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Marine Algae
of Dominica

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ABSTRACT

Taylor, Wm. Randolph and Charles F. Rhyne. Marine Algae of Dominica. *Smithsonian Contributions to Botany* 3:1-16. 1970—One hundred forty-one species of marine algae are reported from Dominica, W.I., with field notes. An ecological description of twelve collecting localities is given. A discussion of the differences between *Agardhiella tenera* (J. Agardh) Schmitz of the West Indies and New England is made which results in a new combination, *Agardhiella baileyi* (Harvey) W. R. Taylor, for the material from New England.

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Marine Algae of Dominica

Introduction

When he ceased work on his manual of eastern American tropical marine algae (1960), the present senior author was left unhappily aware of the general discontinuities of ranges recorded for the algae on all shores of the Caribbean. Only further detailed field studies could be expected to correct this. It has not appeared practicable at this time to begin with the most conspicuous deficiency, that of the marine flora of the large island of Cuba, nor to begin with the long Mexican and Central American mainland because of the magnitude of the task and the inaccessibility of much of the shoreline, but plans were made for studies in the Lesser Antilles and, with the important assistance of the National Science Foundation (Grant no. GB-3186), field and laboratory work has been carried on through 1966-1968.

In one instance particularly favorable facilities were available, for the Smithsonian Institution most graciously arranged for complete field support of a marine algal survey of Dominica, based on the station set up for the Bredin-Archbold-Smithsonian Biological Survey of Dominica at Clarke Hall on the Layou River. This justifies a more detailed report here than will be practicable for the other islands. Needless to say, we are most grateful to the sponsors of the Survey and the Institution. The Institution furthermore assigned as collaborator Mr. Charles F. Rhyne of its staff, to make advance arrangements, to work with the senior author during his visit, and to continue afterwards to collect in new areas. The senior author is much indebted to him; his contribution to the field work was important, and he has prepared the descriptions of the localities which follow. While Mr. Rhyne made many of his own determinations, the senior author has re-

viewed and is responsible for them all, and has prepared this report.

There seems to have been only one publication on the algae of Dominica, the short list published by Symington Grieve (1909) based on his collection and the identifications by E. M. Holmes. Insofar as possible, where the records seem questionable, they have been checked. By the kindness of the Regius Keeper, Dr. H. R. Fletcher, the Royal Botanic Garden of Edinburgh was able to lend most of the needed Grieve specimens, which enable several corrections to be made. A very few more species are attributed to the island in the senior author's general work (1960).

While little has been known respecting the algae of Dominica, the marine flora of the French islands nearby on the north has been substantially studied (Mazé and Schramm 1870-77, Hamel 1929, Hamel and Hamel-Joukov 1931, Feldman 1948, Questel 1951), but this has chiefly concerned Guadeloupe. Yet farther to the north another center of activity has involved the Virgin Islands, St. Bartholomew, and the Netherlands Antilles (Børgesen 1913-20, Questel 1942, Vroman 1968), but, though adjacent on the south, Martinique seems to have been rather neglected (Hamel *supra*, Taylor 1940), as have all the islands farther south except Barbados and Grenada.

Physiography and General Features of the Coast of Dominica

Dominica is a relatively small, very rugged island, approximately 48 km long and 20 km broad, with two mountain masses exceeding 1,400 m in height, and several other high ridges. Much of the shoreline is not easy of access. In general it was possible to sample each parish except those of St. Peter, St. Luke, and St. David, but that of St. John could only be visited near Portsmouth. Most of the stations were exposed: rocky or sandy, for well-protected sites in bays or

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within reefs, *Thalassia* or *Cymodocea* shoals, and mangrove-bordered shores were in short supply, and this limited considerably the variety of the flora to be expected. Nevertheless, we were able to collect again almost all the species previously reported, hardly 20 actually, and to add well over 100 additional names.

The major part of the island coast is dominated by black volcanic sand, generally interspersed with stretches of weathered rock cobbles and boulders of volcanic origin from a few inches to several feet in diameter. These long stretches, when of sloping black sand alone are decidedly inhospitable to algal attachment unless one ventures beyond into the shallow sublittoral zone where the bottom affords a relatively stable cobble substrate. This was found especially true along much of the leeward (Caribbean) side of the island. The windward (Atlantic) shore was generally bordered by precipitous cliffs, with large rock material in the intertidal and shallow sublittoral zones. Sand beaches were only observed on this shore on protected sides of headlands and embayments.

As stated by Hodge (1954) and observed by the authors, active fringing reefs were practically nonexistent except at two points, these being at Soufrière Bay, Scotts Head on the southwest coast and at Calibishie on the northern coast. In both places, white sand (pulverized coral fragments) was observed in conjunction with offshore coral reefs. The paucity of coral formation can certainly be attributed to the flushing action of the many rivers depositing silt (Hodge, 1954) and could also be attributed to the drop in salinity in areas adjacent to the mouths of larger rivers.

Substrate material brought back from the north (windward) coast yielded in many cases a coralline-coral conglomerate in the form of cobbles with the coral portion definitely in a moribund state. At Calibishie the reef area was apparently in a static state, larger fleshy algae having taken over much of the sublittoral zone.

Collecting Stations with Ecological Notes

1. St. Paul Parish, 2.4 km south of the Layou River mouth. 16 February 1967

Large cobbles and boulders covered the bottom from the middle intertidal zone out to about 2–4 m of water. Black volcanic sand forming a continuous strand along

the upper intertidal zone afforded no attachment at all for intertidal species. A very characteristic flora was observed and collections were made between the middle intertidal down to about one meter below low waterline. Moderate to large tufts of *Chaetomorpha nodosa* were dominant in the intertidal zone interspersed with small tufts of *Ectocarpus breviarticulatus* higher up on the cobbles. From the low watermark to 1–2 m below, *Grateloupia filicina* was prominent. Throughout the wave-washed area *Ralfsia* discolored the majority of cobbles and rocks, generally abundant in or near shaded crevices. Stubby immature plantlets of *Sargassum* were locally abundant in the lower intertidal areas.

2. St. Joseph Parish, about 400 m south of the Layou River mouth. 16 February 1967

This habitat displays a sloping black sand beach with scattered small cobbles from the low watermark out to one meter depth. A portion of this locality was influenced by fresh water from the Layou River, resulting in a lack of variety and general paucity of the fringing flora. The dominant species, *Chondria littoralis*, was observed throughout the area, with abundant *Chaetomorpha clavata*, *Padina gymnospora*, and robust specimens of the variable *Gracilaria domingensis*. The high insolation tended to bleach much of the material in these shallows to a dull yellow and white appearance. Farther out at a depth of 5–10 dm, *Neomeris dumetosa*, *Sphacelaria tribuloides* (?), and *Caulerpa cupressoides* were found on and between the cobbles.

A slight embayment just 100 m south of the last locality contained many specimens of interest. This area was observed under the conditions of onshore winds in conjunction with incoming tides. Large masses of unattached algae accumulated in a drifting mass some 17 m wide lying parallel to the shore. Noting the freshness of many of these specimens and their absence from the area surveyed, it must be assumed that most of these plants were being washed up from lower depths just offshore. Large specimens of *Gracilaria domingensis* were dominant in this drift, some being over 70 cm in length. Other interesting plants were *Agardhiella tenera*, *Codium isthmocladum*, *Enantiocladia duperreyi*, and *Gracilaria damaecornis*.

3. St. George Parish, beside the Post Office, Roseau Harbor. 17 February 1967

This area resembled the locality near the Layou River in that *Chaetomorpha media* was again dominant

along a cobble-boulder shore with moderate to heavy surf. Several species observed here were not found at the latter locality, however, possibly in response to the heavy organic pollution of the harbor area. Two other species were also extremely abundant: *Ulva fasciata* and *Gymnogongrus tenuis*, with large quantities of *Gracilaria ferox*, *Grateloupia cuneifolia*, and *G. filicina*. Strangely, the genus *Enteromorpha* was not observed here at this time.

4. St. Joseph Parish, just south of the Macoucheri River. 20 February 1967

A black sand beach with interspersed cobbles was evident for miles on either side of this locality. Dominant was the ubiquitous *Chaetomorpha nodosa*, with handsome specimens of *Grateloupia filicina*, *Galaxaura cylindrica*, and *Ceramium nitens*, all being extremely abundant in the drift. Another species of interest was *Pterocladia bartlettii* as a dwarf form. *Dictyota indica*, *Gracilaria mamillaris*, *Acanthophora spicifera*, *Giffordia mitchellae*, *Hypnea spinella*, *Spyridia aculeata*, and *Polysiphonia sphaerocarpa* were all prevalent as low-growing matted forms on the stones.

5. St. Luke Parish, about 0.8 km south of Point Michel. 21 February 1967

A rock-cobble shore was observed here, with *Chaetomorpha nodosa*, *Grateloupia filicina*, and *Wrangelia argus* dominating throughout. Most prominent was *W. argus*, in dark tufts at the mean low-tide mark.

6. St. Mark Parish, Scotts Head, Soufrière Bay. 21 February–12 March 1967

Along the shore there was a reef, mostly of dead coral above, but with living corals in deeper water from one meter below low tide to a depth past visual observation. The transparency of the water allowed light penetration to 17 meters or more, past the zone of plant attachment. A striking difference at this locality was the appearance of white sand derived from fragmentation of the offshore coral reef material, contrasting with the shore dominated by black sand north of this area.

