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THE MARINE ALGÆ OF FLORIDA

WITH SPECIAL REFERENCE TO

THE DRY TORTUGAS

BY

WM. RANDOLPH TAYLOR

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WM. RANDOLPH TAYLOR
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MARINE ALGÆ OF FLORIDA WITH SPECIAL REFERENCE TO THE DRY TORTUGAS

INTRODUCTION

The study of the marine vegetation of the Dry Tortugas was originally undertaken to provide a simple check-list of algæ of the islands, for the use of persons visiting the laboratory maintained there by the Carnegie Institution of Washington, with a description of the more important ecological features and records of the locations where plants of experimental importance might be found.

It was soon evident that information about Florida algæ was scanty, and that the texts dealing with adjacent territories were not adequate in affording descriptions and keys, not to mention illustrations, of the Florida species. This lack of a reference text covering the Florida area rendered absolutely necessary a thorough study of all available Florida material before the systematic and ecological reports on Dry Tortugas could be prepared. Therefore it has seemed opportune to collect the records of the occurrence of marine algæ on the east coast of Florida and the Florida Keys and to prepare a unified list, as far as possible eliminating synonyms and adding descriptions of the plants and keys for their more ready identification. Since, in many groups of algæ, identification of genera by scientific methods is laborious, whereas their recognition from illustrations is quick and simple even to persons not trained as phycologists, an attempt has been made to provide adequate drawings and photographs of all genera and species. This proved impracticable with respect to species not present at Dry Tortugas, yet, even among such, a sufficient proportion was made available to prevent confusion among the genera and the more important species.

This is the first time, since Harvey, Farlow and Melvill, that an attempt has been made to list completely the Florida algæ, and the first time that any considerable number of them has been figured, except of course as they may be described in the compendious De Toni's *Sylloge Algarum* which attempts to cover all algæ, or are figured in Kuetzing's *Tabulæ Phycologicæ,* which from their nature can not serve the purposes of a manual. New England marine algæ are fairly available in description if not in illustration, and are adequately listed by Collins in *Rhodora* (6). The flora of the sandy central coast is perhaps sufficiently covered by the list of Martindale for New Jersey (15); the northern limit of the warm belt is well handled in the Beaufort, North Carolina, report of Hoyt (14) and it is hoped that the treatment here given will serve as a usable introduction to the species of what is unquestionably by far the richest portion of our entire eastern coast line. The Gulf coast, including Florida and states westward, is reported as barren, but is practically unknown.

The general character of the Florida flora is obviously tropical, and it includes, excepting ubiquitous Myxophyceæ and endophytes, hardly any temperate zone species; in fact only some 8 or 10 Chlorophyceæ, 2 or 3 Phæophyceæ and 12 to 15 Rhodophyceæ, or about 6 per cent of the over 450 species and varieties now reported from Florida reach the southern shores of Cape Cod. It is difficult to arrive at even approximate figures to show the comparative richness of the Florida flora in relation to other territories, because of omission of whole groups in some of the published lists and because of differences in nomenclatorial precision. Harvey (11) is the most important source of early Florida records and Ashmead (2) reported 66 species from Key West. Murray in 1889 (17) presented a table giving 788 species from the West Indies district. This included Mazé and Schramm's Guadeloupe records as an important element, but of whose new species many are probably invalid, and as the names throughout have not been completely revised the table is undoubtedly greatly in excess of the true number. At that time about 160 species and varieties could be credited to Florida on the basis of Farlow's list (9), after allowing for duplications in names. Collins and Hervey (8) credit 342 kinds (Corallines excluded) to the Bermudas; Howe (12) includes 13 Squamariaceæ and Corallines additional, the total for Bermuda then being about 355. Howe (13) reports about 295 marine species and varieties from the Bahamas, and Hoyt (14) reports 142 from the Beaufort area, the Myxophyceæ being probably incomplete. Of the plants of the Beaufort group which come from the upper limit of the warm area, 91 extend to the Florida-West Indian region. Børgeson (4) records 327 from the Virgin Islands (Danish West Indies) exclusive of Myxophyceæ. The record from Guadeloupe of 790 species and varieties is certainly subject to considerable reduction. Collins' list of New England marine algæ gives about 430 species and varieties. Published corrections and additions increase this to about 465, and mark this a rich area. But it can not be considered that it is actually as rich as the Florida area, for it has received vastly more study, especially with respect to the more minute species. Collins includes the results of careful studies on Myxophyceæ, reporting about 80 species as against 40 for Florida, and many minute endophytes and epiphytes which, while numerous in the tropics including Florida, have hardly been touched upon in collections on that coast. Further, the New England list overlaps two floral districts, the temperate belt extending up Long Island Sound to the southern coast of Cape Cod, and the arctic type of flora extending down the Maine coast toward the northern shore of the Cape. Separate consideration of these two emphasizes the comparative richness of the Floridian flora for, if those species which are found strictly in the sub-arctic waters north of the Cape are subtracted from the list, the number of species in the flora south of the Cape, which is much richer than that north of it, is reckoned to be about 370. To date the only part of Florida studied for any considerable period by trained phycologists is the southernmost end. Harvey, Farlow, Thaxter and the writer have spent considerable periods on the outer Keys. Collections to the north have been mostly made about Miami, Palm Beach and St. Augustine, by persons interested in algæ as amateurs; some have preserved notable collections, chiefly of the macroscopic types. Of the earlier collectors Mrs. Floretta Curtiss deserves special mention, and of the present period Professor and Mrs. S. C. Brooks have sent to the writer considerable Miami material. Harvey and Farlow received material from a variety of correspondents, some of whom even visited Dry Tortugas and included it in their published accounts. J. Cosmo Melvill spent much time in Florida, especially about Key West, although he also studied the west coast. His list (16) affords few records not otherwise available. Scattered critical notes rather than a list of species have resulted from the collections of Dr. M. A. Howe on the Florida coast. Our knowledge of the marine algæ of Florida may be summed up in the statement that for the southern part of the state including the Keys the macroscopic types are pretty well, and the minute types imperfectly, known; for the northern part of the state the macroscopic types are imperfectly known, the smaller types practically unrecorded.

The present writer spent June and July of 1924 at the Dry Tortugas Laboratory of the Carnegie Institution of Washington, and returned for June 1925 and June 1926. The periods at the islands were devoted to an intensive survey of the marine flora of the territory. One day in 1925 and another in 1926 were given to shore collecting and dredging at Key West, and in 1924 a little collecting was done about New Found Harbor Key. The laboratory phase of the study occupied nearly all the time which the writer has been able to devote to research work since the inception of the survey. To facilitate this he has had opportunities to consult the collections of Farlow at Harvard University, which include with his own many Floridian duplicates of Harvey's collecting, as well as those of Farlow's American correspondents and Thaxter's material; the New York Botanical Garden which is especially notable in the collections of Dr. M. A. Howe and of F. S. Collins; and the U. S. National Museum which contains the Curtiss plants and miscellaneous Florida material. The writer's personal collections from Dry Tortugas and Key West involve about 1,600 groups of specimens, with which, for study purposes, may be reckoned the Florida, Bermuda and West Indian material from the Phycotheca Boreali-Americana; also Bermuda material from other sources, especially a fine suite by Miss Anne Hof. A large series from Florida and the West Indies by Professor R. Thaxter was examined, also Jamaica plants collected by Wight, Haitian plants by Dr. C. H. Arndt, and especially a good series of Virgin Island material generously provided by Dr. F. Børgesen, which in other series was also studied at New York and at Harvard, and a considerable number of species from Miami collected by Professor and Mrs. S. C. Brooks.

The Dry Tortugas are a small group of islands some 70 miles west of Key West in the Gulf of Mexico—the outpost between the Gulf and the Straits of Florida. They constitute the final land on the continental ridge which, as a belt of shoals and keys, extends from the southeastern coast of Florida south and west to Key West, the Marquesas and the Dry Tortugas. The prevailing currents tend to go east and north with the Gulf Stream. The land area at Tortugas is small—less than 0.25 square mile apportioned among eight islands—but the shoal area about the keys is considerable. The island group represents the remains of a large oval coral atoll, the present keys lying on the southern margin of the old lagoon. The geological history and physiography of the atoll has been discussed by Agassiz (1). The characters of each island are later considered in detail in relation to the distribution of the algæ. Together they afford an extraordinarily wide range of growth conditions in a space admirably condensed and available for scientific observation. As they lie on the edge of the Gulf Stream they offer a favorable point from which to study the algæ of that current and the benthic species in their distribution down the continental slope to their deepest range under optimum conditions of water purity and transparency. The warmth of the water and its clarity in the shoals enabled a great deal of observation and collection work to be done by wading or from small launches. For deeper work to 15 meters, excellent dredging could be done from the *Velella*, with which a haul could be effected very quickly and the dredge readily controlled by hand. Never, however, have phycological studies in the Florida-West Indian region been served with deep-sea dredging facilities such as were offered by the yacht *Anton Dohrn* of the Carnegie Institution. Equipped as this boat is for really deep-sea dredging and sounding, work to the growth-limit of algæ offered no difficulty whatsoever. The dredge, on a small rectangular iron frame about 10 by 18 inches at the top, was carried on a steel cable and sunk by a heavy sounding lead. Raising at the finish of a haul was effected by a gasoline engine, the entire operation of lowering, dragging and hauling-in taking about an hour for a depth of 60 to 100 fathoms. The dredge was usually left on the bottom for 5 to 10 minutes in shallow water and to 30 fathoms, or sometimes longer on deeper hauls where there was less risk of damage from rough bottom. While frequently the dredge did not secure a very great variety of species at any single haul, on other occasions the catch contained a considerable assortment, as at Station 329, where at least 46 species were secured at 11 meters. The material obtained was preserved as dried specimens and in liquid, the latter method making samples of nearly all species available for detail studies in preparing the illustrations.

There is very little record of previous collections at Dry Tortugas, though those who collected about Key West were sometimes able to get down to Dry Tortugas. In addition, military officers stationed at Fort Jefferson sent occasional specimens for determination, and a very few of these were detected in the Farlow Herbarium. The most important names appear to be those of Mrs. G. A. Hall, F. W. Hooper and perhaps Mrs. Floretta Curtiss, who may only have had her material from Mrs. Hall. Dr. H. H. M. Bowman collected several species, publishing a list of 28 (Carnegie Inst. Wash. Pub. No. 252), with 3 additional species unrecorded but in the Herbarium of the New York Botanical Garden.

It was the original intention of the present writer to prepare no more than a simple tabulation of the algæ at Dry Tortugas as an aid to persons who might desire to obtain material for more detailed studies. The unexpected richness of the flora suggested the preparation of a preliminary paper, and soon after the material from the first summer of study (1924) had been sorted such a manuscript was sent to the

Revue Algologique in expectation of almost immediate publication. The journal went into a dormant state, however, for nearly two years, and the paper (19) did not appear until after the present manuscript had been nearly completed, and so too late to conveniently cite through the text. Any differences appearing between the two texts should be considered as corrections by this present issue.

The generosity of the Carnegie Institution of Washington and of President Merriam in granting the facilities of the Tortugas Laboratory and its boats for this study can not be too strongly acknowledged. The representative of the Institution at the Laboratory, Professor W. H. Longley, has at all times most solicitously encouraged and aided the work.

From the inception of the work the writer has been forced to refer many problems to Dr. Marshall A. Howe, Assistant Director of the New York Botanical Garden, to send him specimens for determination and to consult his collections; throughout Doctor Howe has continued a gracious and stimulating helpfulness for which the writer is most sincerely grateful.

Professor I. F. Lewis has given valuable help in organization of the results of the work, in granting special facilities at the Marine Biological Laboratory at Woods Hole, and in many other ways. In response to an appeal, Dr. Frederick Børgesen kindly sent specimens in illustration of his admirable *Marine Algæ of the Danish West Indies* and these have been of great assistance. Dr. C. W. Dodge has given special help in utilizing the treasures of the Farlow Herbarium at Harvard University, without which the fundamental records of Florida species would have been hopelessly out of reach. Mr. W. R. Maxon has kindly permitted the examination of the collections in the National Herbarium.

The illustrations owe much to the skill and interest of Miss Margaret Sumwalt, who assumed the difficult task of preparing in ink for reproduction most of the pencil drawings. The preparation of manuscript from the rough draft was largely done by Miss Jean F. Grant, thereby relieving the writer of the most trying task of all.

MARINE FLORA OF DRY TORTUGAS

HYDROGRAPHIC FEATURES

WATER TEMPERATURES

The general temperature at Dry Tortugas determines that the flora is typically tropical. Exclusive of the Myxophyceæ, less than 10 per cent of the species reach northward to Cape Cod. A very extended series of observations on air and water temperatures was compiled under the direction of Dr. T. Wayland Vaughan (14). These indicated that the temperature of the water off the wharf in Garden Key channel and that in the moat (Side 1) varied during the period between June 16, 1911, to June 15, 1912, through the range shown in table 1, the data for which were drawn from his paper. In general, the channel readings made at 7 a.m. were lower than those made at 3 p.m. by from 0.5° C. to 2.5° C. From the table we note a maximum range of 16.1° C. (17.2° to 33.3°) in the moat and of 13.4° C. (19.4° to 32.8°) in the channel, indicating a very considerable difference in extreme conditions.

TABLE 1—*Temperatures of Water at Garden Key, June 16, 1911, to June 15, 1912*[1]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Wharf:	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Max..........	24.4	23.3	27.8	29.4	30.6	30.6	32.2	32.8	31.7	30.6	28.9	24.4
Min..........	19.4	19.4	20.0	22.3	26.1	25.6	27.8	27.8	27.8	26.7	22.2	20.0
Moat:												
Max..........	24.4	23.9	27.8	30.0	31.1	31.7	32.8	33.3	31.7	31.0	28.9	25.6
Min..........	17.2	17.2	18.3	22.8	25.6	26.1	27.8	27.2	26.7	26.7	20.0	17.8

[1] Compiled from data given by T. Wayland Vaughan (14).

The temperature of the channel water is probably a little higher than that of the water outside of the reefs, but can fairly represent surface water freely mixed by wind and tide. The moat temperatures are more nearly those attained by the broad shallow flats, but at the point studied are distinctly lower than that reached by the water in the most shoreward parts of the broader lagoon flats or by the more stagnant parts of the moat. The writer planned a series of observations on the temperature of the six sides of the moat, but found that pressure of the taxonomic portion of the work would not allow sufficient time for the continuation of the series beyond the initial stage. It will, however, be of interest to list the readings taken (table 2). These show that the temperature was fairly uniform in those parts of the moat which had a free circulation of the water. For this study thermometers were supported vertically through corks anchored by cords to weights on the bottom, and readings probably represent the temperature of the upper decimeter of water. The average rise through the day (June 21) is 1.55° C., the extreme difference on any one side being 3.0° C., which is also the extreme range of all readings for the day. On June 21, 1926, in connection with the acquisition of a sample of water for specific gravity measurement, the temperature of the surface water in the pool on Side 4 was found to be 34.0° C. The air was quiet and the sunlight powerful.

The temperatures reached by the water in the open moat and in the pools isolated within its walls were not as high as those shown by the shallow pools on Long Key (table 3) which supported a quite luxuriant flora of Myxophyceæ and some filamentous greens, especially *Rhizoclonium Hookeri*. The surface water of these reached

TABLE 2—*Water Temperatures in Moat, Garden Key*

	June 20, 1925		June 21, 1925				
Side	2.15 P.M.	4.00 P.M.	9.15 A.M.	11.00 A.M.	1.00 P.M.	3.00 P.M.	Average through day
	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1..........	31.00	32.50	30.00	31.00	31.25	31.00	30.81
2..........	31.00	31.75	29.00	30.25	32.00	31.00	30.56
3..........	31.00	32.00	30.00	30.00	31.00	31.25	30.56
4..........	32.00	33.00	30.50	31.00	32.00	31.25	31.19
5..........	32.00	32.00	29.50	30.00	31.50	31.00	30.50
6..........	31.00	30.75	30.00	31.00	31.50	31.50	31.00
Av. all sides.	31.33	32.00	29.99	30.54	31.54	31.16	

(NOTE: Weather June 21: Occasional slight clouds until 2.30 P.M., then considerably cloudy, fair breeze. Thermometer at Side 1 near overhead pipe toward southern end; at Side 4 in pool near southern end of side; others in center.)

remarkably high temperatures—35° to 39° C.—in spite of which the algæ floating near the surface seemed luxuriantly healthy. It was expected that this high temperature would so accelerate the evaporation of the water as to considerably raise the salt

TABLE 3—*Temperatures in Pools on Long Key*

	Pool I			Pool II			
Date	Surface above floating algæ	Near surface below algæ	Near bottom	Surface	Dry sand	Light	Remarks
1924	°C.	°C.	°C.	°C.	°C.		
6/7	......	35.5	....	......	42.5	Clouds over sun	High tide
6/7	......	37.5	29.5	......	49.5	Full sun	High tide
7/26	37.5	38.0	36.0 Shaded by algæ; 37.25 Exposed to sun	......	39.0	Partly cloudy	Low tide, windy
1925							
6/6	......	......	32.5	30.0	......	Cloudy	3 P.M. At 6″ depth (II)
6/20	40.0	......	....	a 36.5 b 37.25	43.0	Full sun	3.45 P.M. windy Center pool (II) a Margin pool (II) b
1926							
6/21	......	......	....	39.0	......	Full sun	

concentration in these pools, but it was found that the mixing caused by the rise and fall of the tides and consequent seepage through the very porous sand was sufficient, in conjunction with some slight accumulation of fresh water from rain, to prevent any very considerable increase in density.

SPECIFIC GRAVITY AND SALINITY OF WATER

Observations on the specific gravity of the water about Dry Tortugas as made by the writer are very few and for the most part confined to places appearing to afford peculiar or extreme habitat conditions for the algæ there present. Observations in the moat of Fort Jefferson on Garden Key provided first for an examination of the water in the more open part of the moat where tidal currents provided an ample flow. Here (Side 1) the salt concentration (38.6 per thousand) was not significantly higher than that found on the white sand flats west of the island, and not much higher than the concentration of the water off the more precipitous shores of Loggerhead Key (37.5, 38.0). Further observations were made in a pool enclosed by sand banks in another part of the moat (Side 4). In 1925 the water here showed about the same concentration as that in the open moat (38.4) except as it was diluted (37.4), probably by rainwater from showers which occurred the previous night. By the following year the pool had become even smaller and further isolated by additions to the sand banks, and the water had become deep green from organisms growing in it. After a prolonged dry spell the salinity showed 41.1, the highest observed on any occasion about the islands, but probably not surprising in view of the fact that the pool was flanked on one side by the great brick face of the fort and surrounded by glaring white coral sand, tending to rapid evaporation and high-water temperatures, as 34° C. at the time the sample was taken.

TABLE 4—*Specific Gravity and Salinity of Water at Dry Tortugas*

Place	Date	Specific gravity	Salinity
			Parts per thousand
Garden Key:			
Side 1 Moat........	June 21, 1925	1.0297	38.6
Side 4 Moat........	21	1.0289	37.6
Side 4 Moat........	24	1.0295	38.4
West Flats.........	24	1.0295	38.4
Side 4 Moat........	21, 1926	1.0316	41.1
Loggerhead Key:			
Open Water........	6, 1925	1.0292	38.0
Open Water........	21, 1926	1.0288	37.5
Long Key:			
Pool 1.............	6, 1925	1.0239	31.0
Pool 2.............	6	1.0269	35.0
Pool 1.............	20	1.0292	38.0
Pool 2.............	20	1.0306	39.8
Large Pool.........	21, 1926	1.0310	40.4

Probably the most interesting locations from the standpoint of salinity were certain small pools on Long Key. Unfortunately this island changes rapidly from season to season and the smaller pools which form on it may be short lived and so can not be studied in successive seasons. Two pools were selected in 1925 and observations were made which tended to show a somewhat lesser salinity (31.0, 35.0) than the open water in spite of the fact that the pools responded moderately to tidal influences by seepage through the porous sand of which the island is composed. This low concentration is probably to be attributed to rainwater, as the tested samples were taken from rather near the surface and the weather (before June 6) had been showery for a week. A reading made in 1926 on the largest pool present at that time, and which probably corresponded to Pool 2, showed a decidedly high salinity (40.4), following a prolonged dry period. These shallow pools supported a flora of Myxophyceæ and Chlorophyceæ of notable richness, but of genera which frequently show their adaptability to varying salt concentration (*Chroococcus, Gomphosphæria, Rhizoclonium*), and in respect to these no surprise may be felt. More strange is the presence of considerable beds of *Halodule* in this largest pool in a most flourishing condition as to abundance and breadth of leaf, but the leaves are rather short, probably in relation to the shallow water. Vast numbers of small snails infest the plants and the shores of the pool, and mats of algæ come loose and float to the surface, where the water reaches the extreme temperature of 35° to 40° C.[1]

LIGHT CONDITIONS FOR ALGAL GROWTH

At Dry Tortugas green and to some extent brown algæ were able to grow luxuriantly at very considerable depths, quite in excess of those at which growth is possible in most other localities which have been studied. This made an exploratory investigation necessary in order that some proper estimate might be given of the transparency of the water under the various conditions present in this area. Upon the kind advice of Dr. W. R. G. Atkins of the Plymouth Marine Laboratory an instrument of the type known as a Secchi Disk was constructed. A heavy disk 20 cm. in diameter, enameled white upon the upper surface, was slung from a swivel by three cords to screw-eyes inserted in the margin, and from these same screw-eyes three more cords suspended a heavy weight to sink and steady the disk in the water. This Secchi Disk was lowered from the cockpit of the launch when used in shallow water, or from the deck of the *Anton Dohrn* when used farther from land in deep water, until the disappearance point was reached. It is hoped that the utilization of a disk of the specified proportions will allow a correlation of observations made by the writer with those of Atkins (15) and others. From the launch *Velella*, readings were taken through a glass-bottomed bucket except during periods of almost perfect calm. From the smallest launch, which was provided with a glass set in a well in the bottom of the boat, observations were made through the glass bottom. This latter method, while somewhat more comfortable, did not appear significantly more efficient. From the *Anton Dohrn* all readings were taken by direct observation looking over the rail, the height above the water with the general quietness of surface on days when the observations were made combining to make this adequate. It seemed remarkable how sharply the disk passed the line of visibility—the range within which one could not be certain as to whether it was visible or not being surprisingly small in proportion to the total depth submerged. In shallower waters the disk appeared milky to rich green in color, while in the deep clear waters of the Gulf Stream it shone brilliantly blue.

[1] Dr. Chancey Juday has kindly given information helpful in the preparation of this section.

When observations were made over white sand, diffuse reflection from the bottom often made it difficult to recognize the disk unless a considerable body of water lay under it, but where the bottom was covered with algæ readings were much easier. These difficulties, however, arose only in quite shallow murky water. Sources of error arise in the personal equation in judging where the disk passed out of sight, and in the curvature of the line due to drift of the boat from wind or other causes exceeding that of the disk. The active interest of such other members of the staff and ship's crew as were free at the time readings were taken always gave a considerable group of volunteer observers, who confirmed the visibility of the disk on all observations in the Gulf Stream. The curvature of the supporting line was reduced to a very slight amount by careful navigation of the boat, and it was not enough to materially affect the readings. Finally, the fact that for the major part of this study the disk was lowered upon a line of braided cotton cord marked as a sounding line might be objected to on the assumption that the lower part of the line could be mistaken for the disk in murky water. Such a mistake would hardly be made by anyone who was familiar with the apparatus, but to eliminate all question and likewise to eliminate the curve of the line due to boat drift, a few measurements (Nos. 26, 27, 34, 35) were made from the *Anton Dohrn,* using the slender black braided steel wire of the navigational sounding machine in place of the rather dirty-white hand line, reading the depths on the calibrated dial of the machine. No discrepancies were revealed by this method.

Extraordinary as the Gulf Stream readings may appear, the writer feels that they are quite conservative, in that the disk was clearly present as a gleaming blue star-like object at the depth cited, and that observations under the favorable conditions of prolonged calm and reduced plankton would clearly extend the record. The relation of the time of day, of the degree of agitation of the surface of the water, and of the brightness of the incident light in determining the visibility of the disk at any given depth is in general that the agitation of the surface is most important in reducing the amount of light that enters the water, and that there is little difference in readings due to changes in angle of incidence through the middle of the day, although early in the morning and late in the afternoon this does seriously affect the readings. Finally, the degree of cloudiness or of sunlight, within a wide range, is not a controlling factor. These views, while based on reports of the percentage of light transmissal to depths of water, are probably directly applicable to readings made with the Secchi Disk.

Slightly more than fifty measurements were made with the disk in this reconnaissance. These are presented, with such auxiliary data as the writer has available, in table 5. First of all, they confirm the common knowledge that the water in the lagoon is turbid from suspended calcareous mud. On the outside of the reefs and shoals the water is clearer than within the lagoon, but not nearly as clear as that in the deep off-shore waters. Turbidity throughout is increased during a period of rough water, and decreases gradually as calm weather sets in. The transparency of the water in the lagoon permitted the disk to be seen at a depth of 7.5 to 12.7 meters, generally about 10.0 meters, depending upon the location and the proximity in time

Table 5—*Secchi Disk Readings of Water Transparency, June 1926*

No.	Reading Meters	Long.—Lat. or Depth	Light	Surface	Time	Date	Remarks
		° ′ ″ ° ′ ″					
1	9.8	82 54 40—24 38 10	Sun Pt. Cl.	Mod. R.	1.30 P.M.	5	Readings this date started 1.30 P.M., closed 3.00 P.M.
2	11.3	82 53 40—24 38 10	“ “ “	“ “			
3	9.8	82 53 00—24 37 50	“ “ “	Sl. R.			
4	8.2	82 52 10—24 37 40	“ “ “	“ “			Disk close to white bottom
5	8.2	82 52 20—24 38 10	“ “ “	Mod. Sm.			
6	11.3	82 52 10—24 38 50	“ “ “	Mod. R.			
7	9.8	82 51 30—24 38 30	“ “ “	“ “			
8	8.2	82 51 20—24 38 20	“ “ “	“ “	3.00		
9	8.2	82 48 40—24 39 10	“ “ “	Mod. Sm.	11.30 A.M.	10	Preceding day windy
10	8.2	82 49 40—24 38 50	“ “ “	“ “	1.15 P.M.		
11	9.0	82 50 50—24 38 40	“ “ “	“ “	1.30		
12	10.5	82 53 20—24 38 40	“ “ “	“ “	2.45	14	
13	12.0	82 54 00—24 39 30	½ Sun Pt. Cl.	Rougher	3.30		
14	12.7	82 54 10—24 39 50	“ “ “	Rough	4.00		
15	9.8	82 54 40—24 38 10	Obsc. Lt. Cl.	Smooth	1.45	17	
16	9.5	82 53 00—24 37 50	“ “ “	“	2.00		
17	12.7	82 51 50—24 37 00	“ “ “	“	2.20		
18	9.0	82 51 40—24 37 00	Obsc. Hv. Cl.	“	2.30		
19	11.3	82 51 20—24 37 50	“ “ “	“	3.00		
20	12.1	82 52 10—24 35 30	½ Sun Lt. Cl.	“	3.15		
21	6.6	82 52 20—24 38 10	Sun	“	3.30		
22	20.9	32.9 meters	Sun Pt. Cl.	Mod. Sm.	9.30 A.M.	18	
23	24.7	36.6	“ “ “	“ “	10.20		
24	26.6	51.2	“ “ “	“ “	11.00		Easily visible
a25	26.6	82.5	“ “ “	“ “	11.40		Taken sunny side of boat
b25	25.7	82.5	“ “ “	“ “	11.40		Taken shady side of boat
26	25.5	179.3	“ “ “	“ “	12.05 P.M.		Sounding machine
27	31.0	179.3	“ “ “	“ “	1.15		Sounding machine
28	26.6	124.4	“ “ “	“ “	1.40		Easily visible
29	21.5	32.9	“ “ “	“ “	3.45		
		° ′ ″ ° ′ ″					
30	11.3	82 55 40—24 36 30	Sun	V. Sm.	8.40 A.M.	20	
31	11.0	82 55 50—24 35 10	“	“ “	9.15		Disk on bottom, easily visible
32	19.0	27.5 meters	“	“ “	10.05		
33	26.6	34.7	“	“ “	10.55		Easily visible
34	28.3	110.0	“	“ “	1.00 P.M.		Sounding machine
35	36.4	183.0	“	“ “	2.00		Sounding machine
36	26.6	82.5	“	“ “	4.15		Easily visible
		° ′ ″ ° ′ ″					
37	11.3	82 54 40—24 38 10	Sun	V. Sm.	1.30	21	
38	9.8	82 53 00—24 37 50	“	“ “	2.00		
39	11.3	82 54 40—24 38 40	“	“ “		22	
40	11.3	82 54 40—24 38 10	“	“ “			
41	8.3	82 53 00—24 37 50	“	“ “			
42	9.8	82 57 30—24 36 40	Obsc. Lt. C.	“ “		24	
43	11.3	82 57 40—24 36 30	“ “ “	“ “			
44	12.7	82 57 30—24 37 20	½ Sun Lt. C.	“ “			
45	14.1	82 56 30—24 38 10	“ “ “	“ “			
46	13.4	82 55 50—24 38 40	“ “ “	“ “			
47	13.0	82 55 30—24 39 00	“ “ “	“ “			
48	9.0	82 54 40—24 38 10	Sun	Mod. Sm.		25	
49	10.2	82 53 40—24 38 10	“	“ “			
50	7.5	82 53 00—24 37 50	“	“ “			
51	6.1	82 52 10—24 37 40	“	“ “			

Abbreviations: Mod. R. = Moderately rough water; Mod. Sm. = Moderately smooth water; V. Sm. = Very smooth water (dead calm); Sl. R. = Slightly rough water; ½ Sun = Sun through light clouds; Pt. Cl. = Partly cloudy; Lt. Cl. = Light clouds; Hv. Cl. = Heavy clouds.

Localities: Areas within easy sight of land are indicated by estimated longitude and latitude from U.S.C.& G.S. chart 585; descriptions of positions are as follows: Station 1, 0.2 mile E. of N. end of Loggerhead Key; 2, 0.2 mile E. of center of White Shoal; 3, near "N" buoy, W. end of Garden Key channel; 4, in channel, opposite landing wharf; 5, E. end, Garden Key channel; 6, E. of Middle Ground at "N" buoy; 7, at Iowa Rock between "S–3" and "N–2" buoys; 8, 0.3 mile NE. of Long Key; 9, 0.25 mile W. of East Key; 10, S. of Middle Key; 11, 0.3 mile SE. of Sand Key; 12, SW. of "N–8" buoy between Loggerhead Key and Middle Ground; 13, between S. end of Brilliant Shoal and N. end of Loggerhead Key shoal; 14, NW. of Station 13 and near Loggerhead Key shoal; 15, as Station 1; 16, as Station 3; 17, SW. of Five-Foot Channel; 18, 1.0 mile SW. of Five-Foot Channel; 19, 1 mile E. of Long Key; 20, near "C–1" buoy (SE. of Bird Key): 21, as Station 5; 30, "S–1" buoy in Southwest Channel; 31, "N–2" buoy in Southwest Channel; 37, as Station 1; 38, as Station 3; 39, as Station 1; 40, as Station 2; 41, as Station 3; 42, inshore side "N–10" buoy, SW. end Loggerhead Key; 43, offshore side "N–10" buoy; 44, W. from wreck, NW. of S. end Loggerhead Key shoal; 45, W. of S. end of Loggerhead Key about two miles offshore; 46, WNW. of Lighthouse on Loggerhead Key, about 2 miles offshore; 47, NNW. of N. end Loggerhead Key about 2 miles offshore; 48, as Station 1; 49, as Station 2; 50, as Station 3; 51, as Station 4. Areas out of sight of land are located offshore in water of the depth indicated and in the following directions: Stations 22–26 inclusive S. of Southeast Channel; 27, 28, E. of line running S. from Southwest Channel; 29–34, S. of Southwest Channel; 35, 36 W. of line running S. from Southwest Channel.

to a storm period. The water here had a maximum depth of a little over 20 to 30 meters. In water outside the reefs with somewhat similar depth the disk was visible at 8.2 to 14.1 meters. Measurements outside of the island group in water of 30 to 100 meters gave transparency readings of 19.0 to 26.6 meters. Finally, in the Gulf Stream at a distance from the shore of 15 to 20 miles the disk could be seen at 25.5 to 36.4 meters. The variation at a single station is important as showing the range due to agitation of the water, modified to some extent by prevailing light conditions at the time the observations were made. For instances of this variation may be cited the two stations where observations were made most frequently, which showed that just east of Loggerhead Key shoal the equivalent transparency varied from 9.0 to 11.3 meters, while the station at the western end of Garden Key channel varied from 7.5 to 9.8 meters. The water of the Gulf Stream according to these observations may be at least three times as clear as that of the lagoon. It is not yet possible to correlate closely the relative estimates of transparency given here with the quantitative records of light transmissal published by Poole and Atkins and others. However, Poole and Atkins worked with a photometer having a whitish window, and this could be seen from above when the light reaching it had been reduced to about one-third by its passage into and through the water. As the Secchi Disk used by the writer was much larger and probably much whiter it should be seen to a much greater depth under similar conditions. As an explanation of the presence of green algæ at such unusual depths as they were found—55.0 to 91.5 meters—the transparency of the water alone probably will not suffice, but the character of the bottom must be considered, which was here a very soft sand or mud, and the algæ found (principally Caulerpas) were by their rhizomatous habit and abundant filiform rhizoids admirably adapted to such a substratum.

GEOGRAPHIC DISTRIBUTION OF DRY TORTUGAS ALGÆ

LOGGERHEAD KEY

Loggerhead Key lies near the southwest limit of the group of islands and reefs remaining of the ancient atoll. It is much elongated in a northeast-southwest direction, about 1,400 yards long and 225 yards in greatest breadth, is pointed at the ends and stands on a shoal bank which extends approximately northeast to the northern part of the island and then curves around toward the north. This shoal is about 6.5 times as long as the island itself if measured at a depth of 3 to 4 fathoms, from which level it drops rather sharply. It is much broader on the northwestern side of the island, extending out to a well-developed coral-reef formation, while on the southeastern side it is narrower, with the steep drop to deep water more close at hand. In general the tidal currents pass parallel to the length of the island, running northward on the rising tide and southward on the falling tide. The general trend of the wind is such as to cause the sand banks at the ends of the island to curve toward the westward during the summer, and it is reported that this curve is reversed in the winter. The northwest side of the island is therefore the protected side during the warmer months and calm water generally prevails there; drifting algæ come ashore only upon irregular storms from the westward. At such times the material cast up is generally *Laurencia obtusa,* accompanied by a fair amount of *Dictyota, Hypnea, Spyridia* and *Chondria.* On the other hand *Sargassum* in considerable amounts is generally to be found drifted ashore on the southwestern side, both the pelagic types *S. fluitans* and—much more sparsely—*S. natans,* as well as the attached types, of which *S. pteropleuron* is the most abundant.

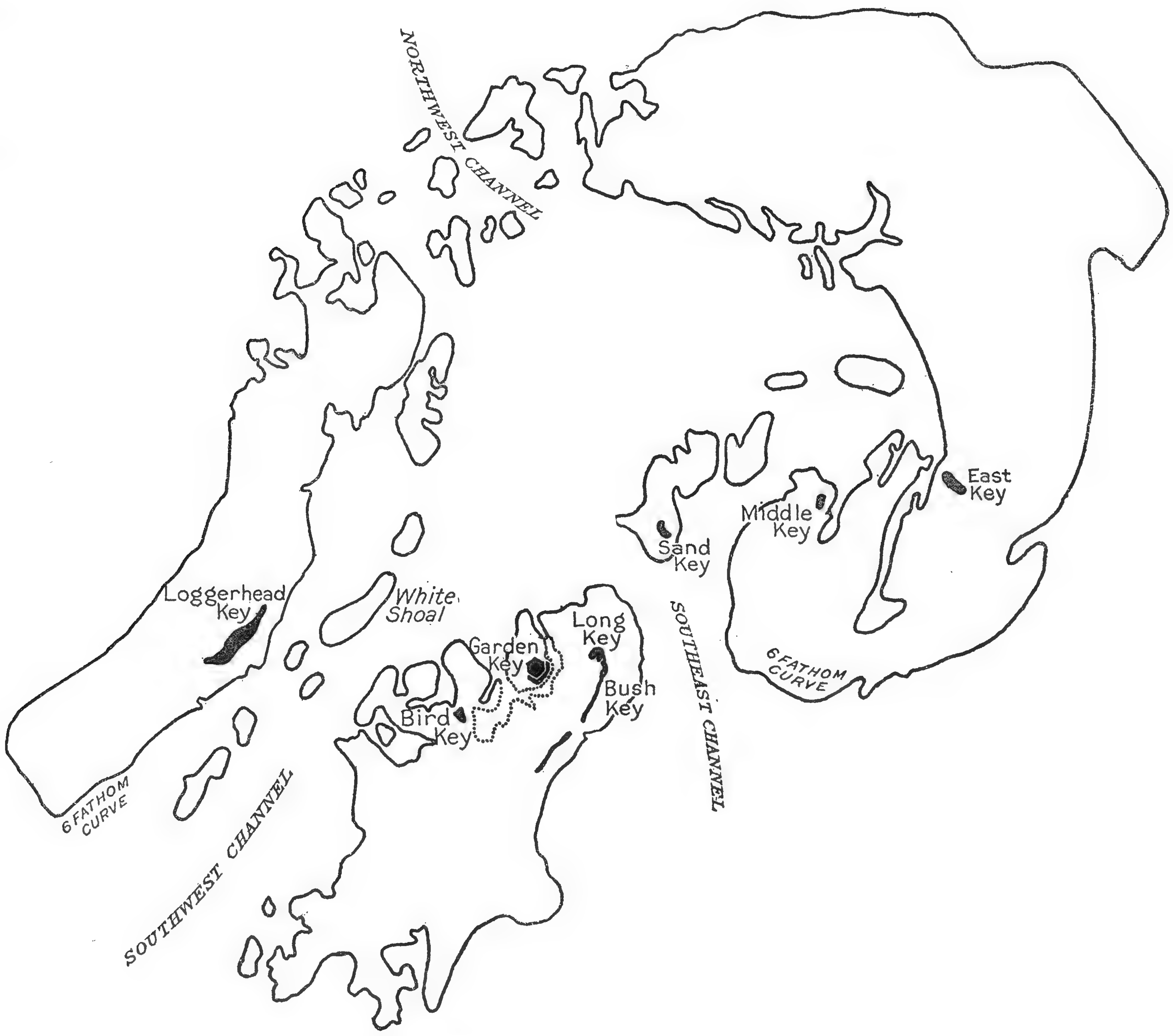

FIG. 1. Sketch map of Dry Tortugas, Florida. The six-fathom contour shows the elliptical character of the submerged atoll and the position of the islands. The dotted line indicating the boundary of the channel south of Garden Key is at considerably less than six fathoms. Many minor shoals are omitted. Adapted from map in Carnegie Inst. Pub. No. 213, Plate 100.

