sulcate. Grooved longitudinally.
Superior. Applied to the ovary when free from the calyx; or to a calyx adnate to an ovary.
Suture. A line of splitting or opening.
Symmetrical. Applied to a flower with its parts of equal numbers.
Syncarp. A fleshy multiple or aggregate fruit.
Tendril. A slender coiling attachment organ.
Terete. Circular in cross section; cylindric.
Ternate. Divided into three segments, or arranged in threes.
Tetradynamous. With four long stamens and two shorter ones.
Tetrasporangium. A sporangium containing four spores.
Tetraspore. A spore formed by the division of the mother-cell into four parts.
Tetrastichous. Arranged in four ranks.
Thalline. Pertaining to a thallus.
Thallus. A plant body, usually flat, showing no differentiation into stem, leaves, and true roots.
Thyrsoid. Like a thyrsus.
Thyrsus. A compact panicle.
Tomentose. Covered with tomentum.
Tomentulose. Diminutive of tomentose.
Tomentum. Dense matted wool-like hairs.
Torsion. Twisting of an organ.
Tortuous. Twisted or bent.
Tracheae. The canals or ducts in woody tissue.
Tracheids. Wood-cells.
Triandrous. With three stamens.
Tricarpous. Composed of three carpels.
Trichogyne. The special receptive organ of a procarp.
Trimorphous. Flowers with stamens of three different lengths or kinds; in three forms.
Triquetrous. Three-sided, the sides channeled.
Truncate. Terminated by a nearly straight edge or surface.
Tuber. A thick short underground branch or part of a branch.
Tubercle. The persistent base of the style in some Cyperaceae; a small tuber.
Tuberculate. With rounded projections.
Turbinate. Top-shaped.
Uliginous. Inhabiting mud.
Umbel. A determinate, usually convex flower-cluster, with all the pedicels arising from the same point.
Umbellate. Borne in umbels; resembling an umbel.
Umbellet. A secondary umbel.
Umbelloid. Similar to an umbel.
Uncinate. Hooked, or in form like a hook.
Undulate. With wavy margins.
Unilocular. Having one cell or compartment.
Urceolate. Urn-shaped.
Utricle. A bladder-like organ; a one-seeded fruit with a loose pericarp; the sac-like end of one of the cortex-forming filaments of certain Algae.
Valvate. Meeting by the margins in the bud, not overlapping; dehiscent by valves.

Vascular. Relating to ducts or vessels.
Vein. One of the branches of the woody portion of leaves or other organs.
Veinlet. A branch of a vein.
Velum. A fold of the inner side of the leaf-base in *Isoetes.*
Velutinous. Velvety; with dense fine pubescence.
Venation. The arrangement of veins.
Ventral. Pertaining to the lower or inner side.
Vernation. The arrangement of leaves in the bud.
Verrucose. Warty or wart-like.
Versatile. An anther attached at or near its middle to the filament.
Verticil. See *Whorl.*
Verticillate. With three or more leaves or branches at a node; whorled.
Vesicle. A small bladder-like structure.
Vestigial. In the nature of a vestige or remnant.
Villous. With long soft hairs, not matted together.
Virgate. Wand-like.
Whorl. A group of three similar organs or more, radiating from a node; Verticil.
Whorled. See *Verticillate.*
Winged. With a thin expansion or expansions.

INDEX.

Phyla, Classes, Sub-classes, Orders and Families in SMALL CAPITALS.
Specific names and English names in roman.
Synonyms in *italic*.
Genera in **heavy** face.