From the high intertidal zone to 5 dm below low water the flora is little different from corresponding spots along the leeward coast north of Scotts Head, except for the occurrence of *Cladophoropsis membranacea*, *Boodlea composita*, and *Struvea anastomosans*. Large specimens of *Colpomenia sinuosa*, another spe-

cies not found elsewhere, were locally frequent, borne on the common white sea urchin.

A zone of Sargassums was observed at about 5–15 dm depth which paralleled the shore, affording protection for smaller algae such as *Gelidiella acerosa*, *Jania rubens*, *Wurdemannia miniata*, *Laurencia microcladia*, and *L. papillosa*. On either side of the Sargassum zone, *Padina* sp., *Dictyota dentata*, *Galaxaura rugosa*, *G. squalida*, and *Acanthophora muscoides* occurred sporadically. *Ralfsia expansa* encrusted the cobbles and suitable substrates from low watermark to one meter below.

As one approached the tip of the headland at Scotts Head, the surf became much rougher and the flora richer, abundant in the upper sublittoral zone, with dense stands of *Sargassum vulgare*, *Turbinaria turbinata*, and iridescent *Dictyota dentata*. It was interesting however, to note the contrasting paucity of numbers and species from about a depth of 3 dm downward. In fact the latter area appeared sterile.

Only once during the field work did the surf conditions allow one to work out from the water's edge on the southern side of Scotts Head, which receives some of the force of the Atlantic surf. It is a locality with extremely heavy wave action and winds, and generally with only *Sargassum platycarpum*, other Sargassums, and *Dictyota dentata* washed up on the sloping cobble beach. Large clumps of *Chamaedoris peniculum* were prevalent in the sublittoral zone at 1–4 m depth. Occasionally *Caulerpa racemosa* and *Dictyota dentata* were found in this area, with *Pocockiella variegata* in large scattered patches over the bottom. Farther out a large flat coral-coraline encrusted rock formation provided substrate for Sargassums and *Dictyota dentata*. Along the edge of this reef in depths of 3–7 m occurred robust specimens of *Styopodium zonale*, a species not found elsewhere on the island.

7. St. David Parish, shore at Rosalie. 22 February 1967.

Located a few hundred meters north of the Rosalie River was a cobble beach subjected to extremely heavy surf action. An abundant growth of *Enteromorpha flexuosa* on the cobbles in the intertidal area indicated probable pollution from the nearby river mouth. Several species, such as *Cryptonemia luxurians*, *Bryothamnion triquetrum*, and *Sargassum* spp., were found as drift. Unfortunately, it was impossible to make observations below the upper intertidal zone.

8. St. John Parish, Prince Rupert Bay just north of Lagon. 23 February 1967.

In this calm, shallow, but large embayment, representative species such as *Padinas*, *Pterocladia americana*, *P. bartlettii*, *Chaetomorpha linum*, *Dictyota cervicornis*, *Ralfsia* sp., *Sargassum* sp., and *Laurencia* sp. were common, with *Hypnea musciformis*, *Dictyota ciliata*, *Cladophora* sp., and *Galaxaura* sp. locally abundant. The shallow sublittoral consisted of encrusted cobbles with some dead coral fragments, upon which lay a thin layer of silt. Uniformity of habitat combined with high insolation produced an abundant but repetitive flora.

9. St. John Parish, Douglas Bay at Tanetane. 24 February 1967

Basically this was the same type of habitat as found in the Prince Rupert Bay area, but with a rougher, rockier shoreline. In some areas *Wrangelia argus* was found abundant as small tufts covering the tips of submerged rocks with *Struvea anastomosans* and *Gymnogongrus tenuis* locally abundant. The sloping sand beach supported *Liagora decussata*, *Grateloupia filicina*, and *Cladophora* in patches on somewhat sand-covered rocks.

10. St. John Parish, Portsmouth, at the mouth of the Picard River. 24 February 1967

Overall the shore appeared very sterile with only two major growths evident: a species of blue-green *Lyngbya* on small tree limbs submerged in water and a red alga that was locally common attached to cobbles.

11. St. Andrew Parish, coral reef at Calibishie. 25 February, 3 March 1967

The area appeared to be characterized by the outlying coral reef, the shore a white sand beach with many fragments of old coral heads along the upper intertidal zone. The coral portion of the reef was apparently not flourishing as well as the one at Scotts Head and possibly was in a dying state. Much of the sublittoral area was overgrown with larger benthic algae while lithothamnia predominated in both attached and loose fragment forms.

Certain localities at Calibishie differed significantly, so that they are here treated individually. (1) This first area was heavily swept by diagonal backwash currents along with heavy agitation on incoming tides.

Algal material was attached to cobbles and coral fragments just beyond the inshore reef at depths of 1.0–1.5 m. It was here that a brown gelatinous thallus was found in great abundance, which later proved to be a palmelloid diatom colony, with many thalli reaching 20 cm or more in extent. This has been identified by the kindness of Mr. Robert Ross, Keeper of Botany, British Museum (N.H.) as *Amphipleura micans* var. *fragilis* (Grev.) Cleve. On *Thalassia* blades, *Fosliella lejolisii* and *F. farinosa* were extremely abundant. Coralline algal fragments were scattered about the bottom, some reaching 10 cm in diameter. As much as 75 percent of the available substrate appeared to be lithothamnioid in nature. Also common in this area were *Chamaedoris peniculum*, *Ernodesmis verticillata*, *Siphonocladus tropicus*, *Pocockiella variegata*, *Galaxauras*, and *Asparagopsis taxiformis*. (2) Attached to the exposed inshore reef surface was a thick carpet of *Jania rubens* and *Cladophoropsis membranacea* which covered most of the top of the reef, and the vegetation rising above it was dominated by large yellow streaks of *Laurencia corallopsis*, abundant *Gelidella acerosa*, *Digenia simplex*, and scattered clumps of *Padina gymnospora*. The leading edge of the reef down to one meter was richly clothed by Sargassums, with large clumps of *Gracilaria debilis*, and with abundant patches of lithothamnia. Just behind the reef on the leeward side, tide pools exposed at low tide gave protection to several plants of *Penicillus capitatus*. (3) About 75 m offshore there was a shoal associated with an exposed ridge 25–30 m high. This shoal was so situated as to miss most of the heavy incoming surf at high tides and to be relatively calm at lower tides. In tide pools ranging in depth from 0.5 to 4 dm *Penicillus capitatus* was found to be locally abundant. Approximately a dozen small and poorly developed plants of *Udotea flabellum* were found in a few shallow sand-bottomed pools. The genus was unusually scarce about Dominica. (4) The majority of the species found in the abundant drift along the beach and in the backwash behind the inshore reef were also collected as attached plants from the intertidal zone out to a depth of 2 m. A few of the drifting species were not found attached, such as *Amansia multifida*, *Cryptonemia* sp., *Gelidium* sp., and *Vidalia obtusiloba*. Such drifting material was probably derived from colonies at greater depths, though, possibly, plants occurred throughout in small amounts and were overlooked.

12. St. Andrew Parish, shoreline in Woodford Hill Bay. 3 March 1967

An area observed on the west side of Pointe La Soie in Woodford Hill Bay was similar to that of Calibishie. A heavy surf continually pounded this cobble-coralline-coral reef substrate, supporting a rich variety of algae, such as *Gracilaria debilis*, *Galaxaura cylindrica*, *Dictyota dentata*, *Laurencia corallopsis*, and *L. papillosa*. The undergrowth carpet for the most part consisted of a species of *Jania*. Shaded tide pools higher up in the intertidal zone yielded large amounts of *Hypnea musciformis*, *Gelidiella acerosa*, *Spyridia aculeata*, and *Centroceras clavulatum*. At the edge of the reef washed by the surf, *Bryocladia thyrigera* was found in abundance, while *Dictyopteris delicatula* was very abundant at depths of 3–10 dm, together with *Galaxaura cylindrica*. A most interesting form of *Laurencia poitei* with flat axes in bilateral blades was also observed in this reef edge area. The influence of the Woodford Hill River was sharply defined by large populations of *Enteromorpha clathrata* and *Chaetomorpha nodosa*. Traveling up the river about 30 to 70 m, the exposed root systems of *Pterocarpus officinalis* were clothed with *Bostrychia rivularis*, and *Compsopogon caeruleus* appeared at 185 m from the river mouth.

Turning away from the headland toward the center of the bay, the shore was lined with a light gray sand. At this point a rather extensive reef area similar to the Calibishie reef exposed itself. Adjacent to this structure was attached *Hemithoecia calvadosii* in abundance. Heavy surf conditions were evident, with a strong backwash from the lee side of the reef, where *Polysiphonia ferulacea*, *Grateloupia filicina*, and *Hypnea musciformis* were dominant.

List of Taxa

The localities are cited according to parishes, starting with St. George, and followed in a clockwise direction. Our collecting station numbers are printed in boldface. An asterisk (*) is used to mark species newly recorded from Dominica.