The attached marine vegetation of the Loggerhead Key territory can best be treated separately for those districts readily accessible on foot from the beach and for the outer shoal territory which can only be studied from a boat. The shore area consists of long stretches of bare and shifting sand alternating with strips of coquina rock which form part of the shore line or, probably by a shifting from an old contour, strike obliquely out from the shore over the shoal for several yards. The flora of the sand strips is poor, if indeed any growth is present. As the island offers no permanently sheltered coves, the characteristic vegetation of such spots is nowhere permanently developed. But in 1925, though quite absent as a characteristic growth in 1924 and again in 1926, under the protection of the curved tip of the northeast end of the island and between that end and the wharf of the Laboratory there was developed an almost continuous and very luxuriant growth of *Spyridia filamentosa, Hypnea musciformis* and *H. cornuta, Centroceras clavulatum* and *Padina Sanctæ-Crucis.* It extended from within easy wading reach to a depth of over 3 meters. Where in the more shifting sand there occur areas of coral fragments or of small blocks of dead coral or coquina, there generally appears some growth of *Dictyota, Chondria, Laurencia, Neomeris* and other species belonging to this type of habitat, but this development is characteristically one of deeper water. The beds of coquina rock which occur on both sides of the island support a highly interesting flora, and one which is quite remarkable in the variety of species concerned. Those on the southeast side, three in number, have a vegetation rather more uniform than the two on the northwest. In 1925 a quick survey was made, within the compass of about two hours, of that group of rocks lying just south of the Laboratory wharf on the northwest side, and a casual repetition of this in 1926 showed practically the same species, with a few additions and a few of the original list unconfirmed. This list follows, the species first noted in 1926 being marked by an asterisk:

Dichothrix olivacea

Caulerpa cupressoides mammillosa*
Caulerpa cupressoides typica
Caulerpa racemosa clavifera*
Caulerpa racemosa uvifera
Cladophora fuliginosa
Cladophora repens
Cladophoropsis membranacea
Codium intertextum
Codium tomentosum
Dasycladus vermicularis
Enteromorpha prolifera
Halimeda Opuntia
Halimeda scabra
Neomeris annulata
Penicillus dumetosus
Rhipocephalus oblongus*
Rhipocephalus Phœnix*
Udotea sublittoralis*
Valonia ventricosa

Colpomenia sinuosa
Dictyota divaricata
Dictyota Bartayresii
Dilophus alternans
Padina Sanctæ-Crucis
Padina Vickersæ
Sargassum polyceratium ovatum

Zonaria zonalis

Acanthophora spicifera
Amphiroa fragilissima
Amphiroa rigida antillana
Amphiroa Tribulus
Bryothamnion triquetrum
Centroceras clavulatum
Cœlothrix irregularis
Corallina cubensis
Digenia simplex
Galaxaura rugosa
Galaxaura subverticillata
Gelidium rigidum
Gelidium pusillum*
Goniolithon solubile
Gracilaria crassissima
Hypnea divaricata
Hypnea musciformis
Jania capillacea
Jania rubens
Laurencia intricata
Laurencia obtusa
Laurencia papillosa
Liagora valida
Polysiphonia Binneyi*
Spyridia aculeata hypneoides
Wurdemannia setacea

In the preparation of this list no search was made for inconspicuous Myxophyceæ, for endophytes or for minute Rhodophyceæ, such as *Acrochætium.* This group of over 50 species, coming from a short stretch of rocks but a few yards in length, indicates the high complexity of the flora in such a habitat. The dominant feature was the great development below low-tide mark of *Laurencia obtusa,* the Dictyotæ, *Dilophus alternans, Halimeda scabra* and considerable *Padina Sanctæ-Crucis.*

Higher up, forming a turf which extended above low-tide mark, grow Janias, *Centroceras, Cœlothrix, Gelidium, Dictyota, Sphacelaria* and dwarf forms of several other things, such as *Padina.* Fine sand sifts through the substance of this turf and generally only the tips of the filaments project beyond it. At the extreme upper limit of vegetation the rocks are nearly bare, and there were found lumps or patches of *Dichothrix olivacea* and dwarf *Enteromorpha.* The rocks on the southeast were especially distinguished by considerable areas of *Wrangelia Argus* and *Laurencia intricata* in the between-tides turf, the former extending down to low-tide mark. Because of these two species, and without any special scarcity of the more dominant forms of the other side, the appearance of the upper portions of the rocks was distinctly different in its rather brilliant pink to red color.

The study of the shore vegetation was conducted as a series of excursions afoot, and the collection was done under observation through a glass-bottomed bucket—obviously impossible in deeper water, where a series of dredge hauls was made to assemble an adequate series of the specimens showing the flora at different depths and with different types of bottom. This was followed by a survey of that part of the shoal visible through the glass bottom of a boat, recording on a map of the shoal the types of bottom traversed and the characteristic plants so far as they could be recognized. In general, the shoal on the northwest side of Loggerhead Key was very much broader than that on the southeast, and carried a much more luxuriant flora. The character of the shoal on the northwest side is fairly uniform throughout the length of the island. Around the northeast end the very shallow inshore water lay on a bare sandy bottom, but farther out where the broken corals became more abundant old and decaying *Zonaria zonalis* plants were seen, with the usual plants growing on small coral fragments inshore. Farther out where the masses were larger a considerable growth of Gorgonians occurred, and patches of coral, living and dead, extended out to deep water, alternating with patches of sand, culminating in a massive reef of stag-horn coral (*Isopora muricata*). This reef extends parallel to Loggerhead Key as the significant outer boundary of the shoal from at least the upper end of the key nearly to the southwest end, being in its greatest luxuriance at about the middle point, with broad interruptions and in part dead at the southern end. It was not examined beyond the length of the island itself. Outside of this reef line there was a rapidly descending bank of sand with but few coral patches, passing out of sight to deep water. Within it the coral masses became of a lesser size and of other species than *Isopora muricata*, scattered and with intervening sand spaces of increasing size. While algæ were absent on the large living stag-horn coral masses, a fair development was visible from above on the margins of the smaller coral masses, principally characterized by Dictyotæ. These scattered heads extended to about 4.5 to 7.5 meters depth, being gradually replaced by small blocks with Gorgonians attached in profusion, and on the bases Dictyotæ, Galaxauræ, *Amphiroa Tribulus, Cladophora fuliginosa* and Sargassa were most readily recognized from above. This territory in turn graded into patches of sand alternating with patches of grass, generally *Thalassia* alone or *Thalassia* with *Cymodocea* or *Halodule.* In some places, generally in relation to off-lying ridges of coquina rock, there succeeded a belt of Gorgonians in comparatively shallow water, but usually the *Thalassia* patches were directly terminated by the unstable sand of the immediate sublittoral belt. Variations in the general succession were few. Inside the great stag-horn zone there was, over quite a large territory, a strip of comparatively barren sand, followed on the inner side by large coral heads, especially toward the southwest end of the island. The succession of flora southwestward from the key showed by contrast a flora unique for the district. Immediately off the point there appeared the usual sand strip, followed with an admixture of coral fragments and bearing Gorgonians and the usual associated plants of shallow water: Dictyotæ, *Laurencia obtusa,* Halimedas and *Cladophora fuliginosa.* Farther out the Gorgonians became less abundant and *Padina Sanctæ-Crucis* dominated, to be succeeded in turn by a *Sargassum* belt, after which Gorgonians in conjunction with *Zonaria zonalis* became the striking feature. Patches of this latter type alternated with patches of sand out to a depth of about 3 meters, at which tufts of *Neurocarpus Justii* appeared, to become in about 3.7 meters almost exclusively the plant on all the dead coral on the bottom, and extending out in large mounds or broad beds beyond the depth-limit of visibility. This area of *Neurocarpus* was one of the few pure algal associations of moderately deep water, and, because of its striking resemblance to the Fuci of northern seas, was particularly distinctive here in the absence of all species of *Fucus.*

On the southeast side of the shoal the land slopes down to the lagoon, with a much narrower strip visible than on the northwest. Three considerable areas of rock exist between the lighthouse wharf on the eastern side and the laboratory site, and one between the lighthouse wharf and the southern end of the island. The general character of the vegetation has been indicated above. The sand belt bounds the shore all along the island except at these rock regions, and off the lagoonward end of the rocks there were large quantities of Gorgonians. Beyond the sand, the *Thalassia* belt followed closely, broken by areas of sand and in places substituted by patches of *Cymodocea* and *Halodule,* the former especially about the northern end of the island and in at least 3 meters of water off the lighthouse wharf. Beyond the grass zone the belt of Gorgonians and associated algæ followed directly or after an intervening belt of sand, and became very broad in quite shallow water toward the southeast. The Gorgonians extended to the sandy slope, dropping to deep water except toward the southeast, where large coral heads became increasingly abundant along the crest of the slope, but without a marked growth of stag-horn coral.

In general the shoal extending northward from the island carried the same general aspect as that which bounded the sides of the island itself. For a considerable distance on the crest, stretched a broad sand strip with wide patches of grass. These patches, of one species or another, were frequent all along the shoal on the eastern side. On the flanks of the grass zone and forming the crest to the northward where it became too deep for regular grass development, came the *Gorgonian* belt which extended laterally to where large coral heads arose from the sand in deeper water and then generally descended beyond the range of visibility. The sand areas between coral heads had a large quantity of broken coral scattered over them and on these fragments grew a sparse vegetation of Dictyotæ and other plants of such a habitat in deeper water but, because of the increased difficulty of observation through such a mass of water, little of this could be observed from a boat.

GARDEN KEY

Garden Key, the second largest of the Dry Tortugas, is notable chiefly for the presence of old Fort Jefferson, which with its related structures almost covers the dry land area and provides unique growth conditions for algæ. The island itself is of irregular shape, about 625 yards in greatest length and 365 yards in breadth, its longest axis extending northeast and southwest. Its southeast side borders on a deep but narrow curving channel, and on it are two extensive iron coaling piers, now largely dismantled through the agency of hurricanes and neglect, and between them a smaller wooden landing wharf. A narrow strip of ground lies between the piers and the fort, which is approached by a wooden walk and causeway to the main and only sally-port. Surrounding the fort is a broad, walled moat, which on the northeast in part faces the open water of the lagoon. This moat, with shallow, warm and quiet water, affords an ideal place for the development of algæ of species rarely seen elsewhere in the group. Within the moat arise the high walls of the irregularly hexagonal fort, the angles bearing projecting bastions. The waters of the moat extend in under the galleries, entering by passages through the walls below low tide, but have only two normal connections with the sea—on the northwest and on the southeast.

The flora of the territory surrounding Garden Key is profoundly affected by the presence of the deep ship channel. The shoal extends nearly north and south, being about 1,380 yards long and 760 yards wide, but the island is located near its southeastern margin. On the front or eastern side the shoal extends out to the inner boundary of the wharves, beyond which it drops off sharply. The vegetation is moderately luxuriant, but greatly overgrown by Myxophyceæ and diatoms. From east of the northern angle of the fort to the southeastern sluice-inlet, which consists of a pair of large pipes, the bottom is level and shallow and carried a patch of *Thalassia*. Between the pipes and the landing wharf a dense growth of *Halimeda Opuntia* occurred which was quite obscured in the northern part by the epiphytes which it bore, but it was clean near the wharf. From the landing-wharf to the southwestern coal wharves there was a fair amount of *H. Opuntia,* and a very considerable amount of *Padina,* which begins to show a worn appearance by the middle of June and largely disappears toward the end of the summer. With the *Padina* there was a quantity of *Acanthophora spicifera, Centroceras clavulatum* and, especially toward the coal wharves, *Codium Pilgeri* (1924, 1925, but absent in 1926), and *Ulva* (1925 only), *Chætomorpha* and *Caulerpa racemosa.* The bottom is of sand thickly covered with broken corals, broken bricks and other detritus from the fort to which these algæ make attachment. In pockets at the bases of the piers supporting the inner part of the coal wharves there was a peculiar and interesting flora consisting of dwarf forms of several species, and especially a considerable growth of sturdy *Bryopsis pennata* and *Spyridia*. The outer piers of the coal wharves show little growth, but on the supporting ironwork there was a good deal of *Goniolithon Boergesenii* and perhaps other Lithothamnieæ. On the slightly sloping concrete foundations of the coal sheds there was a close mat of *Acanthophora spicifera, Spyridia filamentosa, Laurencia obtusa,* which higher and nearer the wall were replaced by *Cladophoropsis,* abundant *Centroceras, Gelidium pusillum, Ralfsia, Hildenbrantia, Jania capillaris* bearing *Crouania attenuata* (absent 1926), *Lithothamnium* and *Peyssonnellia.* Outside of the concrete work the bank drops off sharply, but there was a large quantity of *Halimeda Opuntia* near the top.

Beyond the coal sheds to the westward a sandy point extended out toward the channel. The southeast slope of this is rather steep, bearing some *Chondria sedifolia* and *Centroceras clavulatum,* but descending quickly out of sight into the channel bed. On the western side the water is very shallow indeed and almost bare, with but a little scattered *Chondria.* This was bounded on the outside by beds of *Thalassia.* This grass area had the usual associated plants, which are *Halimeda tridens, Penicillus dumetosus, Udotea Flabellum* in the sand, *Castagnea Zosteræ* on the dead grass and rhizomes near the margins of the beds, and *Acanthophora, Chondria* and *Dictyota* on the occasional dead coral masses. On the westward the Gorgonian association of somewhat deeper water terminated the *Thalassia* beds, and both of these zones are continuous with those lying around the western and northwestern faces of the fort.

The wall of the moat on the western side (No. 3) was exposed to the sea. The outer wall had, on the exposed parts of both outer and inner faces, a shelf about 8 to 12 inches broad, always covered by the tide. As a matter of convenience of reference the sides of Fort Jefferson are here numbered consecutively clockwise from the eastern or sally-port side as No. 1. To about high-tide level the wall was quite intact, but a considerable portion of the upper part near the southern end had fallen forward on to the shoal. The lower part of this and also the coral fragments which littered the shelf and the sand near the foot of the wall were richly covered with encrusting Lithothamnieæ. Beyond this was a broad stretch of bare sand with occasional plants of *Penicillus dumetosus* and *Halimeda tridens,* and, especially near the wall, *Gracilaria cornea.* Over the sand lay occasional smaller rocks bearing luxuriant *Chondria littoralis, Dictyota divaricata, Acanthophora, Centroceras, Hypnea musciformis* and *Neomeris annulata.* Occasionally they were exclusively occupied by *Padina Sanctæ-Crucis* or Dictyotæ, but such were not abundant. Beyond this sand zone appeared the *Thalassia* beds, broken by occasional sand patches. These are generally raised somewhat above the general level of the sand and in shallow water show the grass short-clipped by the limiting action of the tides, though in water 2 feet or more deep at low tide the growth is normal. Growing with the grass in the thinner parts was a fair amount of *Castagnea Zosteræ, Halimeda tridens,* some *Udotea Flabellum* and occasionally a mat of *Halimeda Opuntia,* but these appear to be lacking in deeper water. Separated from these grass patches by a narrow channel was a small shoal with a growth of stag-horn coral and an abundance of Dictyotæ. The wall itself had little growth upon it until one passed north of the fallen portion, where there was a gradual increase in luxuriance until the sluice was reached. By indrifting of sand this was largely destroyed during the winters of 1925–6, but originally consisted of *Acanthophora* in large tufts and beds with open areas which afforded lodgment for *Halimeda scabra, Caulerpa racemosa occidentalis, Hypnea divaricata, Centroceras clavulatum* and occasionally fine *Bryopsis pennata,* while at a somewhat lower level there was much *Laurencia papillosa* and near the sluice *Hypnea musciformis.* As an undergrowth to these larger forms occurred *Herposiphonia tenella* and *Cœlothrix irregularis.* Above low-tide mark there was a crust of various Rivulariaceæ and Oscillatoriaceæ on the bricks, and on the fallen part of the wall considerable *Dichothrix olivacea.*

The fourth side of the moat, facing northwest, had originally been completely exposed to the water but protected by an off-lying sand bank which by Government charts would appear to have been emergent at least at low tide. This bank has disappeared, but the sand has encroached on the wall so that the shelf is in some places covered, and also the wall is quite broken through at two places—one below high-tide line only—and through these, as well as probably over the top, sand has considerably filled the moat, isolating certain pools on the inner side. The flora of the outer wall and shelf was much as described for the third side, with important additions, especially with regard to the flora in 1926, of abundant *Chondria littoralis* and *Hypnea musciformis.* In fact, all the red algæ seemed especially luxuriant in 1926, and in addition to the general flora notable growths of *Eucheuma Gelidium, Dasya corymbosa, Dictyota dentata* and *D. cervicornis* appeared. The belt of dwarfed filamentous greens was also here succeeded near the upper tide line by Myxophyceæ. The sand flat showed little growth except where there lay blocks of coral or fallen masonry, but these were often heavily overgrown with Chondrias, *Heterosiphonia Gibbesii, Gracilaria cornea, Centroceras clavulatum* and *Dictyota cervicornis.* The sand was broader than on Side 3 and was bounded by the grass and *Gorgonian* belts as usual.

The wall on the northwest (No. 5) side is exposed for but a very short distance, beyond which a considerable land area extends out as a point completely enclosing the sixth side. The exposed part of the wall supported a very inconsiderable growth, mostly of dwarfed *Spyridia, Acanthophora* and *Padina Sanctæ-Crucis.* The beach showed no vegetation; beyond it the sublittoral zone of sand had a few scattered coral lumps with *Laurencia papillosa, L. obtusa, Champia, Dictyota,* and between them in the sand were scattered *Halimeda tridens, Penicillus capitatus* and *P. dumetosus.* The outer flats were of grass bearing the usual epiphytes and associated plants toward the west side, but on the north abundant Dictyotas appear where coral fragments are scattered over the sand. This formation, farther to the east, was replaced again by *Thalassia* beds with a considerable admixture of *Hypnea cervicornis,* as the quantity of sand again exceeds that of broken corals. A little ridge, of coquina and coral rock runs out parallel with the channel, and this carried a surprisingly scanty vegetation of stunted *Laurencia papillosa* covered with a coating of filamentous blue-greens, tufts of *Acanthophora* in protected crannies, some *Dichothrix* and some smears of blue-green algæ on the rocks.

The eastern side (No. 6) of the moat wall is protected by sand from the sea and bears no algal vegetation; on the land lying outside it are the northeastern set of coal sheds and related structures. The shore borders on the channel with a narrow sand and mud beach, beyond which the underwater "flat" is very narrow and slopes quickly out of sight. Its vegetation was of but a little *Thalassia* with some *Halimeda Opuntia* and *H. tridens*.

The most interesting feature of the vegetation of Garden Key is the growth within the walled moat of Fort Jefferson. Ecological conditions—which in a more extended island group would be found in highly protected bays, in pools with an underground connection with the sea, or behind a mangrove barrier—are here afforded artificially and are unique for Dry Tortugas. The writer spent two entire weeks during 1924 on a detailed study of the flora here, as well as occasional other visits in that summer, and made a resurvey in detail in 1925 and several visits in 1926. The flora is of course quite varied in its constituents, but what was most impressive was the luxuriance of some of the species, especially the Halimedas, Caulerpas and *Valonia macrophysa*. The moat is between 68 and 70 feet wide, and nowhere over 5 feet deep at low tide, with a soft mud bottom except where the winter storms have thrown quantities of coral fragments and built up bars by raising the bottom level, or in places filling up the entire width. Bounding the outer side is a brick wall, vertical, with a shelf about 8 to 12 inches wide and for the most part below low-water level. Bounding the inner side is the outer wall of the fort proper, which is vertical to about low water, beyond which it is inclined slightly outward. In general, the greater disappearance of mortar from between the bricks, the frequent cavities due to their dislodgment, and the presence of the shelf, afford a much better opportunity for the growth of the algæ on the outer side of the moat upon the retaining wall than on the inner side where the fort face, although similarly of brick, is of more solid construction. As a second factor influencing the distribution of the algæ in the moat the incidence of light is probably of primary importance and will be summarized following the description of the individual features of the several sides. Temperature of the water does not seem to be in any particular degree decisive, but the temperatures for the different sides were taken on certain occasions and are considered elsewhere. Temperature and salinity combining with stagnation were operative in such pools as were cut off from the ocean by sand bars, but even in these a tidal rise and fall was effected by seepage through the coarse and porous sand.

Certain general characters of the bottom flora were constant through most areas of the moat. On the bottom scattered individuals of *Halimeda tridens*, *H. Opuntia* and *Udotea Flabellum* as well as *Thalassia* in small amounts occurred almost everywhere, but are only specifically mentioned where giving character to the flora. *Halimeda Opuntia* formed large masses upon the outer wall and also extended over the bottom, but it is mentioned principally in connection with the survey of the wall. The characteristic features of the bottom flora appear in text-figure 2, and the volume of the wall flora in text-figure 3.

On the front side (No. 1) the bottom of the moat showed large diffuse patches of grass, both *Thalassia* and *Halodule,* with bare spots in them, and tangled among the

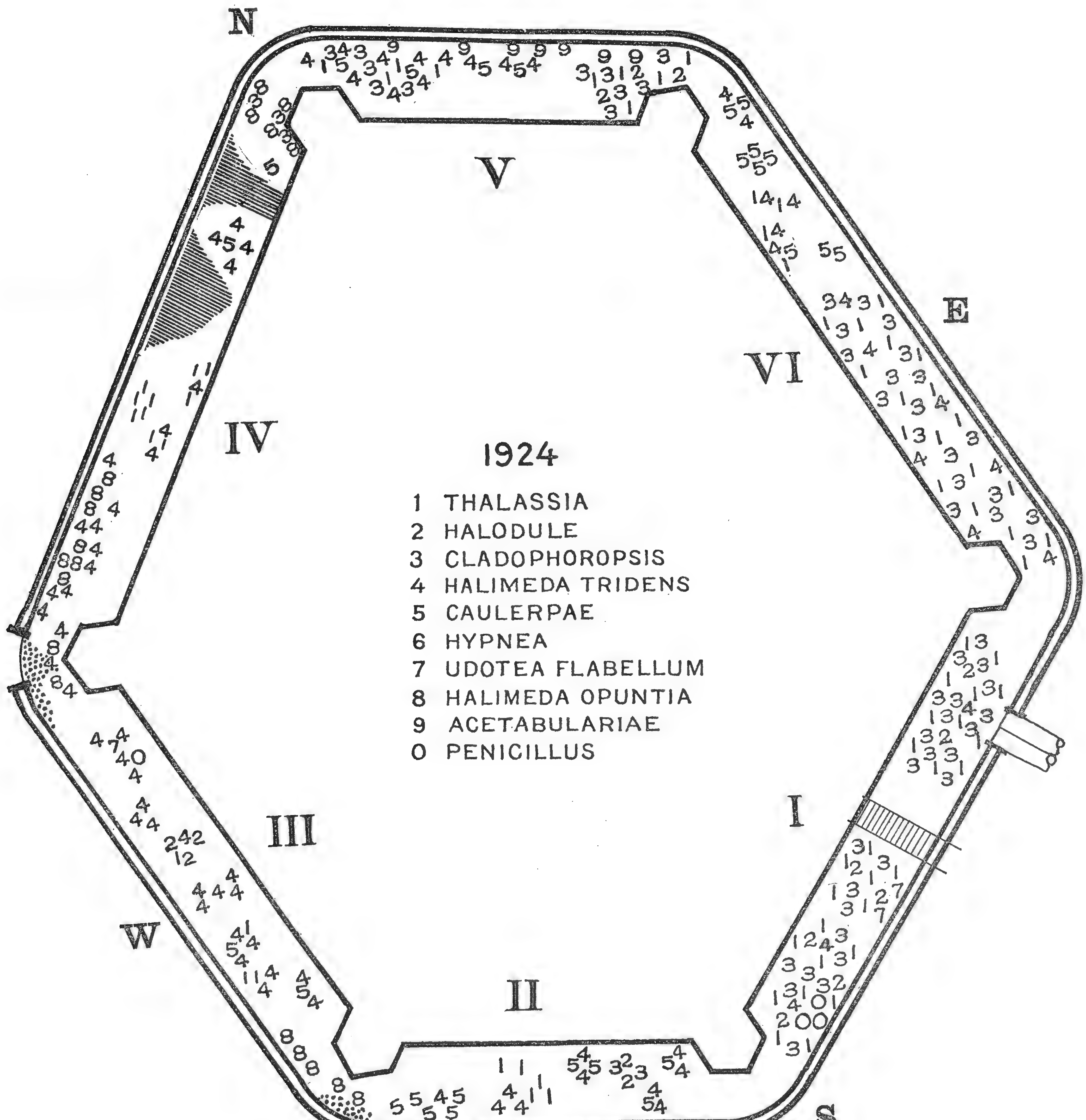

FIG. 2. Diagram of plant distribution on moat bottom, Garden Key, summer of 1924. The position and something of the relative abundance of the more notable bottom-growing types is shown. The sides are numbered in accordance with the description given in the text. Sand-bars are heavily shaded on side IV, and the bar of broken corals and sand about the gate-sluice is indicated by dots. The changes observed in 1926 and 1925 are indicated in the text.

blades were great mats of *Cladophoropsis macromeres* from which may be disentangled scraps of *Ernodesmis* and *Hypnea,* and which was often underlain with *Chætomorpha.* Clumps of *Halimeda tridens* and *Penicillus* were occasional, the latter especially near a freshwater delivery pipe toward the southwestern end. On the face of the fort was a large amount of *Halimeda Opuntia* below low-tide line, with above it much *Cladophoropsis, Cladophora* and *Wurdemannia setacea,* and a fair quantity of *Acanthophora, Caulerpa racemosa* and *C. sertularioides.* On the retaining wall the vegetation was much affected by the depth of the water against the wall face. The northeastern end was deep, rich in *Halimeda Opuntia,* Caulerpas and *Acanthophora,* while on the face of the wall were also *Amphiroa fragilissima* and *Valonia.* As the water shoaled toward the southward the growth decreased so that there was little of any kind except just around the sluiceway. Beyond this, loose mud was abundant on the shelf, which was generally bare of vegetation except where *H. Opuntia* and *Cladophoropsis* extended over it. From the pipe toward the southwestern end the

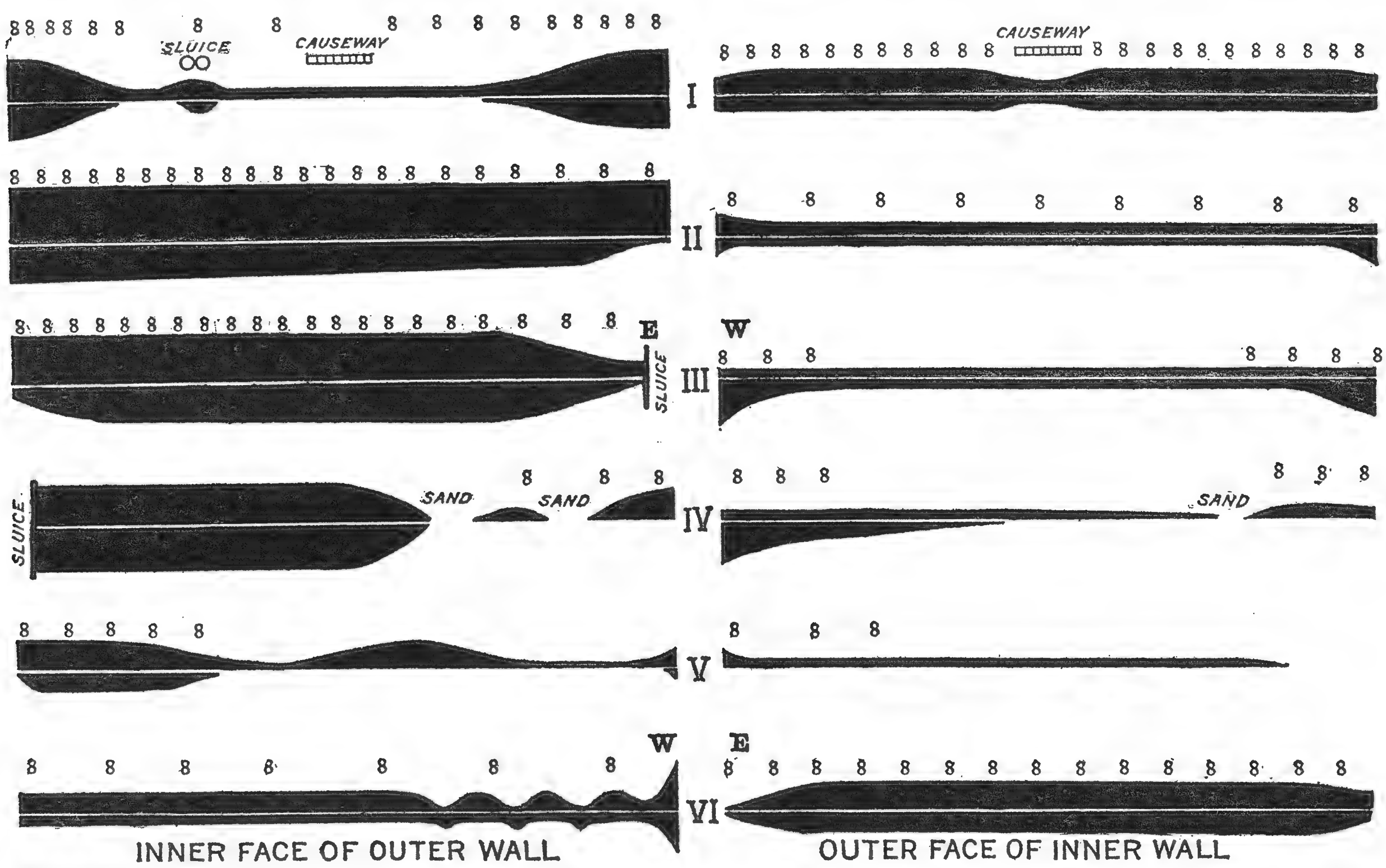

FIG. 3. Diagram showing volume of vegetation on walls of moat, Fort Jefferson, Garden Key. The sides are numbered in sequence as in text. The volume of chlorophyceous growth is plotted above the white dividing line, and the volume of rhodophyceous growth is plotted below it. *Halimeda Opuntia* is represented separately by the figures 8, closer approximation representing greater abundance. The conditions represented pertain to 1924; the volume estimate is roughly approximate.

water again deepened, with a flora grading into that of the second side. All along the front side the amount of *Calothrix crustacea* was of much greater importance as an element of the flora of encrusting micro-forms near high-tide line than on the other sides. In 1925 the vegetation on the bottom seemed to be more evenly distributed over the southwestern bottom and more sparse on that toward the northeast. The rich vegetation of the wall at the northeast end had largely disappeared; in fact the whole outer wall was more bare. No further change was noted in 1926.

The bottom of side No. 2 (southwest) occurred principally as rather isolated patches, each of a rather distinctive character, some being of *Halimeda,* others *Caulerpa,* others with a notable admixture of *Hypnea* or constituted mainly of

Thalassia. These can be recognized in some fashion from the diagram (fig. 2). The face of the fort supported some fair-sized patches of *Halimeda Opuntia*, especially at the southeast end. A thin growth of small *Valonia*, *Amphiroa* and *Cladophoropsis* was generally continuous all along the side, with occasional tufts of *Acanthophora.* The vegetation of the retaining wall was rather uniform and the water was rather deep all along except near the northwest end. *Halimeda Opuntia* formed abundant and luxuriant patches alternating with fine *Valonia*, but there was not much *Amphiroa* except near the northwest end. All the small creeping species seemed more healthy on this side than on No. 1, especially the yellow-stemmed *Herposiphonia.* There was a considerable growth of *Acanthophora* and *Hypnea* upon the *Halimeda Opuntia*, with *Lyngbya confervoides* frequent on the wall between tide marks. A patch of fragments of coral near the wall near the northwest end carried much *Valonia* in rather deeper water, but in the highest portions a delicate *Polysiphonia.* There was no general change visible in 1925, the general growth appearing quite rich. *Valonia macrophysa* was quite scarce on the wall shelf at the beginning of June, but within the month had regained its importance. The following year the Rhodophyceæ had decidedly decreased in importance, but the greens were at least equally luxuriant.

The third side (western) was like the second in having the bottom flora largely limited to a number of isolated patches, differing in character much as did those in that section, but even these were rather thin and broken. About the northern end by the sluiceway the bottom, of broken corals, supported *Acanthophora* and *Hypnea musciformis.* The face of the fort bore a good growth of *Acanthophora* and of *Halimeda Opuntia* near each end, the former sparsely continuing in clumps along the main reach. The entire retaining wall faced fairly deep water except near the turn to the fourth side and the open gate-sluice at that angle. Luxuriant and frequent patches of *H. Opuntia* grew upon the wall and extended over the bottom. Between these was an abundance of *Halimeda scabra* and *Valonia macrophysa*, of *Caulerpa sertularioides*, *C. racemosa*, *Hypnea divaricata* and *Acanthophora*, but *Amphiroa fragilissima* and *Caulerpa cupressoides* were scarce. Over the few rather bare spaces of the wall there was a crust of microscopic forms, including *Calothrix confervicola.* Toward the northern end the vegetation decreased with the shoaling water, especially with regard to *Acanthophora.* In June 1925 it was found that the shoal water at the sluice end was barely practicable for the passage of the skiff which was used in the survey of the bottom flora. In 1924 it had been possible to cross it at mid-tide with a shallow-draft motor launch. This did not seem to alter the general flora, which had much the same character as the preceding year but, like Side 2, with a delayed appearance of *Valonia.* In 1926 the bar across the end of the side was well above high water even at extreme tides, forcing all study of the moat to be done afoot. The vegetation showed a notable decrease in Rhodophyceæ and an increased luxuriance of Chlorophyceæ.

The physiography of Side No. 4 is more varied than that of any of the others. At the southwestern end the water had egress by the gate-sluice in 1924, but this was closed by a broad sand bank in 1925, which had increased in breadth in 1926. In 1924 there was a single pool isolated by sand banks toward the northeastern end; this was progressively reduced in size in 1925 and 1926, and a further isolated pool established at the southwestern end. The water samples from this side were taken from the pool nearest the northeastern end, and the temperature from the southwestern one. The bottom in general showed a decidedly poor vegetation. In 1924 it consisted of several small patches principally involving *Thalassia* and *Halimeda*, except that near the northeast end there was an unusual quantity of *Caulerpa sertularioides*. On the face of the fort there was very poor growth, limited to a little *Acanthophora* and Cladophoraceæ. On the inner face of the retaining wall the section up to the sand bank that extended partway into the moat showed *Laurencia papillosa* ranging but a short distance from the sluice. Beyond this, the wall growth was rather uniform with a moderate growth of *Acanthophora* and *Halimeda scabra*, while between these larger forms were found *Amphiroa* and *Valonia macrophysa*, with *Valonia*, *Lyngbya confervoides*, Cladophoraceæ and microscopic forms on the upper part above low-tide mark. Between the partially occluding sand bar and that which crossed the breadth of the moat there was but a little *Halimeda Opuntia* and *H. scabra* on the wall. Beyond the farther sand bar—to the northeast—there was abundant growth of *H. Opuntia*, *Caulerpa sertularioides*, *C. racemosa* and *H. scabra*. As will be seen from the accompanying diagrams (text-fig. 2) the fourth side of the moat showed a sand bar completely preventing surface water from entering by the sluice at the southwestern end. Further, a broadening of the formerly partial bar divided the main water area into two very much smaller ones. The growth of algæ throughout had been very greatly reduced. In the northeastern pool there was a very slight development of *Halimeda tridens* and the water was colored notably green by suspended plankton. Further progress of blocking up the side was accomplished during the winter of 1925–26, so that the size of both pools was decreased. The first (southwestern) pool still had a fair growth of Halimedas, *Caulerpa*, some *Thalassia*, and but few *Penicillus capitatus*. A break under the wall about halfway along the side had no communication with either of the permanent pools within, but just flooded a few feet of sand at high tide. In the upper (northeastern) pool was some *H. Opuntia* and especially some *H. Monile cylindrica*, but it was mostly barren. In the lobe of water extending around from Side No. 5 there was a dense growth of the small *Hypnea divaricata*.

Over the bottom of Side No. 5 (northeastern) there was a thin general growth of *Cladophoropsis*, especially toward the north end, underlain by scattered *H. tridens*. Along the greater part of the outer side was a bank of sand and coral fragments, and where not exposed at low tide this supported a sparse growth of *Acetabulum crenulatum*, *A. pusillum* and *Acicularia Schenckii*. Near the northwest end there was a general growth of *Thalassia* and *Halophila* under the *Cladophoropsis* and *Chætomorpha*. Midway of the side and beyond the sand bank appeared a quantity of *Halimeda tridens*, *Caulerpa cupressoides* and *C. sertularioides*. The Acetabularieæ constituted the striking feature of this section, being exceedingly rare elsewhere in the moat. Upon the fort wall was a rich development in the slime of microscopic forms, a little sparse *H. scabra* and some *Caulerpa racemosa* and *H. Opuntia*. On the inner side of the retaining wall there was, toward the rather deep northwestern end, an abundant growth of alternating patches of *H. Opuntia* and *Amphiroa* mixed with *H. scabra*, much *Caulerpa racemosa*, *C. sertularioides* and some *C. cupressoides*. Above the sand banks were only *Cladophoropsis membranacea* and *Valonia ocellata;* beyond it was a moderate return to the same flora as at the opposite end. In 1925 the long sand bank had become somewhat divided into two parts, with *Acetabulum crenulatum* on the northwestern part. On the southeastern stretch the principal vegetation was *Polysiphonia*. *Acicularia* was very scarce, and no *Acetabulum pusillum* was noted. In 1926 the general character was retained, except that throughout the wall was rather bare. *Acetabulum crenulatum* was exceedingly abundant on all the shoal area below low tide, which was somewhat increased in extent.

The eastern section (No. 6) of the moat showed toward the southern end a great general mat of *Cladophoropsis* which extended about half the length of the side. Toward the northern end there were small patches of distinctive character—*Thalassia*, or *Caulerpa*, or *Halimeda*, all more or less covered with *Cladophoropsis*. On the fort wall face was a quite rich growth, the basis being *H. Opuntia* with, especially in the northern portion, a large amount of *Cladophoropsis*. *Acanthophora* and *Caulerpa sertularioides* were both moderately abundant and *Valonia macrophysa* formed cakes between the *Halimeda* tufts. The large amount of *Herposiphonia* (of the yellow axis, free-extended form) was notable. Above low tide there was much *Cladophoropsis* and *Wurdemannia setacea*. The water was deep all along the inner side of the retaining wall. There were few large clumps of *H. Opuntia* and little *H. scabra*. For the northern half there was, in addition, some little *Valonia* and *Amphiroa*, and small amounts of *Caulerpa* and *Acanthophora*. Toward the southern end the wall was in good part bare of large species, with less of the Halimedas and an increased growth of *Acanthophora* on the areas with macroscopic vegetation. In 1925 and 1926 the bottom showed no marked change; the wall of the fort had a rich growth as before and the retaining wall was largely bare.

A review of the data just given shows a much greater growth on those walls which receive the morning—eastern—sun. Other than the light, no factor observed seems of possible significance in explanation of the markedly preferential distribution of the algæ. The temperatures acquired by the several sides during the day were not very different, because of the rather general mixing afforded by water currents set up by tide water passing in and out through the sluices. Exceptions to this of course occur in those pools isolated by sand bars, but these have little part in establishing the general type of flora. The character of the substratum was uniformly mud on the bottom and brick walls as sides, with the exception of such bars of sand and coral fragments as are noted, which supported a rather special flora, and which, since they may be depended upon to shift from year to year, can hardly be considered as bearing part of the permanent flora of the moat. Both reds and greens shared in the peculiarities of distribution; the brown algæ were of no importance within the moat; the blue-greens shared with the corals, sponges and other animals the spaces left by the larger algæ, but some of these were abundant on the sides largely barren of higher algæ.

LONG, BUSH AND BIRD KEYS AND REEFS

At Dry Tortugas by far the greatest sub-water area within range of study from a small boat is that which extends south from Long Key along the great reefs and northeastward across to surround Bird Key, and then, as a broad though broken shoal, extends southwestward about two miles additional. Within the northwestward indentation of this broad shoal complex lies Garden Key, separated from it by the main ship channel skirting the east, south and southwest of that island. This area combines the features of a great reef fully exposed to deep water and the surf from the eastward and, on its inner side, surrounding a very shallow lagoon margin with the various characters assumed in comparatively quiet and warm water.