Serial numbers of the material we collected jointly are preceded by the last digits of the collection year (67–234), while his initial designates those collected by the junior author separately (R–234). The first set of material has been deposited in the Smithsonian

Institution and the second in the herbarium of the University of Michigan. Finally, incorporated in the list are those algae in a small collection made in July 1966 by William L. Stern and Dieter C. Wasshausen (S&W–234), which add essentially new localities. The use of this collection has been a welcome privilege.

Class CHLOROPHYCEAE

Order ULOTRICHALES

Family CHAETOPELTIDACEAE

**Diplochaete solitaria* Collins

St. Mark: Area 6, R–307B, on *Herposiphonia* from the offshore reef.

Family ULVACEAE

**Enteromorpha clathrata* (Roth) J. Agardh

St. Andrew: 12, R–246, at the river mouth, intertidal and common.

**Enteromorpha flexuosa* (Wulfen) J. Agardh

St. Joseph: 2, 67–338, on rocks just below low tide level in an area of boulders and cobbles surrounded by black sand. St. John: 8, 67–486, drifted ashore; 9, 67–500, frequent as attached to large rocks. St. David: 7, 67–457, also with *E. lingulata*, 67–458 p.p., common on rocks in heavy surf.

**Enteromorpha lingulata* J. Agardh

St. Joseph: north of St. Joseph, R. M. King C–1139. St. David: 7, 67–458 as noted above. Doubtless it is at least as abundant as *E. flexuosa*, and both really common, especially near settlements, or wherever there may be a little pollution, but these commonplace species were seldom collected.

Ulva lactuca Linnaeus

St. Andrew: 11, 67–531.

Ulva fasciata Delile

St. George: 3, 67–348, abundant on the shore rocks between tide levels. St. Joseph: 4, 67–396, frequent on the rocks in a dwarf form. St. John: 8, 67–487, tufts of a dwarf form drifted ashore. St. Andrew: 12, R–218, common on the reef. St. Mark: 6, 67–428, R–279, frequent on the rocks along the peninsula to Scotts Head, and infrequent on small stones in sandy areas.

Grieve (1909, p. 8) mentions the presence of this alga on Dominica without giving a definite locality. About the island, as elsewhere in the West Indies, the aspect of *U. fasciata* varies a great deal. In the narrow and branched form it is at once recognizable, but at times the resemblance to *U. lactuca* v. *rigida* is great, especially in crowded, dwarfed forms, and microscopic examination of frond sections must be made.

Order CLADOPHORALES

Family CLADOPHORACEAE

- **Chaetomorpha linum* (Müller) Kützing
St. Paul: 1, 67-360, drifted ashore. St. John: 8, 67-479, very common as entangled among other attached algae. Also 67-488, drifted ashore.
- **Chaetomorpha nodosa* Kützing
St. Paul: 1, 67-328, common on the boulders at the highest algal level; 0.8 km. south of Layou, S&W-27810, between Layou and Goodwill, S&W-27864. St. Joseph: On rocks just north of St. Joseph, R. M. King C-1137; 4, 67-410, common in similar situations. St. John: 9, 67-498, on the larger rocks. St. Andrew: 11, 67-553; 12, R-247, common in situations such as those in St. Paul Parish. St. Mark: 6, 67-422, common in similar situations on the peninsula to Scotts Head.
- **Chaetomorpha aerea* (Dillwyn) Kützing
St. John: 6, 67-495, 67-499, common on the intertidal rocks.
- Chaetomorpha media* (Wulfen) C. Agardh
St. George: 3, 67-353, in considerable quantity. St. Mark: 6, 67-423, R-264, frequent as attached to the intertidal rocks and at a depth of about 3 dm, on the peninsula to Scotts Head.
Grieve (1909, p. 8) probably refers to this species under the name *C. antennina* Kützing as a misidentification, reporting it from the northeast coast, which would indicate St. Andrew Parish.
- **Chaetomorpha clavata* (C. Agardh) Kützing
St. Joseph: 2, 67-333, forming numerous tufts on the rocks. Cells markedly swollen, as visible to the unaided eye.
- Rhizoclonium arenosum* (Carmichael) Kützing
St. George: Roseau, according to Grieve (1909, p. 9), a doubtful record.
Grieve also reported the var. *occidentalis* Kützing from the same place, but I would consider his specimen under this name in the herbarium of the Edinburgh Botanic Garden to be *Chaetomorpha nodosa*.
- **Cladophora fuliginosa* Kützing
St. Andrew: 11, R-173, R-182A, R-189C, abundant on the inshore reef.
- **Cladophora fascicularis* (Mertens) Kützing
St. Paul: 1, 67-362, frequent in the drift. St. Joseph: 2, 67-339, on boulders. St. John: 8, 67-473, attached to the rocks; 9, 67-504, 67-505, where frequent as attached to rocks off the sandy beach. St. Andrew: 12, R-215, on a cobblestone reef.

Order SIPHONOCLADIALES

Family DASYCLADACEAE

- **Neomeris dumetosa* Lamouroux
St. Joseph: 2, 67-334, very scarce and small, on stones below low tide level.
- **Neomeris annulata* Dickie
St. Andrew: 11, R-198, on the inshore reef.

Family VALONIACEAE

- **Ernodesmis verticillata* (Kützing) Børgesen
St. Andrew: 11, 67-526, frequent on rocks beyond the inshore reef in 6-12 dm of water, also, drifted ashore, 67-564.
- **Siphonocladus tropicus* (Crouan) J. Agardh
St. Andrew: 11, 67-562, R-176, frequent on the reef edge to a depth of 6 dm, and numerous plants drifted ashore.
- **Chamaedoris peniculum* (Ellis & Solander) Kuntze
St. Andrew: 11, 67-538, frequent as attached among coral fragments beyond the inshore reef at 6-12 dm depth. St. Mark: 6, R-291, on the south side common at 12-30 dm depth.
- **Dictyosphaeria cavernosa* (Forsskål) Børgesen
St. Andrew: 11, R-195, R-199, on the inshore reef.
- **Dictyosphaeria vanbosseae* Børgesen
St. Andrew: 11, 67-554, attached to rocks of the inshore reef.
- **Cladophoropsis membranacea* (C. Agardh) Børgesen
St. John: 8, 67-483, drifted ashore. St. Andrew: 11, 67-559, R-173A, drifted ashore and abundant on the inshore reef. St. Mark: 6, 67-425, R-266, soft tufts common on rocks of the peninsula to Scotts Head.
- **Boodlea composita* (Harvey) Brand
St. Mark: 6, 67-426, R-268, forming dense cushions on rocks along the peninsula to Scotts Head.
- **Struvea anastomosans* (Harvey) Piccone
St. John: 9, 67-492, scarce as attached to rocks along the beach. St. Andrew: 11, R-170, epiphytic on *Digenia* on the inshore reef. St. Mark: 6, 67-434, scarce on the rocks along the shore of the peninsula to Scotts Head.
- **Anadyomene stellata* (Wulfen) C. Agardh
St. Andrew: 11, 67-580, in the drift, probably from the rocky reef offshore; 12, R-214, on the coral reef.
A plant of crevices in exposed reefs and rocky shores, seldom in accessible places on this island.

Order SIPHONALES

Family CAULERPACEAE

- **Caulerpa cupressoides* (West) C. Agardh, var. *cupressoides*
St. Andrew: 11, R-154, on the offshore reef, and R-185, on a coral-cobble bottom at 6-9 dm depth.
- **Caulerpa cupressoides* var. *lycopodium* (J. Agardh) Weber-van Bosse f. *elegans* (Crouan) Weber-van Bosse.
St. Joseph: 2, R-318, 67-337, occasional colonies growing on the sand.
- **Caulerpa racemosa* (Forsskål) J. Agardh
St. Andrew: 11, 67-534, on rocks beyond the inshore reef at a depth of 6-12 dm.
- Caulerpa sertularioides* (Gmelin) Howe
St. Paul: 1, 67-363, drifted ashore. St. Joseph: 2, R-319, 67-463, on cobbles at about 6 dm depth. St. Andrew: 11, R-186, on the inshore reef.

- **Caulerpa taxifolia* (Vahl) C. Agardh
St. Andrew: 11, 67-540, attached to rocks beyond the inshore reef at 6-12 dm depth.
- **Udotea flabellum* (Ellis & Solander) Lamouroux¹
St. Andrew: 12, R-218, very scarce, in offshore tide-pools; 11, R-150.
- **Penicillus capitatus* Lamarck
St. Andrew: 11, R-151, R-174, R-187, frequent in off-shore rock tide-pools.
- Halimeda simulans* Howe
St. John: 8, at 11-28 m, *W. L. Schmitt*, 28 iii 56. Reported in Hillis 1959, p. 369 (but in University of Michigan Herbarium).
- **Codium isthmocladum* Vickers
St. Paul: 1, 67-364, one large specimen drifted ashore.
St. Andrew: 11, 67-532, infrequent as attached to rocks beyond the inshore reef at 6-12 dm depth.

Class PHAEOPHYCEAE

Order ECTOCARPALES

Family ECTOCARPACEAE

- **Ectocarpus breviararticulatus* J. Agardh
St. Paul: 1, 67-330, on large boulders. St. Joseph: 4, 67-407, on rocks along the shore. St. John: 9, 67-502, on rocks off the sandy beach. St. Mark: 6, 67-441, rocks along the peninsula to Scotts Head.
- **Giffordia mitchellae* (Harvey) Hamel
St. Joseph: 4, 67-409, on rocks along shore.

Order SPHACELARIALES

Family SPHACELARIACEAE

- **Sphacelaria tribuloides* Meneghini
St. Paul: 1, 67-325, scarce, on the large rocks along shore.

Order DICTYOTALES

Family DICTYOTACEAE

- **Dilophus guineensis* (Kützinger) J. Agardh
St. Paul: 1, 67-365. St. Joseph: 2, 67-394, brought ashore on a fisherman's net, coll. Rhyne; 4, 67-411, on scattered rocks. St. Mark: 6, R-277, at depths of 6-30 m; R-294A, the south side.
This species is widely distributed and very common on other islands, but since often small in the intertidal zone of

exposed shores it may have been neglected in collecting on Dominica.

- **Dilophus alternans* J. Agardh
St. Andrew: 11, 67-579, drifted ashore.
- Dictyota bartayresii* Lamouroux
Grieve (1909, p. 10) lists this (as *D. bartayresiana*) without citing a definite station, but there is nothing implausible about the record.
- **Dictyota divaricata* Lamouroux
St. John: 8, 67-490, drifted ashore.
- **Dictyota indica* Sonder
St. Joseph: 4, 67-386, one plant only.
- **Dictyota cervicornis* Kützinger
St. John: 8, 67-480, attached on rocks along the shore.
- **Dictyota ciliolata* Kützinger
St. Joseph: S&W-27861, south of Mero. St. John: 8, 67-471, frequent as attached to the rocks. St. Andrew: 11, 67-583. St. Mark: 6, R-300, on the south side, frequent at 12-30 dm depth.
- **Dictyota jamaicensis* W. R. Taylor
St. Paul: S&W-27874, between Layou and Goodwill.
- **Dictyota dentata* Lamouroux
St. Paul: 1, 67-357, numerous plants drifted ashore. St. Joseph: 4, 67-387, on rocks along the beach. St. Andrew: 11, 67-543, locally common on rocks beyond the inshore coral reef at 6-12 dm depth. St. Mark: 6, 67-449, on the south side, frequent as drifted ashore.
Probably quite common but the tendency to limit collections to well-grown plants caused the much more numerous dwarfed ones of the low intertidal zone of exposed shores to be neglected. This is true for the Dictyotas and Padinas in general, for unless the plants are well grown the identifications are always unreliable.
- Dictyopteris delicatula* Lamouroux
St. George: 3, 67-355, scarce as washed ashore. St. Joseph: 4, 67-401, 67-408. St. John: Grieve (1909, p. 9) lists this from Portsmouth. St. Mark: 6, R-294B, on the south side, frequent at 9-30 dm depth.
- **Dictyopteris plagiogramma* (Montagne) Vickers
St. Andrew: 12, R-256B, a scrap drifted ashore.
- **Pocockiella variegata* (Lamouroux) Papenfuss
St. Andrew: 11, 67-542, R-184, locally abundant, attached to rocks and coral cobbles beyond the inshore at 6-12 dm depth. Also, drifted ashore, 67-578. St. Mark: 6, R-290, on the south side, at depths of 12-30 dm.
- Styopodium zonale* (Lamouroux) Papenfuss
St. Mark: 6, R-289, on the south side, scarce at depths of 3-6 m.
- **Padina vickersiae* Hoyt
St. Joseph: 4, 67-381; scarce at this location.
- **Padina gymnospora* (Kützinger) Vickers
St. Joseph: 2, 67-340, common on large rocks scattered over the sand. St. Andrew: 11, 67-555, common as attached plants on the inshore reef. St. Mark: 6, R-269, frequent at depths of 6-12 dm.
Padinas were not uncommon about the island, but often only 1-2 cm tall and sterile, so that identification was seldom practicable.

¹ In a paper in press, written subsequent to the preparation of this Dominica report, the senior author questions the correctness of the joint citation of Ellis and Solander as authors of several species names.

Order PUNCTARIALES

Family PUNCTARIACEAE

- **Colpomenia sinuosa* (Roth) Derbès and Solier
St. Andrews: 11, 67-530, common as attached to rocks beyond the inshore reef at 6-12 dm depth. St. Mark: 6, 67-429, frequent on rocks along the peninsula to Scotts Head.
- **Rosenvingea sanctae-crucis* Borgesen
St. John: S&W-27825 Prince Rupert Bay, Portsmouth Harbor.

Order FUCALES

Family SARGASSACEAE

- Sargassum filipendula* C. Agardh
St. Mark: 6, 67-446, on the south side.
The rather inadequate specimens which Grieve (1909, p. 9) assigned here, without specifying a definite locality, seem to belong in *S. vulgare*, so his may be considered a rather unsatisfactory new record for the island.
- **Sargassum rigidulum* Kützinger
St. David: 7, 67-453.
- Sargassum vulgare* C. Agardh
St. George: 3, 67-347, a small amount washed ashore; 1, 67-332, on rocks scattered along the shore; 67-376, drifted ashore. St. John: Grieve (1909, p. 9) lists this species from Portsmouth. St. Andrew: 11, 67-560, drifted ashore. St. David: 7, 67-455. St. Mark: 6, 67-430, R-302, abundant on rocks at the reef edge at 3-15 dm depth.
- , var. **foliosissimum* (Lamouroux) C. Agardh
St. John: 8, 67-476, 67-477.
- Sargassum pteropleuron* Grunow
Grieve (1909, p. 9) lists this without a definite station.
- **Sargassum hystrix* J. Agardh
St. David: 7, 67-452.
- Sargassum platycarpum* Montagne
St. David: 7, 67-454, on the boulders. St. Mark: 6, R-298, on the south side, on reef rock at depths of 0.9-6.0 m. Grieve (1909, p. 9) lists this species without citing a definite locality. It does not seem to be as common about the island, or at least not as well developed, as on several other islands of the Lesser Antilles.
- **Turbinaria turbinata* (Linnaeus) Kuntze
St. Mark: 6, R-301, abundant at the reef edge at depths of 3-15 m.

Class RHODOPHYCEAE

Order BANGIALES

Family BANGIACEAE

- **Erythrocladia subintegra* Rosenvinge
St. George: 3, 67-353 p.p., epiphytic on *Chaetomorpha media*, intertidal on rocks.

Family COMPSOPOGONACEAE

- **Compsopogon caeruleus* (Balbis) Montagne
St. Andrew: 12, R-248A, about 185 m from the bay, very abundant on the roots of *Pterocarpus*.

Order HELMINTHOCLADIALES

Family HELMINTHOCLADIACEAE

- **Helminthocladia calvadosii* (Lamouroux) Setchell
St. Andrew: 12, R-250, locally abundant on the reef.
- **Liagora ceranoides* Lamouroux
St. Joseph: 2, 67-464, common on rocks at a depth of a meter or somewhat more. St. Andrew: 11, 67-527, frequent on rocks beyond the inshore reef at depths of 6-12 dm.
- **Liagora valida* Harvey
St. John: 8, 67-469, attached to rocks in shallow water.
- **L. decussata* Montagne
St. Paul: 11, 67-327, frequent on rocks in shallow water. St. John: 9, 67-501, abundant in patches on rocks off the sandy beach.
It was a particular piece of good fortune to find this very striking species on Dominica, for it has seldom been collected: on Jamaica (for Phyc. Bor.-Amer. no. 89 by Pease and Butler), on Guadeloupe (Crouan) and on St. Vincent (the type-locality).
- **Galaxaura squalida* Kjellman
St. John: 8, 67-474, attached to rocks in quiet water. St. Andrew: 11, R-158, very abundant at 3-6 dm. depth.
- **Galaxaura subverticillata* Kjellman
St. Mark: 6, 67-435, frequent on the rocks of the peninsula to Scotts Head.
- **Galaxaura rugosa* (Ellis & Solander) Lamouroux
St. Paul: 1, 67-372B, drifted ashore. St. Andrew: 11, 67-584, drifted ashore. St. Mark: 6, R-262, infrequent.
- **Galaxaura cylindrica* (Ellis & Solander) Lamouroux
St. Paul: 1, 67-372C, drifted ashore. St. Joseph: 4, 67-377, frequent as drifted ashore; S&W-27850, south of Mero, on a rocky bottom. St. Andrew: 11, 67-545, R-202, on cobbles and the inshore reef at 6-12 dm depth; 12, R-233, common at 3-9 dm depth.
- **Galaxaura oblongata* (Ellis & Solander) Lamouroux
St. Paul: 1, 67-373, drifted ashore.
- **Galaxaura marginata* (Ellis & Solander) Lamouroux
St. Paul: 2, S&W-27813; 1, 67-368, on a rocky bottom, and scarce as drifted ashore. St. Joseph: 4, 67-379, scarce as drifted ashore. St. Andrew: 11, 67-569, drifted ashore; 12, R-23.

Family BONNEMAISONIACEAE

- **Asparagopsis taxiformis* (Delile) Collins and Hervey
St. Andrew: 11, R-159, abundant over the cobbles at 6-12 dm depth.