Long Key, terminating the emergent land to the northwest, is a broad sandy island, deeply indented by a very shallow little bay on the southwestern margin. It bears a rather scanty vegetation of grasses and succulent subxerophytic herbs and such shrubs as bay-cedar and *Tournefortia.* As its shape has changed in recent years there have been left small depressions, two of which extend to below low-tide mark and contain a permanent body of water. In the larger of these pools there was a considerable growth of *Halodule;* in the smaller there is a floating mass of filamentous green algæ and blue-green algæ. Encrusting Myxophyceæ covered the bottom of both. Some record was made of the salinity and temperature range of the water in these pools and it is considered elsewhere in this text. The littoral zone of the island is of sand for almost its entire circumference, and in this there is practically no growth of algæ. On the eastern side this zone is bounded by a broken coral strip with the usual flora of such bottom in shallow water. Outside of this were beds of *Thalassia* alternating with bare sand, and this condition extended out until at a depth of 3 meters, more or less, it was replaced by tufts of Gorgonians on more massive coral blocks, which in turn extend to deep water. Continuing around the north of the island we find that the broken-coral zone gradually diminishes in importance and finally disappears, so that toward the west a zone of *Thalassia* impinges immediately upon the bare shore and continues toward the deep water of the channel. On the upper part of the slope of this channel the *Thalassia* did not grow well and was replaced by a rather sporadic development of *Spyridia* and *Hypnea*, which were abundant in 1925 but practically lacking in 1926. The general flora of the shoal abutting on the south shore of Long Key will be considered later in connection with the other members of the group. In the bay which marks the southern side, the water is exceedingly shallow over a soft bottom on which is a considerable growth of *Halodule* and, in 1925, very many *Penicillus capitatus.*

Bush Key consists of a reef of varying width and about 1,150 yards in length, hardly extending above high tide except at its northern part, where there is a low sand bank quite destitute of bushes. It is really quite continuous with the eastern part of Long Key, as is obvious during low tides. It is separated from the reef locally known as Bird Key Reef by the Five-Foot Channel, but these two reef lines are essentially parts of the same reef fringing the eastern edge of the Long Key-Bird Key shoal and have a closely similar flora, at least on the seaward side. Bird Key Reef (about 1,000 yards long) is exposed to a considerable extent only during extremely low tides, but Bush Key is always exposed through its greater part during any low tide. The flora of the portion laid bare by the tide is quite unprepossessing and in extreme contrast to the beautiful tide-pool vegetation of northern rocky coasts. However, the number of species involved is probably of a similar order, but with the greater illumination the Rhodophyceæ concerned lose their color, and all the forms are more or less submerged or powdered with white coral mud. Highest on the rocks, which consist of loose or, more largely, cemented coral fragments, we find a blackish discoloration caused by various coral-penetrating organisms. These rocks are barely wet at high tide. Lower, where the moisture is more continuous, there was a considerable encrusting vegetation of microscopic forms, mainly Rivulariaceæ and especially *Dichothrix olivacea.* Grading down from this we have a phase based on *Valonia ocellata* and dwarfed *Dictyosphaeria favulosa,* and from rocks in this and deeper water also there developed long strands of *Rhizoclonium Hookeri* and sometimes *Chætomorpha gracilis.* On rocks barely emergent at low tide the crevices and tiny pools were filled with a growth marked by *Laurencia papillosa* in an extremely viridescent and dwarfed state, and with it were encrusting Lithothamnieæ, which can scarcely be said to appear in determinable state at this level, but slightly lower they thrive. Perhaps the first one reached was *Goniolithon decutescens,* which covered the loose coral sticks. Much of the vegetation in June was covered with slimy Oscillatoriaceæ, and in permanently submerged portions with *Hormothamnion.* From this point the vegetation differed completely on inner and outer sides. Indeed, the breadth of each zone is notably different on the two sides, being far greater on the inner than on the seaward slopes. On the seaward side from low-tide level downward the dominant plants are Laurenciæ and Dictyotæ. Many other species become prominent in spots, but these two groups are ubiquitous from low tide to at least 10 fathoms. The most important *Dictyota* in shallow water is *D. divaricata.* Somewhat deeper a closely-crisped form of *D. Bartayresii* appeared, and sometimes *D. cervicornis,* though the latter in typical form was more characteristic of clear though quiet water. For the most part the Dictyotæ here form close and often iridescent mats that in early summer at least are not to be assigned with any certainty to any particular species, with the exception of the polymorphic but characteristic *D. divaricata.* The Laurenciæ are represented by *L. papillosa,* which beginning with exceedingly dense forms of the tide pools and wave-beaten rocks assumes, in the sublittoral, a sturdy and well-branched, though typical form, but in deep water appears finally with hardly any of its characteristic features, resembling for the most part simply the under parts of the shallower water forms much grown up. Within reach of even low-tide wavelets were found the rosy mats of *L. intricata,* and below these appeared the bushy, soft *L. obtusa,* mixed with wiry *L. microcladia.* Chondrias did not seem important constituents of the higher parts, at least, of the vegetation of these reefs. *Sargassum*, however, was very abundant in the sublittoral, and most of it was *S. polyceratium ovatum.* A particular peculiarity of distribution was shown by *Liagora pinnata*, which was abundant on Bush Key, both in the lower tide-pools as well as to 0.9 or 1.2 meters in depth, but across the narrow Five-Foot Channel it was absent in 1925 and 1926.

The sublittoral available for collecting by wading is comparatively narrow on the seaward (eastward) side of the reef. Beyond it the zone of *Thalassia* or other grasses was omitted as a distinctive feature, and such plants as appeared were scattered among the much more obvious growth of Gorgonians and algæ which immediately succeeded to the *Laurencia-Dictyota-Sargassum* belt of the close sublittoral. Even the Gorgonian belt was for the most part rather narrow and sloped out steeply, but it was extremely luxuriant, and with the associated strikingly colored fish constituted one of the most beautiful submarine landscapes of the islands. The algal constituents of this phase are not particularly prominent. Down most of the length of Bush Key the Gorgonians were associated with tufts of *Padina* and *Zonaria*, alternating with bare sand. Outside of this region in 4.5 to as little as 1.5 meters of water are large coral masses, for the most part dead, toward the northern end. Here only a small proportion of this is *Isopora*, which increases considerably as the deeper water comes closer to the shore line along the southern end of the Key at the approach to Five-Foot Channel, and which continues across the Channel on to Bird Key Reef. The Gorgonian phase became less luxuriant as one continued south along Bird Key Reef until near the southern end, where it regained part of its beauty. In the less populated area the amount of *Zonaria* was especially increased. All along the reefs a stretch of rather sterile sand associated with many dead and some new living corals bounds the Gorgonian zone on the east. Very little algal growth is visible here from above, and it consisted simply of the Dictyotæ on the dead corals, which also carried Gorgonians, but these were not so striking a feature as in the inner range and the dominant aspect was given by the stretches of sand. A primary factor in disturbing the regularity of the vegetation along the reefs is the presence of the Five-Foot Channel, which is, in fact, considerably deeper than its name would indicate at the point at which it bisects the reef line, but it becomes more shallow and less distinct in traversing the inner flats. Through the reefs it carried a belt of the beautiful Gorgonian formation. Immediately on the outer reef line there was a sparse growth of *Dictyota*, *Laurencia obtusa* and small patches of *Thalassia*, but within it the Gorgonians alone were in evidence, with fine living corals.

Protected by Long Key, the Reef, and to some extent by Bird Key on the south, there extends a wide area of warm shoal water intersected by irregular channels and depressions of small extent. Extending down from the crest of the reefs the succession of blackened area and belts of encrusting species was followed by considerable developments of Lithothamnieæ over masses of dead *Porites* coral, or else the living *Porites* beds extend up to very near the low-tide line. The development of living *Porites* is not at present of considerable extent except near the southern end of Bird Key Reef. The algal vegetation of the dead corals consisted for the most part of encrusting Lithothamnieæ and *Dictyosphæria.* The living *Porites* beds show the encroachment of the Lithothamnieæ on their margins and in dead spots throughout, and in addition a little work with a crowbar will demonstrate many plants of *Valonia ventricosa* among the branches of the coral, or under the edges of projecting masses. Often the dead Lithothamnieæ were in turn covered by green crusts of *Petrosiphon.* A fairly considerable amount of *Thalassia* was generally visible, scattered among the *Porites.* Although the upper portions of the living parts of the *Porites* colonies are extremely fragile, the lower portions, and the dead beds as well, are quite solid because of the cementing action of the Lithothamnieæ, especially species of *Goniolithon.* This cementing action appears to be extremely important in affording a very considerable strength to a reef structure which, if only the corals were present, would be but a spongy and brittle mass. To consider the vegetation in specific fashion, along the southern shore of Long Key there was a very bare area of soft mud, with scattered *Halimeda Opuntia* and *H. tridens,* but near the little shallow bay that extends into the island even these forms were absent. Out beyond the mud and *Halimeda* district some broken *Porites* beds occurred, grading off at about 1.5 meters depth to a broad stretch of sand and broken corals, which supported little more than a small quantity of *Centroceras* and on the larger pieces a little *Laurencia papillosa* and *Acanthophora.* Along the inner side of Bush Key the shallower zone was largely of sand with broken corals, or mud, supporting small patches of *Thalassia,* with some small amount of *Porites* in poor condition and occasional patches of *Halodule.* Progressing toward deep water on the channel border the *Thalassia, Halodule* and clumps of *Halimeda Opuntia* became more scattered, but extended down as far as could be seen from the surface. Across the generally deeper territory constituting the Five-Foot Channel the same character of growth was maintained, but of course was replaced toward the reef proper by Gorgonians, Dictyotæ and Laurencias where the current is strong enough to keep the rocky bottom free from mud. On the southern part of the flats the *Porites* areas near the reef were almost continuous and generally in quite healthy condition. One notable feature of the higher parts of these was the great number of Octopi which emerge at certain times. They were observed by the writer in especially great abundance during a low spring tide in June 1925. Outside of the *Porites* the bottom was largely covered with *Thalassia* with a smaller area devoted to *Halodule,* broken by quite deep pools which were in part connected by indefinite channels.

Bird Key is small, sandy and somewhat oval in shape. The shore itself carried almost no trace of algal vegetation except along the eastern side, where, in front of the bird warden's cottage and extending on the broken corals to a depth of about 1 meter, there was a luxuriant growth of *Chætomorpha gracilis* in long streamers with a small amount of *Hormothamnion.* In the sublittoral the northeast portion of the island showed a shoal of broken corals bearing *Dictyota, Chondria* and *Laurencia,* which shelved steeply down into the deep entrance to Bird Key Harbor. More to the southward in front of the *Chætomorpha* area there was a considerable bed of living *Porites* coral; outside of it down to the harbor were broken coral fragments mostly barren of vegetation. This barren character extended along the shore nearly to the southern end, the sand being in frequent agitation because of the powerful currents which, with each recurring change of tide, sweep around the point. Inshore in the loose sand there was no vegetation. Outside of it, in the direction of Bird Key Reef, is a broad shoal of considerable extent, which differed rather considerably from that over most of the area in the reefs, in that, probably because of the current, there is little in the nature of a deposit of mud, and on the broken corals there was an interrupted but luxuriant growth of *Dictyota*, Chondrias (including especially *C. sedifolia*), *Centroceras*, *Laurencia*, *Halimeda* and *Spyridia*. On such parts as have larger blocks of coral there were tufts of *Acanthophora*. In water of 0.6 meter depth *Padina Sanctæ-Crucis* flourished just west of a quite deep pool, surrounded by the usual association on broken corals. Farther out toward the reef there was an increase of *Halodule* bordering the deeper holes, and as the water becomes extremely shallow near the reef *Thalassia* covered the mud almost without a break to the reef or to the *Porites* beds a little more to the north. In the holes which break the flats were a few Gorgonians on coral blocks, but these seemed in stunted and unhealthy condition. Westward around the tip of the island the growth on the coral fragments increased in luxuriance, and other types, such as *Eucheuma isiforme*, became obvious. Outside of this, and to the southwestward, were broad grass flats extending down parallel to the southern extension of the reef. The grass development became luxuriant inshore about the middle of the western side of the island, and was here heavily coated with filamentous as well as encrusting epiphytes. Outside of the grass zone toward and around the northwest shore the broken coral formation again became dominant, extending out toward Southwest Channel with interruptions of deep holes containing Gorgonians and patches of *Thalassia*.

EAST, MIDDLE AND SAND KEY GROUP

There lie to the westward of the larger islands three of the Dry Tortugas which are but little sandy islets, seldom visited from the Laboratory and not at all, at the present, depended upon as a source of research material. These—Sand, Middle and East Keys—showed comparatively few features of marked interest during the two brief visits of the writer. They lie on individual shoals, separated from each other and from the main group by comparativly deep channels. That surrounding East Key is of considerable size, but the other shoals are small.

Sand Key, the westernmost of the three, lies 1.5 miles northeast of Garden Key, and is a rather narrow, somewhat curved sand bank with very little vegetation. Surrounding it rather continuously on the southwest, but appearing only in limited patches on the southeast and mostly absent on the northeast, are beds of coquina rock, which at fullest development are broad and extend to a depth of several feet below low tide. These supported a limited flora, *Sargassum* on the southeast, associated with *Cladophora fuliginosa* and other small species. On the southwest and west the rocks are broad and flat and on these the growth was principally of *Dichothrix* and other microscopic forms. However, there was a fair growth of *Zonaria zonalis* in the broken places in deep water and *Padina Sanctæ-Crucis* flourished in dwarf state in shallow water.

Middle Key was the least in extent at the time of the writer's visits—1924 and 1926—but its shores supported by far the most luxuriant flora. It lies a little more than 1.25 miles east and slightly north of Sand Key. Above the water level the phanerogam vegetation was negligible, but the island was the breeding place of numbers of Least Terns. The maximum development of algæ occurred on the eastern side. The growth was very luxuriant on broken corals and fragments of coral rock characterized by *Chondria littoralis, Acanthophora spicifera, Hypnea musciformis* and Dictyotæ. In 1924 and 1926 these were in some degree overgrown with *Ceramium subtile,* which since 1924 has not been frequent anywhere else in the group, though the writer was under the impression during that year that it was a rather common form. Further, in 1926 there was a luxuriant growth of *Cladophora fascicularis,* which had been recorded from Tortugas only from tiny and most dubious fragments. Lastly must be noted splendid plants of *Dictyota ciliolata,* which long ago had been brought from these islands by F. W. Hooper (1876), but whose collection was represented at the Farlow Herbarium by miserably prepared specimens. This plant was not collected by the writer before 1926.

East Key, lying a little over a mile east of Middle Key, and the largest of the three islands under immediate consideration, supports a very considerable phanerogam vegetation of grasses, succulent herbs and shrubs, but toward the southern part is rather broken by bare open patches of sand. The shore all around the island is broadly sandy. Beyond this is a belt with blocks and small fragments of coral embedded in the sand and bearing the characteristic vegetation of such a formation. Eastward from the island and beyond this sublittoral vegetation, broken *Thalassia* patches extended, bearing here and there small tufts of Gorgonians and with Dictyotæ, Laurencias, and Sargassæ increasing as the *Thalassia,* in somewhat deeper water, gave place to a more continuous growth of Gorgonians on coral blocks, alternating with small rather bare patches of sand.

BATHYMETRIC DISTRIBUTION OF DRY TORTUGAS ALGÆ

The distribution of marine algæ with respect to depth is primarily dependent upon the amount of light which penetrates the water, and secondarily on other factors. At Dry Tortugas the amount of light available at any given depth is probably above the average, and consequently the flora at the greater depths is fairly rich. A limiting factor appears in the general softness of the bottom in deeper water. This probably prevents the appearance of many species, especially Rhodophyceæ which would be quite able to flourish in the reduced light, but which require a firm substratum. While this may account for the poverty of deep-water Rhodophyceæ, the presence of Siphonales in deep water can be explained only by the transparency of the water, combined with their adaptations to a muddy substratum. Tables were prepared showing the depths at which the algæ of the four major groups were found, dividing the vertical line of water depth into sections at Littoral-Sublittoral, 3.1, 9.2, 18.3, 36.6, 55.0, 73.2 and 91.5 meters or deeper. These sections were selected primarily because they fitted with the depths reached by the various methods of collecting; namely hand-picking while wading, by a potato-fork set upon a 15-foot handle and used from a small launch or skiff, a dredge used from the launch *Velella*, and a dredge used from the *Anton Dohrn*. The metric depths have been introduced in the tables, but all the field records were made in feet and fathoms.

TABLE 6—*Relative Distribution of Algæ*

Depth	Myxophyceæ	Chlorophyceæ			Phæophyceæ			Rhodophyceæ		
	Number species	Number species	Also shallower	Also deeper	Number species	Also shallower	Also deeper	Number species	Also shallower	Also deeper
L–SL	31	48	..	18	20	..	9	82	..	35
3.1M	2	27	19	24	14	11	10	52	42	44
9.2	3	34	24	20	17	11	13	56	44	33
18.3	3	24	20	16	16	13	5	46	30	22
36.6	3	17	15	11	6	5	1	24	23	7
55.0	0	13	12	11	1	1	1	7	7	2
73.2	0	10	10	8	1	1	1	3	2	0
91.5	0	9	7	..	1	1	..	0	0	..

An inspection of table 6 shows several features of interest. All the major groups have a large littoral-sublittoral flora with a heavy proportion of species never secured in deeper water. Probably the list of these (119 forms) would be somewhat reduced by more extended dredgings, but the distinct character of the shore flora would be evident to any one working in the district. Of this number the Myxophyceæ constitute an important part (31 forms) and this zone is the only one in which they are significant. Although not much studied from the dredgings, owing to pressure of more interesting tasks on the larger forms, such observations as were recorded indicate a poverty of species and of bulk of individuals, except near the surface. The remaining three groups show an increase in the number of species below the 3-meter zone, the totals shifting from 95 to 110 forms, followed by a drop below the 9-meter zone to 90 forms and subsequent decrease to about 50 forms below the following 18-meter zone. It is of course impracticable to list separately the species present at all levels, but it becomes of interest to note those present in deeper water, as follows on opposite page.

In addition to this list, *Struvea elegans*, *Dasya corymbifera* and *Gracilaria cylindrica* were recorded from a depth supposed to have been 110.0 meters, but as this depth was not confirmed by a sounding these were not added to the list.

It will be clear from this that Caulerpas and Codiaceæ are most important in deep water, so far as dredging gives evidence of the conditions at Dry Tortugas. This is quite contrary to the reports available from other districts where the Rhodophyceæ remain dominant from moderate to extreme depths. The depth at which a sharp break appears in the number of species representing any given group serves to indicate to some extent the lower limit of luxuriance of that group. It is difficult to interpret the Chlorophyceæ on this basis, for there is a very great drop from 48 to 27 species between the Sublittoral-Littoral belt and the 3-meter zone, followed by an increase to 34 forms at the 9-meter zone and a drop back to 24 forms at 18-meters, after which the figures read 17, 13, 10 and 9 forms for the greater depths. The sharpest drop after the preliminary fluctuation is that following the close of the 9-meter zone, so this point is suggested as approximating the critical one for the order in this district. The drop in Phæophyceæ is clearly following the 18-meter zone, and that for the Rhodophyceæ follows the 36-meter belt. The fact that these figures are multiples of the lower range (9 meters) is due to the coarseness of the zones selected, and would at once disappear if it had been possible to analyze the soundings more minutely.

List of species	Depth		
	55.0 meters	73.2 meters	91.5 meters
Acicularia Schenckii	—	x	—
Anadyomene stellata	x	—	—
Avrainvillea asarifolia	—	—	x
Avrainvillea levis	—	—	x
Caulerpa Ashmeadii	x	x	x
Caulerpa crassifolia mexicana	x	x	x
Caulerpa cupressoides flabellata	—	x	x
Caulerpa lanuginosa	—	—	x
Caulerpa prolifera	x	x	x
Caulerpa racemosa macrophysa	—	—	x
Caulerpa racemosa microphysa	—	—	x
Cladocephalus luteofuscus	—	x	—
Codium ithsmocladum	x	x	—
Sporochnus bolleanus	x	x	x
Chrysymenia Enteromorpha	x	—	—
Dasya ramosissima	x	—	—
Eucheuma isiforme	x	—	—
Halymenia Gelinaria	x	x	—
Kallymenia Limminghii	—	x	—
Laurencia intricata	x	—	—
Lithothamnion occidentale	x	—	—
Scinaia complanata intermedia	—	x	—

Many dredgings were actually taken, amounting to 86 in 1924, 43 in 1925 and 35 in 1926. Of this total of over 160 hauls about 60 were made with the *Anton Dohrn* in deep water, and the records do not account for occasional hauls (at least during the first year), which failed to yield algal material. Because of the general sloping character of the bottom it was customary to dredge up slope when possible, especially in shallow water, so that the depth as recorded for most hauls reads as ranging between two depths. This makes it possible to summarize the data only on the basis of general zones by recording the maximum and minimum depths approximated by a given species. Table 6 records the data for a given species, on the supposition that the species might be found at any level between the extremes recorded for it. A similar table was prepared, which recorded for each zone only those actually represented by specimens preserved from a depth definitely noted at the time of dredging and within the zone in question, but it was found that this system introduced too many glaring inconsistencies and the table is not reproduced. Especially important as a causative factor in this was the fact that for shallower waters down to 36 meters many of the commoner species were not dried and preserved as records, but their presence was merely noted on cards or, when work pressed most heavily, disregarded. The table as now given includes for each depth not only all species actually collected at that depth, but in addition those whose range includes the zone under consideration.

TABLE 7—*Percentages of Algæ at Different Depths*

Depth	Total No. of species	Myxophyceæ	Chlorophyceæ	Phæophyceæ	Rhodophyceæ
		per cent	*per cent*	*per cent*	*per cent*
L–SL	181	17	26	12	45
3.1M	95	2	28	15	55
9.2	110	3	31	15	51
18.3	90	3	27	18	52
36.6	70	4	24	8	34
55.0	21	0	62	5	33
73.2	14	0	72	7	21
91.5	10 (+3)	0	78	7	15

Table 7 considers the data on a percentage basis. This form emphasizes the dominance of the Chlorophyceæ in deep water, and calls attention to the fact that the Rhodophyceæ, thanks to numerous small species, greatly outnumber in their own natural territory the much more showy Chlorophyceæ and Phæophyceæ of shallow water, although to be sure, they are much less in total bulk of specimens than those groups.

MARINE PHANEROGAMS

It was inevitable that the writer should be attracted to the several marine phanerogams which formed vast beds in shallow water or came up in the dredge with algæ from deeper water. In discussing in the preceding pages the distribution of the vegetation about the islands, a necessary emphasis has been placed upon *Thalassia*, *Halodule* and *Cymodocea* because they gave a striking character to many areas and a place for attachment to many of the smaller algæ. On the other hand no systematic record was kept of the presence of these and of the two species of *Halophila* from deeper water. Such data as were kept are of interest, however, as they may add something to our knowledge of the habits of these peculiar plants.

Thalassia testudinum Koenig and Sims is by far the commonest aquatic phanerogam at Dry Tortugas, forming vast beds from near low-tide level down to 11 meters—perhaps lower, although no records are at hand in excess of this depth. This plant was only found in flower and fruit in 1926, when during early June male flowers were frequently observed floating with the currents, and the plants on the inner side and southern end of Bird Key Reef were found to be fairly often in flower, especially the plants in shallow water of less than 1 meter depth—the male plants abundantly predominating.

Halodule Wrightii Aschers, with narrow, flat leaves, is perhaps the next most frequent species, especially in quiet or stagnant water. It attains particular luxuriance in pools on Long Key, where the leaves reach nearly 3 mm. in breadth, as also in the moat of Fort Jefferson. It was not recorded from water in excess of 11 meters depth, and is not listed in Bowman's ecological account of the islands. One plant with old flower pedicels alone represents fertile material.

Cymodocea manatorum Aschers is almost as frequent as *Halodule*, and is distinguished readily by its cylindrical leaves. It was dredged to 6.2 meters, but probably goes deeper. Bowman (July 1916) secured material with old flowers.

Halophila Baillonis Aschers has a slender running stem near the surface of the sand or mud, and bears oval petiolate leaves in pairs at the nodes. The flowers and fruits are borne between the leaves and are almost sessile. It was found in flower and fruit in July 1924 and on frequent other occasions. It was dredged in from 5.5 to 29.3 meters, generally in 14 to 18 meters, sometimes in abundance, especially near the channel off the south end of Loggerhead Key.

Halophila Engelmanni Aschers, with rather a deeper placed stem bearing almost sessile leaves in whorls at the summits of erect branches, was never secured in quantity, but was not infrequent in small amounts in deeper water. One plant was found in fruit in June. The dredge records give it as from 4.6 to 73.2 meters, and one estimated depth of 91 meters. In general it is a plant of deeper water than that most favorable for *H. Baillonis*.

MARINE ALGÆ OF FLORIDA

SYSTEMATIC DESCRIPTIONS

An attempt has been made to reduce to synonymy and incorporate in the following pages all records of marine algæ from the east coast of Florida and the Florida Keys. Records from the west coast are inconsiderable, and the shore line is reported as unfavorable to the growth of a variety of marine algæ. Omissions will probably be few and confined to incidental records inserted in monographic works or papers dealing with other territories. Species present at Dry Tortugas have been fairly fully described and primarily upon specimens found there, additional data being added from compilations or by observation of specimens from other Floridian or West Indian stations, and are given in brackets. Species reported from elsewhere in Florida are listed on the authority of the original report except where, as noted, such determination appears to the writer to be faulty. For these non-Tortugan species usually very brief descriptions have been compiled from various sources and are given in brackets. In many cases it has been possible to confirm both records and the accuracy of the descriptions, but in others this has not been the case. The ordinal, family and generic descriptions are compiled throughout, of necessity, especially from De Toni, *Sylloge Algarum* and Engler-Prantl, *Die Natürlichen Pflanzenfamilien.* The keys are for the most part original, the non-Tortugan species being added by compilation. Citation of records and synonyms has been limited to Harvey (1852, 1853, 1858), Farlow (1876, 1881), Collins (1909, 1912, 1918), Børgesen (1913–1920), Collins and Hervey (1917), Howe (1920), and Hoyt (1920), with a few additional records from Collins, Holden and Setchell, *Phycotheca Boreali-Americana,* Melvill (1875), Howe (1918) and others. It does not appear to the writer that there is a sufficiency of records to justify an attempt to indicate the range of species up or down the Florida coast and so they are simply listed as from the state. The range through the West Indies has been given in quite general terms and not continued east and south of the Virgin Islands from lack of modern lists over a greater territory. The illustrations of species from Dry Tortugas have been prepared from living specimens, or from dried or fluid-preserved material, as seemed most advantageous; the few from non-Tortugan species are mostly from herbarium specimens secured by exchange or purchase and are appropriately designated in the description of the figures concerned.

MYXOPHYCEÆ

Plants unicellular, colonial, or filamentous; cells of simple organization with chromatin, at most, collected toward the center of the cell as an incipient nucleus, and phycocyanin, chlorophyll and other pigments collected toward the periphery of the cell; cells or cell aggregates naked or surrounded by colorless or colored gelatinous sheaths; multiplication by fission or by hormogone formation; reproduction by resting spores or by gonidia.

1. Multiplication by fission, distinct filaments not produced .... Coccogonales (39)
1. Distinct filaments present which may multiply by hormogonia .... Hormogonales (42)

COCCOGONALES

Plants unicellular, colonial, or in indefinite filaments; multiplication by fission; gonidium and resting spore formation present in some genera.

1. Colonies without definite base or apex; gonidium formation absent................Chroococcaceæ (39)
1. Cells in indefinite colonies or forming indefinite branching filaments, producing internal gonidia; or attached by a basal end and forming gonidia at the apex...Chamæsiphonaceæ (40)

CHROOCOCCACEÆ

Plants of cells which retain their association in colonies of 2, 4, or more cells, within a general gelatine or a succession of sheaths; reproduction by cell division in 2 or 3 dimensions and the break-up of the families of cells; reported also to form resting cells.

1. Cells dividing in 3 planes, free or in pairs or larger colonies........................2
1. Cells dividing in 2 planes, forming flat sheets....................................Merismopedium (40)

2. Cells in pairs or, at most and rarely, fours, flattened on the face of the last division.....Chroococcus (39)
2. Cells forming colonies which are much larger at maturity, cells round................Gloeocapsa (40)

CHROOCOCCUS Naegeli

Plants of rounded cells which retain their arrangement in pairs for a time after division, and remain somewhat flattened on the divided faces; pairs and larger groups of cells, when these persist, surrounded by somewhat lamellose colorless sheaths which in some species become confluent; division in three planes.

1. Cells 2, 4, or 8 in a group, protoplast 5 to 7μ in diameter ....C. membraninus
1. Cells 1 or usually 2 in a group, protoplasts 20 to 45μ in diameter.....................C. turgidus

Chroococcus membraninus (Meneghini) Naegeli

(Plate 1, fig. 3)

Plants (forming a mucous stratum or) free, the cells normally showing their relation in pairs, and the pairs aggregated into small colonies of 2 to 8 cells; protoplasts somewhat flattened on adjacent faces, 5.4 to 7.2μ (3 to 8μ) in greatest diameter; membranes somewhat lamellose, colorless.

Chroococcus membraninus (Meneghini) Naegeli, Collins and Hervey (1917); *C. membraninus* (Meneghini) Naegeli, Collins in Howe (1920).

Bermuda and Bahamas; newly reported for Florida.

Frequent among other algæ, though rarely in considerable quantity, except where in masses with other forms in pools on Long Key, Dry Tortugas.

Chroococcus turgidus (Kuetzing) Naegeli

(Plate 1, fig. 4)

Plants of cells generally obviously showing their relation in pairs, sometimes solitary but hardly ever remaining intact until the completion of the division into 4 cells; protoplasts 20 to 47μ in greater diameter and 11 to 28μ in lesser diameter; colonies 34 to 75μ in greater diameter and 30 to 70μ in lesser diameter; sheaths thick, not coherent, membranes markedly lamellose, colorless.

Chroococcus turgidus Naegeli, Farlow (1881); *C. turgidus* (Kuetzing) Naegeli, Collins and Hervey (1917); *C. turgidus* (Kuetzing) Naegeli, Collins in Howe (1920).

Bahamas; Bermuda; West Indies; cosmopolitan; apparently newly reported for Florida.

Occasional among other algæ, though rarely in considerable quantity, except in "Pool No. 1" on Long Key, Dry Tortugas, where it was in great abundance with *Gomphosphæria* and filamentous algæ.

GLŒOCAPSA Kuetzing

Plants of rounded cells which retain little of their association in pairs after division, except the arrangement within sheaths; not remaining flattened on adjacent faces; groups of cells of the same age united within concentric sheaths, which may be lamellose and colorless or brightly colored; division in three planes.

Glœocapsa fusco-lutea (Naegeli) Kuetzing

(Plate 1, fig. 2)

Plant of spherical cells arranged in twos, fours or larger groups within successive sheaths, forming small masses (to 50μ in diameter); protoplasts to 2μ (1.5 to 2μ, with sheaths 4.5 to 5.5μ) in diameter; membranes somewhat lamellose, colorless to yellowish-brown.

Gloeocapsa fusco-lutea (Naegeli) Kuetzing, Collins and Hervey (1917).

At Dry Tortugas occasional among other algæ especially in "Pool No. 2" on Long Key.

This material differs from the description in Tilden in the fairly distinct lamellæ of the sheath, and in the fact that the colonies were hardly crustaceous, but in small masses on or among other algæ. There seemed no better disposition of the material, however.

MERISMOPEDIUM Meyen

Plants in the form of flat colonies one cell in thickness, the cells spherical or somewhat flattened after division, associated more or less in families of related ages, gelatinous investment general, individual sheaths not defined; division in two directions.

Merismopedium convolutum Brèbisson

(Plate 1, fig. 5)

Plant forming plates of cells to 0.2 mm. or more (1 to 4 mm.); cells associated in families but the series not strikingly distinct, adjacent cells separated by a small fraction of their diameter; cells 6.25 to 7.5μ in greater diameter (4 to 5μ broad by 8μ long).

Merismopedium convolutum Brèbisson, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Occasional at Dry Tortugas among other algæ; among filaments of a *Chamædoris* at 4.6 to 7.6 meters on Loggerhead Key shoal, and among filaments of *Dichothrix* on rocks and old wall, Garden Key.

CHAMÆSIPHONACEÆ

Plants as solitary or colonial groups of cells; cells arranged irregularly or as irregular filaments; frequently showing differentiation of base and apex; covered with individual or common integuments; multiplication by cell division, reproduction by segmentation and liberation of a terminal gonidium or by the formation of several enlarged gonidangia.

1. Plants of irregular, branching filaments; in shells, etc.	Hyella (42)
1. Plants not forming filaments	2
2. Cells radiately and peripherally placed in somewhat spherical free colonies	Gomphosphæria (41)
2. Cells in radiate rows in an attached pulvinate colony	Oncobyrsa (42)
2. Cells attached; forming cushions, or flat layers, or solitary	3
3. Cells not showing much, if any, differentiation into base and apex	Xenococcus (42)
3. Cells ovoid or pyriform, solitary or colonial	Dermocarpa (40)

DERMOCARPA Crouan

Plants of isolated or gregarious cells, the cells showing individual sheaths fairly clearly but in gregarious types surrounded by a common jelly; cells ovoid or pyriform in shape, the broader end directed outward; reproduction by the formation of gonidia in an enlarged cell functioning as a gonidangium.

1. Cells isolated .... D. solitaria
1. Cells growing in colonies .... D. prasina

Dermocarpa prasina (Reinsch) Bornet and Thuret

(Plate 1, figs. 8, 9)

Plants notably gregariously united into colonies, widely spreading or sometimes pulvinate, the individual cells ovoid to pyriform, the broader end outward; colony involved in a general gelatine, the individual cells with fairly distinctive individual sheaths, which are colorless; cells 7 to 12μ in diameter (4 to 24μ in diameter by 15 to 30μ long).

Dermocarpa prasina (Reinsch) Bornet and Thuret, Collins and Hervey (1917); *D. prasina* (Reinsch) Bornet and Thuret, Collins in Howe (1920).

Bermuda and Bahamas; newly reported for Florida.

Probably not uncommon at Dry Tortugas, but not often recognized; abundant on *Padina* in the moat of Fort Jefferson on Garden Key.

Dermocarpa solitaria Collins and Hervey

(Plate 1, fig. 1)

Plants solitary or few together, of single cells, the base somewhat flattened and expanded to the rather broader apex; wall moderately thick, especially below, and colorless; length 19 to 57μ (to 75μ), greatest diameter 9.2 to 13.9μ (to 20μ, gonidia formed by a division of a vegetative cell, the upper cell containing 8 to 12 gonidia, each 5 to 6μ in diameter).

Dermocarpa solitaria, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Isolated cells which are probably this species were rather widely distributed at Dry Tortugas, but distinctive material was not so common; however, on *Padina* in the moat of Fort Jefferson on Garden Key it was rather abundant.

GOMPHOSPHÆRIA Kuetzing

Plants in the form of hollow spherical colonies, which are solitary or associated in small groups; cells subperipheral in the gelatinous matrix, individually surrounded by indistinct separate sheaths, pyriform, or cordate with approaching division, the broader end outermost; reproduction by formation of gonidia in vegetative cells.

Gomphosphæria aponina Kuetzing

(Plate 1, fig. 7)

Plant forming definite solitary or aggregated free-floating colonies; cells peripheral in the colony, pyriform, the broad end outward, frequently in division and then appearing cordate; colonies surrounded by a thin layer of jelly, which also extends to the center as branched stalks which support the cells; protoplasts 3.7 to 5.6μ in greater breadth and 7.5 to 11μ in length; individual cells and pairs of recently divided cells in separate sheaths within the general jelly; (gonidia numerous, minute).

Gomphosphæria aponina Kuetzing, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Abundant at Dry Tortugas on Long Key in "Pool No. 1" with *Chroococcus turgidus* and other unicellular and filamentous algæ.

HYELLA Bornet and Flahault

Plants of more or less tangled radiating filaments of somewhat isolated cells, the filaments showing true branching, the cells sometimes dividing longitudinally as well as transversely; reproduction by the release of cells from the filaments or by the formation of gonidia in enlarged cells functioning as gonidangia.

Hyella cæspitosa Bornet and Flahault

(Plate 1, fig. 10)

Plant in shells and coral, forming grayish-green patches some millimeters in breadth; filaments much contorted, frequently indefinite, especially in the branching; cells 3.6 to 7.3μ (rarely to 10μ) in diameter.

Hyella cæspitosa Bornet and Flahault, Collins and Hervey (1917); *H. cæspitosa* Bornet and Flahault, Collins in Howe (1920).

Bermuda and Bahamas; newly reported for Florida.

Perhaps common at Dry Tortugas; material probably of this species was frequently observed in small quantities among other algæ within or partially within the substance of shells or coral fragments; specifically recorded from Garden Key, and from the east side of Loggerhead Key, in old fragments of corals.

ONCOBYRSA C. Agardh

Colonies cushion-like, hard, leathery, adherent; sheaths thick, gelatinous, confluent; cells spherical or elongated, usually regularly arranged in radial rows; cell contents blue-green or violet.

A very small species, obviously of the present genus, was found on filamentous epiphytes upon *Codium*, Garden Key, 1924, with cells 1.5 to 2μ long, somewhat oval. It was not abundant enough to justify assigning it a name.

XENOCOCCUS Thuret

Plants forming aggregations of cells, at first 1 cell thick, later sometimes several cells thick; cells spherical or laterally compressed; general gelatinous integument colorless or somewhat yellowish; reproduction by formation of gonidia in enlarged vegetative cells acting as gonidangia.

Xenococcus Schousbœi Thuret

(Plate 1, fig. 6.)

Plants as aggregations of cells forming colonies 1 cell thick; individual sheaths not visible around each cell but a general gelatine present; cells little differentiated into base and apex, nearly round except as laterally compressed by adjacent cells of the same colony; diameter of the cells 3 to 4.5μ (4 to 9μ).

Xenococcus Schousbœi Thuret, Collins and Hervey (1917); *X. Schousbœi* Thuret, Collins in Howe (1920).

Bahamas, Bermuda and Jamaica; newly reported for Florida.

Frequent on other algæ at Dry Tortugas, but rarely recorded; with *Dermocarpa* on *Padina* in the moat, Garden Key.

HORMOGONALES

Plants filamentous, the filaments simple, or falsely or truly branched; differentiated into base and apex or undifferentiated; multiplication by hormogonia; reproduction by resting spores or gonidia; heterocysts present or absent.

1. Heterocysts absent .... Oscillatoriaceæ (43)
1. Heterocysts usually present 2

2. Filaments unbranched .... Nostaceæ (47)
2. Filaments branched 3

3. Branches formed by longitudinal division of an axial cell .... Stigonemataceæ (49)
3. Branches formed by transverse division of the filament, with continued growth from both portions 4

4. Filaments without a specially differentiated base .... Scytonemataceæ (48)
4. Filaments tapering toward the apex from a clearly marked base .... Rivulariaceæ (49)

OSCILLATORIACEÆ

Filamentous plants, the filaments naked or enclosed in sheaths which may unite the filaments into larger masses; filaments composed of single row of cells, occasionally forming false branches, filaments one to many within a sheath; reproduction by the formation of hormogonia—short lengths of trichome—which escape from the parent sheath, if one is present, to start a new filament.