Order GELIDIALES

Family GELIDIACEAE

- **Gelidiella acerosa* (Forsskål) Feldmann and Hamel
St. Paul: 2, S&W-27814, on a rocky bottom. St. Mark: 6, 67-431, locally common on the intertidal rocks. St. Andrew: 11, 67-541, R-189, attached to rocks beyond the inshore reef at 6-12 dm depth; abundant on this reef, 67-458; 12, R-210, common on the reef.
- Gelidiopsis planicaulis* (W. R. Taylor) Taylor
St. Andrew: Marigot Bay, R. G. Fennah 1939, in pools on a rocky ledge. Reported by Taylor (1960, p. 353) without definite locality.
- **Gelidium pusillum* (Stackhouse) Le Jolis
St. Andrew: 11, 67-572, from rocks along shore.
Doubtless a general component of the dense mats of very small algae which are almost everywhere in exposed situations on rocks.
- **Pterocladia bartlettii* W. R. Taylor
St. Paul: 1, 67-331, on intertidal rocks in shallow water. St. Joseph: 4, 67-380, drifted ashore. St. John: 8, 67-467, common as attached to rocks in shallow water.
- **Pterocladia americana* W. R. Taylor
St. John: 8, 67-468, attached to rocks in shallow water.
- **Pterocladia pinnata* (Hudson) Papenfuss
St. Mark: 6, R-297, on the atlantic south side, frequent at 9-30 dm.

Family WURDEMANNIACEAE

- **Wurdemannia miniata* (Draparnaud) Feldmann and Hamel
St. Mark: 6, 67-438, on the rocks of the peninsula to Scotts Head.

Order CRYPTONEMIALES

Family RHIZOPHYLLIDACEAE

- **Ochtodes secundiramea* (Montagne) Howe
St. Andrew: 11, 67-577, R-191, drifted ashore, and frequent on the reef.
Many Rhodophyceae when growing exposed to strong light show strong color changes: i.e., *Wrangelia argus* appears nearly black, while *Laurencia papillosa* changes from blackish-purple through green to yellow, whereas *Ochtodes* maintains its distinctive bright red color.

Family CORALLINACEAE

- **Fosliella lejolisii* (Rosanoff) Howe
St. Andrew: 11, 67-536, abundant on *Thalassia* among coral fragments beyond the inshore reef at 6-12 dm depth; 12, R-230A p.p., on *Amansia*.
- **Fosliella farinosa* (Lamouroux) Howe
St. Andrew: 11, 67-582A, R-157, abundant on *Thalassia*.
Doubtless Fosliellas were much more common about

Dominica than these collection records would indicate, but *Thalassia* beds were not conspicuous about the island, and they furnish the chief habitat for these plants.

- Amphiroa fragilissima* (Linnaeus) Lamouroux
St. Andrew: 11, 67-552, R-175, attached to rocks as the common turf-forming element of the inshore reef. St. Mark: 6, 67-436, on rocks along the peninsula to Scotts Head.
- Amphiroa breviarticulata* Areschoug
Grieve (1909, p. 12) reports this without recording a definite station. The supporting specimen consists of a very few segments which do not seem to be *A. breviarticulata* or *A. fragilissima*, but possibly might be *A. beauvoisii*, entangled among *Centroceras* filaments.
- **Amphiroa rigida* Lamouroux, var. *antillana* Bergesen
St. Andrew: 11, 67-533, locally common as attached to rocks and coral beyond the inshore reef at 6-12 dm depth.
- **Corallina cubensis* (Montagne) Kützing
St. Paul: 1, 67-371, scarce as drifted ashore.
- **Corallina subulata* Ellis & Solander
St. Andrew: 11, 67-585, scarce as drifted ashore.
- **Jania capillacea* Harvey
St. Andrew: 11, R-189A. St. Mark: 6, 67-439B, on the rocks of the peninsula to Scotts Head.
- **Jania rubens* (Linnaeus) Lamouroux
St. Joseph: 2, 67-335, occasional good colonies in shallow water. St. Andrew: 11, 47-550, attached to *Digenia* on rocks of the inshore reef. St. Mark: 6, 67-432, R-260, common on rocks along the peninsula to Scotts Head, forming extensive mats at 6-12 dm depth.

Family GRATELOUPIACEAE

- Grateloupia filicina* (Wulfen) C. Agardh
St. George: 3, 67-349, common intertidally on rocks. St. Paul: 1, 67-327, common on intertidal rocks. St. Joseph: 4, 67-397, common on the rocks. St. John: 8, 67-489, drifted ashore; 9, 67-493, 67-503, common locally on rocks and drifted ashore. St. David: 7, 67-461, often dwarf, on rocks in the surf.
Grieve (1909, p. 11) reports this species without definite locality. He also reports the var. *filiformis* J. Ag., and *G. prolongata* J. Ag. with its var. *cauda* De Toni, but the record specimens do not seem distinct from *G. filicina*, simply being poorly developed individuals.
- **Grateloupia cuneifolia* J. Agardh
St. George: 3, 67-350, common on the rocks. St. Luke: 5, 67-420, on the rocks.
Grieve (1909, p. 11) reported *G. cutleriae* Kützing without a definite station. The record specimens seems referable to *G. cuneifolia*.
- Grateloupia versicolor* J. Agardh
Grieve (1909, p. 11) reported this plant without a definite station, but no confirming specimen has become available. The record is very doubtful, since the type of the species comes from Pacific Mexico, and it is not certainly known from Atlantic waters.
- **Cryptonemia luxurians* (Mertens) J. Agardh
St. David: 7, 67-450.

Order GIGARTINALES

Family GRACILARIACEAE

- **Gracilaria verrucosa* (Hudson) Papenfuss
St. Paul: 1, 67-367, occasional as drifted ashore.
- **Gracilaria debilis* (Forsskål) Bergesen
St. Andrew: 11, 67-554B, attached to rocks of the inshore reef; 12, R-231, frequent at the reef edge.
- **Gracilaria damaecornis* J. Agardh
St. Paul: 1, 67-370, scarce as drifted ashore. St. Andrew: 11, 67-554B, attached to rocks of the inshore reef.
- **Gracilaria ferox* J. Agardh
St. George: 3, 67-352, frequent on the intertidal rocks.
- **Gracilaria cervicornis* (Turner) J. Agardh
St. Joseph: 12, R-314, R-325, common on the reef at 3-6 dm. St. John: S&W-27847 p.p. Prince Rupert Bay, Portsmouth Harbor.
- **Gracilaria domingensis* Sonder
St. Paul: 1, 67-374, large plants common as washed ashore. St. Joseph: 2, Rhyne 67-392, brought ashore on a fisherman's net; R-309, 67-342, drifted ashore and on stones among black sand; 4, 67-383. St. Andrew: 11, R-178, infrequent.
Narrow-bladed, generously branched specimens suggest a connection with *G. cervicornis*, but the sparingly branched individuals with long axes 2 cm broad are so markedly different that merging the species seems unreasonable.
- **Gracilaria mammillaris* (Montagne) Howe
St. Paul: 2, S&W-27815. St. Joseph: 4, 67-415, on rocks along shore, a somewhat peculiar form of recurved habit.
- **Gracilaria sjostedtii* Kylin
St. John: S&W-27834, Prince Rupert Bay, Portsmouth Harbor.

Family SOLIERIACEAE

- **Euचेuma echinocarpum* Areschoug
St. Andrew: 11, 67-558, 67-576, drifted ashore; 12, R-235, infrequent along the reef edge.
- **Euचेuma schrammi* (Crouan) J. Agardh
St. Andrew: 12, R-236, infrequent along the reef edge.
- Agardhiella tenera* (J. Agardh) Schmitz—Plants tending to a colonial habit, the bases ramified and intertwined, attaching by small digitate holdfasts, generally bearing several erect axes; erect portions to 10-25 cm tall, 1.5-2.0 mm diameter, widely and irregularly alternately branching, or with distinct excurrent axes which bear a few similar indeterminate branches and, alternately and radially, numerous subsimple, somewhat more slender, acute-tipped branchlets. Structurally showing a cortex of a single compact surface layer of small chromatophore-bearing cells with two, seldom to four layers of inner colorless cells increasing in size toward the center; the medullary cavity more or less loosely filled with filaments of three types, consisting of one or more major longitudinal filaments (18)-32-45-(65) μ diameter which eventually become very thick walled, and

which occasionally bear short slender lateral branchlets that may divide several times to connect with other filaments and the cortex, and also as the third type numerous very slender thin-walled loosely anastomosing filaments (3.8)-4.7-6.5-(10.0) μ diameter. Zonate tetrasporangia occur in the outer cortex, (17)-23-31-(46) μ diameter, 36-46-(60) μ long. The cystocarps are also immersed in the cortex, causing moderate lateral swelling, discharging through a pore. Spermatangia were not seen on this material.

Because of the large number of collections studied, only a small representative sampling can be cited. While almost all countries and islands are mentioned, not all provinces, counties, or parishes could be included. Except for specimens of historical interest, collection dates are not significant enough to justify inclusion.

FLORIDA: Dade County, Key West, *W. H. Harvey* 40 (as *Rhabdonia baileyi*), February 1850 (NY); Brevard County, Indian River, *E. Palmer* 51, 1874 (WRT). BAHAMAS: New Providence Island, Nassau, *M. S. Synder* s. n., 1895 (UM). CUBA: Habana Province, Playa de Marianas, *Baker & Van Heuman* s. n., (NY); Oriente Province, Gibara, *Diaz-Pifferer* 123 (WRT). JAMAICA: no location, *Pease & Butler* s. n., 1900 (NY); St. Thomas Parish, Roselle, *Taylor* 56-168 (UM). HAITI: southwest peninsula, southwest coast, Anse à Drick, *C. R. Orcutt* 9794 (NY), same but northwest coast, Jérémie, *H. H. Bartlett* 17869 (UM). PUERTO RICO: San Juan Province, Cataño, *M. A. Howe* 2271 (NY); Mayaguëz Province, Mayaguëz, *Diaz-Pifferer* 2067 (NY). VIRGIN ISLANDS: St. Thomas Island, Charlotte Amalie, *F. Bergesen* s. n., (NY); St. Croix Island, Christiansted, *Bergesen* 193 (UM). NEVIS: St. Thomas Lowland Parish, Pinneys Beach, *Taylor* 68-141 (UM). ANTIGUA: St. John Parish, causeway to Rat Island, *Taylor* 67-274 (UM). GUADELOUPE: Saunay, *C. LeGallo* 160 (WRT). DOMINICA: St. Joseph; 4, 67-358, 67-389, 67-416; St. Paul 2, 67-369. ST. VINCENT: St. George Parish, Calliaqua Bay, *G. R. Proctor* A.2596 (UM). BARBADOS: St. Michael Parish, Kensington, *A. Vickers*, *Algues de la Barbade* 123, 13 January 1899; St. Joseph Parish, Bathsheba, *Vickers*, *ibid.*, also 123, 26 January 1903 (NY). GRENADA: St. Andrew Parish, Grenville Beach, *Taylor* 66-298. TOBAGO: Rockley Bay, Scarborough, *Taylor* 39-500 (UM). TRINIDAD: Taparo Point, *W. D. Richardson* 1685 (WRT). COSTA RICA: Limon Province, Puerto Limon, *C. W. Dodge et al.* 42 (WRT). Columbia: Bolivar Department, Cartagena, *F. A. Barkley* 18B0009 (WRT). VENEZUELA: Federal District near Caracas, *G. Falcón*, 12, 16, 67 (WRT). BRAZIL: Ceará Province, Fortaleza, *F. Drouet* 1360 (WRT), São Paulo Province, Ilha São Sebastião, *A. B. Joly* 52 (WRT).

Since I feel that a distinction must be made between the *Agardhiella* typical of the West Indies and that of New England, I have introduced the discussion of this species with a description entirely based on West Indian

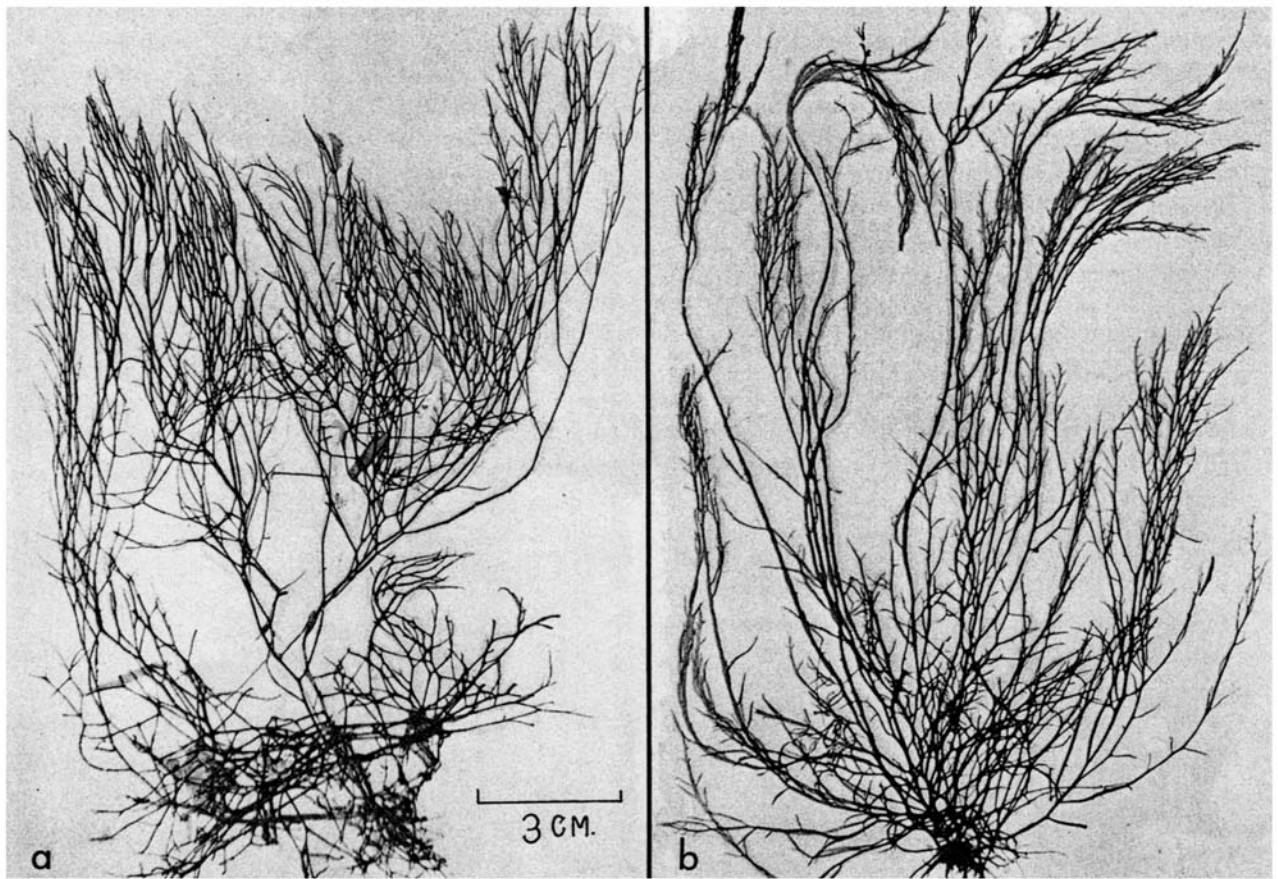


FIGURE 1.—*Agardhiella tenera* (J. Agardh) Schmitz: *a*, from a loose substrate of coarse granular material showing a loosely entangled basal portion and erect branches without dominant axes (plant from Tobago); *b*, from a firm substrate, the entangled base compact, the erect portions with distinctive main axes (plant from Dominica).

material, excluding reproductive structures not readily described from herbarium material. In short, the plants grow in colonies—if on a firm substrate, with compact fibrous bases felted together, if on broken shells or corals, with a loose open mat of fibers mingled with the surface material—and these groups of plants may come ashore in considerable masses inextricably entangled below, free enough above. As to habit, Figure 1*a* shows a portion of a clump with the loosely entangled base below, and it is also an example of the habit where no well-defined axes develop. In contrast, Figure 1*b* shows a portion of a colony with a densely felted base and conspicuous erect axes.

Unfortunately, collectors commonly only mount portions of their plants, and representative bases are seldom seen in herbaria. There is a histological character

available which can be used, but requires the utmost care in manipulation. Freehand sections should be cut from dried material, or of material in fluid preservative after partial hardening in alcohol, and the part selected should be from a main stem near the middle of the plant, because if too young the structures will not have matured, and if too near the base the medulla will be found to be, for mechanical reasons, greatly compacted. When this is skillfully done and good sections expanded in water with a little heat, the medulla should be examined closely. It will be found that strong filaments run lengthwise of the plant, sometimes singly, but varying greatly in number. When few they stand out spectacularly, but when more numerous some are smaller than others and less distinct. They are thin-walled at first near branchlet apices, but later the walls

become exceedingly thick and refractive. Figure 2a shows the aspect in transection, Figure 2b that in longisection. In the latter the short intercommunicating spurs from these thick filaments appear, and also the irregular, very slender thin-walled filaments which make up the bulk of the medullary tissue. Near the apices the short spur filaments are very distinctive as alternate single-celled projections from the long main filaments.

In contrast the northern counterpart *Agardhiella* lacks these continuous longitudinal filaments, though in transection some briefly swollen filaments or anastomoses may look very like them, but in longisection their nature is clear. The branches are often coarser and may reach 4 mm in diameter, the plant bases are not widely entangled and the tetrasporangia are larger. Its southern range limits seem to be Florida and Texas, for

examples: FLORIDA, Palm Beach County, Jupiter Inlet, Mrs. G. A. Hall, *Phyc. Bor.-Amer.* 1396 (NY), Levy Co., Cedar Keys, M. A. Howe 6884 (NY). TEXAS, Galveston County, Galveston Bay, C. E. Burt s. n. (UM).