1. Trichomes without a well-developed, persistent gelatinous investment 2
1. Trichomes with an enveloping mucous or firm investment 4

2. Filaments free and solitary or in no definite arrangement 3
2. Filaments united into bundles, somewhat twisted, with little mucous; a plankton organism .... Trichodesmium (47)

3. Trichomes twisted spirally into close coils, no cell walls visible .... Spirulina (46)
3. Trichomes not regularly twisted, cell walls usually readily seen .... Oscillatoria (45)

4. Sheaths sharply delimited, hardly mucous or diffluent 5
4. Sheaths markedly diffluent, forming a general gelatinous matrix by which the sheath limits may be obscured 6

5. Filaments single within a sheath .... Lyngbya (44)
5. Filaments numerous within a sheath .... Symploca (46)

6. Plant with 1 to 5 trichomes in a sheath, differentiated at maturity into basal and erect portions .... Hydrocoleum (43)
6. Plant with the filaments separate, forming an organized gelatinous mass .... Phormidium (45)

HYDROCOLEUM Kuetzing

Plants forming a general diffuse stratum from which arise erect tuft-like portions; filaments one to few within a sheath, loosely aggregated, the sheaths diffluent or soft and agglutinated.

Hydrocoleum lyngbyaceum Kuetzing ex Gomont

(Plate 1, fig. 17)

Plants forming small mucous patches and tufts, slightly calcareous near the base; 1 to 5 trichomes in a sheath, diameter of the trichome 11.5 to 15μ (8 to 16μ), the end slightly tapering to the more or less capitate and clearly calyptrate end cell; filaments very slightly constricted at the nodes; sheaths colorless, indefinite, agglutinated.

Hydrocoleum lyngbyaceum Kuetzing ex Gomont, Collins and Hervey (1917); *H. lyngbyaceum* Kuetzing, Collins in Howe (1920).

Florida; Bermuda; Bahamas and the West Indies.

At Dry Tortugas forming small mucous patches and tufts on rocks on the east side of Loggerhead Key south of the Lighthouse wharf.

LYNGBYA C. Agardh

Filamentous plants with strong, sometimes lamellose sheaths which persist and do not become permanently adherent with neighboring filaments; trichomes of disk-like or sometimes cylindrical cells; reproduction by the formation of hormogonia which are extruded from the sheaths.

1. Trichomes more than 20μ in diameter, not definitely attached	2
1. Trichomes less than 20μ in diameter, floating or forming definitely attached strata	L. confervoides (44)
2. Plant mass pink, cells 0.33 to 0.17 as long as broad	L. rosea (45)
2. Plant mass blackish, cells 0.13 to 0.10 as long as broad	L. majuscula (44)
Species not well understood	L. hyalina (44)

Lyngbya confervoides C. Agardh ex Gomont

(Plate 1, fig. 20)

Plant forming brownish-green masses, especially on stones; filamentous, the filaments with thick persistent lamellose sheaths, which are colorless; cells very thin disks, the trichomes little or not constricted at the walls; the end cell not capitate or calyptrate, somewhat rounded; trichomes 10 to 13μ (9 to 25μ) in diameter, filaments 16 to 20μ (or more) in diameter.

Lyngbya confervoides C. Agardh, Harvey (1852); *L. confervoides* C. Agardh, Farlow (1876); *L. confervoides* C. Agardh ex Gomont, Collins and Hervey (1917); *L. confervoides* C. Agardh ex Gomont, Collins in Howe (1920).

New England to Florida; Bermuda; Bahamas and through the West Indies.

At Dry Tortugas especially abundant in the moat of Fort Jefferson, Garden Key, growing on the wall near low-tide line and on stones in very shallow water, Bird Key Reef; material probably of this species appeared in small amounts elsewhere.

Lyngbya hyalina Harvey

(Plant mass forming indefinite, very soft and somewhat gelatinous continuous tufts or pilose strata; filaments attached by their bases, erect, straight, very slender, arachnoid, gelatinous, membranaceous, flaccid; transverse walls visible in older plants; cell contents granular, very pale yellowish-green or nearly colorless.)

Lyngbya hyalina Harvey (1858); *L. hyalina* Harvey, Farlow (1875).

Described from Key West, Florida, by Harvey.

Lyngbya majuscula Harvey ex Gomont

(Plate 1, fig. 19)

Plants filamentous, forming blackish-green or somewhat blackish-purple masses, the filaments with thick and persistent lamellose colorless sheaths, cells very thin disks, the trichomes little or not constricted at the nodes; end cell not capitate or calyptrate, somewhat rounded; trichomes 24 to 33μ (16 to 60μ) in diameter, cells about 2μ long; filaments 35 to 41μ (or more) in diameter.

Lyngbya majuscula Harvey (1852); *L. majuscula* Harvey, Farlow (1876); *L. majuscula* Harvey ex Gomont, Collins and Hervey (1917); *L. majuscula* Harvey ex Gomont, Collins in Howe (1920).

New England to Florida; Bermuda; from the Bahamas through West Indies.

Common at Dry Tortugas in shallow water, forming large masses over the white coral sand in quiet places, as on Garden Key and the west side of Loggerhead Key, but less abundant in 1926 than in previous seasons. Dredged in shallow water.

Lyngbya rosea n. sp.

(Plate 1, fig. 22)

Plants forming pink to pinkish-brown masses among larger algæ; filamentous, the filaments with comparatively thin colorless sheaths; cells about one-third to one-sixth as long as broad, very slightly barrel-shaped or constricted at the nodes, the end cell rounded, neither capitate nor calyptrate; trichomes 40 to 60μ in diameter, the sheath 1.5μ to rarely 2μ thick.

Newly described here from Florida.

At Dry Tortugas a plant of deep water, entangled among other algæ, in large masses; Southwest Channel at 14.6 to 32.9 meters.

The species of *Lyngbya* with pink or violet color which are reported from our territory (West Indies and neighborhood), especially by Crouan, are so inadequately described that the present writer feels disinclined to refer the present very beautiful species to any of them.

OSCILLATORIA Vaucher

Plants filamentous, the secreted mucous at once dissolving, leaving the filaments free; filaments of a single series of cells, unbranched; reproduction by the separation of a portion of the filament.

1. Filaments less than 5μ in diameter .... O. lætevirens
1. Filaments more than 5μ in diameter .... O. Corallinæ

Oscillatoria Corallinæ Gomont

(Plate 1, fig. 14)

Plant filamentous, the filaments tortuous, somewhat tangled; trichomes 9 to 11μ (6 to 10μ) in diameter, the cells slightly constricted at the nodes, one-fourth to two-thirds as long as broad or perhaps longer; the tip of the filament very slightly tapering, the end cell rounded and slightly thickened on the end.

Oscillatoria Corallinæ Gomont, Collins and Hervey (1917); *O. Corallinæ* Gomont, Collins in Howe (1920).

New England to Bermuda; Bahamas; West Indies; newly reported for Florida.

With other algæ in bottom of "Pool No. 2" Long Key; with *Chætomorpha gracilis,* in tide pool on Sand Key.

Oscillatoria lætevirens Crouan ex Gomont

(Plate 1, fig. 13)

Plant filamentous, the filaments straight or somewhat curved, without sheaths; trichomes 2 to 3μ in diameter, the cells square or one-half to more often two-thirds as long as broad; apex of trichome slightly tapering, sometimes somewhat bent, the end cell rounded or rounded-conical, not calyptrate or capitate.

O. lætevirens Crouan ex Gomont, Collins and Hervey (1917).

New England to Bermuda and newly reported for Florida.

At Dry Tortugas found in pools on Long Key, with other algæ.

PHORMIDIUM Kuetzing

Plants filamentous, the filaments of 1 row of cells; straight or flexuous, the filaments forming diffluent mucous sheaths which usually unite to form a general soft mucous matrix.

Phormidium persicinum (Reinke) Gomont var?

(Plate 1, fig. 16)

Plant as small masses among other algæ; trichomes 1.2μ (1.7 to 2μ) in diameter, flexuous, somewhat entangled, the cells in length about equal to the diameter, or somewhat greater or less; slightly barrel-shaped; apex of the filament very slightly tapering, the end rounded conical and not capitate or calyptrate.

Newly reported for Florida.

At Dry Tortugas with *Symploca* at 4.6 to 7.6 meters on White Shoal, dredged.

SPIRULINA Turpin

Plants forming blue-green or purplish masses, or as isolated filaments; filaments spirally coiled, cell divisions if present obscure; reproduction by division of the filament.

1. Color of colony rose-pink.. S. rosea
1. Filaments, if aggregated into a colony, blue-green in mass..................... 2

2. Trichome about 1μ in diameter, or somewhat greater, coils close................ S. subsalsa oceanica
2. Trichome reaching to 1μ in diameter, coils loose............................ S. subtilissima

Spirulina rosea Crouan ex Gomont

(Plate 1, fig. 11)

Plant forming considerable masses, rose-pink in color; trichomes 1.2 to 1.5μ in diameter, the spiral filaments about 3.6μ across.

Spirulina rosea Crouan ex Gomont, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Abundant in the moat of Fort Jefferson on Garden Key, Dry Tortugas, on the edges of pipes forming sluice-way on the southeast side and on neighboring algæ.

Spirulina subsalsa Oerstedt fa. oceanica (Crouan) Gomont

(Plate 1, fig. 12)

Plant occurring as isolated filaments, blue-green in color; trichomes 1μ in diameter, spiral filaments 3.1 to 4.7μ in diameter.

Spirulina subsalsa Oerstedt forma *oceanica* Gomont, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Frequent in "Pool No. 2" on Long Key, Dry Tortugas, and among *Gelidium pusillum conchicola*, Garden Key.

Spirulina subtilissima Kuetzing

(Plate 1, fig. 24)

Plant occurring as isolated filaments or massed, blue-green in color; trichome 0.6 to 1.0μ in diameter, spiral filaments about 2.0 to 2.5μ in diameter, rather loosely coiled.

Newly reported for Florida.

With *Chroococcus* and other algæ in pools on Long Key, scanty.

SYMPLOCA Kuetzing

Plants forming erect wick-like tufts from a matted base; filaments sheathed, forming false branches; sheaths thin, agglutinated.

Symploca profunda n. sp.

(Plate 1, fig. 18)

Plants forming tufts 3 to 10 mm. high, the individual strands about 0.2 to 0.3 mm. in diameter; color strong pink to violet; trichomes 6.5 to 8.5μ in diameter, with sheath to about 10μ; cells somewhat shorter than long, or square, very slightly constricted at the nodes; apex of trichome briefly tapering, straight or slightly bent, the end cell not capitate, nor with a definite calyptra, although some apices suggest a slightly thickened membrane.

Newly described here from Florida.

Dredged in fair quantity at Dry Tortugas in 4.6 to 7.6 meters on White Shoal and on Loggerhead Key shoal and to 36.6 meters beyond Southwest Channel.

This species seems to have its nearest relative in *S. violacea* Hauck; the sub-ærial habitat of *S. violacea* contrasts strikingly with the present form, which also has cells relatively longer than those reported by Collins for *S. violacea* as he found it at Bermuda. *S. hydnoides* Kuetzing also seems to show some points of resemblance, and this may be but a variety of that species.

TRICHODESMIUM Ehrenberg

Plants of the plankton, forming colonies of twisted filaments with little or no mucous; filaments of a single row of cells, without branches; reproduction by division and breaking of the filament.

Trichodesmium Thiebautii Gomont

(Plate 1, fig. 15)

Plant filamentous, aggregated into macroscopic sub-cylindrical twisted masses, or into spherical masses with the filaments twisted together at the center; trichomes pale yellowish in color, 12 to 20μ (7 to 16μ) in diameter, the cells 0.5 to 1.25 (or 2.0) times as long as broad, very slightly barrel-shaped or constricted at the nodes; apex of the filament capitate and calyptrate.

Trichodesmium Thiebautii Gomont, Collins and Hervey (1917); *T. Thiebautii* Gomont, Collins in Howe (1920).

Bermuda; Bahamas; West Indies; newly reported for the Florida coast.

Frequent in the Gulf Stream plankton a few miles south of Dry Tortugas; frequently observed while dredging beyond Southwest Channel.

NOSTOCACEÆ

Plants filamentous, the filaments free or in definite or indefinite colonies, according as the mucilage is dissolved or forms firm or adhesive sheaths; filaments without differentiation of base from apex; forming hormogonia, heterocysts and resting spores or gonidia which have a thick, sometimes spiny wall.

1. Filaments with distinct, firm individual sheaths .... Nodularia (48)
1. Filaments embedded in a soft general jelly .... Hormothamnion (47)

HORMOTHAMNION Grunow

Plants filamentous, the filaments embedded in a general soft gelatinous matrix, the individual sheaths obscure; the mass organized into a decumbent basal portion bearing erect, filiform projections; heterocysts present, intercalary.

Hormothamnion enteromorphoides Grunow

(Plate 2, fig. 3)

Plants filamentous, the filaments embedded in a soft jelly with a basal stratum from which arise erect projections; trichomes straight or somewhat curved, the cells lightly or strongly barrel-shaped, the end cell tapering to a contracted round point; trichomes (6 to) 6.5 or 7.5μ in diameter; heterocysts present, somewhat oval to barrel-shaped, 8.4 to 9.4μ (6 to 7μ) in diameter and 9.4 to 11μ (7 to 10μ) long.

Hormothamnion enteromorphoides Grunow, Collins in Howe (1920).

Florida and the West Indies.

Rather frequent in shallow quiet water on the west side of Loggerhead Key, and on Bird Key Reef, as blue-green, soft patches, the erect portions sometimes very little developed. Reported from Key West and Tortugas by Farlow (*vide* Forti in De Toni, *Sylloge Algarum*).

The plant at Dry Tortugas differs from those previously reported principally in the somewhat larger heterocysts.

NODULARIA Mertens

Plants filamentous, the filaments with a rather thick gelatinous sheath; cells flattened, disk-shaped; heterocysts depressed; gonidia spherical or depressed in series between the heterocysts.

Nodularia? fusca n. sp. = Cyanothrix Willei Gardner

(Plate 1, fig. 23)

Plant filamentous, the trichome surrounded by a broad sheath; cells rather widely separated, transversely oval in side view, or flattened disk-shaped if recently divided, rarely the filaments showing individual sheaths around pairs of cells; cells brownish-green to light brown in color; trichome 6.5 to 10.3μ in diameter, the filaments 15 to 19μ; heterocysts and spores not seen.

Newly described here from Florida.

Abundant at Dry Tortugas among masses of other algæ, especially Myxophyceæ, in pools on Long Key.

This material is placed in the genus *Nodularia* on slight grounds, the spores and heterocysts which are so distinctive being lacking; however, the general facies of the plant is that of *Nodularia* rather than of any other genus known to the writer.

SCYTONEMATACEÆ

Plants filamentous, forming mats or tufts; filaments not differentiated into base and apex, forming false branches and surrounded by firm sheaths; heterocysts present; multiplication by hormogonia.

SCYTONEMA C. Agardh

Plants filamentous, the filaments forming false branches in pairs between the heterocysts at no well-defined point, the branches issuing from the old sheaths more or less at right angles and forming individual sheaths.

Scytonema ocellatum Lyngbye

(Plate 2, fig. 1)

Plant forming a dense mat 2 to 4 mm. thick on the bottom of the pool; filaments 9.5 to 13μ in diameter, trichomes 5.6 to 9.5μ (6 to 14μ), slightly constricted at the nodes near the ends of the filaments, not constricted below; cells about one-third to one-half as long as broad near the apex of a filament, becoming square to 1.5 times as long as broad below; apex with a capitate, calyptrate end cell; heterocysts 9.5 to 22.5μ, generally about 13μ in length, cylindrical; sheaths firm, dark-yellowish to brown, the lamellæ parallel except near the frequently infundibuliform tips; branches generally single but sometimes in typical pairs.

Scytonema ocellatum Lyngbye, Collins and Hervey (1917); *S. ocellatum* Lyngbye, Collins in Howe (1920).

New England to Pennsylvania; Florida; Bermuda and Jamaica.

Forming an extensive mat in an artificial pool on East Key, the water somewhat brackish, probably frequently dried up in summer, but when seen in 1924, 1925 and 1926 covered with a few inches of water.

This species is previously reported from fresh water, but here must, at least in winter, be exposed to considerable amounts of salt carried in the spray. It differs from the standard description principally in having somewhat elongated heterocysts.

STIGONEMATACEÆ

Plants filamentous, the filaments of one to several cells in diameter, forming true branches; heterocysts and gonidia present.

MASTIGOCOLEUS Lagerheim

Plants within the substance of shells or corals, filaments branched, the branches but 1 cell in diameter; forming heterocysts terminally on short 1-celled lateral branches or sessile on the sides of the main branches.

Mastigocoleus testarum Lagerheim ex Bornet and Flahault

(Plate 2, fig. 2)

Plant in the substance of shells and corals, branching, the branches with thin sheaths; diameter of trichomes 5.4 to 9μ (3.5 to 6μ), of the filaments 6.5 to 10μ; filaments very slightly constricted at the nodes, heterocysts of somewhat irregular oval shape, 9 to 11μ (6 to 18μ) in diameter.

Mastigocoleus testarum Lagerheim ex Bornet and Flahault, Collins and Hervey (1917); *M. testarum* Lagerheim ex Bornet and Flahault, Collins in Howe (1920).

New England to Bermuda; Bahamas; West Indies; and newly reported for Florida.

Probably common at Dry Tortugas, though not often recorded; noted with *Hyella* as grayish discolorations on corals and shells, especially on Bird Key Reef, on the east side of Loggerhead Key, and on Bush and Garden Keys.

RIVULARIACEÆ

Plants filamentous, the filaments with a well-differentiated free apex which usually ends in a hair; filaments enclosed in individual sheaths and in some genera also in a general gelatinous matrix; branching false, the branches and the main filaments usually with basal heterocysts; intercalary heterocysts may also be present; reproduction by gonidia and hormogonia.

1. Filaments included in a general gelatinous matrix .... Rivularia (54)
1. Filaments with sheaths, but without a general matrix 2

2. False branches included within parent sheath for a considerable portion of their length..... Dichothrix (52)
2. False branches not included within parent sheath .... Calothrix (50)

CALOTHRIX C. Agardh

Plant filamentous, the filaments not embedded in a general gelatinous matrix, generally tapering from base to apex, although in some species cylindrical below; branches false, immediately free from the parent sheath; heterocysts basal and intercalary; gonidia basal, sometimes seriate.

1. Plant endophytic .... C. parasitica (51)
1. Plant not primarily endophytic 2

2. Filaments with intercalary and basal heterocysts 3
2. Filaments with basal heterocysts only 5

3. Trichomes 6 to 8μ in diameter 4
3. Trichomes 12 to 20μ in diameter 7

4. Trichomes less than 6.5μ broad, cells usually more than three-fourths as long as broad . C. longifila (51)
4. Trichomes more than 6.5μ broad, cells usually less than three-fourths as long as broad.. C. æruginea (50)

5. Plant forming a crust on the substratum .... C. scopulorum (52)
5. Plant not forming a crust 6

6. Pigment pink, sheath thin .... C. rosea (52)
6. Pigment blue-green, sheaths thick .... C. confervicola (50)

7. Filaments attached at middle .... C. pilosa (51)
7. Filaments attached at base .... C. crustacea (51)

Calothrix æruginea Thuret ex Bornet and Flahault

(Plate 2, fig. 11)

Plants epiphytic, the filaments short to moderately elongated, usually curved at the base, solitary or in groups; heterocysts basal, subspherical or flattened on the upper side (rarely intercalary); trichomes 6.5 to 8μ (7 to 9μ) in diameter, slightly constricted especially below; cells one-third to three-fourths as long as broad; trichomes ending in a long hair; (sheaths occasionally yellow below).

Calothrix æruginea Thuret ex Bornet and Flahault, Collins and Hervey (1917); *C. æruginea* Thuret ex Bornet and Flahault, Collins in Howe (1920).

New England; Bermuda; Bahamas; West Indies.

On *Zonaria*, Bird Key Reef, and occasional elsewhere at Dry Tortugas. Reported at Tortugas by Farlow (*vide* Forti in De Toni, *Sylloge Algarum*).

Calothrix confervicola C. Agardh ex Bornet and Flahault

(Plate 2, fig. 7)

Filaments epiphytic, comparatively short, straight or curved, in tufts, heterocysts basal, depressed to sub-spherical, 11.2 to 13μ broad; trichomes 11.2 to 13μ broad below, 9.4 to 11.2μ broad in the shaft above, distinctly constricted at the nodes, especially below; cells variable in thickness, from about one-fifth to two-thirds as long as broad.

Calothrix confervicola C. Agardh, Harvey (1852); *C. confervicola* C. Agardh, Farlow (1876); *C. confervicola* C. Agardh ex Bornet and Flahault, Collins and Hervey (1917).

New England to Bermuda; West Indies; newly reported for Florida.

At Dry Tortugas on Cladophoræ in the moat, Fort Jefferson, Garden Key.

Calothrix crustacea Thuret ex Bornet and Flahault

(Plate 2, fig. 10)

Filaments forming a crust on stones, etc., the filaments flexuous, 0.75 to 1 mm. long, somewhat tangled, heterocysts basal and intercalary, the basal heterocysts one to a few, oval or depressed, somewhat broader than the trichome, the intercalary heterocysts barely wider than the trichome, about half as long as broad; trichome cylindrical, tapering shortly near the apex, slightly constricted at the nodes, 12.5 to 14.5μ in diameter; sheaths thick, reaching a filament diameter of 25μ above, colorless to brownish.

Calothrix crustacea (Schousboe) Bornet and Flahault, Farlow (1891); *C. crustacea* Thuret ex Bornet and Flahault, Collins and Hervey (1917).

New England to Florida; Bermuda and West Indies.

At Dry Tortugas found with *C. scopulorum* forming a crust on the wall of the moat, Garden Key.

Calothrix longifila n. sp.

(Plate 2, fig. 8)

Filaments epiphytic, much elongated, straight or flexuous; trichomes slender, very slightly constricted at the nodes, diameter 5.6 to 6.5μ; cells as long as broad or somewhat shorter; sheaths thin, colorless; pigment blue-green or pinkish; heterocysts basal, spherical to oval, 9 to 10μ in diameter, or intercalary, oval to cylindrical, 5.6 to 6.5μ in diameter, 11 to 12μ long.

Here newly described from Florida.

On Cladophoras in the moat, Garden Key, Dry Tortugas.

Calothrix parasitica Thuret ex Bornet and Flahault

(Plate 2, fig. 13)

Plant usually endophytic; the filaments comparatively short, straight or more usually curved, solitary or in small groups; the heterocysts basal, depressed to sub-spherical, 10 to 11μ in diameter; trichomes 3.7 to 6.5μ (7 to 8μ) in diameter, tapering rather markedly from the base, where it is 9.4 to 11.3μ, the apex ending in a slender hair; trichomes very faintly constricted at the nodes; cells variable in length, about one-third as long as broad.

Calothrix parasitica Thuret, Farlow (1891); *C. parasitica* Thuret ex Bornet and Flahault, Collins and Hervey (1917); *C. parasitica* Thuret ex Bornet and Flahault, Collins in Howe (1920).

New England; Bermuda; Bahamas; newly reported for Florida.

Frequent at Dry Tortugas in soft gelatinous Rhodophyceæ and Phæophyceæ; especially recorded from *Liagora farinosa* washed ashore on the east side of Loggerhead Key.

Calothrix pilosa Harvey

(Plant cæspitose, widely expanded, black or dark blue-green; filaments 10 to 40μ in diameter, 2 to 10 mm. in length, decumbent and interwoven at the base, erect at the apices, elongate, rigid, free or growing together laterally in fascicles, distinctly thicker in upper portions; sheaths hard, thick, at first orange, finally yellowish-brown, opaque, uniform; trichomes 10 to 20μ in diameter, briefly tapering at the apex; terminating in a hemispherical cell, here and there interrupted by heterocysts; cell contents olive brown.)

Calothrix pilosa Harvey (1858); *C. pilosa* Harvey, Farlow (1876); *C. pilosa* Harvey, Collins and Hervey (1917); *C. pilosa* Harvey, Collins in Howe (1920).

Florida and the West Indies.

Calothrix rosea n. sp.

(Plate 2, fig. 12)

Filaments growing among other algæ, elongated, tortuous at full development, or at least much curved; heterocysts basal, depressed to sub-spherical or ovoid, solitary; trichomes distinctly constricted at the nodes, generally ending in a tapering but not hair-like tip; cell contents rose-pink; diameter of a trichome 9 to 12μ, cells as long as broad to one-half or at least one-third as long as broad below; near the apex shorter, one-third to one-fifth as long as broad; filaments 10.8 to 14.4μ in diameter; sheath colorless, thin.

Here newly described from Florida.

Growing with *Symploca* in 4.6 to 7.6 meters of water on Loggerhead Key shoal, and White Shoal at Dry Tortugas.

This plant shows some similarity to *C. æruginea*, but differs in the more slender filament with longer cell, the thinner, uncolored sheath, and the pink cell pigment.

Calothrix scopulorum C. Agardh ex Bornet and Flahault

(Plate 2, fig. 6)

Plants forming a crust on stones; the filaments flexuous, heterocysts basal, one to several in a series, 10.8 to 16.2μ (10 to 18μ) in diameter; filaments usually notably swollen at the base, above 14.4 to 18μ in diameter; trichome swollen at the base, tapering to a hair-tip at the free end, 9 to 10.8μ in diameter in the shaft; cells distinctly constricted at the ends, the length equal to the breadth or to about one-half as long as broad; heterocysts basal, 1 to 3 in a series.

Calothrix scopulorum C. Agardh, Harvey (1852); *C. scopulorum* C. Agardh, Farlow (1876); *C. scopulorum* C. Agardh, Farlow (1881); *C. scopulorum* C. Agardh ex Bornet and Flahault, Collins and Hervey (1917); *C. scopulorum* C. Agardh ex Bornet and Flahault, Collins in Howe (1918).

New England to Bermuda; Bahamas; West Indies; newly reported for Florida.

With *C. crustacea* forming a crust on the brick wall of the moat, Fort Jefferson, Garden Key.

DICHOTHRIX Zanardini

Plants filamentous, the filaments forming false branches which in their lower portions are obviously enclosed within the parent sheath; filaments usually with basal and intercalary heterocysts; sheaths firm, the colony not enclosed within a general jelly.

1. Plants primarily saxicolous with brown sheaths, trichomes more than 13μ above base ... D. olivacea (53)
1. Plants primarily epiphytic with pale sheaths 2

2. Filaments 17 to 22μ in diameter .... D. fucicola (52)
2. Filaments 15μ in diameter .... D. penicillata (53)

Dichothrix fucicola Bornet and Flahault

(Plate 2, fig. 15)

Plants forming tufts or coatings on various algæ, the filaments deliquescent branched, branches false; trichomes 9.4 to 13μ in diameter above the somewhat swollen base, which to 21μ; the cells clearly constricted at the nodes below but very slightly so above; heterocysts basal and intercalary, the basal heterocysts 21 to 29μ wide by 21 to 27μ long; usually somewhat flattened in contact with the parent branch, but otherwise depressed-oval to spherical; intercalary heterocysts about 17 by 34μ; sheaths most often colorless to slightly brownish.

Dichothrix fucicola Bornet and Flahault, Collins and Hervey (1917); *D. fucicola* Bornet and Flahault, Collins in Howe (1920).

West Indies; Bermuda and Bahamas; newly reported for Florida.

Probably quite frequent on old algal growths around Dry Tortugas, but rarely in quantity sufficient for herbarium preservation; dredged in over 7.6 meters of water on White Shoal, attached to *Acanthophora* and *Laurencia;* also on rocks near Garden Key shore, the determination probably correct, although the filaments are rather slender.

Dichothrix olivacea Bornet and Flahault

(Plate 2, fig. 14)

Plants forming rounded thick tufts or mats on stones, etc., the filaments in deliquescent branched tufts; heterocysts basal and intercalary, the basal to 20μ broad and 17μ long, sometimes 13μ broad and 27μ long, usually flattened somewhat in contact with the parent branch, but otherwise depressed oval to spherical; intercalary heterocysts short to longer-cylindrical, 18 to 36μ long; trichomes usually 13 to 15μ in diameter, but reaching 20μ (10 to 15μ), cells one-third as long as broad to more often of nearly equal dimensions or slightly longer; sheaths usually 2 to 3μ thick, but reaching 5.4μ, light to dark brown in color.

Guadeloupe in the West Indies; newly reported from Florida.

Rather abundant in some places at Dry Tortugas; especially so on rocks on Sand Key and on the outer face of the moat wall, Fort Jefferson, Garden Key; also on rocks, west side of Loggerhead Key.

The correspondence of this material to the descriptions of *D. olivacea* is fairly close and probably better than to *D. Baueriana*, the other most similar species. The principal differences lie in the somewhat broader shorter cells and darker sheaths.

Dichothrix penicillata Zanardini ex Bornet and Flahault

(Plant mass cæspitose, fastigiate-penicillate, scattered or gregarious, dark-green; filaments 25 to 35μ in diameter in the ultimate branches, 2 mm. in length, short, flexuous; sheaths thick, gelatinous, soft, uniform, hyaline; heterocysts oblong, solitary.)

Dichothrix penicillata Zanardini, Bornet and Flahault, Revision des Nostocacèes Hètèrocystèes, Annales des Sciences Naturelles vii, Bot., 3:379–380. 1886.

Florida.

In the above record by Bornet and Flahault this species is listed as from Tortugas in the Gulf of Mexico, collected by Hooper. The collector and the district indicate that Dry Tortugas, Florida, is meant.

POLYTHRIX Zanardini

Plants cæspitose, forming a coating on sand or mud, filamentous, the filaments several to many within a common sheath; sheath firm, branching, especially with several short corymbiform branches near the upper end; trichomes with basal heterocysts, hardly tapered toward the apex.

Polythrix corymbosa Grunow ex Bornet and Flahault

(Plate 1, fig. 21; plate 2, fig. 4)

With the generic characters; trichomes 4.5 to 6.5μ in diameter, hardly constricted at the nodes, (terminating in a slender hair); basal heterocysts depressed-ovoid, 11 to 13μ in diameter; intercalary heterocysts long-cylindrical with rounded ends, or long-oval (or sub-spherical); sheaths brownish, darker below.

Microcoleus corymbosus Harvey (1852); M. *corymbosus* Harvey, Farlow (1875); *Polythrix corymbosa* Grunow ex Bornet and Flahault, Collins and Hervey (1917); *P. corymbosa* Grunow ex Bornet and Flahault, Collins in Howe (1920).

Florida; Bermuda and Bahamas.

Not noted at Dry Tortugas.

RIVULARIA Roth

Plants filamentous, the base broader than the usually hair-like apex; filaments growing in a tuft or crust-like expanse, radiating in position; branching false; surrounded by individual sheaths and a common gelatinous matrix; heterocysts present; spores present in some species.

1. Trichomes occasionally reaching 5.5μ in diameter . . . . R. nitida
1. Trichomes normally exceeding 5.5μ in diameter above . . . . R. polyotis

Rivularia nitida C. Agardh ex Bornet and Flahault

(Plate 2, fig. 5)

Plants forming an irregular crust and nodules over fragments of shell and corals; dark-green in color, rather firm; trichomes not definitely constricted at the nodes, slender, the diameter 4.7 to 5.6μ (3 to 5μ), cells once to twice as long as broad; basal heterocysts nearly spherical, 10.4 to 13μ in diameter; sheaths sharply defined, brownish below.

Rivularia plicata Carmichael, Farlow (1881); *R. nitida* C. Agardh ex Bornet and Flahault, Collins in Howe (1920).

New England; Bahamas; newly reported for Florida.

On corals and shells, Bird Key Reef, in shallow water.

Rivularia polyotis Bornet and Flahault

(Plate 2, fig. 9)

Plants forming firm and dark-green nodulose masses, or scattered nodules; basal heterocysts depressed ovoid, 5.4 to 12μ in greater diameter; trichomes slightly to strongly constricted at the nodes, the cells one-half to twice as long as broad; trichomes 5.6 to 9.4μ (8 to 13.5μ) in diameter; sheaths sometimes brownish below.

Rivularia polyotis Bornet and Flahault, Collins and Hervey (1917); *R. polyotis* Bornet and Flahault, Collins in Howe (1920).

New Jersey; Florida; Bermuda and Bahamas.

All of the Dry Tortugas *Rivularia* material was exceedingly difficult to determine, with the exception of the obviously distinct *R. nitida.* Separation of *R. polyotis*-like specimens from *R. Biasolettiana*-like material proved hopeless; for the most part the resemblance was with *R. polyotis;* the description is based primarily on Key West material collected by Howe.

On *Sargassum* drifted on to Loggerhead Key; on *Thalassia* growing near the shore of Loggerhead Key; on *Halimeda Tuna* growing near the shore of Garden Key.

CHLOROPHYCEÆ

Plants unicellular, colonial, or forming filaments or plates of cells, simple or branched, in higher types developing a high degree of structural differentiation; cells with a well-developed nucleus and chloroplasts, which may be small and numerous or few and of complex forms, the photosynthetic pigment being chlorophyll, with other pigments when (rarely) present usually in the vacuoles rather than the chromatophores; pyrenoids present in many genera, the anabolite generally starch, occasionally oil; cell membrane not often colored, generally cellulose, frequently in simpler types gelatinous; cells primitively motile by few to 2 equal cilia, in higher groups becoming motionless except in reproduction, the 2-ciliate type in some groups modified to multiciliate ones; multiplication by vegetative means and by ordinary mitotic cell division; reproduction by the formation of zoöspores or aplanospores in sporangia and by resting spores, also by the formation of gametes, either isogamous or oögamous in character.

1. Cells generally uninucleate, chloroplasts single or few .... Ulotrichales (55)
1. Cells always multinucleate 2

2. Plants multicellular at maturity .... Siphonocladiales (59)
2. Plants unicellular, cœnocytic, walls formed in reproduction only .... Siphonales (76)

ULOTRICHALES

Simple or branched filaments or forming membranes, rarely in few-celled families; cells uninucleate, rarely plurinucleate, the chromatophore usually single, simple or of deeply cleft ramifying outline; pyrenoids one to several.

1. Frond membranaceous .... Ulvaceæ (55)
1. Frond filamentous, the filaments uniseriate .... Chætophoraceæ (58)

ULVACEÆ

Plants attached or forming free membranous expansions, filaments or tubes; cells with 1 or 2 plate-like chromatophores, 1 or 2 pyrenoids and a single nucleus; reproduction by biciliate zoöspores or by isogametes.

1. Plant a broadly expanded membrane 2 cells thick .... Ulva (57)
1. Plant forming a simple or branched tube .... Enteromorpha (55)

ENTEROMORPHA Link

Plant essentially tubular, simple or branched, though of a solid rod of cells at attenuate extremities; cells with a single parietal chromatophore at the outer face of the cell, containing a pyrenoid; cells uninucleate; reproduction by zoöspores and isogametes.

1. Branches present 2
1. Branches absent, or represented by occasional basal proliferations .... E. flexuosa (55)

2. Branches not terminating in a single series of cells .... E. prolifera (56)
2. Branches terminating in a single series of cells 3

3. Chromatophores much smaller than the cells .... E. plumosa (56)
3. Chromatophores nearly filling the cells .... E. salina (56)

Enteromorpha flexuosa (Wulfen) J. Agardh

(Plate 7, fig. 2)

Plants tufted, to 9 cm. high, tubular, tapering to the base, the individual tubes to 7 mm. in diameter; wall 1 cell thick, the large cells in distinct longitudinal rows.

Enteromorpha intestinalis Link p.p.?, Farlow (1876); *E. flexuosa* (Wulfen) J. Agardh, Collins (1909); *E. flexuosa* (Wulfen) J. Agardh, Collins and Hervey (1917); *E. flexuosa* (Wulfen) J. Agardh, Børgesen (1913); *E. flexuosa* (Wulfen) J. Agardh, Collins in Howe (1920).

Florida; Bermuda; the Bahamas through the West Indies to the Virgin Islands.

One tuft found floating, Loggerhead Key; in a dwarfed form frequent on shells on south side of Garden Key.

Enteromorpha plumosa Kuetzing

(Plate 3, figs. 1, 18)

Plants soft and delicately filamentous (to 1 to 3 dm. tall), the ultimate branches monosiphonous; branches alternate or opposite, in graded series to the delicate tips, or delicate filaments arising from the main branches directly; cells 12 to 25μ broad by 23 to 40μ long; in longitudinal series.

Enteromorpha Hopkirkii Harvey (1852); *E. Hopkirkii* Harvey, Farlow (1876); *E. plumosa* Kuetzing, Collins (1909); *E. plumosa* Kuetzing, Børgesen (1913); *E. plumosa* Kuetzing, Collins and Hervey (1917); *E. plumosa* Kuetzing, Collins in Howe (1920).

New England to Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

At Dry Tortugas occasional as poorly developed tufts; fairly well developed on hull of U. S. Lighthouse Service "30," the launch of the Tortugas lighthouse; also in shallow water near shore, Loggerhead Key.

The determination of this material is fairly satisfactory, better than that of the other small Enteromorphas found at Dry Tortugas. Probably they were out of season when the islands were visited.

Enteromorpha prolifera (O. F. Müller) J. Agardh

(Plate 3, fig. 19)

Plants erect to a height of 1.5 (to 6) dm., soft, filaments slender, branched abundantly below, but more sparingly above, about 0.1 to 1.5 mm. (elsewhere often more) in diameter; cells 8.5 to 13μ in diameter, arranged in longitudinal series.

Enteromorpha prolifera (O. F. Müller) J. Agardh, Collins (1909); *E. prolifera* (O. F. Müller) J. Agardh, Collins and Hervey (1917); *E. prolifera* (O. F. Müller) J. Agardh, Hoyt (1920).

New England to Florida, Bermuda and the West Indies.

The Dry Tortugas material was exceedingly delicate and soft in the only well-developed collection; the remainder of the collections were of short tufts 1 to 3 cm. tall, much worn, and largely sifted over by sand. Garden Key on conch shells, to 1.5 dm.; Loggerhead Key, rocks, abundant, as low turf.

Except for its delicacy and comparative lack of branches above, this material fits fairly well under the name adopted. The branches, where present and intact, were tubular to the rather bluntly rounded end. Most of the cells measured about 10μ.

Enteromorpha salina Kuetzing

(Fronds filiform, tubular, with a few branches, which are sometimes opposite, of two or more rows of cells, or in the youngest of a single series; cells quadrangular, 14 to 16μ square, or slightly longer than broad, in longitudinal series throughout; membrane thickened on both sides.)

Enteromorpha salina Kuetzing, Collins (1909).

Reported from Florida.

Var. polyclados Kuetzing

(Filaments beset with more or less numerous short, horizontal, spine-like ramuli.)

Enteromorpha salina Kuetzing var. *polyclados* Kuetzing, Collins (1909); *E. salina polyclados* Kuetzing, Howe (1920).

Reported from Florida and the Bahamas.

ULVA Linnæus

Plant in the form of an expanded membrane, 2 cells in thickness, cells with a single chromatophore placed on the outer face of the cell and containing a single pyrenoid; cells uninucleate; reproduction by zoöspores and isogametes.

1. Thallus not naturally perforate, usually 60μ or more thick .... U. Lactuca rigida
1. Thallus regularly perforate, usually less than 60μ thick .... U. profunda

Ulva Lactuca Linnæus var. rigida (C. Agardh) LeJolis

(Plate 3, figs. 20, 21; plate 7, fig. 7)

Plants attached in crowded masses, divided into broad lobes, dark and tough, to 1 dm. high; cells of the blade 13 to 22μ broad; thickness of blade 60μ, cells higher than broad in section, chromatophore thick and concave, completely filling the outer end of the cell; outer wall greatly thickened, lateral walls thick.

Ulva Lactuca Linnæus p.p., Harvey (1852); *U. Lactuca* Linnæus, Farlow (1876); *U. Lactuca* Linnæus var. *rigida* (C. Agardh) LeJolis, Collins (1909); *U. Lactuca* Linnæus var. *rigida* (C. Agardh) LeJolis, Børgesen (1913); *U. Lactuca* Linnæus var. *rigida* (C. Agardh) LeJolis, Collins and Hervey (1917); *U. Lactuca* Linnæus, Howe (1920).