I refer to microscopic differences between the southern and northern plants with some misgivings, since the observations were made upon herbarium material. Measurements of tetrasporangia in a few samples of northern material under the same treatment accorded those from the West Indies gave measurements of (37)–46–60–(78) μ diam., (69)–73–92–(110) μ in length, so that a more extended series might confirm that they are about twice as large. The structure of the cystocarp in New England material has long been well known (Kylin 1928). All too few specimens of the West Indian plants with cystocarps have been avail-

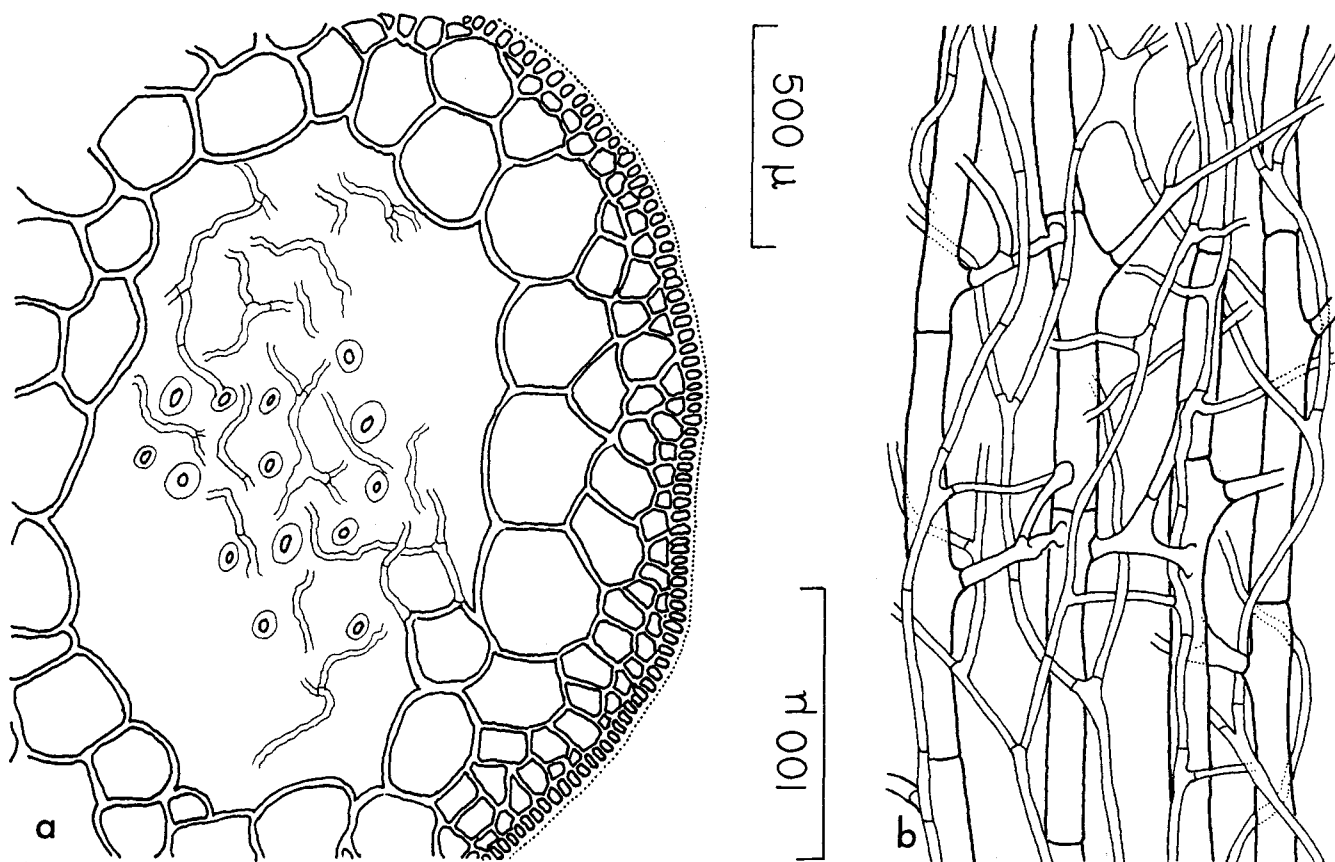


FIGURE 2.—*Agardhiella tenera* (J. Agardh) Schmitz: a, transection of main axis, details only partly filled in, showing cortical structure and large and small filaments of the medulla (plant from Costa Rica); b, partial longisection of the medulla, showing large and small filaments, with the lateral branches from the large ones connecting with others (plant from Costa Rica).

able, and of course they had been dried. While the sections made were far from good, it appeared that the carpospore mass was surrounded by a sheath of filaments, varying from substantial to vestigial in different cystocarps, while rare to scarce trabeculae composed of single filaments penetrated from this sheath into the carposporangial mass. This seemed to be hollow, with the more mature carposporangia separated from a slender stalklike cell by a less mature sporangial rudiment. This looked more like Kylin's figure of *Solieria* (1956, fig. 207D) than like *Agardhiella* (Taylor 1962, pl. 59, fig. 9) as drawn from New England material. If this is confirmed, it is doubtful that the northern and southern plants attributed thus far to *Agardhiella tenera* can be kept in the same genus.

It has been many years since the senior author first suspected that plants from the West Indies ascribed to *Agardhiella tenera* differed from those found on the New England coast. Until the present he has not had occasion to study their structure comparatively, or to trace the significant records of the species from various latitudes in the literature. J. G. Agardh described *Gigartina tenera* (1841, p. 18) from the warmer coasts of North America and the West Indies. Bailey (1848, p. 39) lists *Rhabdonia baileyi* as a Harveyan manuscript name, the plants from Fort Hamilton, Staten Island and Long Island, New York. Kützing (1849, p. 777) presented *Sphaerococcus tener* from the West Indies with Agardh's name in synonymy. Agardh (1852, p. 353) shifted his plant to *Rhabdonia* with *G. tenera* and *S. tener* as synonyms, limiting the distribution to the West Indies, and specifically mentioning Haiti, Puerto Rico, and St. Croix, but not indicating which specimens he had before him in 1841, though some he surely did. Harvey (1853, p. 122) assigned plants to *Solieria chordalis* J. Agardh, with a range from Cape Cod to Key West, Florida, which are clearly the northern *Agardhiella* (plate 23A), while he mentions *R. baileyi* as undescribed, and assigns it to *S. chordalis* with reservations. That he recognized differences between the northern and southern plants is not only clear from his text (1853, p. 122), but in his Colombia paper (1861, p. 177) he lists *S. chordalis* as extra-tropical and *R. tenera* as tropical and present at Cartajena. Nevertheless he labeled Key West material (*Harvey 40* at NY) as *R. baileyi* which seems on structural grounds to be of the West Indian type and so not like that of Long Island, New York. Kützing (1866,

p. 26, pl. 74) reintroduced *Rhabdonia baileyi* with a description, ascribing it to Harvey, with its range the Atlantic coast of North America, and a little later (1868, p. 27, pl. 75) described as new *Sphaerococcus tenuis* from the Bahamas. His drawing of the axis structure of *S. tenuis* is incorrect, for by the kindness of Dr. J. Th. Koster and Dr. W. F. Prud'homme van Reine of the Rijksherbarium, Leiden, I was able to section a fragment of the type and found it to correspond structurally to that of other West Indian specimens of *Agardhiella*. Agardh later (1876, p. 592) reintroduced the concept of a mainland range, including in synonymy *Solieria chordalis* Harvey non C. Agardh. Schmitz (1889, p. 371) mentions *Agardhiella* as a new genus and cites *A. tenera* as formerly in *Rhabdonia*, but gives no generic diagnosis, correcting this much later (1896, p. 371), though not citing the place of publication in *Rhabdonia* or *Gigartina*. Farlow in his first substantial listing of American marine algae (1873, p. 289) listed *Solieria chordalis* from southern Massachusetts and Long Island while later (1875, p. 368), retaining our plant in *Rhabdonia*, he assigned no locality, but the next year accepted the range as Cape Cod southward and the West Indies (1876, p. 698) continuing this in his New England text (1881, p. 159). Thus the pattern for the customary American treatment was set. DeToni (1897, p. 322) accepted *Agardhiella* with *A. tenera* (J. Agardh) Schmitz as the only species. His description "Frons a radice fibrosa surgens . . ." fits our West Indian plant very well, but he adopts the wider range for the species. Kylin (1928, p. 67) described the structure of the Massachusetts material, though he later recognized (1932, p. 16) that the type of the species came from the West Indies, without changing his descriptions.

In short, if one accepts the West Indian area as the type district and the plants as I have described them as typical, then the northern materials described in the literature (as referred to in Taylor 1962, p. 267), and with representative specimens mentioned earlier, must be distinguished by their own name, for which the best available seems to be *Agardhiella baileyi* (Harv. ex Kützing) W. R. Taylor n. comb. (= *Rhabdonia baileyi* Harvey ex Kützing 1866, p. 26). The lectotype should be the specimen illustrated by Kützing (1866, pl. 74, figs. c, d) from Greenport, Suffolk County, on the northeastern end of Long Island, New York. This is, in

the Kützing herbarium at Leiden, designated no. 37 from Bailey. I have sectioned a fragment of it by the kindness of the curator, Dr. W. F. Prud'homme van Reine, and it shows clearly the thallus and cystocarp structure which characterize the New England plant we have been calling *A. tenera*. A Harveyan specimen from New York in the J. G. Agardh herbarium at Lund under the early designation of *Solieria chordalis* (no. 34490) is the characteristic plant as found in open water from Long Island and the southern shores of Cape Cod, as is one from Greenport (no. 34492) which Harvey may very well have received from Bailey and sent to Agardh.