Eastern coast from Canada to Florida; Bermuda; Bahamas; and through the West Indies.

At Dry Tortugas recorded in 1924 as one tiny fragment on *Padina* from west of the main wharf, Garden Key; in 1925 the plant grew luxuriantly between tide marks and lower between the main and the western coal wharves, Garden Key, but it was entirely absent in 1926.

The comparative scarcity of this species about the Dry Tortugas is notable; perhaps it is related to the drifting soft limy mud which covers much of the territory, this being much less on the south side of Garden Key than in most other suitable places.

Ulva profunda n. sp.

(Plate 3, figs. 2, 3, 16, 17)

Plant at first ovate, attached by a cuneate base and a stalk about 1 mm. long; later widely expanded, delicate, irregular, to 4 dm. or more in diameter; regularly clathrate, the openings generally 0.5 to 1.5 cm. but reaching 6 cm. in diameter; cells of the membrane angular, variable in size, averaging about 18 to 36μ in diameter, containing 1 (rarely 2) chromatophores which nearly cover the face of the cell in the living state and contain 1, rarely 2, pyrenoids; thickness of blade 30 to 60μ, cells sub-equal to broader than high in section, thin-walled; vertical walls about 0.3μ thick, outer membrane 1.5 to 3.0μ thick, cells bounding the openings frequently much elongate in the plane of the blade, reaching surface diameters of 18 by 72μ, or more.

Newly described here from Florida.

Dredged in 64.0 to 67.7 meters off Southwest Channel with *Kallymenia perforata*, etc., June 1925, when a small non-perforate piece, perhaps the same species, appeared in 14.6 to 18.3 meters. In 1926 a large quantity was obtained in 32.9 meters.

This material was rather pale in color when living, though darkening on drying. The perforations occur with such regularity and show such characteristic margining as to indicate that they are a normal character of the plant, like the perforations of *Agarum*. Two little pieces showed the basal attachment. The greater part of the material was of small fragments, but pieces 4 dm. in diameter were secured.

CHÆTOPHORACEÆ

Plants fundamentally filamentous, branched, generally creeping or forming disk-like expansions; cells uninucleate or plurinucleate, with chromatophores and pyrenoids; hairs present in some genera, reproduction by zoöspores, aplanospores, akinetes and by motile gametes.

1. Plant forming disk-like expansions 2
1. Plant branching, not forming definite disks 3

2. Marginal cells of disk elongated, definitely filamentous in arrangement .... Ulvella (59)
2. Marginal cells irregular, not notably different in arrangement .... Protoderma (59)

3. Plant in or upon algæ, rarely other objects .... Phæophila (58)
3. Plant within shells or coral .... Gomontia (58)

GOMONTIA Bornet and Flahault

Creeping branched filaments, the cells uni- to plurinucleate, penetrating the substratum but forming sporangia on the surface which give rise to 4-ciliate zoöspores; large irregular akinetes with thick irregular walls and rhizoidal projections are also formed, and germinate to produce aplanospores or biciliate motile cells.

Gomontia polyrhiza (Lagerheim) Bornet and Flahault (var?)

(Plate 3, fig. 11)

Plant filamentous, embedded in the shells of mollusks, irregular branches of a single row of cells; vegetative cells 9 to 12μ (4 to 8μ) in diameter and 22 to 28μ long; sporangia (?) 18 to 23μ (30 to 40μ) in diameter; aplanospores 4μ in diameter.

Gomontia polyrhiza (Lagerheim) Bornet and Flahault, Collins (1909); *G. polyrhiza* Bornet and Flahault, Børgesen (1913); *G. polyrhiza* (Lagerheim) Bornet and Flahault, Collins and Hervey (1917); *G. polyrhiza* (Lagerheim) Bornet and Flahault, Howe (1920).

New England to Florida; Bermuda; Bahamas and the West Indies to the Virgin Islands.

Common on shells and coral fragments in shallow pools along shore, Bush Key especially abundant.

PHÆOPHILA Hauck

Plant epiphytic or somewhat endophytic, of branching filaments 1 cell wide, the cells bearing 1 to few hairs which are continuous with the cell, not segmented off nor swollen at the base; reproduction by zoöspores.

Phæophila floridearum Hauck

(Plate 3, figs. 4–6)

Plants filamentous, epiphytic, branching, prostrate or partly endophytic, cells bearing 1 to few hairs, the bases sheathless, the shafts straight to generally twisted into a spiral; vegetative cells 9 to 15μ (12 to 40μ) in diameter and 15 to 50μ long; sporangia irregular, the swollen central portion about 30 to 37.5μ in diameter.

Phæophila floridearum Hauck, Collins (2d Suppl. 1918); *P. floridearum* Hauck, Børgesen (1913); *P. floridearum* Hauck, Collins and Hervey (1917).

Bermuda and the Virgin Islands; newly reported for Florida.

Very frequent at Dry Tortugas in and on other algæ, especially the softer Rhodophyceæ and the Codiaceæ. Especially abundant on old branches of *Acanthophora spicifera* in the moat, Fort Jefferson, Garden Key.

PROTODERMA Kuetzing

Plant a spreading indefinite disk of irregular cells, the filamentous relation much obscured, becoming a disk of more than one cell in thickness in the center; cells containing one chromatophore and a pyrenoid; reproduction by aplanospores and zoöspores.

Protoderma marinum Reinke (var ?)

(Plate 3, fig. 12)

Plant forming a thin coating on stones, the cells irregularly placed, associated into a fairly definite membrane with an irregular margin; cells 2.8 to 7.5μ (6 to 12μ) in diameter, generally about 4.6μ.

Protoderma marinum Reinke, Collins (1909); *P. marinum* Reinke, Collins and Hervey (1917).

New England to Connecticut; Bermuda; newly reported for Florida.

Frequent at Dry Tortugas on cemented rocks of coral, shells, etc. In tide pools on Bush Key.

ULVELLA Crouan

Plants epiphytic, disk-like, essentially filamentous, the central area distorted to obscure the filamentous arrangement of the cells, and becoming more than one cell in thickness; cells with parietal chromatophore and pyrenoid and a single nucleus.

Ulvella Lens Crouan

(Plate 3, figs. 13 to 15)

Plants reaching 0.1 to 1.0 mm. in diameter, the center of irregular rather rounded cells, the marginal cells radially arranged and indicating a filamentous structure; marginal cells considerably elongated, often dichotomously forked, usually dividing by an oblique wall across one of the limbs, becoming 2 to 3 cells thick in the center of the disk; (cells 15 to 20μ in diameter in the center of the disk and 10 to 15μ by 20 to 30μ near the margin).

Ulvella Lens Crouan, Collins (1909); *U. Lens* Crouan, Børgesen (1913); *U. Lens* Crouan, Hoyt (1920).

North Carolina and the Virgin Islands; newly reported for Florida. Growing on *Cladophoropsis* in the moat of Fort Jefferson, Garden Key.

The cell measurements are from Collins (1917); those in De Toni, *Sylloge Algarum*, are slightly different, but do not distinguish between disk and marginal cells.

SIPHONOCLADIALES

Plants multicellular, generally branched, the cells usually multinucleate with many pyrenoids; chromatophore single, net-shaped, or plant with many small chromatophores.

1. Main axis distinct, of limited growth 2
1. All axes of potentially unlimited growth .... Cladophoraceæ (59)

2. Branches of cells similar in form to the primary cell .... Valoniaceæ (70)
2. Branch cells usually in whorls, different in form from the axis .... Dasycladaceæ (66)

CLADOPHORACEÆ

Filamentous, septate, branched or unbranched, a distinctive main axis not present in branched types and all axes of potentially indefinite growth; cells multinucleate and with many small chloroplasts; reproduction by zoöspores or by iso- or anisogametes, sometimes by akinetes or similar resting spores.

1. Filaments generally unbranched 2
1. Filaments always branched 3

2. Filaments occasionally with short branches, often abruptly bent and notably tangled, slender .... Rhizoclonium (66)
2. Filaments unbranched, flexuous, usually large .... Chætomorpha (60)

3. Filaments not systematically united with each other 4
3. Filaments united to form a net-like thallus .... Microdictyon (65)

4. A wall usually formed immediately across base of each branch .... Cladophora (61)
4. Basal wall formation absent or delayed .... Cladophoropsis (64)

CHÆTOMORPHA Kuetzing

Plant at first attached, but frequently later free in tangled masses; filamentous, unbranched, all except the basal cell capable of division; reproduction by zoöspores or gametes.

1. Filaments mostly over 80μ in diameter 2
1. Filaments mostly under 80μ in diameter .... C. gracilis

2. Filaments 200μ or over in diameter .... C. Linum
2. Filaments 180μ or less in diameter .... C. brachygona

Chætomorpha brachygona Harvey

(Plate 4, fig. 12)

Filaments generally coarse, flexuous-entangled, the cell walls thick; filaments 80 to 180μ (125 to 175μ) in diameter, cells 60 to 420μ in length, generally equal to the diameter.

Chætomorpha brachygona Harvey (1858); *C. brachygona* Harvey, Farlow (1876); *C. brachygona* Harvey, Børgesen (1913); *C. brachygona* Harvey, Collins and Hervey (1917); *C. brachygona* Harvey, Howe (1920).

Florida; Bermuda; Bahamas and West Indies to the Virgin Islands.

At Dry Tortugas some few filaments tangled with other algæ were found in the moat, Fort Jefferson, Garden Key in 1924, measuring 150 to 180μ in diameter, and a fair quantity in 1926 measuring 80 to 100μ.

This material agrees with the description in Collins, *Green Algæ of North America,* and the key in Howe, *Bahama Algæ,* fairly well as to diameter, but the cells were very irregular in length, especially in the 1924 material, often being about one-half longer than broad and rarely twice as long as broad, while Collins indicates that the cells should be equal in length to the diameter, or shorter, which is generally true in the 1926 material.

Chætomorpha gracilis Kuetzing

(Plate 4, fig. 13)

Filaments delicate, forming tangled, soft masses; color pale green, the cell walls thin; filaments 50 to 60μ (30 to 70μ) in diameter, cells 58 to 168μ, mostly 110μ long.

Chætomorpha gracilis Kuetzing, Collins (2d Suppl. 1918); *C. gracilis* Kuetzing, Børgesen (1913); *C. gracilis* Kuetzing, Collins and Hervey (1917).

Bermuda; Virgin Islands; newly reported for Florida.

Forming long streamers in a pool on west side of Loggerhead Key, on Garden Key and on Sand Key; dredged on White Shoal in 1.5 to 6 meters, and Southeast Channel at 36.6 meters and Southwest Channel at 34.7 meters.

Chætomorpha Linum (O. F. Müller) Kuetzing

(Plate 4, fig. 11)

Filaments coarse, free, flexuous, the wall thick; diameter 180 to 250μ (200 to 300μ), length of cells 210 to 420μ, usually as long or longer than broad; color pale.

Chætomorpha longiarticulata Harvey ? (1858); *C. longiarticulata* Harvey, Farlow (1875); *C. Linum* (Flora Danica) Kuetzing, Collins (2d Suppl. 1918); *C. Linum* (O. F. Müller) Kuetzing, Collins and Hervey (1917); *C. Linum* (O. F. Müller) Kuetzing, Howe (1920).

New England to Florida and Bermuda; Bahamas and through the West Indies to the Virgin Islands.

In the moat, Fort Jefferson, Garden Key, forming masses with other filamentous algæ on the bottom; not often pure.

CLADOPHORA Kuetzing[1]

Plants filamentous, attached by a disk or branched holdfast; branched, the basal portion decumbent, or altogether erect; branches alternate or opposite or sometimes dichotomous or trifarious, subtended by a wall; main axis as well as branches monosiphonous, cells cœnocytic; reproduction by zoöspores or motile gametes.

1. Low, pulvinate or matted, with main filaments more or less prostrate .... C. repens (64)
1. Erect 2

2. Main filaments from 150μ up 3
2. Main filaments seldom reaching 150μ 5

3. Ramuli clustered 4
3. Ramuli not clustered .... C. fuliginosa (62)

4. Ramuli long, slender, cylindrical or nearly so .... C. fascicularis (62)
4. Ramuli short, stout, with constricted nodes .... C. Hutchinsæ (63)

5. Main filaments distinctly angled or flexuous 6
5. Main filaments straight or nearly so 9

6. Ramuli short, acute, spine-like .... C. polyacantha (63)
6. Ramuli not spine-like 7

7. Ramuli long, in pectinate series at tips of branches .... C. gracilis (63)
7. Ramuli not in pectinate series at tips of branches 8

8. Fronds light or pale green, a plant of exposed rocky shores .... C. flexuosa (62)
8. Fronds light yellow-green .... C. luteola (63)

9. Ramuli acute, main filaments not over 60μ in diameter .... C. glaucescens (63)
9. Ramuli not acute .... C. delicatula (61)

Cladophora delicatula Montagne

(Loosely tufted, soft, dull green, about 10 cm. high; filaments 40 to 60μ in diameter below, 4 to 6 diameters long; loosely branching, branches virgate, erect; ramuli in short secund series, seldom over 8 cells in length, cells 20 to 30μ diameter, 1 to 2 diameters long; joints somewhat constricted.)

Cladophora delicatula Montagne, Collins (1909); *C. delicatula* Montagne, Collins and Hervey (1917).

Florida and the West Indies.

Not recorded from Dry Tortugas.

[1]This genus was exceedingly poorly represented at Dry Tortugas, perhaps because of the season. A treatment generally helpful to persons collecting along the southern coast, based on the material collected at Tortugas, would not be possible, and consequently the Florida records in F. S. Collins, *Green Algæ of North America*, have been made the basis for the text, and the key to species has been adapted from his general key to the genus. Even this is probably markedly inadequate, as the number of additional species recorded from Bermuda and the Bahamas strongly suggests that a careful study conducted along the coast, especially the more southern portion, would show a considerably larger population of species of *Cladophora*.

Cladophora fascicularis (Mertens) Kuetzing

Plants large, 30 to 50 cm. in length; main axes stout, cells to 360μ (200 to 250μ) in diameter and 2 to 5 diameters in length, sparingly branched; ultimate indefinite branches with densely fasciculate ramuli, 1.5 to 3.0 mm. in length, crowded near their tips, somewhat pectinate in arrangement; cells of the ramuli 70 to 120μ in diameter, and 1 to 3.5 diameters in length.

Cladophora fascicularis (Mertens) Kuetzing, Collins (1909); *C. fascicularis* (Mertens) Kuetzing, Børgesen (1913); *C. fascicularis* (Mertens) Kuetzing, Collins and Hervey (1917); *C. fascicularis* (Mertens) Kuetzing, Howe (1920); *C. fascicularis* (Mertens) Kuetzing, Hoyt (1920).

North Carolina; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Abundant in 1926 on broken corals near the shore, Middle Key.

Cladophora flexuosa (Griffiths) Harvey

(Fronds 10 to 20 cm. high, light green; main filaments 80 to 120μ diameter, regularly flexuous, with flexuous alternate branches, 40 to 80μ diameter, with alternate or secund, curved and sometimes refracted ramuli; cells from 6 diameters long below to 2 in the ramuli.)

Cladophora flexuosa Griffiths, Harvey (1858); *C. flexuosa* Griffiths, Farlow (1876); *C. flexuosa* (Griffiths) Harvey, Collins (1909); *C. flexuosa* (Griffiths) Harvey, Collins and Hervey (1917); *C. flexuosa* (Griffiths) Harvey, Hoyt (1920).

Newfoundland to Florida; Bermuda.

Not reported from Dry Tortugas.

Cladophora fuliginosa Kuetzing

(Plate 4, fig. 5)

Plants tufted, erect, bright green, crisp, drying blackish; filaments dichotomous to alternate and irregular below; above with a distinct, usually arcuate axis, the ramuli secund above and regularly placed at nearly every node; cells slightly swollen in the main axis, even less so in the ramuli; diameter of main axis reaching 380μ in strong plants, that of the ramuli reaching 290μ (cells 150 to 160μ diameter).

Blodgettia confervoides Kuetzing, Harvey (1858); *B. confervoides* Kuetzing, Farlow (1876); *Cladophora fuliginosa* Kuetzing, Collins (1909); *C. fuliginosa* Kuetzing, Børgesen (1913); *C. fuliginosa* Kuetzing, Collins and Hervey (1917); *C. fuliginosa* Kuetzing, Howe (1920).

Bermuda; Florida; Bahamas through the West Indies to the Virgin Islands.

Widely distributed about Dry Tortugas; collected in shallow water to 1.5 meters on Loggerhead and Long Keys; dredged very frequently, sometimes in quantity, Loggerhead Key shoal, 2.4 to 12.8 meters; Bird Key, 3.1 to 6.2 meters; White Shoal, 16.5 meters; off Southwest Channel, 32.9 meters.

The Tortugas material was very large in its parts, so that the description in Collins would not allow the insertion here of much of it; however, Howe admits a diameter of 320μ and Børgesen to 300μ; little of the Tortugas material exceeds 320μ. The branching as described by Collins would not permit the inclusion of the notably secund specimen figured. This is taken from the 32.9 meter collection; most of the collections show a much more irregular branching, but in all those which are well developed the upper part of the axis is arcuate, with a few secund ramuli, the lower ones being alternate.

Cladophora glaucescens (Griffiths) Harvey

(Fronds 10 to 40 cm. long, glaucous or yellowish green, loosely tufted, much branched, ending in long erect, acute, alternate, or sometimes secund ramuli; cells at base 50 to 60μ diameter, in ramuli 25 to 30μ; cells usually 4 to 6 diameters long, sometimes considerably longer.)

Cladophora glaucescens Griffiths, Farlow (1876); *C. glaucescens* (Griffiths) Harvey, Collins (1909).

Labrador to Florida.

Not located at Dry Tortugas.

Cladophora gracilis (Griffiths) Kuetzing

(Plate 4, fig. 1)

(Fronds usually not over 30 cm. long, yellowish or glaucous green, somewhat harsh to the touch; main filaments up to 160μ diameter, irregularly bent, branching at the angles; the branches more slender, set at the tips with secund series of long, attenuate, acute ramuli, 40 to 60μ diameter; cells 3 to 5 diameters long throughout.)

Cladophora gracilis Griffiths, Harvey (1858); *C. gracilis* Griffiths, Farlow (1876); *C. gracilis* (Griffiths) Kuetzing, Collins (1909).

New England to Florida, abundant northward.

Represented at Dry Tortugas by a few little tufts, probably a dwarf form of the species showing the following characters:

Plant less than 2 cm. high, irregularly pinnate to dichotomously branched below, above pectinate-secund; filaments 55 to 85μ diameter below, the ramuli 35 to 40μ; length of cells in main branches 120 to 200μ, in the ramuli 120 to 170μ. Loggerhead Key, in 0.6 meter of water at low tide.

Cladophora Hutchinsiæ (Dillwyn) Kuetzing

(Fronds glaucous green, up to 40 cm. high; filaments 120 to 300μ diameter, stiff, flexuous, sparingly branched; ramuli few, secund, blunt, with constricted nodes; cells 2 to 3 diameters long.)

Cladophora Hutchinsiæ (Dillwyn) Kuetzing, Collins (1909).

New Jersey to Florida; West Indies.

Not recorded from Dry Tortugas.

Cladophora luteola Harvey

(Fronds pale yellow-green, tufted, very slender, much branched, not matted; very flexuous, with rounded angles; branching irregular, frequently trichotomous; ramuli secund or opposite, at the tip pectinate, somewhat corymbose and crowded; cells cylindrical, about 60μ diameter in main branches, 35μ in ramuli, 6 to 8 diameters long.)

Cladophora luteola Harvey (1858); *C. luteola* Harvey, Farlow (1876); *C. luteola* Harvey, Collins (1909); *C. luteola* Harvey, Collins and Hervey (1917); *C. luteola* Harvey, Howe (1920).

Bermuda; Florida; Bahamas and the West Indies.

Not reported from Dry Tortugas.

Cladophora polyacantha Montagne?

(Plate 4, figs. 8, 9)

Plant attached to, and entangled among, other algæ, the filaments rather entangled, marked by long flexuous main filaments and scanty, wide-spreading lateral alternate branches, the ultimate branches bearing short, few-celled branchlets; main filaments reaching 110μ in diameter, branchlets to 42μ; cells in main axis reaching a length of 420μ, in the ultimate branchlets to 120μ.

Cladophora flexuosa (Griffiths) Harvey forma *floridana* Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 978; ? C. polyacantha* Montagne, Collins (1909).

Florida.

Dredged at 18.3 and 36.6 meters out Southwest Channel.

Howe (in a letter) refers this plant to *Cladophora flexuosa* forma *floridana* Collins; Collins makes this a synonym of *C. polyacantha* Montagne, but as to this there may be some objection; the description is based entirely on the Tortugas material.

Cladophora repens (J. Agardh) Harvey?

(Plate 4, figs. 4, 6, 7)

Plants low, to 1 or 1.5 cm. high, forming mats, light green in color, entangled; filaments alternately or irregularly branched below, secundly branched above, the ultimate ramuli in the upper part rarely subdivided, but cut off by a basal wall; the branches often attached together by simple or pedicellate hapteræ, the basal wall of which has a ramifying, lobed margin; filaments reaching 110μ in diameter, or the smallest to 60μ, the upper about 84μ.

? Cladophora repens (J. Agardh) Harvey, Collins (2d Suppl. 1918).

Bermuda; this may be a new record for Florida.

Partly drifted over with sand; rocks, western side of Loggerhead Key.

This disposition of the material is not satisfactory, but no other seems to be more definitely correct. According to the description in Børgesen, *Algæ of the Danish West Indies*, the placement would be with *C. crispula* Vickers, but Collins' treatment of that species is quite different. The description given above, drawn from Tortugas material, is quite distinct from that in Collins' text, but an examination of the Bermuda material showed that, except in color, the similarity was considerable.

CLADOPHOROPSIS Børgesen

Prostrate and attached by multicellular holdfasts below, the erect branches above forming tufts or mats; branching irregular, or secund toward the tips; branches showing delay in the formation of cross walls, which, when produced, are usually not at the base of the branch; origin not in a simple clavate cell of definite growth; cells multinucleate.

This genus is generally and perhaps technically correctly placed in the Valoniaceæ; however, as the origin of the filament is reported as essentially different from that group, and as the aspect is certainly that of a *Cladophora*, it is retained, as in older works, in the Cladophoraceæ as a matter of convenience in spite of the character of the branching, without insisting on the theoretical correctness of this placement.

1. Plant attached, main filaments rarely over 250μ diameter.......................... C. membranacea (65)
1. Plant free, main filaments generally over 350μ diameter.......................... C. macromeres (64)

Cladophoropsis macromeres n. sp.

(Plate 4, figs. 15, 16)

Plant much branched, forming loose, soft, bright green or pale masses, floating or drifting over the bottom; filaments to 1.5 dm. or more in length, glossy when dried; filaments green throughout, or somewhat paler below; no basal decumbent colorless stratum present; branching irregular below, irregular to distinctly secund above, branches unicellular or divided to long cells; diameter of the main filaments 375 to 460μ, of the ultimate branches 210 to 295μ; holdfasts of any type not seen.

Newly described here from Florida.

Abundant in the moat, Fort Jefferson, Dry Tortugas, alone or mixed with other filamentous algæ; not found attached in any definite fashion, but rather lying free on the soft mud of the moat bottom, or occasionally upon, or perhaps only entangled with, Halimedas.

While few but size-characters distinguish it from *C. membranacea*, and while the quiet conditions of the moat would favor the production of a lush type of growth, the presence of *C. membranacea* growing luxuriantly within a few feet, without apparent transitional forms, suggests the independence of this type.

Cladophoropsis membranacea (Agardh) Børgesen

(Plate 4, fig. 14)

Plant much branched, forming dense, soft pale tufts attached to the substratum; markedly nitent when dried; filaments colorless below, horizontal and tangled, becoming erect and green above; branching irregular below, alternate to secund above, branches frequently multicellular; diameter of main filaments 170 to 270μ, of the branches 100 to 145μ; zoöspores (or gametes?) discharged through one to several pores which are surrounded by thickened cell walls.

Cladophora membranacea Agardh, Harvey (1858); *C. membranacea* Agardh, Farlow (1876); *Cladophoropsis membranacea* (Agardh) Børgesen, Collins (1909); *C. membranacea* (Agardh) Børgesen (1913); *C. membranacea* (Agardh) Børgesen, Collins and Hervey (1917); *C. membranacea* (Agardh) Børgesen, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Abundant at Dry Tortugas, forming extensive patches on the wall of the moat, Garden Key, both inside and outside; also on rocks, Loggerhead Key and Sand Key.

MICRODICTYON Decaisne

Plant net-like, without stalk or percurrent primary axis, consisting of branches of various orders, which, when they meet, unite to form the meshes of the net; axes multicellular, the subdivisions effected by ordinary transverse walls, cells multinucleate; reproduction by zoöspores.

Microdictyon Boergesenii Setchell

(Plate 6, fig. 1)

Plant forming sheets of indefinite extent, usually tangled among other algæ, but reaching at least 3 cm. in diameter, attaching at various points and giving rise to new nets; pale green in color; cells of main filaments averaging 285μ long and 145 to 170μ in diameter; meshes of moderate size, the smallest meshes which seem to be a part of the regular system about 500 to 590μ on a side, and these further subdivided by irregular branches; free tips projecting into the meshes average 65μ broad by 205μ long.

Microdictyon Agardhianum Decaisne, Collins (1909); *M. umbilicatum* (Velley) Zanardini, Børgesen (1913).

Virgin Islands; newly reported for Florida.

Seemingly a plant of deep water at Dry Tortugas; dredged in 32.9 meters off Southwest Channel, later still further seaward at between 82.5 and 159.5 meters; other specimens from the same territory were secured without accurate data.

In a recent paper Setchell (Univ. California Pub. Bot., Vol. 13) has presented a discussion of the relations of the species of this genus. Børgesen (17) does not agree with the disposition made of the West Indian plants, believing that they are similar to European material which he considers to be *M. umbilicatum*. However it may agree with European material, the specimens collected by the present writer are certainly not the *M. umbilicatum* from Sydney, Australia, as represented in a set of Harvey's *Australian Algæ* at the Academy of Natural Sciences in Philadelphia, which is much darker, coarser and closer of mesh. The Tortugas specimens are somewhat more delicate than called for by Setchell's description.

RHIZOCLONIUM Kuetzing

Plants filamentous, of a series of cœnocytes; free-floating or terrestrial; filaments with short 1 to few-celled rhizoidal or simple branches, or without branches; filaments sharply angled and much contorted, the cells often swollen, thick-walled; reproduction by zoöspores or akinetes.

Rhizoclonium Hookeri Kuetzing

(Plate 3, fig. 7; plate 4, fig. 18)

Filaments forming dark masses, much tangled, cells usually cylindrical, but in some filaments much swollen and contorted, frequently sharply bent; branches few, rhizoidal; cell diameter 55 to 85μ (90μ), generally about 70μ, length of the cells 42 to 220μ, cell walls thick (4 to 10μ; multicellular branches sometimes frequent and sometimes with secondary branches).

Rhizoclonium Hookeri Kuetzing, Collins (1909); *R. Hookeri* Kuetzing, Børgesen (1913); *R. Hookeri* Kuetzing, Collins and Hervey (1917); *R. Hookeri* Kuetzing, Howe (1920).

Bermuda; West Indies to Virgin Islands; Bahamas and newly reported for Florida.

"Pond No. 1" on Long Key, forming the under part of a mass of floating filamentous and unicellular algæ, and on stones on Bird Key Reef.

This material was at first determined as *R. tortuosum* Kuetzing, but the present seems to be the more proper disposition. An examination of material recorded as *R. Hookeri* Kuetzing from Java, collected by H. Moeller seems to show practically the same characters, except that the size of the cells runs somewhat higher in extreme filaments, although the average is about the same. The Dry Tortugas material did not show pluricellular branches, and exceedingly rarely even unicellular ones.

DASYCLADACEÆ

Plants multicellular, cœnocytic, branched, the branches either of indefinite growth and acting as secondary axes or whorled and of limited growth; frequently tipped by deciduous hairs; gametes or aplanospores produced in the ultimate branches or in sporangia.

1. Plants calcified 2
1. Plants not calcified 5

2. Branches in 1 to 3 whorls near top of axis .... 3 (See Addenda)
2. Branches in many whorls nearly covering axis 4

3. Spores with lime-encrusted walls, segments of corona superior rounded on outer side .... Acetabulum (67)
3. Spores with unencrusted walls, but embedded in a solid mass of lime, segments of corona superior indented on outer side .... Acicularia (68)

4. Plant simple, small .... Neomeris (69)
4. Plant forking, large, obviously segmented .... Cymopolia (69)

5. Branch whorls close together, gametangia between cells of secondary whorls .... Dasycladus (69)
5. Branch whorls farther apart, sporangia outside of cells of secondary whorls .... Batophora (68)

ACETABULUM (Tournefort) Ludwig

Plants erect, calcareous, the stalk bearing rhizoids below and terminating above in a disk of generally laterally coherent branch cells arranged in a whorl; cells of the disk bearing projections forming rings called coronæ on upper or lower face near the axis, and on the upper corona branched hairs; frequently a series of superimposed disks are formed; reproduction by aplanospores formed in the cells of the disk; the spore walls lime-encrusted.

1. Disk less than 3 mm. in diameter .... A. pusillum
1. Disk more than 4 mm. in diameter 2

2. Rays separate or lightly laterally attached .... A. Farlowii
2. Rays firmly united in a well-calcified disk .... A. crenulatum

Acetabulum crenulatum (Lamarck) Kuntze

(Plate 5, figs. 11, 22 to 24)

Plants reaching a height of 7 cm., the disks on mature plants with a diameter of 12 to 18 mm. and of 30 to 80 rays; 1 to 3 disks may be present, the largest and youngest uppermost; disks showing a crown of projections around the summit of the axis, the corona superior, each segment of which bears a branched, colorless hair; disks also bearing a crown of projections around the axis on the lower surface, each segment being forked outwardly; rays of the disk rounded-truncate at the outer end, terminating in a low nodule or a more or less acute spine, and containing the aplanospores which are (75 to 140μ) in diameter and have a lime-encrusted wall.

Acetabularia crenulata Lamouroux, Harvey (1858); *A. crenulata* Lamouroux, Farlow (1876); *A. crenulata* Lamouroux, Collins (1909); *A. crenulata* Lamouroux, Børgesen (1913); *A. crenulata* Lamouroux, Collins and Hervey (1917); *Acetabulum crenulatum* (Lamarck) Kuntze, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas found only in the moat, Fort Jefferson, Garden Key, growing on broken corals in shallow water, where abundant.

Acetabulum Farlowii (Solms) Howe

(Stipe 1 to 2 cm. high; disk 4 to 7 mm. in diameter, nearly flat; rays 20 to 30, lightly coherent or free, slightly compressed toward the obtuse or truncate ends; corona superior 0.15 mm. in diameter, with 2 hair scars on each ray; aplanospores 40 to 120 in a sporangium.)

Acetabularia Farlowii Solms, Collins (1909).

Type from Florida.

Acetabulum pusillum Howe

(Plate 5, figs. 17 to 21)

Plants 2 to 3 mm. tall, the stalk often transversely rugose; the disk of few rays, about 1.5 to 2 mm. (1.0 to 2.5 mm.) in diameter; rays broad, obovate or somewhat cylindrical, generally approximated to a flat disk but occasionally irregularly placed (as in *A. polyphysodes*); disk bearing a corona superior on the upper side around the axis, the segments showing two deciduous hairs, or their scars; corona inferior lacking; spores with a calcified wall, 70 to 85μ in diameter, spherical.

Acetabularia pusilla (Howe) Collins (1909); *Acetabulum pusillum* Howe (1920).

Bahamas; Jamaica; newly reported for Florida.

At Dry Tortugas noted only on fragments of coral and associated with *A. crenulatum* and *Acicularia Schenckii* in the moat, Fort Jefferson, Garden Key. The plants were rather numerous, but because of small size were hard to detect and may well have occurred elsewhere.

ACICULARIA d'Archiac

Plants stalked, crowned by a disk of laterally approximated cells; lime-encrusted throughout; rays of the disk with an upper and a lower series of projections (corona superior and corona inferior), the former with the segments cleft on the outer end and bearing branched hairs or their scars on the upper side; spores embedded in a mass of lime within the ray cells of the disk.

Acicularia Schenckii (Moebius) Solms

(Plate 5, figs. 8, 26 to 28)

Plants 7 to 25 mm. high, the disk 4 to 8 mm. in diameter; disks showing a crown of projections around the axis on upper and lower faces, the uppermost (corona superior) cleft on the outer margin of each segment, and bearing two hairs or hair scars on upper face; corona inferior divided to 2 to 3, rarely 4, divisions on each segment on the outer margin; rays of the main disk abruptly truncate at the outer end, or especially when young somewhat rounded, terminating in a small acute spine and containing the aplanospores, round, 60 to 75μ (80μ) in diameter, embedded in lime.

Acicularia Schenckii (Moebius) Solms, Collins (1909); *A. Schenckii* (Moebius) Solms, Børgesen (1913); *A. Schenckii* (Moebius) Solms, Collins and Hervey (1917); *A. Schenckii* (Moebius) Solms, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands; newly reported for Florida.

At Dry Tortugas this plant was abundant with *Acetabulum* in the moat, Fort Jefferson, on Garden Key; abundant disks were dredged in many of the deeper 1924 hauls and, although not examined, were probably in part at least this species; it was dredged in 73.2 meters off Southwest Channel.

BATOPHORA J. Agardh

Plants with an elongated axis bearing rather distant whorls of short branches subdividing to 6 to 7 series; the fertile plants markedly different in appearance; fertile branches bearing 1 to 3 successive series of large sporangia outside of the whorls of branches; cells cœnocytic, plants not calcified.

Batophora Oerstedi J. Agardh

(Plate 5, figs. 1, 2, 15, 16)

Plants reaching 1 dm. in height, the whorled branchlets with a spread of 7 mm., the whorls separated by an interval of 0.5 to 1.0 mm., each branchlet dividing to about 7 successive series, the outer of which are deciduous, leaving scars on the ends of the supporting cells; fertile plants crowded with the green oval sporangia, which are borne at the summits of the first 2 to (4) whorls, usually 2 to 5 in a whorl, outside of the accompanying branchlets (occasionally terminal), and measure 700 to 850μ (500 to 1,000 by 325 to 450μ); spores 40 to 45μ in diameter, round, smooth.

Dasycladus occidentalis Harvey (1858); *D. occidentalis* Harvey, Farlow (1876); *Batophora Oerstedi* J. Agardh, Collins (1909); *B. Oerstedi* J. Agardh, Børgesen (1913); *B. Oerstedi* J. Agardh, Collins and Hervey (1917); *B. Oerstedi* J. Agardh, Howe (1920).

Var. occidentalis (Harvey) Howe

Smaller, rarely over 4 cm., much more slender, 2 to 4 mm., and dense, the whorls of branchlets closely placed.

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas represented by the variety, which was but once collected, on *Thalassia* south of Loggerhead Key.

CYMOPOLIA Lamouroux

Plants branched, consisting of calcified segments which are made up of a large axial cell covered with corticating branches of limited growth, each usually of a basal cell and one whorl of distal cells, and bearing the sporangium, when present, centrally between the distal cells; growing tips provided with branched hairs, the basal cells of which are persistent.

Cymopolia barbata (Linnæus) Lamouroux

(Plate 5, figs. 4, 13; plate 10, fig. 11)

Plants erect and branching to a height of 1.0 to 1.5 (2.0) dm., the branches cylindrical, segmented, calcified; structurally composed of an axial series of cells bearing whorls of closely placed corticating filaments consisting of a basal cell and a whorl of 4 to 10 distal cells, these widely expanded at the summit where they are 115 to 125μ in diameter; at the growing tip carrying a tuft of branched filaments consisting of 5 to 6 successive series of cells, the lower 3 or 4 which contain chloroplasts, the short basal cell persistent, but the remainder deciduous; sporangia solitary at the end of the first cell of the corticating filaments, and surrounded by the outer whorl of cells, round to sub-pyriform, 125 to 160μ (160 to 200μ) in diameter.

Cymopolia barbata (Linnæus) Lamouroux, Harvey (1858); *C. barbata* (Linnæus) Lamouroux, Farlow (1876) *C. barbata* (Linnæus) Lamouroux, Collins (1909); *C. barbata* (Linnæus) Lamouroux, Howe (1920).

Florida at Key West, where abundant in shallow water; Bermuda and Bahamas.

Not recorded from Dry Tortugas.

DASYCLADUS Agardh

Plants with an elongate axis bearing closely-placed whorls of short compound branches divided to 3 or 4 whorls of branchlet cells; the fertile branches bearing a single gametangium in the center of the whorl at the top of the basal cell; cells cœnocytic, plants uncalcified.

Dasycladus vermicularis (Scopoli) Krasser

(Plate 5, figs. 3, 6, 7)

Plants with a central axis bearing rhizoids at the base and densely covered by the whorls of branches; height 2 to 4 cm., diameter 3 to 6 mm., uncalcified; branches divided into 3 to 4 successive whorls of cells, the ultimate short, spine-like, or filiform, colorless; gametangia solitary, spherical, in the center of the secondary whorl at the top of the first cell of the fertile branch.

Dasycladus clavæformis C. Agardh, Farlow (1876); *D. clavæformis* (Roth) C. Agardh, Collins (1909); *D. clavæformis* (Roth) C. Agardh, Børgesen (1913); *D. clavæformis* (Roth) C. Agardh, Collins and Hervey (1917); *D. vermicularis* (Scopoli) Krasser, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common at Dry Tortugas, growing on fragments of coral, shells, etc.; in shallow water, 0.6 to 3.1 meters, around Loggerhead and Long Keys also dredged to 4.6 to 9.2 meters off Bird Key Reef and Loggerhead Key.

NEOMERIS Lamouroux

Plants with an elongate axis bearing closely-placed whorls of short compound branches, each consisting of a basal cell bearing one whorl of cells with greatly expanded distal ends, each of which is terminated by a delicate deciduous multicellular hair; sporangia solitary at the top of the basal cell and between the cells of the outer whorl; calcified.

Neomeris annulata Dickie

(Plate 5, figs. 5, 14)

Plants about 7 to 15 mm. high, 2 mm. in diameter, heavily calcified below, but more lightly calcified in the green upper portion; surmounted by a tuft of fine deciduous multicellular unbranched hairs; whorls of branches distinctly visible, the expanded angular capitate ends of the outer cells approximated to form a fairly even surface; cells of the outer whorl two to each basal cell, the ends 100 to 125μ (80 to 135μ) in diameter; sporangia solitary between the cells of the outer whorl, stalked, the expanded end obovate, 70μ broad by 140μ long (or larger), containing a single aplanospore (46 to 80μ by 115 to 175μ).

Neomeris annulata Dickie, Collins (1909); *Neomeris annulata* Dickie, Børgesen (1913); *Neomeris annulata* Dickie, Collins and Hervey (1917); *Neomeris annulata* Dickie, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Very common at Dry Tortugas on all shores and Keys, in shallow water on fragments of coral and shell, also on coquina or coral rock, the brilliant green-tipped white plants often growing closely together in great quantity; dredged to 5.5 meters off Long and Bird Keys and frequently in deeper water.

VALONIACEÆ

Vesicular to filamentous, apparently septate, originating from a persisting initial cell of limited growth; remaining vesicular with only hapteral branches or freely branched from a main axis; reproduction by zoöspores or sometimes by aplanospores; cells multinucleate with many small chromatophores.