Through the very great kindness of Dr. O. Almborn, Keeper of the Herbarium in the Universitets Botaniska Museum, Lund, I have been able to examine the *Rhabdonia tenera* specimens in Agardh's herbarium. Unfortunately, almost all are undated and lack more or less of the essential data. These have now been examined histologically, however, and most can clearly be assigned to *Rhabdonia baileyi* (of the earlier terminology) or to *Agardhiella tenera* of warmer seas, leaving a very few uncertain ones which may belong to a third very soft species. When Agardh (1852) clarified his concept of the range of his *R. tenera* he mentioned Haiti, Puerto Rico, and St. Croix as sources. I was unable to get satisfactory sections of the specimens from Haiti and St. Croix now in the herbarium and they lacked the distinctive basal parts, but those from Puerto Rico (*ex herb.* Binder) could be studied with confidence and agreed with what I found in more recent material scheduled above. Therefore I suggest that the latter specimen retaining the base (no. 34480) be designated the lectotype for *Gigartina tenera* J. Agardh (1841, p. 18), later designated *Rhabdonia tenera* (J. Agardh) J. Agardh, and currently called *Agardhiella tenera* (J. Agardh) Schmitz.

Family HYPNEACEAE

**Hypnea spinella* (C. Agardh) Kützing

St. Joseph: 4, 67-402, forming mats on the rocks in shallow water.

**Hypnea musciformis* (Wulfen) Lamouroux

St. Joseph: S&W-27854, south of Mero; 2, 67-345, common on stones in shallow water. St. John: 8, 67-470, frequent in similar situations. St. Andrew: 12, R-250, R-253, R-256A, locally common on the reef and over the sandy bottom in shallow water.

Family PHYLLOPHORACEAE

**Gymnogongrus griffithsiae* (Turner) Martius

St. Joseph: 4, 67-404 *p.p.*

Gymnogongrus tenuis (J. Agardh) J. Agardh

St. George: 3, 67-351, very common on the upper intertidal parts of rocks. St. Paul: S&W-27871, between Layou and Goodwill; 1, 67-326, occasional on boulders over black sand. St. Joseph: 4, 67-380C, in mats of algae drifted ashore, but dwarf. St. Mark: 6, R-283, on the reef at 6-12 dm depth.

Grieve (1909, p. 10) reports this and the vars. *angustata* J. Agardh and *brevifolia* Holmes without listing definite stations. The record specimens under the varietal names do not seem distinctive, simply being rather small.

Order RHODYMENIALES

Family RHODYMENIACEAE

**Botryocladia occidentalis* (Børgesen) Kylin

St. Andrew: 11, R-193, locally common at 6-12 dm depth.

Family CHAMPIACEAE

**Coelothrix irregularis* (Harvey) Børgesen

St. George: 3, 67-354, washed ashore on the rocks.

Champia parvula (C. Agardh) Harvey

St. Andrew: 12, R-237A.

Order CERAMIALES

Family CERAMIACEAE

**Wrangelia argus* Montagne

St. John: 9, 67-497, common on rocks along the beach.

St. Mark: 6, 67-424, R-304, on rocks along the peninsula to Scotts Head and on the reef at 6-12 dm depth. St.

Luke: 5, 67-419, locally common on rocks.

**Ceramium subtile* J. Agardh

St. Andrew: 11, 67-571 (?), drifted ashore as epiphytic on *Gracilaria*.

**Ceramium nitens* (C. Agardh) J. Agardh

St. Paul: 1, 67-361, frequent as drifted ashore. St. Joseph:

4, 67-384, frequent in the drift. St. Andrew: 11, R-190, mixed with other small algae. St. Mark: 6, R-296, on the south side, common at depths of 9-30 dm.

Centroceras clavulatum (C. Agardh) Montagne

St. Joseph: S&W-27856, south of Mero; 2, 67-341; S&W-27868, on rocks somewhat below low tide level between

Layou and Goodwill. St. Andrew: 11, 67-586, drifted ashore; 12, R-206, R-221, very common high on the reef and in tidepools. St. Mark: 6, 67-439A, on the rocks along the peninsula to Scotts Head.

**Spyridia aculeata* (Schimper) Kützing

St. Joseph: 4, 67-406, on rocks in shallow water.

Family RHODOMELACEAE

- **Falkenbergia hillebrandii* (Bornet) Falkenberg
St. Andrew: 11, 67-528, among other algae attached to the rocks beyond the inshore reef at 6-12 dm depth.
- **Polysiphonia sphaerocarpa* Børgesen
St. Joseph: 4, 67-403, attached to rocks along the shore.
St. Mark: 6, 67-427, dwarf, on rocks along the peninsula to Scotts Head.
- **Polysiphonia binneyi* Harvey
St. Joseph: 4, 67-400, attached to rocks along the shore.
- **Polysiphonia ferulacea* Suhr
St. Andrew: 12, R-244, where intertidal on cobbles, and R-249 on the inshore reef and its vicinity (both det. G. W. Hollenberg).
- **Bryocladia thyrsgera* (J. Agardh) Schmitz
St. Andrew: 12, R-245, abundant on cobbles in shallow water. St. David: 7, 67-459, at a high intertidal level on the boulders.
- **Bryocladia cuspidata* (J. Agardh) De Toni
St. Andrew: 12, R-251.
- **Bryothamnion triquetrum* (Gmelin) Howe
St. Joseph: 2, R-316. St. Andrew: 11, 67-539, R-177, common as attached to rocks beyond the inshore reef at 6-12 dm depth. Seemingly not widespread on Dominica.
- **Bryothamnion seaforthii* (Turner) Kützing
St. Andrew: 11, 67-574, drifted ashore; 12, R-230B, on the edge of the reef at 6-12 dm depth; R-210, on the reef at Pointe La Soie.
- **Digenia simplex* (Wulfen) C. Agardh
St. Andrew: 11, 67-549, R-192, abundant attached high in the intertidal zone on the inner reef.
This is another of the usually ubiquitous species of the upper intertidal zone seldom collected on this visit. It is commonly very stunted and loaded with epiphytes and, thus concealed, doubtless widespread about the island.
- **Bostrychia rivularis* Harvey
St. Andrew: 12, R-248, abundant on *Pterocarpus* roots.
- **Herposiphonia secunda* (C. Agardh) Ambronn
St. Mark: 6, R-307A, on the offshore reef.
- **Amansia multifida* Lamouroux
St. Andrew: 11, 67-556, drifted ashore. 12, R-230A, frequent at the reef edge to 3 dm depth.
- **Vidalia obtusiloba* (Mertens) J. Agardh
St. Andrew: 11, 67-582, drifted ashore.
- **Enantiocladia duperreyi* (C. Agardh) Falkenberg
St. Paul: 1, 67-359, frequent as drifted ashore. St. Joseph: 2, R-308; 4, 67-382, drifted ashore.
- **Chondria littoralis* Harvey
St. Joseph: 2, R-315, 67-346, on small rocks scattered over the black sand just below low tide line and to 12 dm depth; 4, 67-391, on the submerged cobbles.
This species as ordinarily encountered in very shallow water is pale yellow or nearly colorless; unless very promptly mounted or preserved it is liable to decay after collecting.
- **Acanthophora muscoides* (Linnaeus) Bory
St. Paul: S&W-27863 between Layou and Goodwill.

Acanthophora spicifera (Vahl) Børgesen

- St. Paul: S&W-27817 ca. 0.8 km south of the Layou River.
St. Joseph: 4, 67-412. St. John: 9, 67-491, infrequent, but on rocks near the shore.
Grieve (1909, p. 10, as *A. thierii* Lamx.) reports this with some doubt as to its identity and without a specific location.
- **Laurencia corallopsis* (Montagne) Howe
St. Andrew: 11, 67-547, 67-563, common as attached on the inner reef and drifted ashore.
- **Laurencia papillosa* (Forsskål) Greville
St. Joseph: 4, 67-417, attached to rocks in shallow water near high tide line. St. John: 8, 67-478, in similar situations. St. Andrew: 11, 67-557, drifted ashore; 12, R-207, R-208, common on the reef. St. Mark: 6, 67-442, attached near high tide line to rocks along the peninsula to Scotts Head.
This species is all but ubiquitous in exposed situations near high tide level on rocks, and when thus exposed to strong light its normal blackish-purple color does not develop, so that the plants appear bright greenish-yellow.
- Laurencia poitei* (Lamouroux) Howe
St. Andrew: 12, R-234. A juvenile form with flat blades and axes. Grieve (1909, p. 11, as *L. tuberculosa*) lists this without recording a definite station.
- **Laurencia scoparia* J. Agardh
St. Andrew: 12, R-255, drifted ashore.
- **Laurencia intricata* Lamouroux
St. Andrew: 11, 67-546, 67-587, scarce, attached to the inner reef and drifted ashore.
- **Laurencia microcladia* Kützing
St. Joseph: 4, 67-413, attached to rocks in shallow water. St. Andrew: 11, 67-588, drifted ashore. St. Mark: 6, 67-444, on the rocks of the peninsula to Scotts Head.

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