1. Plant of obvious filaments 2
1. Plant vesicular 5

2. Thallus long-stalked 3
2. Thallus not long stalked 4

3. Stalk slender, branch filaments forming a net .... Struvea (73)
3. Stalk stouter, annulate, branch filaments forming a terminal brush .... Chamædoris (71)

4. Thallus decumbent .... Petrosiphon (72)
4. Thallus erect .... Siphonocladus (73)

5. Not definitely branched, a multicellular sac .... Dictyosphæria (71)
5. Branches of buds constricted off from the parent cell 6

6. Branches in one plane, producing a membrane 8
6. Branches if present irregularly placed 7

7. Bearing whorled vesicular branches .... Ernodesmis (72)
7. Branches irregularly placed or apparently absent .... Valonia (74)

8. Intervals between primary filaments completely filled .... Anadyomene (70)
8. Rounded spaces of various sizes retained between the main filaments .... Cystodictyon (71)

ANADYOMENE Lamouroux

Plants foliaceous, attached by rhizoids to the substratum, decumbent to erect, the blades composed of branching series of cells, the main series forming 3 to several cells at each forking; secondary cells formed along the sides of the main elements fill up the interstices; cells throughout cœnocytic.

Anadyomene stellata (Wulfen) C. Agardh

(Plate 5, fig. 12; plate 6, fig. 3)

Plants 5 to 25 mm. tall, the blades crisped, usually clustered below, attached near the point of origin by rhizoids which are also formed along the main rib-cells; cells of the main branch system usually several at each forking, the small cells which are formed along the sides completely filling up the interstices.

Anadyomene flabellata Lamouroux, Harvey (1858); *A. flabellata* Lamouroux, Farlow (1875); *A. stellata* (Wulfen) C. Agardh, Collins (1909); *A. stellata* (Wulfen) C. Agardh, Børgesen (1913); *A. stellata* (Wulfen) C. Agardh, Collins and Hervey (1917); *A. stellata* (Wulfen) C. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Widely distributed in small amount at Dry Tortugas, not often well developed except on Bird Key Reef, where it occurred under rocks in considerable amount, also dredged on Loggerhead Key shoal at 2.4 to 7.6 meters, and off Middle Key in 5.5 to 7.6 meters of water, and in 11.0 meters in and 32.9 meters beyond Southwest Channel.

CHAMÆDORIS Montagne

Plant consisting of a stalk bearing rhizoids at the base and a tuft of filaments at the summit; stalk of a single row of cells, filaments at the summit with transverse walls above the branches; cells multinucleate; stipe calcified.

Chamædoris Peniculum (Ellis and Solander) Kuntze

(Plate 5, fig. 9; plate 7, fig. 6)

Plant erect to a height of 1 to 2 dm., the stalk bearing a cluster of rhizoids at the base, generally 2 mm. in diameter, rarely branched, annulate, the segments about 1 mm. high, calcified; at the summit bearing the flat or convexly recurved tuft of dichotomously or irregularly branched filaments, which reaches a diameter of 3 to 6.5 cm., remaining uncalcified.

Chamædoris annulata (Lamarck) Montagne, Collins (1909); *C. Peniculum* (Solander) O. Kuntze, Børgesen (1913); *C. Peniculum* (Ellis and Solander) Kuntze, Howe (1920).

Florida; Bermuda; Bahamas and the Virgin Islands.

At Dry Tortugas only secured by dredging in 4.6 to 6.2 meters on the slopes of Loggerhead Key shoal and at 36.6 meters outside of Southwest Channel, at which point the stalks reached 2 dm.

This plant is exceptionally likely to be covered with epiphytes; it seemed that the stalk was in large part embedded in the substratum.

CYSTODICTYON Gray

Plant showing prominent radiating, monosiphonous filaments connected by lateral cells; except for small to large rounded spaces the intervals between the main filaments filled by small cells; reproduction unknown.

Cystodictyon pavonium J. Agardh

(Frond up to 3 cm. diameter; main filaments radiating from centers in various parts of the frond, stout, tapering, openings rounded, of various sizes.) The frond may reach a length of 6.5 cm. or more.

Cystodictyon pavonium J. Agardh, Collins (1909).

Reported from Florida.

DICTYOSPHÆRIA Decaisne

Plants multicellular, rounded, solid or—in ours—hollow, attached by rhizoids; cells macroscopic, cœnocytic, attached to each other by minute tenaculæ.

Dictyosphæria favulosa (C. Agardh) Decaisne

(Plate 5, figs. 10, 25; plate 11, fig. 15)

Plants 2 to 7 cm. in diameter or proliferating or uniting to form large masses; consisting of a single layer of cells, or irregularly of more than one layer; increase by internal division of the cells, or by budding; cells reaching 0.1 to 1.0 mm. in diameter, or somewhat greater, laterally attached by tenaculæ.

Dictyosphæria favulosa Decaisne, Harvey (1858); *D. favulosa* Decaisne, Farlow (1876); *D. favulosa* (C. Agardh) Decaisne, Collins (1909); *D. favulosa* (C. Agardh) Decaisne, Børgesen (1913); *D. favulosa* (C. Agardh) Decaisne, Collins and Hervey (1917); *D. favulosa* (C. Agardh) Decaisne, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas quite common, but often in exposed situations not reaching full development; common and well developed on inner side of Bird Key Reef on mud, broken corals and Halimedas, and dredged in 9.2 to 32.9 meters in and outside of Southwest Channel.

ERNODESMIS Børgesen

Plants originating as a single erect clavate cell, bearing a whorl of branch cells at the summit, and these with similar whorls of branches; cells cœnocytic; reproduction by zoöspores.

Ernodesmis verticillata (Kuetzing) Børgesen

(Plate 6, fig. 4)

Plant with a single basal cell, annularly constricted near the base and about 15 mm. high, bearing at the summit a whorl of branches of a single cell each, these with a terminal whorl of branches, to the sixth order; axis and branches cœnocytic, tapering from apex to base, maximum diameter 1.5 to 2.5 mm., length 10 to 15 mm.

Valonia verticillata Kuetzing, Collins (1909); *Ernodesmis verticillata* (Kuetzing) Børgesen (1913); *E. verticillata* (Kuetzing) Børgesen, Collins and Hervey (1917).

Bahamas to West Indies; newly reported for Florida.

Forming large tufts in the southeast section of the moat, Fort Jefferson, Garden Key.

It proved difficult to determine just how many series of branches this plant might develop, but the number certainly exceeds that cited by Collins. The plant may lie loose on the bottom of the moat among *Chætomorpha* and *Cladophoropsis*, but attached individuals were also secured.

PETROSIPHON Howe

Plant of dichotomously branched filaments forming a basal layer, producing close erect filaments in the center, and rhizoids attaching to the substratum; filaments dividing transversely into multinucleate cells.

Petrosiphon adhærens Howe

(Plate 4, figs. 3, 17; plate 11, fig. 16)

Plant encrusting, filamentous, the horizontal primary filaments laterally approximate, dichotomously branched, tardily septate; giving rise in older parts of the plant to descending simple and one-celled to branched and many-celled rhizoids, and to many erect filaments which give the plant a thickness reaching 2 mm.; diameter primary filaments 125 to 295μ (300 to 850μ), frequently slenderer as a local condition in part of a plant; cell walls very thick, somewhat transversely striate.

Petrosiphon adhærens Howe, Collins (1909); *P. adhærens* Howe, Collins and Hervey (1917); *P. adhærens* Howe (1920).

Bermuda; Bahamas; newly reported for Florida.

Abundant on dead coral fragments on the inner side Bird Key Reef, just below low-tide level.

This plant forms green patches on the white coral, contrasting with the pink patches of Lithothamnieæ.

SIPHONOCLADUS Schmitz

Plants originating as a single elongate cell which divides to form a row of cells or a somewhat parenchymatous axis; branching by outgrowth of the cells, no wall being formed at the base of the branch; cells cœnocytic, reproduction by zoöspores.

1. Primary cell long, erect..S. tropicus
1. Primary cell short..S. rigidus

Siphonocladus rigidus Howe

(Plate 6, fig. 5)

Plants 1.0 to 1.5 cm. high, forming dense crisp masses, the primary cell obscure; the lower parts rhizoidal, the upper portions simple or of a single row of cells, branches irregular or secund, the branches generally not subdivided; branches 0.3 to 1.0 mm. (0.35 to 1.10 mm.) in diameter.

Siphonocladus rigidus Howe, Collins (1909); *S. rigidus* Howe, Collins and Hervey (1917); *S. rigidus* Howe, Howe (1920).

Florida and Bermuda to Bahamas.

At Dry Tortugas collected in 0.9 meter of water, Garden Key.

Siphonocladus tropicus (Crouan) J. Agardh

(Primary cell up to 4 cm. long, 1 cm. wide, with annular constrictions near the base; branches similar, also with constrictions near the base, often longer than the primary cell; cells of third generation similar but generally shorter; zoöspores many in a cell which has reached its full growth, escaping by small perforations in the walls.)

Siphonocladus tropicus (Crouan) J. Agardh, Collins and Hervey (1917); *S. tropicus* (Crouan) J. Agardh, Børgesen (1913); *S. tropicus* (Crouan) J. Agardh, Collins (1909).

Florida, Bermuda and the West Indies.

STRUVEA Sonder

From an elongate primary cell there is developed a stalk which gives rise by apical growth to a more or less regular net-like blade composed of opposite ramuli produced at each node of the monosiphonous midrib and branches on these to 1 to 3 successive degrees, the ultimate ramuli usually not segmented by a wall from the parent cell.

1. Plant small, about 1 to 3 cm., the blades somewhat attached to each other.......S. anastomosans (73)
1. Plant large, over 5 cm., the blades free..S. elegans (74)

Struvea anastomosans (Harvey) Piccone

(Plate 3, fig. 10)

Plants densely tangled or attached to each other, to about 1 to 3 cm. tall, the main erect axes 200 to 300μ in maximum diameter, unsegmented in the lower stalk portion, subdivided above and forming a blade 2 to 10 mm. broad with ultimate ramuli 100 to 140μ in diameter; primary ramuli opposite in pairs or threes on the axis, the third series generally only partly developed; ramuli of all orders at first continuous with the parent cell, but soon cut off by a cross wall; branching fairly regular to the third or fourth orders, becoming irregular.

Struvea anastomosans (Harvey) Piccone, Børgesen (1913).

Virgin Islands; newly reported for Florida.

In 1926 one small patch found tangled among *Galaxaura* loose within Bird Key Reef, Dry Tortugas, and in small quantity on fragments of bricks on the east side of Garden Key. Usually quite small and tangled.

Struvea elegans Børgesen

(Plate 6, figs. 6, 7)

Plant erect from a creeping base to a height of 12 cm., branched from the base, the stalk portion of the frond 3.5 to 4.5 cm. long, 1 mm. in diameter, with a basal cell 2 to 2.3 cm. long; blades 4 to 7.5 cm. long and 3 cm. broad when mature, with apical growth, a multicellular midrib and opposite branches somewhat incompletely developed to the second order, uniting to form a flat net which, although regular when young, becomes irregular and tangled when old.

Struvea elegans Børgesen, (1913).

Virgin Islands; newly reported for Florida.

Southwest Channel; once dredged in deep water. A good clump of typical material.

VALONIA Ginnani

Plants cœnocytic, consisting of one or few cells irregularly placed, with, in addition, short rhizoidal hapteron cells; reproduction by zoöspores.

1. Producing but one main vegetative cell........V. ventricosa (75)
1. Branching to several vegetative cells........2

2. Cells small, filamentous below, above forming solid masses of cells about 0.5 to 1 mm. in diameter........V. ocellata (75)
2. Cells large........3

3. Cells less than 5 mm. in diameter........4
3. Cells more than 5 mm. in diameter........V. macrophysa (75)

4. Cells short-cylindrical, plants in dense tufts........V. Ægagrophila (74)
4. Cells long-cylindrical, plant repent........V. utricularis (75)

Valonia Ægagrophila C. Agardh

Plants forming rather dense clusters several centimeters in diameter, cells 5 to 10 mm. in length, 1 to 2 (to 3) mm. in diameter, arcuate, cylindrical, branching irregularly from the sides of the cells or more especially from near the ends.

Valonia Ægagrophila C. Agardh, Collins (1909); *V. Ægagrophila* C. Agardh, Børgesen (1913); *V. Ægagrophila* C. Agardh, Howe (1920).

Bahamas and through the West Indies to the Virgin Islands; newly reported from Florida at Miami (Brooks) and Dry Tortugas.

Dredged once on Loggerhead Key shoal in 4.6 to 7.6 meters of water. The Dry Tortugas material approaches *V. utricularis,* but the Miami material is typical.

Valonia macrophysa Kuetzing

(Plate 13, fig. 17)

Plants forming small to very extensive crusts 2 to 5 cm. or more in thickness; cells laterally approximated and somewhat adherent, ovoid to obovate, clavate or irregular, branching from near the base or from exposed sides; diameter 0.5 to 1.5 cm., usually about 1 cm., length 1 to 3.5 cm., usually about 2 cm.

Valonia macrophysa Kuetzing, Børgesen (1913); *V. macrophysa* Kuetzing, Collins and Hervey (1917); *V. macrophysa* Kuetzing, Collins (2d Suppl. 1918); *V. macrophysa* Kuetzing, Howe (1920).

Bermuda; Bahamas to the Virgin Islands; newly reported from Florida, from Miami, (Brooks), Key West (Taylor) and Dry Tortugas.

Very abundant in the moat of Fort Jefferson, Garden Key, growing on the brickwork at about low-tide level; a small specimen probably of this species was dredged in 32.9 meters off Southwest Channel.

This species was collected by Mrs. M. M. Brooks at Miami and used for physiological studies, in conjunction with *V. ventricosa,* but seems not to have been previously reported in a systematic work dealing with this region.

Valonia ocellata Howe

(Plate 13, fig. 20)

Plants forming crusts rather less than 1 cm. thick, dense above, attached by filamentous cells below; upper cells to 2 to 4 mm. diameter, sometimes undivided, but usually closely branched, to form a moruloid mass of cells which individually are about 0.3 to 0.6 mm. in diameter.

Valonia utricularis (Roth) C. Agardh fa. *crustacea* Kuckuck, Børgesen (1913); *V. utricularis* (Roth) C. Agardh fa. *crustacea* Kuckuck, Collins and Hervey (1917); *V. utricularis* (Roth) C. Agardh, fa. *crustacea* Kuckuck, Collins (2d Suppl. 1918); *V. ocellata* Howe (1920).

Bermuda; Bahamas to the Virgin Islands; newly reported for Florida.

Abundant on reefs in shallow water beyond Bird and Bush Keys; Loggerhead Key; in the moat of Fort Jefferson, Garden Key. As this plant is rather insignificant, it is probably rather common in small amounts, but has passed unnoticed.

Valonia utricularis (Roth) C. Agardh

(Plate 13, fig. 19)

Plant prostrate or ascending, cells 5 to 20 mm. long, 1 to 2.5 mm. in diameter, arcuate, clavate-cylindrical, branching from sides or ends.

Valonia utricularis C. Agardh, Collins (1909); *V. utricularis* (Roth) C. Agardh, Børgesen (1913); *V. utricularis* (Roth) C. Agardh, Collins and Hervey (1917).

Bermuda; West Indies to Virgin Islands; newly reported for Florida.

Once dredged off Loggerhead Key; growing among *Hypnea* and *Cladophora fuliginosa.*

Valonia ventricosa J. Agardh

(Plate 13, fig. 18)

Plant usually of a single large vegetative cell attached by several minute hapteral cells at the base; shape spherical to slightly pyriform or oblate-sphæroidal, seldom irregular when unimpeded in growth; 1.5 to 4 cm. in diameter, generally about 2 to 3 cm., but one specimen to 4 cm. in diameter by 5.5 cm. long.

Valonia ventricosa J. Agardh, Collins (1909); *V. ventricosa* J. Agardh, Børgesen (1913); *V. ventricosa* J. Agardh, Collins and Hervey (1917); *V. ventricosa* J. Agardh, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands; newly reported for Florida at Miami (Brooks) and Dry Tortugas.

Frequent and locally abundant in shallow water, especially along Bird Key Reef, where it grows under blocks of coral and coquina and also between the branches of the coral *Porites*, where, by reason of pressure, it assumes contorted forms; dredged on White Shoal and to 18.3 meters in Southwest Channel.

SIPHONALES

Plants of filamentous nature, the filaments simple or associated to form complexly organized plant masses of characteristic form, unicellular, forming cross-walls with reference to reproductive organs only, multinucleate, chromatophores numerous.

1. Filaments associated to form more or less complex thalli.............................Codiaceæ (76)
1. Filaments free or casually intertangled...2

2. Filaments organizing root, stem and leaf elements; supported by trabeculæ............Caulerpaceæ (94)
2. Filaments less specialized..3

3. Branching plumose, zoöspores and gametes biciliate...............................Bryopsidaceæ (92)
3. Branching dichotomous or irregular, zoöspores multiciliate..........................Derbesiaceæ (93)

CODIACEÆ

Plants filamentous, the filaments branched, without cross-walls, multinucleate and with many small chromatophores, twisted together to form thalli of specific form; the surface branches of the strands usually different from the axial ones; reproduction by anisogametes or by zoöspores.

1. Plant showing a differentiated stalk portion.......................................2
1. Plant showing no differentiated stalk portion.......................................Codium (78)

2. Plants hardly calcified above...3
2. Plants distinctly calcified above..4

3. Blade portion uncorticated..Avrainvillea (76)
3. Blade portion showing distinct cortical filaments...................................Cladocephalus (78)

4. Plants of jointed segments..Halimeda (81)
4. Plant not segmented...5

5. Plant stalked, fan- or cup-shaped...Udotea (89)
5. Plant a stalked tuft composed of filaments or little blades..........................6

6. Terminal tuft of free filaments...Penicillus (85)
6. Terminal tuft of filaments united, at least when young, to small blades...............Rhipocephalus (87)

AVRAINVILLEA Decaisne

Plants usually stalked, with an expanded flabellum; uncalcified; structural filaments dichotomously branched, constricted above the forks; flabellum without specialized cortical filaments.

1. Flabellum spongy, stalk 10 mm. or more in diameter..................................A. nigricans (77)
1. Flabellum thin, compact, stalk under 10 mm. in diameter.............................2

2. Blades shallowly cordate, surface filaments indistinctly or not moniliform.............A. levis (77)
2. Blades deeply cordate, surface filaments distinctly moniliform.......................A. asarifolia (77)

Avrainvillea asarifolia Børgesen

(Plate 8, fig. 9; plate 9, fig. 30)

Plants to 1.5 dm. tall, stalked; stalk 6 to 8 mm. in diameter (6 to 23 cm. long), decidedly flattened, at least above; blade to 8 (or 10) cm. long, 15 cm. broad, broadly ovate to reniform, the base deeply cordate at full development with cuneate attachment to the stalk, dark olive green, thin and compact in consistency, very little zonately marked; filaments cylindrical or lightly and occasionally constricted in the center of the blade (where 20 to 30μ in diameter), becoming very closely felted, closely dichotomously divided and irregularly moniliform near the surface (where 8 to 13μ in diameter), forming an incipient cortex.

Avrainvillea asarifolia Børgesen, Collins (1909); *A. asarifolia* Børgesen (1913).

Virgin Islands; newly reported for Florida.

At Dry Tortugas this plant was dredged as several individuals in 91.5 meters off Southwest Channel; also in 4.6 to 7.6 meters on Loggerhead Key shoal.

To the writer this species does not exhibit the closeness of character to *H. levis* recognized by Collins; the facies will readily distinguish it in the field, and the character of the cortical filaments will distinguish fragments under the microscope.

Avrainvillea levis Howe

(Plate 8, fig. 11; plate 9, figs. 24 to 26)

Plant erect to a height of 11 cm. inclusive of the stalk; stalk cylindrical below, somewhat flattened above, 5 to 6 mm. in diameter, (0.5 to 4 cm.) to 5 cm. long; flabellum to 6 cm. long, 9 cm. broad, light dull green in color, distinctly zonate, thin and firm of consistency, broadly rounded or somewhat reniform with a shallowly cordate base; axial filaments of the blade not moniliform constricted (to 35μ), the surface filaments closely interwoven to form an incipient cortex, not moniliform constricted, or at most slightly so in the ultimate divisions (6 to 24μ diameter).

Avrainvillea levis Howe, Collins (1909); *A. levis* Howe (1920).

Florida, Bahamas and West Indies.

At Dry Tortugas this plant was once dredged as a few good specimens off Southwest Channel in 91.5 meters.

Avrainvillea nigricans Decaisne

(Plate 8, fig. 10; plate 11, fig. 8)

Plant to 1.5 dm. high, inclusive of the erect stalk; stalk 10 to 13 mm. in diameter, cylindrical and irregular below, flattened above and transitional to the blade, which is cuneate-rounded at the base, to 6 cm. long and 8 cm. broad, soft, of notably moniliform filaments, dull brown in color (those of the interior 50 to 70μ diameter, near the surface about 30μ, with closer set constrictions; sporangia clavate to globose, 350 to 800μ by 200 to 350μ; spores ovoid, pyriform, or elongate-ellipsoidal, 130 to 300μ by 66 to 120μ).

Avrainvillea nigricans Decaisne, Collins (1909); *A. nigricans* Decaisne, Børgesen (1913); *A. nigricans* Decaisne, Collins and Hervey (1917); *A. nigricans* Decaisne, Howe (1920).

Forma fulva Howe

(Plate 9, figs. 27 to 29)

Blade less expanded, thick and spongy, the filaments more sharply tapering at surface, coarser, more closely dichotomous, brighter brown to yellowish in color.

Florida; Bermuda; Bahamas; West Indies and the Virgin Islands.

The form dredged as a single small plant on White Shoal in 4.6 meters of water.

It is notable that this plant, usually considered common in the American tropics, is so rare at Tortugas. This is probably because of the exposed character of the district, with little really soft muddy bottom in shallow water.

CLADOCEPHALUS Howe

Plant stalked, terminating in a flabellum or in a brush of narrow segments, uncalcified; structurally of unseptate branched and cœnocytic filaments, forming on the stalk and on the blades a cortex of interlaced slender filaments.

Cladocephalus luteofuscus (Crouan) Børgesen

(Plate 8, fig. 12; plate 9, figs. 12, 13)

Plant to 1 dm. tall including the erect stalk; stalk 2 to 4 mm. in diameter, simple (or branched), flattened above, with a cuneate attachment to the blade; blade broadly oval, lower margin obtuse to rounded or transverse, but not cordate, 4.5 cm. long and 7 cm. broad, smooth of surface, somewhat zonate; the blade structurally with a distinct although simple cortex of interlaced filaments (filaments of medulla of stipe 50 to 80μ diameter, the repeatedly dichotomous branches forming the cortex diminishing in the ultimate divisions reaching 4 to 10μ diameter).

Cladocephalus luteofuscus (Crouan) Børgesen, Collins (1909); *C. luteofuscus* (Crouan) Børgesen (1913).

West Indies to the Virgin Islands; newly reported for Florida.

At Dry Tortugas dredged at 14.6 to 18.3, 27.5, 29.3, and 72.3 meters in and off of Southwest Channel.

In the field this is most likely to be confused with *Avrainvillea levis;* the most obvious difference is in the shape of the lower margin of the blade.

CODIUM Stackhouse

Plants filamentous, the filaments without cross-walls although sometimes nearly divided by constricting thickenings of the filaments; filaments dichotomously branched, differentiated into axial strands and corticating branches which are cylindrical to oval or turbinate and radially oriented; filaments united to form fleshy branching or crustaceous expanded thalli of characteristic form; reproduction by fragmentation or by anisogametes borne in gametangia attached to the corticating utricle filaments; uncalcified.

1. Prostrate 2
1. Erect 3

2. Plants indistinctly branched .... C. intertextum (79)
2. Plants of narrow, cylindrical branches .... C. repens (80)

3. Utricles usually 200μ in diameter, or more 4
3. Utricles usually less than 200μ 5

4. Light green, cylindrical throughout .... C. isthmocladum (79)
4. Dark green, broadly flattened below the dichotomies .... C. decorticatum (78)

5. Plants dense, branches cylindrical, end wall of utricles less than 10μ thick at apex .... C. tomentosum (81)
5. Plants loose, branches strongly flattened below the dichotomies, end wall of the utricle generally over 10μ thick at apex .... C. Pilgeri (80)

Codium decorticatum (Woodward) Howe

(Plate 6, fig. 14)

(Frond dichotomously branched, often much elongate, the younger divisions terete, the older ones flattened, especially below the dichotomies, being there distinctly cuneate;

utricles obovate-clavate, 300 to 400μ in diameter, five to six times as long as the greatest diameter.) Reported to 1 meter long, with dichotomies to 5 cm. broad.

Codium decorticatum (Woodward) Howe, Collins (1st Suppl. 1912); *C. decorticatum* (Woodward) Howe, Collins and Hervey (1917); *C. decorticatum* (Woodward) Howe, Hoyt (1920).

North Carolina to Florida; Bermuda; West Indies.

Codium intertextum Collins and Hervey

(Plate 6, figs. 11, 12; plate 7, fig. 5)

Plants prostrate, flattened, continuously expanded or showing broad irregular flattened branches, about 3 to 7 mm. thick and dorsiventral, without utricles on the attached surface, or at the margin somewhat centric, terete and free; utricles elongate cylindrical or more seldom clavate, rounded at the tips or more generally flattened and somewhat capitate; length 400 to 650μ or rarely to 1,000μ, diameter 42 to 195μ, rarely to 294μ, average 80 to 100μ (70 to 90μ), terminal membrane moderately thickened, 3 to 4μ; hair (or gametangium) scars frequent; gametangia not seen.

? *Codium difforme* Kuetzing, Collins (1909); *C. intertextum* Collins and Hervey (1917); *C. intertextum* Collins and Hervey, Collins (2d Suppl. 1918); *C. intertextum* Collins and Hervey, Howe (1920).

Var. cribosum Howe

(Plate 6, fig. 13)

Plants as described for *C. intertextum;* but terminal wall of the utricles somewhat thicker, and pitted.

C. intertextum Collins and Hervey var. *cribosum* M. A. Howe (1920).

Bermuda and Bahamas; the species newly reported for Florida under this name, and the variety, known from the Bahamas, newly recorded for the state.

Frequent in shallow water around Loggerhead Key on rocks and bases of Gorgonians; dredged to 4.6 and 7.6 meters; the variety from rocks in shallow water on east side of Loggerhead Key, but once collected.

The description given above differs somewhat from that given by Collins. The Tortugas material showed little of branching character, being generally broadly expanded or lobed deeply at the margin. While this, according to Collins' interpretation, would tend to put the material into *C. difforme* Kuetzing, the size and form of the utricles is more characteristically that described for *C. intertextum.* O. C. Schmidt recognizes *C. adhærens* and *C. difforme,* making *C. intertextum* a synonym of the latter, but the material of the present series of collections presents a wider range of size than he allows for both *C. adhærens* and *C. difforme* combined, showing, for instance, a size-range whereby a plant having utricles of an average diameter of 67μ showed many large ones, up to 294μ. Since the characters in general agree with Collins' plant it has been decided to follow Howe in using *C. intertextum* Collins and Hervey as the name for the Florida material, earlier collections of which have been recorded as *C. difforme.*

Codium isthmocladum Vickers

(Plate 6, figs. 10, 15; plate 7, fig. 10)

Plants erect to a height of 2 dm. with a basal holdfast of coarse branching filaments; light green in color, nitent and somewhat adherent to paper on drying; loosely dichotomously branched, forming large lax masses, branches 3.5 to 4 mm. in diameter above dichotomies, 6 to 8 mm. across the fork, sometimes constricted, especially above the dichotomies; utricles 120 to 460μ rarely to 600μ, generally about 250 to 300μ in diameter, the end wall considerably thickened, to 18 to 56μ, usually about 37μ in older portions of the thallus, and distinctly lamellose; gametangia when present usually 3 to 5 on a utricle, 85 to 126μ in diameter, 170 to 250μ long.

Codium tomentosum of early authors, in part; *C. isthmocladum* Vickers, Børgesen (1913); *C. isthmocladum* Vickers, Collins and Hervey (1917); *C. isthmocladum* Vickers, Howe (1920).

Florida; Bermuda; Bahamas and the West Indies.

Sometimes drifted ashore after storms; collected in 3.1 to 3.7 meters of water with diving hood by Dr. W. H. Longley; occasional at 4.6 to 7.6 meters, becoming very frequent at 18.3 meters on Loggerhead Key Shoal; White Shoal, and out Southwest Channel to 73.2 meters, five collections being derived from water deeper than 27.5 meters.

This is an easily recognized species, adhering fairly well to paper, the light color and thin texture, with a rather shining surface when dried, serving as naked-eye characters. The constrictions of the branches are not important and generally are lacking.

Codium Pilgeri O. C. Schmidt

(Plate 6, fig. 9; plate 7, fig. 3)

Plants erect, about 1.5 dm. tall, very dark green, coarse and thick when dried, not adhering to paper; loosely branched, branching dichotomous to cervicorn, the axis distinctly flattened below the forks; branches 3 to 4 mm. in diameter above the dichotomies, to 8 to 12 mm. in breadth across the forks; utricles broadly spindle-shaped to clavate or cylindrical, the ends broadly rounded, terminal cell membrane 10 to 14μ, sometimes to 23μ thick; utricles generally 125 to 165μ, frequently 240 to 290μ in diameter, 750 to 1,000μ long; hair scars frequent, gametangia not seen.

? *Codium tomentosum* of earlier writers in part; *C. Pilgeri* O. C. Schmidt, Bibliotheca Botanica, Heft 91.

Bermuda to West Indies according to Schmidt: newly reported for Florida.

Abundant in front of Fort Jefferson on Garden Key (1924, 1925), on old stones and bricks and the concrete foundations of the coal piers. In shallow water, especially near low-tide level.

Several difficulties appear on an examination of Schmidt's discussion of this plant. He cites P.B.–A. 1869 from Bermuda as this species, but the specimen in the copy in the herbarium of the present writer is surely *C. isthmocladum*, and likewise that in the Herbarium of the New York Botanical Garden. P.B.–A. 168 from Jamaica is cited as this species, and the utricle characters agree with the Tortugas material, although the terminal thickening is greater, while the habit is more slender. The separation of this present material from *C. tomentosum* is difficult under Schmidt's description, but there are two distinct plants at Dry Tortugas, one fitting *C. tomentosum* well and the other more nearly like the description of *C. Pilgeri*, so that it seems advantageous to adopt the latter name.

Codium repens (Crouan) Vickers

(Plate 6, fig. 8; plate 7, fig. 8)

Plants prostrate, to about 12 cm. in diameter attached at intervals by tufts of rhizoidal filaments; light green in color, dichotomously branched to irregular, adhering to paper fairly well; branches 3 to 5 mm. in diameter, somewhat dorsiventrally flattened; utricles clavate to somewhat cylindrical, 175 to 400μ, usually about 175 to 225μ (150 to 300μ) in diameter, length 500 to 1,000μ, the terminal wall hardly thickened; gametangia not seen.

Barbadoes and Guadeloupe; not previously reported for Florida.

On rocks, Loggerhead Key in shallow water; dredged at 2.7 to 13.8 meters on Loggerhead Key Shoal and at 11.0 and 32.9 meters in and beyond Southwest Channel. A comparatively rare species at Tortugas.

The plants collected by the writer had a somewhat more regular branching than indicated by the figures of Miss Vickers, but the determination is clear.

Codium tomentosum (Hudson) Stackhouse

(Plate 6, fig. 16; plate 7, fig. 4)

Plants erect, about 1 dm. tall, dark green, densely grown to form close, firm masses, not adhering well to paper on drying; branching dichotomous to somewhat irregular, branches 2 to 4 mm. in diameter, somewhat broader below the forks; utricles obconical to somewhat cylindrical, broadly rounded at the end; length 500 to 675μ, diameter 84 to 250μ, generally 130 to 170μ (100 to 200μ), end wall moderately thickened, to 3.5 or 5μ, gametangia not seen.

C. tomentosum Stackhouse, Harvey (1858); *C. tomentosum* Stackhouse, Farlow (1876); *C. tomentosum* (Hudson) Stackhouse, Børgesen (1913); *C. tomentosum* (Hudson) Stackhouse, Collins and Hervey (1917); *C. tomentosum* (Hudson) Stackhouse, Howe (1920); *C. tomentosum* (Hudson) Stackhouse, Hoyt (1920).

Cosmopolitan in warm waters; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Once found on the outer side of the moat wall, Garden Key, and occasional on the reef rocks on both sides of Loggerhead Key in shallow water.

The early references to this species are to be accepted with caution; much of their material was of other species, as, for instance, material collected at Key West by Hooper, which seems to be *C. isthmocladum*.

HALIMEDA Lamouroux

Plants erect from a fibrous holdfast, segmented, segments moniliform to cylindrical or disk-shaped, entire or lobed, calcified; structure filamentous, filaments cœnocytic, fusing in some species at the nodes and at the base of the sporangiophores; differentiated into axial and cortical filaments, the latter closely branched with their ends forming the boundary of the segments and closely approximated; reproduction by zoöspores produced in sporangia on branched sporangiophores borne externally on the upper margin or surface of the segments.

1. Branches in more than one plane, at least below .... H. Opuntia (82)
1. Branches characteristically in a single plane 2

2. Upper branches with entire outline 3
2. Upper branches with crenate or lobed outline 6

3. Upper branches cylindrical .... H. Monile (82)
3. Upper branches flat 4

4. Dull when dry, peripheral utricles with a central spine .... H. scabra (84)
4. Glossy when dry, peripheral utricles not armed 5

5. Segments large, soft, little calcified .... H. discoidea (82)
5. Segments smaller, firm and well calcified .... H. Tuna (85)

6. Segments strongly ribbed .... H. tridens (84)
6. Segments slightly ribbed or plane .... H. simulans (84)

This key follows in many features that of Collins (1909). An alternative and more precise one is that of Howe (1920), but as it involves important determinations of microscopic features, the one offered above will prove of more general utility in the field.

Halimeda discoidea Decaisne

(Plate 10, fig. 17; plate 11, fig. 23)

Plant to 1.5 or 2 dm. tall, sparingly branched, so lightly calcified as to adhere to paper in drying; when dry, texture almost papyraceous, greenish to whitish and distinctly shining, segments flat, large, reaching 2.5 to 3 (or 3.5) cm. in diameter below, broader than long, margin entire or somewhat angular, corticating filaments with truncate ends 37 to 56μ (40 to 85μ) broad, simple or fused in pairs; sporangia not seen.

Halimeda discoidea Decaisne, Børgesen (1913); *H. discoidea* Decaisne, Howe (1920).

Florida; Bahamas through the West Indies.

Frequent in dredgings about Dry Tortugas, mostly at 3.1 to 9.1 meters, but also at 11.0, 32.9, and 36.6 meters. Seldom secured in complete individuals, owing to the comparative fragility of the plant.

This is only likely to be confused with *H. Tuna* var. *platydisca*, but is normally with larger segments, and these are thinner when dry and more lightly calcified; the base of the plant is hardly differentiated in character from the upper part, about one segment being sub-cylindrical and stalk-like, whereas in *H. Tuna* var. *platydisca* the segments tend to diminish decidedly toward the base.

Halimeda Monile (Ellis and Solander) Lamouroux

Plant to 1.0 or 1.5 dm. tall, closely branched and strongly calcified; dull green in color; segments thick and flattened, somewhat triangular or irregular below, above cylindrical, 3-lobed, to simple, cylindrical in the uppermost part, 3 to 8 mm. long, 1.5 to 2 mm. in diameter; sporangia not seen.

Halimeda incrassata Lamouroux, Harvey (1858); *H. incrassata* Lamouroux, Farlow (1876); *H. incrassata* (Ellis and Solander) Lamouroux, var. *monilis* (Ellis and Solander) Børgesen forma *robusta* Børgesen and forma *cylindrica* Børgesen (1913); *H. Monile* (Ellis and Solander) Lamouroux, Collins and Hervey (1917); *H. Monile* (Ellis and Solander) Lamouroux, Howe (1920).

Forma robusta Børgesen

(Plate 10, fig. 1)

Plant robust, branching dense; segments below broad, cuneate, somewhat fused laterally, above tridentate to cylindrical; peripheral utricles 30 to 51μ in diameter.

Forma cylindrica Børgesen

Plant slender, scantily branched; segments below narrow, generally free, sometimes tridentate on upper side, in uppermost parts narrowly cylindrical; peripheral utricles 35 to 60μ in diameter.

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

Garden Key, especially in the moat of Fort Jefferson, where common; in shallow water inside Bird Key Reef, and dredged off the reef in 4.6 to 9.1 meters of water. Forma *robusta* is the plant of open situations, forma *cylindrica* of the most sheltered and stagnant places, as in the moat.

Halimeda Opuntia (Linnæus) Lamouroux

Plants forming dense cushions without distinct attachment region or differentiated stalk portion; densely branched, branches frequently arising at right angles to each other; segments frequently lobed and somewhat ribbed, green when young, becoming white in lower (older) portions of the plant.

Halimeda Opuntia Lamouroux, Harvey (1858); *H. Opuntia* Lamouroux, Farlow (1875); *H. Opuntia* (Linnæus) Lamouroux, Collins (1909); *H. Opuntia* (Linnæus) Lamouroux, Børgesen (1913); *H. Opuntia* (Linnæus) Lamouroux, Howe (1920).

1. Lower segments at most slightly 3-lobed .... var. typica
1. Lower segments deeply 3-lobed 2

2. Plant large, segments 8 mm. or more across .... var. triloba
2. Plant small, segments less than 6 mm. across .... var. minor

Var. minor Vickers

(Plate 10, figs. 3, 4)

Plants forming small cushions 3 to 4 cm. thick, densely branched below, branches frequently arising at right angles to each other; less closely branched above, the successive segments generally formed in the same plane; lower segments triangular or triradiate and the arms sub-cylindrical, 2.5 to 3 mm. long and 2 to 3 mm. broad, sometimes simple, cylindrical; upper segments obovate, 4 to 5 mm. broad, 3 to 3.5 mm. long, somewhat crenate lobed on upper margin, nearly straight on lower margin except for the slight pedicellar protuberance; corticating filaments with truncate ends 18 to 27μ broad; sporangia not seen.

Halimeda Opuntia (Linnæus) Lamouroux fa. *minor* Vickers, Algues de la Barbade; ? not *Corallina opuntioides minor* Petiver, Petrographia 1767.

Var. triloba (Decaisne) Barton

(Plate 10, fig. 2)

Plants forming dense cushions to 5 dm. or more in thickness, densely branched, branches frequently arising at right angles to each other; upper segments broadly ovate to reniform, cordate on lower margin, 3-ribbed and distinctly crenate; lower segments deeply 3-lobed and 3-ribbed, to triradiate with sub-cylindrical branches, sometimes simply cylindrical or sometimes somewhat 5-lobed; segments averaging 10 mm. broad and 6 mm. long above and 10 mm. long and 10 mm. broad below; sporangia not seen.

In earlier texts included under the general name *H. Opuntia* (Linnæus) Lamouroux; *H. Opuntia* (Linnæus) Lamouroux var. *triloba* (Decaisne) Barton, Børgesen (1913).

Var. typica Barton

(Plate 10, figs. 5 to 7; plate 11, fig. 17)

Plants forming dense cushions about 1 dm. thick, densely branched, branches frequently arising at right angles to each other; upper segments broadly ovate to reniform, cordate on lower margin, slightly 3-ribbed and lightly crenate, lower segments slightly 3-lobed, markedly 3-ribbed; segments 7 to 10 mm. broad, 4.5 to 6 mm. long; sporangia not seen.

In early texts included under the general name *H. Opuntia* (Linnæus) Lamouroux; *H. Opuntia* (Linnæus) Lamouroux var. *typica* Barton, Børgesen (1913).

The variety *minor* was described from the Barbadoes and is here newly reported for Florida. Variety *triloba* and variety *typica* occur in Florida and from the Bahamas through the West Indies to the Virgin Islands.

The variety *minor* was occasionally dredged off Loggerhead Key and out Southwest Channel in 7.6 meters to 9.1 meters of water. The variety *triloba* was very abundant at Dry Tortugas in and around the moat, Fort Jefferson, Garden Key, forming great beds and dredged to 4.6 to 7.6 meters on White Shoal. The variety *typica* was occasional on the reef around Loggerhead Key, and dredged offshore at 6.2 to 9.3 meters.

The variety *minor* seems entirely distinct from typical *H. Opuntia* and certainly is not a habitat-form; as it is quite an *H. Opuntia* in miniature, except for the little-divided plane ultimate branches (which frequently are not in evidence), it seems best not to sever the connection established for the name by Miss Vickers. The variety *typica* seems at Dry Tortugas to be quite easily distinguished from the variety *triloba;* it is by far the less common of the two, and was never found in a large clump. However, it is reported elsewhere as forming extensive beds.

Halimeda scabra Howe

(Plate 10, figs. 9, 10, 18; plate 11, fig. 22)

Plants erect to a height of 1 dm., frequently branched, moderately calcified, branches typically in one plane; segments flat, without ribs, broadly ovate, entire above, straight or very broadly obtuse below, entirely dull of surface and harsh to the touch; 10 to 20 mm. wide, 7 to 13 mm. long; filaments of the central strand fused in twos and threes at the joints; terminal divisions of the corticating filaments round-truncate 37 to 47μ (27 to 50μ) broad at the exposed end, bearing a prominent central spine; sporangia generally marginal on the disks borne on stalks which are once definitely dichotomously divided, usually 6 to 12 on each stalk, pyriform, 165 to 250μ (320μ) broad by 210 to 290μ long.

Halimeda scabra Howe, Collins (1909); *H. scabra* Howe (1920); by the earlier writers confused with *H. Tuna.*

Florida and the Bahamas.

Common at Dry Tortugas on all the western islands and reefs; especially abundant in the moat, Fort Jefferson, Garden Key, on the brickwork; dredged to 9.3 meters.

Material in the Farlow Herbarium from Florida, named *H. Tuna*, is partly this species. The distinction is not easily made in the field, although perfectly simple on decalcified specimens with a microscope; nevertheless the spines can be seen along the edges of clean segments with a high-power hand lens when held against a strong light.

Halimeda simulans Howe

(Plate 10, fig. 12; plate 11, figs. 18, 19)

Plant erect to a height of 1 to 1.5 dm., frequently branched below, strongly calcified, branches typically in one plane; below forming a short stalk of 1 to 3 segments; above this the segments triangular to ovate, entire or somewhat 3-lobed, to 15 mm. broad and 10 mm. long, very slightly glossy, slightly ribbed; the upper part of the plant little branched, branches long, segments broadly ovate, straight or somewhat concave on lower margin, entire to slightly crenate above; terminal divisions of the corticating filaments truncate, 27 to 45μ broad; sporangia seen.

H. simulans Howe, Collins (1909); *H. incrassata* (Ellis and Solander) Lamouroux var. *simulans* (Howe) Børgesen (1913); *H. simulans* Howe, Collins and Hervey (1917); *H. simulans* Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Seldom seen at Dry Tortugas in shallow water, but dredged on White Shoal, near shore on Middle Key and Bird Key Reef, and at about 5.5 meters off East Key; dredged occasionally in deeper water down to 73.2 meters out from Southwest Channel.

Halimeda tridens (Ellis and Solander) Lamouroux

(Plate 10, fig. 14)

Plants erect to a height of 1.5 dm., the lower segments of the plant forming an extensive stalk or trunk portion which branches 2 to 3 times, the segments and the branches more or less fused with each other; above the free segments cylindrical, to flattened, to broad and ovate, somewhat lobed; terminal divisions of the corticating filaments truncate, 42 to 84μ

in diameter; sporangia borne on stalks once dichotomously divided, usually 10 to 20 to a stalk, broad-pyriform, 250 to 330μ broad, 330 to 360μ long.

Halimeda tridens Lamouroux, Harvey (1858); *H. tridens* Lamouroux, Farlow (1876); *H. tridens* (Ellis and Solander) Lamouroux forma *typica* (Barton) Collins and forma *tripartita* (Barton) Collins, Collins (1909); *H. incrassata* (Ellis and Solander) Lamouroux *p.p.*, Børgesen (1913); *H. tridens* (Ellis and Solander) Lamouroux, Collins and Hervey (1917); *H. tridens* (Ellis and Solander) Lamouroux, Howe (1920).

Forma typica (Barton) Collins

(Plate 10, fig. 19; plate 11, fig. 20)

Segments in median portion triangular or slightly lobed.

Forma tripartita (Barton) Collins

(Plate 10, fig. 16)

Segments in median portion deeply tri-lobed.

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Frequent about Garden Key, especially in the moat of Fort Jefferson; dredged on Loggerhead Key Shoal, Bird Key Reef and White Shoal to 13.8 meters, also in Southwest Channel to 18.3 meters.

Halimeda Tuna (Ellis and Solander) Lamouroux

Plants erect to a height of 1.5 dm., 1 to 2 somewhat stalk-like segments below; frequently branched, moderately calcified, branches typically in one plane; segments flat, without ribs, broadly ovate, entire on upper edge, transverse to concave on lower edge; slightly glossy of surface and smooth to the touch; terminal divisions of the cortical filaments truncate, 37 to 56μ in diameter; sporangia not seen.

Halimeda Tuna Lamouroux, Harvey (1858); *H. Tuna* Lamouroux, Farlow (1876); *H. Tuna* (Ellis and Solander) Lamouroux, Collins (1909); *H. Tuna* (Ellis and Solander) Lamouroux, Børgesen (1913); *H. Tuna* (Ellis and Solander) Lamouroux, Collins and Hervey (1917); *H. Tuna* (Ellis and Solander) Lamouroux, Howe (1920).

Var. typica Barton

(Plate 10, fig. 8; plate 11, fig. 21)

As described above; segments 10 to 15 mm. wide, 7 to 11 mm. long.

Var. platydisca (Decaisne) Barton

(Plate 10, fig. 13)

Less abundantly branched, less calcified and so less rigid; segments more glossy, larger, to 2 cm. (or more) in diameter.

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

The variety *typica* is common at Dry Tortugas, though less so than *H. scabra*, which it closely resembles in the field. In the moat and on the shore rocks and dredged about Garden Key, Loggerhead Key, and in and off Southwest Channel from 18.3 to 36.6 meters; the more distinct specimens of the variety *platydisca* from deep water.

PENICILLUS Lamarck

Plants erect, stalked, the stalks terminating in a tuft of free, branched filaments; calcareous, structurally composed of branched unsegmented cœnocytic filaments, filaments generally constricted above a fork, the surface segments of those forming the stalk becoming radially disposed, of species-characteristic form.

1. Filaments of head branching with rather wide angles, considerably tangled....2
1. Filaments of head branching with narrow angles, hardly tangled.............3

2. Heads dense, ovoid or pyriform...P. pyriformis (87)
2. Head loose, flattened..P. pyriformis explanata (87)

3. Filaments slender, less than 0.3 mm. in diameter..........................P. capitatus (86)
3. Filaments coarse, more than 0.3 mm. in diameter..........................4

4. Filaments clearly calcified, head whitish green............................P. Lamourouxii (86)
4. Filaments hardly calcified, head rich green...............................P. dumetosus (86)

Penicillus capitatus Lamarck

(Plate 8, fig. 2; plate 9, figs. 4, 16)

Plant to 1.5 dm. from a tangled mass of basal rhizoids; stipe 4 to 7 mm. broad at the top, tapering to 2.5 to 3 mm. at the base, with smooth, firm surface; apical tuft spherical to somewhat pyriform and tapering into the stalk, which penetrates to the center of the head, rounded to somewhat flattened above to 3.5 to 4 cm. broad; filaments of the tuft mostly 2 to 3 cm. long, dichotomously branched, 125 to 150μ (100 to 200μ) in diameter, moderately calcified; peripheral filaments of the stalk closely branched, thickened and truncate at the end, the very tip slightly capitate.

Penicillus capitatus Lamarck, Harvey (1858); *P. capitatus* Lamarck, Farlow (1876); *P. capitatus* Lamarck, Collins (1909); *P. capitatus* Lamarck, Børgesen (1913); *P. capitatus* Lamarck, Collins and Hervey (1917); *P. capitatus* Lamarck, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

In considerable quantity in the moat, Fort Jefferson, Garden Key; sparse, Loggerhead Key; also in a little cove on the west side of Long Key; in 1926 far more common than in previous years throughout the shallow water within Bush Key and Bird Key Reef. The comparative lack of areas of quite quiet water over a muddy bottom limits the places at which this generally common species may be expected about the Dry Tortugas.

Penicillus dumetosus (Lamouroux) Blainville

(Plate 8, fig. 4; plate 9, figs. 1, 18)

Plants erect to a height of 12 cm. above the base, which is of several strands of twisted rhizoids; stalk 2 to 3.5 cm. long, 8 to 14 (to 25) mm. in diameter above, tapering somewhat toward the base, with soft, minutely spongy surface; apical tuft rounded to oval, tapering somewhat to the stalk, to 10 cm. broad, filaments 3.5 to 4.5 cm. long, dichotomously branched, constricted above the forks and occasionally elsewhere, 500 to 670μ (to 800μ) in diameter, uncalcified or very slightly calcified, rich green; corticating filaments of the stalk loosely branched, the end segments thickened, acutely tapering.

Penicillus dumetosus Decaisne, Harvey (1858); *P. dumetosus* Decaisne, Farlow (1876); *P. dumetosus* (Lamouroux) Decaisne, Collins (1909); *P. dumetosus* (Lamouroux) Blainville, Howe (1920).

Florida; Bahamas and through the West Indies.

Garden Key, shallow water on the west side; north side of Long Key; west side of Loggerhead Key; rather common. This is generally a plant of shallow water, in protected areas. Dredged near East Key at 3.7 meters.

Penicillus Lamourouxii Decaisne

(Plate 8, fig. 3; plate 9, figs. 3, 19)

Plants erect to 7 cm. above the base of tangled rhizoids; stalk 1 to 2 cm. long, 6 to 8 mm. in diameter, soft, with slightly spongy surface; terminal tuft to 5 cm. tall, 4 cm. broad, pyriform; filaments about 2 to 3 cm. long, 350 to 430μ (400 to 500μ) in diameter, constricted above the forks and frequently elsewhere, moderately calcified; corticating filaments of the stipe sharply inflated above the basal constriction, forming a considerable sac topped by the branching portion, the segments of which are short, blunt, to somewhat acute, and thickened.

Penicillus Lamourouxii Decaisne, Collins (1909); *P. Lamourouxii* Decaisne, Børgesen (1913); *P. Lamourouxii* Decaisne, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas collected on the west side of Loggerhead Key in shallow water and dredged in 32.9 and 73.2 meters off Southwest Channel.

This plant was thought to be uncommon at Dry Tortugas, but it is possible that it was often not collected under the impression that the plants were underdeveloped specimens of *P. dumetosus*.

Penicillus pyriformis A. and E. S. Gepp

(Plate 8, fig. 1; plate 9, figs. 10, 17)

Plants to 12 cm. high above the base of tangled rhizoids; stalk 3 to 3.5 cm. long, 5 to 7 mm. in diameter, hardly penetrating the head, rather rough, with minutely spongy surface; apical tuft oval to pyriform, tapering somewhat into the stalk; filaments widely branched, intertangled, strongly calcified, giving the head considerable firmness; filaments 2 to 3 cm. long, 170 to 250μ (150 to 200μ) in diameter, constricted above the forks and occasionally elsewhere; corticating filaments of the stalk loosely branched, the end segments thickened, acutely tapering.

Penicillus pyriformis A. and E. S. Gepp, Collins (1909); *P. pyriformis* A. and E. S. Gepp, Børgesen (1913); *P. pyriformis* A. and E. S. Gepp, Collins and Hervey (1917); *P. pyriformis* A. and E. S. Gepp, Howe (1920).

Forma explanata Børgesen

(Plate 8, fig. 5)

Plants 5 to 7 cm. tall, the stipe short, 2 to 3 cm. long, 3 to 6 mm. in diameter, the apical tuft very loose, broadly expanded and somewhat flattened, to a diameter of 8 to 12 cm.; the filaments 4 to 6 cm. long; otherwise approximately as in the species.

Penicillus pyriformis A. and E. S. Gepp forma *explanata* Børgesen, Collins (1909); *P. pyriformis* A. and E. S. Gepp forma *explanata* Børgesen (1913).

The species is known from Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands. The forma *explanata* has been described from the Virgin Islands; and is newly reported for Florida.

At Dry Tortugas this species was found only locally near Bird Key Reef in shallow water in 1924 and 1925 but appeared in abundance in the moat, Fort Jefferson in 1926 in a rather soft form, and was also present on Loggerhead Key in the usual condition. The forma *explanata* was dredged in 3.1 to 6.2 meters on Bird Key shoals, and in 4.6 to 7.6 meters on White Shoal.

The forma *explanata* did not, at Dry Tortugas, show the slightest tendency to grade into the typical form and appears to the writer to deserve rather greater nomenclatorial distinctness.

RHIPOCEPHALUS Kuetzing

Plant erect, calcareous, with a stipe surmounted by a tuft of filaments which are either evanescently or permanently associated in flabellæ one filament thick; stipe corticated by the radially disposed peripheral filaments.

1. Filaments of the head permanently associated into cuneate flabellæ .... R. Phœnix (88)
1. Filaments quickly separating .... R. oblongus (88)

Rhipocephalus oblongus (Decaisne) Kuetzing

(Plate 8, fig. 6; plate 9, figs. 5, 20)

Plants to 6 cm. tall, composed of a rather dense tuft of filaments at the summit of the stalk; stalk to 3.2 cm. high and 4 mm. thick, rather smooth; head to 3.5 cm. long and 1.5 cm. broad, oval or to 3 cm. long and 3 cm. wide, funnel-shaped; filaments 125 to 170μ (160 to 200μ in diameter above, 200 to 350μ at the base) in diameter, 1.5 to 2.5 cm. long, dichotomously branched with narrow angles, branches straight and somewhat closely approximated, constricted above the dichotomies and frequently also elsewhere; corticating filaments of the stalk radially disposed, finely branched, the ultimate divisions truncate at the ends, the outer portions thickened, but the truncate end not particularly so; when young generally funnel-shaped, the filaments of the head forming evanescent flabellæ.

Rhipocephalus oblongus (Decaisne) Kuetzing, Collins (1912) 1st Suppl.; *R. oblongus* (Decaisne) Kuetzing, Howe (1920).

Florida; Bahamas; West Indies.

At Dry Tortugas this plant was found only in very shallow water near the shores of Loggerhead Key.

The Tortugas material, being usually small, was easily differentiated from *Penicillus capitatus*, and in the field more resembled young forms of *P. pyriformis* or of *Udotea littoralis*. The plant is, however, none too readily separated from *P. capitatus* when it is well developed; the flabellæ are hard to recognize, but the form of the ultimate segments of the cortical filaments of the stipe offer a character of considerable aid.

Rhipocephalus Phœnix (Ellis and Solander) Kuetzing

Plants erect to a height of 6 cm. from the basal mass of rhizoids; stalk to 3 mm. diameter, 2 cm. long, with smooth surface; head of flabellæ, the component filaments 50 to 85μ (55 to 100μ) in diameter, constricted above the forks but seldom elsewhere; corticating filaments of the stipe ultimately radially disposed, much subdivided, the ends truncate and the wall thickened, but not especially so across the truncate end.

Penicillus Phœnix Lamarck, Harvey (1858); *P. Phœnix* Lamarck, Farlow (1876); *Rhipocephalus Phœnix* (Ellis and Solander) Kuetzing, Collins (1909); *R. Phœnix* (Ellis and Solander) Kuetzing, Howe (1920).

Two kinds may generally be recognized:

Forma typicus Gepp

(Plate 8, fig. 7; plate 9, fig. 21)

Blades about 5 mm. broad, 1.5 to 2 cm. long, the head at most one-half longer than broad.

Forma brevifolius Gepp

(Plate 8, fig. 8)

Blades about 3 mm. broad, 4 to 7 mm. long, the head twice as long as broad, or longer.

Florida; Bahamas through the West Indies.

At Dry Tortugas this plant is widely distributed in small quantity. It is frequent to the northeast of Long Key in about 1.2 meters of water, and was dredged in 9.2 to 18.3 meters in Southwest Channel and at 73.2 meters beyond it; also on White Shoal and Loggerhead Key Shoal in 4.6 to 7.6 meters, and in 1926 was abundant in 1.8 to 3.1 meters near the Laboratory wharf.

Both forms are present at Dry Tortugas, and are generally easily enough distinguished, but some of the material was clearly intermediate.

UDOTEA Lamouroux

Erect, stalked, calcareous plants, bearing a terminal, more or less proliferous fan-like or funnel-shaped flabellum; stalk and flabellum composed of unsegmented, dichotomously branched filaments which are constricted above the forks and occasionally elsewhere; the stalk and in some species the flabellum also covered by a cortical layer formed by the specialized surface branches of the component filaments.

1. Flabellum a flat or proliferous blade 3
1. Flabellum funnel-shaped, rarely and exceptionally flat 2

2. Flabellum spongy, base slightly decurrent . . . . U. sublittoralis (91)
2. Flabellum papery, base truncate . . . . U. cyathiformis (89)

3. Blade composed of filaments without special projections . . . . U. conglutinata (89)
3. Blade with filaments bearing corticating branches or projections 4

4. Blade corticated with densely branched filaments, the erect segments terminally truncated . . . . U. Flabellum (90)
4. Surface filaments of blade bearing small simple or branched projections 5

5. Projections simple or digitately branched, in a single row . . . . U. spinulosa (90)
5. Projections wart-like to truncate or widely-branched, in 2 to 4 rows . . . . U. Wilsoni (91)

Udotea conglutinata (Solander) Lamouroux

(Plate 8, fig. 13; plate 9, figs. 11, 22)

Plants to 9.5 (or 10) cm. tall, from a base of twisted rhizoid-cords; stipe to 1.5 cm. long, flattened and expanded above, cylindrical, 2 mm. in diameter below, smooth and firm of surface; blade to 7.5 cm. high, 10.5 cm. broad, at maturity deeply cordate below, whitish of surface and finely longitudinally fibrillose, moderately thin and firm, zonate, filaments 25 to 45μ (28 to 60μ) in diameter; structurally the stalk showing a close, dense cortex of widely branched peripheral filaments, the ultimate segments very slender, tapering, thickened at the end; the blade not corticated by special projections or branches of the filaments.

Udotea conglutinata Lamouroux, Harvey (1858); *U. conglutinata* Lamouroux, Farlow (1876); *U. conglutinata* (Solander) Lamouroux, Collins (1909); *U. conglutinata* (Solander) Lamouroux, Børgesen (1913); *U. conglutinata* (Solander) Lamouroux, Collins and Hervey (1917); *U. conglutinata* (Solander) Lamouroux, Howe (1920); *U. conglutinata* (Solander) Lamouroux, Hoyt (1920).

North Carolina; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Infrequent at Dry Tortugas and usually secured by dredging; on Loggerhead Key Shoal sublittoral and at 10.7 meters, but much more frequently at greater depths, as at 9.2 to 14.6, 18.3, 22.0 and 32.9 meters in and outside of Southwest Channel.

This plant is reported as sometimes cyathiform, and *U. cyathiformis* is sometimes flat, or seemingly so. In doubtful cases the texture of the blade will, with practice, assist in the determination, and the character of the peripheral filaments of the stalk will give the most conclusive evidence.

Udotea cyathiformis Decaisne

(Plate 8, fig. 14; plate 9, figs. 7, 23)

Plants funnel-shaped, to 6 cm. high, stalked; stalk 1.0 to 1.5 cm. long, 2 to 4 mm. in diameter, smooth of surface, and when dry with a yellow to tawny color; flabellum cyathiform, 3 to 4.5 cm. long, 3 to 5 cm. broad, attaching to the stem abruptly from a small slightly flattened or even concave base, usually symmetrical, often split; very thin, stiff and papery of texture, whitish green in color, the surface smooth, under a lens showing the straight filaments running closely parallel with each other and longitudinally of the flabellum, 30 to 50μ (40 to 125μ?) in diameter, uncorticated; stipe corticated, the ultimate corticating segments truncate, the ends not greatly thickened.

Udotea cyathiformis Decaisne, Collins (1909); *U. cyathiformis* Decaisne, Børgesen (1913); *U. cyathiformis* Decaisne, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this plant has only been secured by dredging, at 7.3 to 14.6 and 18.3 meters in Southwest Channel and at 73.2 and 91.5 meters outside it, also on White Shoal at 4.6 to 7.6 meters.

As interpreted here this species probably includes only part of the material assigned there by Howe. The balance is placed under the new species *Udotea sublittoralis*, where the more important distinctions are noted.

Udotea Flabellum (Ellis and Solander) Howe

(Plate 7, fig. 9; plate 9, figs. 2, 6)

Plant reaching a height of 2 dm. above the dense mass of basal rhizoids; stalk 1 to 2 cm. long, to 1 cm. wide and somewhat flattened above, cylindrical and narrower below, surface smooth and firm; blade cordate below, often proliferous from the margin or face, reaching 3 dm. broad, somewhat split into irregular segments, the proliferations sometimes densely crenate-undulate; surface green, firm, rugose, distinctly zonate; structurally the stalk shows a cortex of densely branched peripheral filaments with truncate and thickened ends; the blade shows a similar cortex, the peripheral branches, however, smaller and shorter.

Udotea flabellata Lamouroux, Harvey (1858); *U. flabellata* Lamouroux, Farlow (1876); *U. flabellum* (Ellis and Solander) Howe, Collins (1909); *U. flabellum* (Ellis and Solander) Howe, Børgesen (1913); *U. flabellum* (Ellis and Solander) Howe, Collins and Hervey (1917); *U. Flabellum* (Ellis and Solander) Howe (1920); *U. flabellum* (Ellis and Solander) Howe, Hoyt (1920).

North Carolina; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this species is frequently found in shallow water, as in the moat, Fort Jefferson, Garden Key, and around Loggerhead, Garden and Long Keys; it has been dredged off Bird Key Reef in shallow water down to 4.6 and 9.2 meters and in Southwest Channel in 7.3 to 18.3 meters, and outside at 73.2 meters.

Udotea spinulosa Howe

(Plate 8, fig. 15; plate 9, figs. 14, 15)

Plants erect to a height of 8 cm., stalked, the flabellum a simple blade; stalk 3 to 10 mm. long, 2 mm. wide, smooth and white; blade to 6 cm. high and 8 cm. broad, at insertion obtuse to transverse on lower margin, rather thin and delicate, surface smooth, whitish green, slightly zonate; filaments of flabellum longitudinally nearly parallel, constricted above the forks (48 to 64μ in diameter), the surface filaments bearing a row of corticating projections 40 to 120μ long, which are either simple, rather long, pointed spines, or shorter ones, bearing 2 to 5 forks at the summit of a short trunk-portion; cortical filaments of stipe densely branched, the ultimate segments tapering, thickened.

Udotea spinulosa Howe, Collins (1909); *U. spinulosa* Howe, Børgesen (1913); *U. spinulosa* Howe (1920).

Bahamas; Virgin Islands; newly reported for Florida.

At Dry Tortugas this species appeared frequently in dredgings out Southwest Channel from 9.2 to 18.3 meters, and outside the channel in 22.0, 29.3, 55.0, 73.2 and 91.5 meters.

This species can be recognized in the field from small *U. conglutinata* by the shape of the base of the blade, and more accurately with a microscope or high power hand lens, the corticating spines giving a very obvious feature for recognition.

Udotea sublittoralis n. sp.

(Plate 8, fig. 16; plate 9, figs. 8, 9)

Plants funnel-shaped, rarely flat, stalked; height to 5 cm.; stalk 2 to 10 mm. long, 0.75 to 2.0 mm. in diameter, white or greenish; flabellum funnel-shaped, 2.5 to 4.0 cm. long, 2 to 3 cm. broad, decidedly thick and of spongy consistency; very indefinitely zonate, frequently asymmetrical, briefly tapering into the summit of the stalk; filaments composing the flabellum widely dichotomously branched, flexuous and interwoven, not firmly agglutinated together, but rather individually calcareously encrusted, 50 to 85μ in diameter; filaments forming the cortex of the stalk very irregularly branched, the apices irregular, tapering or bent, sometimes somewhat truncate.

Newly described here from Florida.

Bush Key, outside of the reef; Garden Key, in 1.2 meters of water; Loggerhead Key, the west side, and north side of Long Key, always in shallow water.

This plant is to be most quickly distinguished from *U. cyathiformis* by the shape of the blade at its base and by the very spongy, rather than papery, consistency. The corticating filaments of the stalk are also much more irregular, and the ends, instead of extending erectly to the surface, there becoming abruptly truncate, are irregular toward the surface and tend to branch parallel to it. From *U. conglutinata* it differs in a much more spongy blade, as well as the characters of the stalk cortex.

Udotea Wilsoni Gepp and Howe

(Plate 11, figs. 4 to 7)

(Plants about 10 cm. high, stipitate, calcified; stipes 1.0 to 1.5, occasionally 4.0 cm. long, simple or branched above; frond of numerous flabellate proliferations usually attached together along a line in continuation of the axis; individual blades semicordate at base, round or flabellate above, entire or lobed, striate and sometimes zonate; frond filaments 40 to 50μ in diameter, subparallel, mixed with flexuous entangled branches, the blade pluriseriate at least in lower portion, filaments sparingly dichotomous without evident supradichotomal constrictions, thickly beset with short, simple or forked, very obtuse lateral appendages which are usually in 2 double rows directed toward the two surfaces of the blade, about 25 to 40μ long in upper part of blade and 25 to 120μ long near the base, where they are less regularly placed; filaments of the stipe bearing lateral appendages once or twice dichotomously divided and with obtuse apices.)

At Dry Tortugas but a single piece of blade found:

Blade fragment 19 mm. long, 16 mm. wide, rounded above, tapering to the base and probably a complete sector of the original; surface transversely undulate and zonate, white, surface microscopically finely pitted, comparatively heavily lime-encrusted; structurally the filaments dichotomously branched, frequently clearly and generally at least obscurely, constricted above the forks; beset with 2 to 4 rows of projections which interlock closely to give the blade its dense and even surface; projections short, wart-like, to longer, expanded and branched to 5 to 8 lobes above, these tending to be spread in the plane of the blade-surface.

Udotea Wilsoni Gepp and Howe in Gepp, *Algæ of the Siboga Expedition.*

Florida; Bahamas.

At Dry Tortugas dredged in 9.2 to 14.6 meters in Southwest Channel.

This Dry Tortugas fragment differs from the original description in having the filaments distinctly constricted above the forks, and perhaps in having more consistently 4 rows of more branched projections. The projections from neighboring filaments interlock so that it is really quite difficult to separate them satisfactorily for drawing.

BRYOPSIDACEÆ

Plants cœnocytic, giving rise to erect branches from a rhizoidal base, the branches subdividing and bearing slender ultimate ramelli; reproduction by anisogametes, the two forms generally produced in the ultimate ramelli of different plants.

BRYOPSIS Lamouroux

Plants cœnocytic, the main branches erect from a rhizoidal base, giving off main divisions which bear pinnate or penicillate tufts of ultimate ramelli nearly separated from the parent axis by a considerable constricting thickening of the wall at the base; reproduction by anisogametes produced in the ultimate ramelli.

1. Ultimate ramelli surrounding branchlets....................................3
1. Ultimate ramelli in 1 or 2 rows..2

2. Frond with 2 rows of ramelli, triangular-lanceolate, light in color...............B. plumosa (93)
2. Frond with 1 or 2 rows of ramelli, linear-lanceolate, dark in color...............B. pennata (93)

3. Main axes coarse, ultimate ramelli generally 5 to 15μ in diameter...............B. Duchassaingii (92)
3. Main axes slender, plant darker, ultimate ramelli 20μ or more in diameter........B. hypnoides (92)

Bryopsis Duchassaingii J. Agardh

Plant erect to a height of 1 to 2 dm., very pale green in color, several main branches arising from the base, these each dividing to form a few main lateral branches of indefinite growth; branches of the first two orders 0.75 to 1.25 mm. thick; main branches with very many slender branches which are closely surrounded with the very delicate ultimate ramelli.

Bryopsis Duchassaingii J. Agardh, Collins (1909); *B. Duchassaingii* J. Agardh, Børgesen (1913); *B. Duchassaingii* J. Agardh, Collins and Hervey (1917); *B. Duchassaingii* J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas but one small, much denuded specimen was secured west of the southern end of Loggerhead Key.

The description is based upon Key West specimens.

Bryopsis hypnoides Lamouroux

(Frond seldom over 10 cm. high, soft, rather pale green, usually much branched, branches in no definite order, growing smaller in the successive series, and with no sharp division between the lesser branches and the ramuli that clothe them on all sides, and themselves branch more or less.)

Bryopsis hypnoides Lamouroux, Harvey (1858); *B. hypnoides* Lamouroux, Farlow (1876); *B. hypnoides* Lamouroux, Collins (1909); *B. hypnoides* Lamouroux *p.p.*, Børgesen (1913); *B. hypnoides* Lamouroux, Collins and Hervey (1917); *B. hypnoides* Lamouroux, Howe (1920); *B. hypnoides* Lamouroux, Hoyt (1920).

New England to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Bryopsis pennata Lamouroux

(Plate 11, fig. 13)

Plant having a rather tangled base above the rhizoidal holdfasts, forming large tufts of erect main filaments to 7 cm. high which are infrequently branched; ultimate branches with distichous ramelli of rather uniform length, giving the frond a linear lanceolate outline; plant dark green in color, often metallically iridescent.

Bryopsis plumosa Lamouroux *p.p.*, Harvey (1858); *B. plumosa* Lamouroux *p.p.*, Farlow (1876); *B. plumosa* (Hudson) C. Agardh var. *pennata* (Lamouroux) Børgesen (1913); *B. pennata* Lamouroux and *B. Leprieurii* Kuetzing, Collins (1909); *B. pennata* Lamouroux with vars. *secunda* (Harvey) Collins and *Leprieurii* (Kuetzing) Collins, Collins and Hervey (1917); *B. pennata* Lamouroux, Howe (1920).

Var. secunda (Harvey) Collins and Harvey

(Plate 11, figs. 11, 12)

Differing in the unilateral arrangement of the two rows of ramelli, giving a secund plumose appearance to the frond.

Bryopsis plumosa (Hudson) C. Agardh var. *secunda* Harvey and var. *Leprieurii* (Kuetzing) Børgesen (1913), and as above.

Florida; Bermuda; Bahamas and the West Indies to the Virgin Islands.

At Dry Tortugas found principally around the moat and old wharves of Garden Key, but also on rocks, Loggerhead Key.

This plant is recognized by Collins under the species name and the varieties *secunda* and *Leprieurii*. At Dry Tortugas what probably is the species proper may be recognized, but it is not abundant. The main bulk is clearly the variety *secunda*, but a considerable part of each clump shows the interrupted frond of the variety *Leprieurii*, which the present writer can not consider as distinct. There seems to be very little in common with the *B. plumosa* of the same territory, or that of northern waters, so the treatment of Collins is preferred to that of Børgesen.

Bryopsis plumosa (Hudson) C. Agardh

(Plate 11, fig. 14)

Plant erect to a height of 5 cm., a few main axes arising from the basal rhizoidal attachment; primary axes several-branched, these branches bearing the ramelli in two rows, the ramelli progressively shorter from near the base, which is 6 to 8 mm. broad, giving a broadly triangular-lanceolate form to the branch; plant light, bright green in color.

Bryopsis plumosa Lamouroux *p.p.*, Harvey (1858); *B. plumosa* Lamouroux *p.p.*, Farlow (1876); *B. plumosa* (Hudson) C. Agardh, Collins (1909); ? *B. plumosa* (Hudson) C. Agardh, Børgesen (1913); *B. plumosa* (Hudson) C. Agardh, Hoyt (1920).

New England to Florida; Virgin Islands.

Dredged at Dry Tortugas at 14.6 and 18.3 meters in Southwest Channel.

An examination of the specimens of *Bryopsis* from the Virgin Islands collected and determined by Børgesen under the name *B. plumosa* and deposited at the New York Botanical Garden did not disclose any which were strictly comparable with that recorded here, or with the New England material familiar to the writer. It would all be placed by him under the forms of *B. pennata* as interpreted by Collins.

DERBESIACEÆ

Frond filiform, unicellular or with occasional partitions, multinucleate, simple or branched, with no differentiation of axis and branches; chromatophores numerous disks, with or without pyrenoids; asexual reproduction by large multiciliate zoöspores, each with one nucleus, formed in lateral cells partitioned off from the filaments.

DERBESIA Solier

With the characters of the family; the only genus.

1. Partitions lacking, filaments to 50 or 75μ in diameter..........................D. fastigiata
1. Partitions often present, filaments 40 to 50μ in diameter.........................D. vaucheriformis

Derbesia ? fastigiata n. sp.

(Plate 11, figs. 1 to 3)

Plant filamentous, lubricous, 0.5 to 2.0 cm. high, cœnocytic, dichotomously branched, densely interwoven below, the upper filaments erect; lower portion of filaments distantly branched, straight to flexuous, occasionally spirally twisted, not constricted above the forks, 50 to 75μ in diameter; erect filaments ending in a series of closely placed, fasciculate dichotomies of 4 to 7 successive divisions frequently slightly thickened at right angles to the fork just below each division, giving a tuft 850 to 1,010μ in length; diameter of the filaments just below the tuft 25 to 42μ, the ultimate divisions 7.5 to 11μ in diameter; the ultimate segments tapering toward the apices, which are rounded; sterile.

Here newly described from Florida.

On the Laboratory wharf, Loggerhead Key, and on *Codium*, Garden Key, Dry Tortugas, Florida.

Lacking fertile material a definite generic assignment of this plant is not possible.

Derbesia vaucheriformis (Harvey) J. Agardh

(Filaments erect, 40 to 50μ diameter, dichotomously branched, up to 4 or 5 cm. high, in dense, fastigiate tufts; on one or both branches, a short distance above the forking, two partitions are often formed, the space between being 30 to 35μ in length, and about the same diameter; sporangium formed in the place of a branch, ovoid or broadly pyriform, 190 to 300μ by 100 to 130μ, supported by a slender pedicel, about 15μ in diameter, 50 to 100μ long, in which two partitions, similar to those at the base of a branch, enclose a cell 2 to 4 times as long as broad; spores large, about 15 in a sporangium.)

Chlorodesmis vaucheriformis Harvey (1858); *Chlorodesmis? vaucheriformis* Harvey, Farlow (1876); *Derbesia tenuissima* (DeNotaris) Crouan, Farlow (1881); *D. vaucheriformis* (Harvey) J. Agardh, Collins (1909); *D. vaucheriformis* (Harvey) J. Agardh, Collins and Hervey (1917); *Derbesia vaucheriformis* (Harvey) J. Agardh, Howe (1920).

New England; Florida; Bermuda; Bahamas.

CAULERPACEÆ

Thallus cœnocytic, reaching a large size; branched, generally differentiated into rhizoidal, stoloniferous and upright regions, the latter assuming in the several species a great variety of forms; internally the cœnocyte is braced by a system of trabeculæ; reproduction unknown, except by fragmentation of the thallus.

CAULERPA Lamouroux

With the characters of the family.

1. Rhizome and erect portion similar in character.................................C. fastigiata (98)
1. Rhizome and erect portion differentiated.......................................2

2. Erect blade flat, undivided..C. prolifera (100)
2. Erect portion subdivided into ramuli..3

3. Ramuli with acute tips...4
3. Ramuli with blunt, rounded tips..11

4. Ramuli always forked...5
4. Ramuli normally simple...7

5. Plant coarse, with a stalk 1 to 3 mm. in diameter, ramuli above only...............C. paspaloides (99)
5. Plant delicate, without specially differentiated stalk portion.......................6

6. Ramuli filiform, more than 10 times as long as broad............................C. verticillata (103)
6. Ramuli short, less than 10 times as long as broad...............................C. Webbiana (104)

7. Ramuli in 2 to few ranks...8
7. Ramuli in many ranks, filiform...C. lanuginosa (98)

8. Blade flat, ramuli broad and flat..C. crassifolia (96)
8. Ramuli round in section..9

9. Ramuli in 2 to 3, rarely several ranks, more than 10 times as long as broad..........10
9. Ramuli in 2 to 5 or more ranks, less than 5 times as long as broad..................C. cupressoides (96)

10. Ramuli nearly cylindrical, 0.3 to 0.5 mm. in diameter............................C. sertularioides (103)
10. Ramuli generally clavate, 1.5 to 2.0 mm. in diameter, rarely smaller................C. Ashmeadii (95)

11. Ramuli cylindrical, 2 ranked...C. Vickersiæ (104)
11. Ramuli rarely cylindrical, if so, more than 2 ranked..............................12

12. End of ramulus terminating abruptly in a peltate disk............................C. peltata (100)
12. End of ramulus generally swollen, rounded or compressed.........................C. racemosa (101)

Caulerpa Ashmeadii Harvey

(Plate 12, fig. 11; plate 13, fig. 1)

Plants forming a branching stolon on the substratum, this being 2.0 to 2.5 mm. in diameter and exceeding 3 dm. in length, giving off stout descending branches at intervals of 2 to 4 cm. which divide into slender segments densely clothed by the ultimate delicate rhizoids to which sand adheres closely, and also giving off ascending expanded branches at intervals of 2 to 5 cm., the branches forming blades 4 to 13 cm., generally 9 cm., long and 17 to 30 mm., generally 20 to 22 mm. (pinnules 2 to 3 cm. long) broad, on stalks 1.75 to 2 mm. in diameter and 20 to 27 mm. long; the blades with a slightly flattened mid-rib bearing complanate, ascending, slightly curved ramuli which are 10 to 18 mm. long, about 1 mm. in diameter above the contracted base and 1.5 to 2 mm. in diameter just below the rounded mucronate tip.

Caulerpa Ashmeadii Harvey (1855); *C. Ashmeadii* Harvey, Farlow (1876); *C. Ashmeadii* Harvey, Collins (1909); *C. Ashmeadii* Harvey, Børgesen (1913).

Florida and the Virgin Islands.

At Dry Tortugas found by dredging seaward from the Southwest Channel, where it occurred at depths from 7.3 meters to 73.2 or probably 91.5 and even 110.0 meters. It was exceedingly plentiful in some places, appearing to be a plant of deep water on a soft bottom, growing with *Halophila* and other Caulerpas.

This exceedingly beautiful plant appears to be quite rare in collections, and certain features shown by the abundant material available to the writer seem worthy of special note. In particular the ramuli are not simply blunt, as described by Harvey and Børgesen, but normally have a distinct spine at the apex. Harvey's statement is very clear on this point; an examination of a portion of the original material at the Farlow Herbarium showed it to consist of old fragments, mostly battered, and all with a heavy cell wall. My own material seemed to be of all stages of maturity; in the soft-walled young blades the spines were obvious, while in the older more horny ones it was at times hard to see them without soaking up the material, and finally parts of some branches failed to exhibit any sign of a spine, and agreed with the material in the Farlow Herbarium. While the species is normally a rather sturdy plant and amply distinct from any other species, a number of variants have appeared at Dry Tortugas. The simplest of these is a small form with the few ramuli widely separated (2 to generally 5 and sometimes 10 mm.) and sub-cylindrical, but rather abruptly expanded toward the distal end, which is mucronate. Another series of forms led through increasingly slender and delicate specimens to individuals with the ramuli nearly cylindrical and reaching only to 0.5 to 0.75 mm. diameter at the distal end; these ramuli were mucronate for the most part, but not entirely. The extreme form of this series comes rather close to the deep-water form of *C. sertularioides*. Distinct as are both of these forms of *C. Ashmeadii* in the extreme cases, it is not considered that they are sufficiently significant to deserve individual names.

Caulerpa crassifolia (C. Agardh) J. Agardh

Plants forming a branching stolon on the substratum, this 0.5 to 1.25 mm. in diameter and 1.5 dm. or probably more in length, giving off frequent descending and finely branched rhizoidal segments and at intervals of 1 to 3 cm. ascending expanded blade segments; blades (to 10 cm. long) on pedicels generally 1 to 1.5 cm. long or nearly sessile, with a broad flat mid-rib bearing rather wide, flat and generally curved ramuli, which taper sharply to the mucronate apex.

Caulerpa Mexicana Sonder, Harvey (1858); *C. crassifolia* C. Agardh, as var. *mexicana*, Farlow (1876); *C. crassifolia* (C. Agardh) J. Agardh with forms, Collins (1909); *C. crassifolia* (C. Agardh) J. Agardh, Børgesen with forms (1913); *C. crassifolia* (C. Agardh) J. Agardh forma *mexicana* (Sonder) J. Agardh, Collins and Hervey (1917); *C. crassifolia* (C. Agardh) J. Agardh, Howe (1920).

Forma typica (Weber) Børgesen

(Plate 12, fig. 10)

Blades to 6.5 cm. long, 1 cm. wide, ramuli about 1.5 mm. broad, not much tapered toward the base, somewhat falcate to nearly straight, and well separated to overlapping.

Forma mexicana (Sonder) J. Agardh

(Plate 12, fig. 21)

Blades to 7 cm. long, 17 mm. wide, ramuli 2.5 mm. broad, much narrower (1.75 mm.) at the base, notably falcate, and overlapping toward the distal end.

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

On Dry Tortugas *C. crassifolia* is rather scarce, but was found on Loggerhead Key Shoal and in Southwest Channel and seaward from it, at depths from 5.5 to 73.2 meters and probably 91.5 and 110.0 meters.

By far the greatest bulk of the material collected at Dry Tortugas is a dwarf form with nearly sessile blades only 1 to 2 cm. long, rather closely placed on the stolons. In addition to this, which hardly deserves even a form name, characteristic specimens of forma *mexicana* occur, and occasional pieces which come close to forma *typica*. The forma *laxior* (Weber) Collins, found on Bermuda, may also be expected.

Caulerpa cupressoides (West) C. Agardh

Plants forming a branching stolon on the substratum, this being 1.5 to 2.5 mm. in diameter and several decimeters in length, and giving off at intervals stout descending branches which divide into fine ultimate rhizoids, while on the upper side of the stolon arise the ascending branches, which fork repeatedly and bear rows of short, stout, mucronate, usually imbricate ultimate ramuli.

Caulerpa cupressoides C. Agardh, Harvey (1858); *C. cupressoides* C. Agardh and *C. ericifolia* C. Agardh, Farlow (1876); *C. cupressoides* (Vahl) C. Agardh, Collins (1909); *C. cupressoides* (Vahl) C. Agardh, with varieties and forms, Børgesen (1913); *C. cupressoides* (Vahl) C. Agardh, Collins and Hervey (1917); *C. cupressoides* (West) C. Agardh, Howe (1920).

1. Ramuli generally in 2 ranks 2
1. Ramuli in 3 or more ranks 3

2. Erect axis, stalked, naked at base 6
2. Base of erect axis ramulate .... Lycopodium alternifolia (97)

3. Ramuli not twice as long as the diameter of the axis 4
3. Ramuli twice as long as the diameter of the axis or longer 7

4. Frond slender, 3 to 4 rows of ramuli .... Turneri (98)
4. Frond stout, 5 or more rows of ramuli 5

5. Base of axis ramulate .... mamillosa typica (97)
5. Base of axis naked .... mamillosa nuda (98)

6. Plant low .... disticha (97)
6. Plant tall, to 2 dm .... flabellata (97)

7. Plant stout, erect axes short, stiff .... typica (97)
7. Plant soft, erect axes long, lax .... Lycopodium alternifolia (97)

Var. disticha Weber

Frond often much branched, base naked; ramuli, all except the lowest, cylindrical and opposite in two ranks, except occasionally multiseriate near the summit; ramuli erecto-patent, up to twice the diameter of the axis.

Var. ericifolia (Turner) Weber

(Frond surrounded by multiseriate cylindrical ramuli appressed to the axis; length about the diameter of the axis.)

Var. flabellata Børgesen

(Plate 12, fig. 18; plate 13, fig. 4)

Descending branches not numerous, the ascending branches usually with an unforked lower portion 3 to 8 cm. long and free from ramuli, branching 3 to seldom 5 times, to a height of 2 dm. more, the branches flattened and with two rows of ramuli which vary from little more than serrations to projections somewhat longer than broad.

Var. Lycopodium (C. Agardh) Weber forma alternifolia Weber

(Frond tall and little branched, lax, with some of the ramuli sub-navicular in 3 ranks, the rest cylindrical, distichous or multiseriate and with a length of twice the diameter of the axis; a plant of shallow water.)

Caulerpa Lycopodium forma *plumarioides* Børgesen (1913) *p.p.*

Var. mamillosa (Montagne) Weber

Branches bearing short obovoid or sub-navicular ramuli which in length hardly equal the diameter of the axis, in 5 or more ranks.

Forma typica Weber

The base of the upright axis surrounded by ramuli.

Forma nuda Weber

The base of the upright axis not surrounded by ramuli.

Var. Turneri Weber

(Frond slender, ramuli in 3 or 4 ranks, sub-navicular or conical, small, length hardly equaling the diameter of the axis, appressed or nearly so.)

Var. typica Weber

(Plate 12, fig. 19; plate 13, fig. 16)

Descending branches at intervals of 2 to 5 cm., ascending branches at intervals of 1 to 3 cm., unbranched for 5 to 15 mm., with few or generally no ramuli, above branching 1 to 4 times, the branches bearing 3 rows of ramuli which attain a length of about twice the diameter of the axis to which they are attached.

Florida; Bermuda; Bahamas, and generally through the eastern American tropical region so far as known.

At Dry Tortugas the variety *typica* is common in the moat at Fort Jefferson on Garden Key, and here formed large beds with long stolons spreading widely over the bottom. Around the shores of Garden, Bush and Loggerhead Keys a more condensed form was frequent in shallow water, and at Loggerhead Key var. *mamillosa* was occasional on rocks. The var. *flabellata* is a plant of deep water; the long upright branches generally tore away from the rhizomatous part so that complete specimens were seldom obtained by dredging; it was dredged in Southwest Channel at 18.3 meters and also at depths calculated to be 91.5 and 110.0 meters. The other varieties were not detected at Dry Tortugas.

Caulerpa fastigiata Montagne

(Plate 12, fig. 12)

Plants of rather turf-like habit; forming a filiform branching stolon which gives off descending rhizoidal filaments and erect filaments to about 3 cm. high, which are similar to the stolons and bear slender cylindrical branches somewhat fastigiate in arrangement and irregular in attachment, and with obtuse apices.

Caulerpa fastigiata Montagne and variety *confervoides* Crouan, Collins (1909); *C. fastigiata* Montagne, Børgesen (1913); *C. fastigiata* Montagne, Collins and Hervey (1917); *C. fastigiata* Montagne, Howe (1920).

Var. confervoides Crouan

(Stolon floating, emitting loose, floating fronds 10 cm. long.)

Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

At Dry Tortugas but one collection was made of what could be referred to this species; it had a somewhat more pronounced stolon than usual, but the branch apices were blunt, so differentiating the piece from degenerate plants of the *sertularioides*-group. It came from seaward of Southwest Channel at 73.2 meters. The materal was fragmentary; the figure and description are drawn from material collected by Thaxter at Key West.

Caulerpa lanuginosa J. Agardh

(Plate 12, fig. 4)

Plants forming a stolon below the surface of the substratum, this being covered with branched hairs to which adhere an abundance of sand particles, and giving off occasional descending rhizoidal branches and ascending lycopodioid branches, the bases of which are like the stolon, but which, after a short space of naked stalk, bear crowded filiform, somewhat incurved simple ramuli; the ascending branches reach a height of 7 (to 10) cm. and with the ramuli a diameter of 5 mm., and occasionally fork; the ramuli have a length of 3 to 4 mm., a diameter of about 85μ, taper sharply, and end in a pronounced spine.

Caulerpa Lycopodium Harvey (1858); *C. lanuginosa* C. Agardh, Farlow (1876); *C. Lycopodium* Harvey with var. *delicatula* (Grunow) Weber, Collins (1909); *C. lanuginosa* J. Agardh, Howe (1920).

Florida and the Bahamas; according to Collins, through the West Indies.

The Dry Tortugas material was dredged off Southwest Channel in 29.3 and 32.9 meters and also probably at a depth of 91.5 and 110.0 meters. It could not satisfactorily be distinguished into a species proper and a variety; the erect portion varied from 3 to over 7 cm. high, the ramuli were of regular contour, but tapered sharply to a thickened spine. The larger form in no case showed serrations on the ramuli, although Collins distinguishes as occurring in Florida both the species, which he reports as having serrate ramuli ending in a spine, and the variety *C. lycopodium* var. *delicatula* (Grunow) Weber, not over 3 cm. high and with simple, slightly acuminate ramuli.

Caulerpa paspaloides (Bory) Greville

(Plate 13, fig. 6, 7; plate 6, fig. 2)

(Stolon robust, up to 4 mm. in diameter; frond of a naked stipe (or pedicel), simple or dichotomous, bearing at its summit simple, dichotomous or palmate branches, covered with ramuli; ramuli in 3 or 4 alternating ranks, sub-verticillate or inclined to right and left, with bases in contact, imbricate or distinct, pinnate; pinnules inclined to one side, bases adjacent or opposite, simple, forked, or again pinnate, pinnules almost always mucronate.) Plant reaching a height of 1.0 to 1.5 dm.

Caulerpa paspaloides Bory, Harvey (1858); *C. paspaloides* Bory, Farlow (1876); *C. paspaloides* (Bory) Harvey Collins (1909); *C. paspaloides* (Bory) Greville, Howe (1920).

Var. typica Weber

(Pedicel of varying length, branches cylindrical or flattened, ramuli pinnate, sub-verticillate, alternate and imbricate, sometimes leaving a naked strip along the back of the branch.)

Forma paspaloides Weber

(Branches sub-cylindrical; ramuli pinnate; pinnules with bases adjacent, forked or with a single row of secondary pinnules.)

Forma phleoides (Bory) Weber

(Branches sub-cylindrical, ramuli pinnate, pinnules with adjacent bases, with two rows of secondary pinnules.)

Forma compressa Weber

(Pedicel very short, 1 to 2 cm. long; branches 2 to 3 cm. long, cylindrical, digitate at the summit of the pedicel, surrounded by very dense, imbricate ramuli in many indistinct ranks; ramuli small, plane, with simple or forking, opposite or sub-opposite, pinnately distichous, patent pinnules.)

Forma flabellata Weber

(Pedicel up to 11 cm. high; branches simple or branched, flabellately arranged at the summit of the pedicel, flattened, ramuli distinctly inclined to right and left, with bases adjacent, dense, but not as much so as in the preceding forms; pinnules inclined to one side, biseriate, simple or forked.)

Var. wurdemanni Weber

(Pedicel about 8 cm. high; branches to 10 cm. or more, with biseriate, sub-opposite or scattered ramuli, bearing biseriate, simple, unilateral pinnules.)

Var. laxa Weber

(Pedicel up to 18 cm. high; branches up to 28 cm.; arising fasciculately at the summit of the pedicel, surrounded by very small, distant, sub-verticillate ramuli; pinnules small, simple, unilateral.)

Florida and the West Indies.

Although the writer has collected this species abundantly at Key West and has seen a number of specimens which showed great range of form from other localities, he is at present unwilling to prepare a key to these, and limits himself to quoting Collins' descriptions.

Caulerpa peltata (Turner) Lamouroux

(Plate 12, fig. 9; plate 13, fig. 13)

Plants small, probably not over 1 dm. in diameter; forming a frequently forked stolon producing descending rhizoidal branches, and ascending branches which reach a height of 5 to 15 mm., bearing one or two to several lateral ramuli, which consist of a short, slender pedicel 1 to 2 mm. in length, ending in a disk-like head 0.5 to 1.0 mm. thick and 1.5 to 4 (to 8) mm. broad; occasionally the erect branches are in part slender, dichotomously to fastigiately branched, and 0.5 to 0.25 mm. in diameter, without ramuli.

Caulerpa peltata (Turner) Lamouroux, Collins (1909); *C. peltata* (Turner) Lamouroux, Collins and Hervey (1917).

Bermuda and West Indies according to Collins; apparently not previously recorded from Florida.

Occasional on rocks in shallow water on Loggerhead Key and especially on Bird Key Reef, also dredged in 32.9 meters off Southwest Channel.

The specimens with several ramuli to each stalk have smaller, more convex disks and suggest forms of *C. racemosa*, but those with fewer ramuli are rather typical. Some also seem to approach descriptions of forma *imbricata* (Kjellman) Weber, but were not readily separable.

Caulerpa prolifera (Foerskal) Lamouroux

(Plate 12, fig. 15)

Plants forming a slender, occasionally forking stolon, giving rise to descending rhizoidal branches at intervals of 0.5 to 2.0 cm., and to ascending blades at intervals of 1 to 5 cm.; blades with a slender stalk 0.5 to 1.0 cm. long, the distal part a simple flat blade 3 to 13 (to 30) mm. broad and 3.0 to 6.5 (to 13) cm. long, with an obtusely to acutely tapering base, and a usually obtuse apex; blade frequently proliferating from the end, face or margin, producing an attached blade of form similar to the original.

Caulerpa prolifera Lamouroux, Harvey (1858); *C. prolifera* Lamouroux, Farlow (1876); *C. prolifera* (Foerskal) Lamouroux, Collins (1909); *C. prolifera* (Foerskal) Lamouroux, Børgesen (1913); *C. prolifera* (Foerskal) Lamouroux, Collins and Hervey (1916); *C. prolifera* (Foerskal) Lamouroux, Howe (1920); *C. prolifera* (Foerskal) Lamouroux, Hoyt (1920).

Forma obovata J. Agardh

(Frond shorter and broader, obovate-oblong.)

North Carolina to Florida; Bermuda; throughout the West Indies, cosmopolitan in the tropics.

At Dry Tortugas this species is extremely abundant in dredgings in comparatively deep water off Southwest Channel, occurring in depths of 18.3 to 73.2 meters sounded, and probably also 91.5 and 110.0 meters. Growing with Halophilas, especially *H. Baillonis*, and other Caulerpas, on a sandy or muddy bottom.

Collins recognizes a forma *obovata* J. Agardh as occurring in Florida, also forma *zosterifolia* Børgesen; our material was nearer the type than either variety.

Caulerpa racemosa (Foerskal) J. Agardh

Plants forming a branching stolon system on the substratum, extending widely to form plants of a meter or two in diameter; bearing descending rhizoidal branches at frequent intervals, and ascending foliar branches consisting of an erect axis with lateral stalked clavicular to spherical ramuli.

Caulerpa clavifera C. Agardh, Harvey (1858); *C. clavifera* C. Agardh, Farlow (1876); *C. racemosa* (Foerskal) C. Agardh and varieties, Collins (1909); *C. racemosa* (Foerskal) Weber with varieties, Børgesen (1913); *C. racemosa* (Foerskal) J. Agardh and varieties, Collins and Hervey (1917); *C. racemosa* (Foerskal) J. Agardh, and *C. clavifera* (Turner) J. Agardh, Howe (1920).

1. Ramuli abruptly expanded from the pedicel........2
1. Ramuli gradually decurrent on to the pedicel........4

2. Ends of ramuli spherical........7
2. Ends of ramuli depressed........3

[3. Ramuli few, nearly flat, plants small........C. peltata] (100)
3. Ramuli several, convex, plants large........macrophysa (101)

4. Ramuli cylindrical to narrowly clavate........5
4. Ramuli broadly clavate to turbinate........6

5. Axis with many densely imbricate ramuli........lætevirens (101)
5. Axis with few rather distant ramuli........gracilis (101)

6. Ramuli dorsiventrally compressed........uvifera (102)
6. Ramuli not compressed........clavifera (101)

7. Pedicel very short or lacking........microphysa (102)
7. Pedicel equal to the swollen extremity........occidentalis (102)

Var. clavifera (Turner) Weber

(Plate 12, fig. 8; plate 13, fig. 10)

Erect axes 1 to 3 cm. tall, ramuli not crowded, pedicels 0.5 to 1 mm. long, rather gradually expanded into a rounded end (1 to) 1.75 to 2.5 mm. in diameter.

Var. gracilis (Zanardini) Weber

(Frond slender and elongate, often creeping, with rare cylindrical ramuli, or with a considerable number of small clavate ramuli.)

Var. lætevirens (Montagne) Weber forma typica

(Ramuli with swollen summit, turned more or less to one side.)

Var. macrophysa (Kuetzing) n. comb.

(Plate 12, fig. 3; plate 13, fig. 9)

Erect axes 3 to 6.5 cm. tall, ramuli attached at intervals of 2 to 4 mm. in length, expanded sharply into a spherical (?) or depressed-convex end 3 to 5 mm. in diameter.

Var. microphysa (Weber) n. comb.

(Plate 12, fig. 14; plate 13, fig. 11)

Erect axes 3 to 20 mm. tall, ramuli crowded, on pedicels 0.5 mm. long or nearly sessile, abruptly expanded into a spherical top 1.0 to 1.5 mm. in diameter.

Var. occidentalis (C. Agardh) Børgesen

(Plate 12, fig. 5; plate 13, fig. 8)

Erect axes 2 to 10 cm. tall, ramuli not crowded, radially disposed or sometimes somewhat distichous, pedicels 1 to 2.5 mm. long, expanded abruptly to a sub-spherical top 1.5 to 2.5 mm. in diameter.

Var. uvifera (Turner) Weber

(Plate 12, fig. 6; plate 13, fig. 3)

Erect axes 1.5 to 2.5 cm. tall, ramuli closely crowded, sharply ascending, pedicels 2 to 3 mm. long, gradually expanded to a rounded, compressed top which is 1.5 to 2.5 mm. in diameter across the convex compressed face.

The species in the broad sense is cosmopolitan in warm waters. Varieties *clavifera* and *uvifera* are found in Florida, Bermuda, Bahamas and through the West Indies. Variety *occidentalis* appears at the Virgin Islands and elsewhere in the West Indies, but seems to be newly recorded from Florida. Variety *macrophysa* has been reported from Jamaica and St. Croix by Collins; variety *microphysa* does not appear previously to have been reported from America; variety *gracilis* is described from Sand Key near Key West, Florida; variety *lætevirens* is known from Florida and the West Indies.

At Dry Tortugas this species and its varieties were very common in a wide range of habitats. *C. racemosa clavifera* was the general type on the reefs in shallow water. *C. racemosa uvifera* and *C. racemosa occidentalis* were primarily plants of the moat of Fort Jefferson on Garden Key, although the former did appear on rocks in shallow water around Loggerhead Key. *C. racemosa macrophysa* was a plant found only in very deep water, being secured in two hauls off Southwest Channel in depths calculated to be 91.5 and 110.0 meters. *C. racemosa microphysa* was more common than the last, appearing in moderate to deep water at 5.5 and 14.6 to 32.9 meters sounded and probably 91.5 and 110.0 meters, on White Shoal and out Southwest Channel to deep water.

C. racemosa clavifera shows much variation, especially condensed forms in very shallow or exposed situations. Small specimens of *C. racemosa occidentalis* in the moat at Fort Jefferson could not always be distinguished from *clavifera*, and loose forms of *uvifera* were also troublesome to place. The two forms generally described as of *C. racemosa clavifera*, namely forma *macrophysa* and forma *microphysa*, appear to the writer to be much more sharply marked from each other and the remaining local types than varieties *uvifera*, *clavifera* and *occidentalis* are from each other. The local material of *macrophysa* differs from that of Collins (1909) in that the tops of the ramuli are depressed-convex rather than globular, but the writer's copy of P.B.–A 870, given this name by Collins, does not seem to have the tops altogether spherical, some being about as depressed as in the writer's own collections. The nearest other related form is *C. racemosa* variety *Lamourouxii* (Turner) Weber, but the ends of the ramuli in that variety are comparatively little expanded, quite unlike the Tortugas specimens. In addition to the above, the varieties *gracilis* and *lætevirens* may be expected to occur at Dry Tortugas although not recorded.

Caulerpa sertularioides (Gmelin) Howe

(Plate 13, fig. 5)

Plants forming a branching stolon system over the substratum, and forming beds a meter or two in diameter; stolon giving off, sparingly, sturdy descending rhoizoidal branches which reach a length of 10 to 15 cm., and branch to filiform ultimate divisions; also giving off erect foliar branches with a narrow midrib and slender curved cylindrical ramuli with an apical mucro, usually arranged in two ranks to produce a flat blade.

Caulerpa plumaris C. Agardh, Harvey (1858); *C. plumaris* C. Agardh, Farlow (1876); *C. sertularioides* (Gmelin) Howe, Collins (1909); *C. sertularioides* (Gmelin) Howe, Børgesen (1913); *C. sertularioides* (Gmelin) Howe, Collins and Hervey (1917); *C. sertularioides* (Gmelin) Howe (1920).

Forma brevipes (J. Agardh) Svedelius

(Plate 12, figs. 2, 17)

Blade nearly or quite sessile, 1 to 5 cm. long, rarely forked.

Forma Farlowii (Weber) Børgesen

(Pinnules opposite, alternate, in pairs, or even in several rows.)

Forma longipes (C. Agardh) Collins

(Plate 12, fig. 16)

Blade with a naked pedicel 1 to 3 cm. long, reaching 15 (to 25) cm. in length and 22 mm. in breadth, not infrequently forked, occasionally with 3 rows of ramuli.

The species with forma *brevipes* and forma *longipes* is cosmopolitan in warm seas, and known from Florida and the West Indian region to the Virgin Islands; the forma *Farlowii* known from Florida and the Virgin Islands.

At Dry Tortugas well-developed forma *longipes* was only found in the moat at Fort Jefferson on Garden Key, where it grows luxuriantly; specimens without clearly marked varietal characters grew in quiet water generally, but variety *brevipes* was commonest in a condensed type which occurred sparingly in the sublittoral and was dredged from shallow water to 29.3 meters, and one specimen to probably 110.0 meters. A specimen near variety *longipes* was secured in a dredge-haul which began at a depth of 146.6 meters and continued until a sounding of 82.5 meters was registered, and so was growing at least at the latter depth.

From rocks in shallow water and dredged to 9.2 meters there was frequently secured a type of forma *brevipes* with blades 1 to 1.5 cm. long, closely set on the stolons, rigid and dark. This is probably a condensed type related to difficult living conditions. Dwarfed specimens were not uncommon in shallow water about the reefs, but in this environment *C. sertularioides* is not nearly so abundant as *C. racemosa clavifera*. At a depth of probably about 18.3 meters, there was secured a lax form (plate 12, fig. 13; plate 13, fig. 15) with blades 1.5 to 2 cm. long and 1 cm. broad, with few widely spaced ramuli, up to 5 or 6 to a side. It had somewhat the aspect of a sturdy *C. fastigiata*, especially where there were but 2 or 3 ramuli, but these were mucronate. It may be worthy of designation as a distinct form. Some slender, deep-water individuals were suggestive of types of *C. Ashmeadii*, under which heading they are discussed.

Caulerpa verticillata J. Agardh

(Plate 12, fig. 7; plate 13, fig. 2)

Plants forming a decumbent stolon system giving rise to descending rhizoidal segments and erect, forking axes bearing whorls of di-trichotomously branched ramuli which are forked and mucronate at the apices; plants rather tufted, 1 to 3 cm. high, the whorls 2 to 4 mm. in diameter, 1.25 to 2.5 mm. in length, the branches 100μ in diameter at the base to 42μ in diameter at the ultimate segments.

Caulerpa verticillata J. Agardh, Collins (1909); *C. verticillata* J. Agardh, Børgesen (1913); *C. verticillata* J. Agardh, Collins and Hervey (1917); *C. verticillata* J. Agardh, Howe (1920).

Bermuda; Bahamas; Jamaica and the West Indies region in general, seemingly not previously reported from Florida; the writer found abundance of luxuriant material at Key West (Mangrove Key) with *Catenella, Acetabulum* and *Amphibia* on mangrove roots in shallow water.

At Dry Tortugas only secured by dredging; obtained at depths of from 1.8 to 55.0 meters on Loggerhead Key Shoal, Southwest Channel, and seaward from the channel; growing among larger algæ.

Caulerpa Vickersiæ Børgesen, variety luxurians n. var.

(Plate 12, fig. 20; plate 13, fig. 12)

Plants to 2 cm. high, erect with slightly developed stolon, forming descending rhizoidal branches and erect foliar branches, which are sometimes solitary, sometimes in small groups, simple or forked, sessile or stalked, reaching a height of 5 to 15 mm., blades forking 1 to 5 times, or often simple, 1 to 2 mm. broad, ramuli usually opposite in two rows on the slender midrib, 0.5 to 1.0 mm. long, 60μ to 85μ in diameter, sometimes forked, and with obtuse apices, the end wall little thickened, and a mucro entirely absent.

Caulerpa Vickersiæ Børgesen occurs at St. Croix, the Barbadoes and in Japan, according to Børgesen. The occurrence of the variety at Dry Tortugas is the first record for Florida.

This plant was entirely overlooked in 1924, although it grew in a district moderately closely studied. It was found on rocks around the bases of larger algæ and Gorgonians, in shallow water on the outer side of Bird Key Reef and along the shore of Loggerhead Key.

This variety differs from the original species as described by Børgesen in its greater stature, more branching habit, longer and more slender ramuli.

Caulerpa Webbiana Montagne, forma tomentella (Harvey) Weber

(Plate 12, fig. 1; plate 13, fig. 14)

Plants without distinct, naked stolon; branching freely, decumbent to ascending, forming tangled mats 2 dm. or more in diameter, the decumbent portions rather free from chlorophyll and with filiform rhizoids among the ramuli; the ramuli densely imbricate, whorled, about 0.25 mm. long, 0.33 mm. broad, branching 2 to 3 times sub-dichotomously with closely forked, mucronate apices.

Caulerpa Webbiana Montagne forma *tomentella* (Harvey) Weber and forma *disticha* Weber, Collins (1909); *C. Webbiana* Montagne forma *disticha* Weber, Børgesen (1913).

Caulerpa Webbiana Montagne is general in the West Indies; the forma *disticha* from the Virgin Islands; the forma *tomentella* from Barbadoes. Seemingly not previously reported from Florida.

Rather abundantly dredged at one place on the shoal 3 miles north of Loggerhead Key at 11.0 to 12.8 meters, on sand and coral fragments.

PHÆOPHYCEÆ

Plants filamentous or parenchymatous; cells uninucleate, with one to many strap-shaped or lenticular chromatophores containing chlorophyll more or less masked by a brown combination of other pigments; cell division mitotic, often accompanied by the formation of an aster in connection with the spindle; growth apical, trichothallic or intercalary; multiplication by fragmentation of the parent plant, by marginal or similar proliferations, or by special propagulæ formed by modified branches; reproduction by zoöspores produced in unilocular sporangia and by gametes produced in usually plurilocular gametangia, facultative alteration in function of the gametes and the zoöspores being known; evolution of the gametes represented from isogamy to oögamy; zoöspores replaced in function by motionless spores in some genera.

1. Plants filamentous with persistent and obvious apical cells .... Sphacelariales (105)
1. Plants usually without obvious apical cells; if these present, tissue parenchymatous 2

2. Asexual reproduction by zoöspores 3
2. Asexual reproduction by tetraspores, or asexual spores not freed 4

3. Gametophyte and sporophyte equal in size .... Ectocarpales (106)
3. Gametophyte (in some genera) larger than the sporophyte, gametes markedly unequal in size .... Cutleriales (116)

4. Asexual tetraspores freed to produce an equal gametophyte .... Dictyotales (116)
4. Asexual spores retained, producing a condensed gametophyte phase, merely cytological in character .... Fucales (125)

SPHACELARIALES

Filamentous, generally erect and branched, usually becoming polysiphonous in the lower portions of the filaments by the formation of longitudinal walls in the cells, and in some species corticated; growth of the erect filaments from apical cells; sporangia and gametangia known, the latter with indications in some genera of a differentiation of sex; gametophyte and sporophyte generations similar.

SPHACELARIACEÆ Reinke

Filamentous plants, the originally monosiphonous filament growing from an apical cell and dividing by longitudinal walls; reproductive organs formed by the metamorphosis of all or part of a branch, consisting of gametangia and sporangia; multiplication in some species by propagulæ.

SPHACELARIA Lyngbye

Plants filamentous, branched, growing from prominent apical cells, the segments from these divided regularly by vertical walls; axis erect from a partly decumbent or penetrating base, not corticated by segmentation from the axis; reproduction by sporangia (zoöspores) and gametangia (gametes), also by specialized branchlets, propagulæ, which break loose and give rise to new individuals.

1. Propagulæ slender, the stalk and arms many times longer than broad .... S. furcigera (105)
1. Propagulæ short and stout, the stalk and arms very broad .... S. tribuloides (106)

Sphacelaria furcigera Kützing

Generally closely tufted, to 1 cm. tall, the filaments to 36μ in diameter below, bearing slender propagulæ whose stalk attaches to the axis by a rather ill-marked pedicellar joint;

stalk of propagulum to 24μ in diameter and 810μ long, bearing at the summit two slender spreading arms which reach a length of 450μ.

Sphacelaria furcigera Kuetzing, Collins and Hervey (1917).

Florida (Biscayne Bay, Thaxter, det. W.R.T.); Bermuda.

Sphacelaria tribuloides Meneghini

(Plate 14, figs. 7 to 10)

Tufted or scattered sparsely, forming erect branched filaments 4 to 5 mm. tall, 40 to 60μ in diameter, bearing hairs 10 to 15μ in diameter with basal intercalary growth; bearing on short pedicel cells propagulæ with two free arms, having a spread of 140 to 165μ, arms thick, 50 to 67μ broad, general aspect broadly triangular, very rarely with 3 free arms by bifurcation of one of the original arms, and retaining the flattened form.

Sphacelaria tribuloides Meneghini, Børgesen (1914); *S. tribuloides* Meneghini, Collins and Hervey (1917); *S. tribuloides* Meneghini, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands, and probably newly reported for Florida.

At Dry Tortugas this genus is a frequent member of the low turf vegetation covering coquina rock and coral fragments, and is usually so obscured by sand as to be hard to discern; by reason of lack of propagulæ most of the material, while probably this species, is indeterminable. Loggerhead, East and Garden Keys, near the shore.

ECTOCARPALES

Plants monosiphonous or parenchymatous, or of filaments united to form more complex solid types of thallus; sporangia and gametangia known; growth apical, trichothallic or intercalary; gametophyte and sporophyte similar in form.

1. Plants persistently simply filamentous throughout . . . . Ectocarpaceæ (106)
1. Plants in part parenchymatous, or of united filaments with specialized distribution of function 2

2. Plants completely parenchymatous at maturity . . . . Asperococcaceæ (109)
2. Plants at maturity filamentous in construction at least in part 3

3. Plants encrusting, of parallel ascending rows of cells . . . . Ralfsiaceæ (115)
3. Plants pulvinate to erect 4

4. Plants with filaments only as supports for reproductive organs . . . . Stilophoraceæ (115)
4. Plants with evident filamentous construction, or free filaments 5

5. Free vegetative filaments only at stem and branch apices; not pulvinate . . . . Sporochnaceæ (114)
5. No free vegetative filaments, or if present plants pulvinate . . . . Chordariaceæ (111)

ECTOCARPACEÆ

Plants filamentous, branched, with trichothallic or intercalary growth or, especially on decumbent attached parts, apical growth and without longitudinal subdivision of the cells of the filament; gametangia or sporangia formed by the metamorphosis of all or part of an ultimate branch; gametes isogamous or anisogamous.

1. Gametangia and sporangia appearing lateral on free branches; erect filaments generally branched . . . . Ectocarpus (107)
1. Gametangia and sporangia terminal, erect filaments not normally branched 2

2. Erect filaments less than 6 cells high; sporangia and gametangia on 1 or 2 celled pedicels. . . . Myrionema (109)
2. Erect filaments more than 6 cells high; sporangia and gametangia on several-celled pedicels . Phycocœlis (109)

ECTOCARPUS Lyngbye

Plant filamentous, filaments usually branched, branches free or in part appressed to the substratum or endophytic; growth apical, intercalary or trichothallic; cells with band or disk chromatophores and a single nucleus usually centrally placed; reproduction by zoöspores produced in unilocular sporangia and by iso- or anisogametes produced in plurilocular gametangia; sexual and asexual phases of similar vegetative appearance.

1. Plants generally 5 cm. or more in height 5
1. Plants usually smaller 2

2. Plant minute, epiphytic 3
2. Plant macroscopic, gametangia blunt . . . . E. Duchassaignianus (107)

3. Filaments creeping below, the erect filaments simple, elongate gametangia 20μ or more in diameter . . . . E. elachistæformis (107)
3. Filaments in part creeping below, erect filaments usually branched, short 4

4. Gametangia 7μ or more in diameter, erect filaments sparsely branched . . . . E. tortugensis (108)
4. Gametangia less than 6μ in diameter, erect filaments densely branched . . . . E. Zonariæ (108)

5. Gametangia obtuse . . . . E. Mitchellæ (108)
5. Gametangia subulate . . . . E. confervoides (107)

Ectocarpus confervoides (Roth) LeJolis

(Fronds 2 to 50 cm. long, attached, deep brown; branches scattered, secund or alternate, not opposite; lower cells of the branches 18 to 40μ in diameter; sporangia oval or ellipsoidal, 23 to 30μ broad by 35 to 50μ long, sessile; gametangia short subulate or fusoid, sessile or shortly pedicellate, 20 to 40μ broad, 60 to 400μ long, not tapering to a hair tip.)

Reported from Florida as forma *Halliæ* (J. Agardh) F. S. Collins by Collins in Collins, Holden & Setchell, *P.B.A. 1079*. Not *Xanthosiphonia Halliæ* J. Agardh, however, which reports to have been a mixture.

Ectocarpus Duchassaingianus Grunow

(Plate 14, fig. 11)

Plants forming soft tufts to 2 cm. tall, filaments freely branched, branches erect-spreading, to 34μ diameter below, cells about as long as broad; above to 15 or 20μ diameter, the cells as long as broad to one-half longer, and ending in hair tips 9 to 11μ in diameter, with cells to 85μ long; gametangia sessile or with a single stalk cell, cylindrical to spindle-shaped, bluntly rounded at the apex; 19 to 30μ in diameter, and 112 to 188μ long; (sporangia ovate, sessile).

Ectocarpus Duchassaingianus Grunow, Børgesen (1913); *E. Duchassaingianus* Grunow, Collins and Hervey (1917); *E. Duchassaingianus* Grunow, Hoyt (1920).

Florida; Bermuda and the Virgin Islands.

Occasional around Garden Key, especially on *Ulva.*

Ectocarpus elachistæformis Heydrich

(Plate 14, fig. 12)

Plants minute, epiphytic, the decumbent branches attaching to the host by simple or branched hapteræ and giving rise to elongate ascending simple filaments which bear the gametangia near the base; decumbent filaments not forming circumscribed patches, but ramifying widely, cells 9 to 12.5μ in diameter, 27 to 39μ long, irregularly cylindrical, usually constricted at the nodes; ascending filaments rarely branched, but if so at the base, reaching a total length of about 1.0 to 1.5 mm., the lower cells 12.6 to 15μ (to 18μ) in diameter, 18 to

36μ long; upper cells near the hair-tip 10.8μ diameter, 54 to 72μ long; hardly constricted at the nodes, and with many peripheral lenticular chromatophores; hairs also occasionally produced from the basal layer; gametangia 21.6 to 25.2μ in diameter, 63 to 80μ long, spindle-shaped to narrowly conical, pointed; sporangia not seen.

Ectocarpus elachistæformis Heydrich, Børgesen (1913); *E. elachistæformis* Heydrich, Collins and Hervey (1917).

Bermuda; the Virgin Islands; Florida, whence newly recorded.

Frequent on *Zonaria* off Bush Key in 1924 and present on *Castagnea* about Garden Key in 1926.

Ectocarpus Mitchellæ Harvey?

Plants forming large diffuse masses, entangled among other algæ; abundantly branched, the main filaments somewhat twisted to form axis-like strands; axial filaments with cells 28 to 47μ in diameter, 90 to 150μ long, bearing abundant branches, the ultimate with cells 7 to 9μ diameter (gametangia reported as elliptic-oblong to narrowly linear-cylindric, obtuse), sporangia not seen.

Ectocarpus Mitchellæ, Harvey (1852); *E. Mitchellæ* Harvey, Børgesen (1914); *E. Mitchellæ* Harvey, Collins and Hervey (1917); *E. Mitchellæ* Harvey, Howe (1920); *E. Mitchellæ* Harvey, Hoyt (1920).

Florida; Bermuda; Bahamas to the Virgin Islands.

Dredged abundantly to 13.8 meters on Loggerhead Key Shoal.

This material is unquestionably of the dominant *Ectocarpus* and through the summer continued in abundant and luxuriant vegetative condition, but the very many samples examined were all barren, and in the lack of gametangia or sporangia any determination to species is very questionable, and so the description given and based on the Tortugas material may be incorrectly associated with this name.

Ectocarpus tortugensis n. sp.

(Plate 14, fig. 1)

Plant a minute epiphyte; decumbent filaments forming a close mat or ramifying loosely over the host, bearing simple or sparsely branched erect filaments with gametangia; cells of basal filaments irregularly cylindrical, somewhat constricted at the nodes, 12 to 27μ long, 7.5 to 12.5μ in diameter; vertical filaments 7.5 to 13μ in diameter, cells 15 to 25μ long, generally 10μ in diameter and about 10 cells in a filament, reaching a height of about 0.2 mm.; gametangia usually 1 to 3 on a single filament, alternate or opposite, sessile, 7.5 to 15μ in diameter, 25 to 50μ long, oval to broadly cylindrical, obtuse, about 3 to 5 cells broad at widest part; sporangia unknown.

Here newly described from Florida.

Occasional on *Zonaria* off Bush Key, 1924.

Ectocarpus? Zonariæ n. sp.

(Plate 14, fig. 13)

Plant a minute epiphyte, forming small tufts or a turf; erect branches possibly arising from a basal layer, reaching a height of about 0.15 mm., densely branched and bearing hairs and gametangia; vegetative filaments 3.7 to 5.6μ in diameter, the cells equaling or somewhat longer than the diameter, not produced into hair tips; hairs borne laterally on and greatly exceeding the tufted filaments, 5.6 to 6.5μ in diameter, cells several times longer than broad; gametangia from metamorphosed branches, terminal or lateral, cylindrical, 5.6μ or somewhat more in diameter, transverse walls irregular, somewhat oblique, longitudinal walls occasional in most of the gametangia, cells equal or somewhat shorter than their diameter.

Here newly described from Florida.

On *Zonaria*, Bush Key, 1924.

The special hairs would suggest that this is perhaps not an *Ectocarpus*.

MYRIONEMA Greville

Thallus microscopic, epiphytic, cushion-shaped, producing a basal layer of cells from which arise simple cylindrical or clavate assimilative filaments; gametangia pod-shaped, multilocular in several series, at least below, supported by stalks from the basal layer as are the ellipsoid or pyriform sporangia.

Myrionema strangulans Greville. var?

(Plate 14, figs. 2 to 4, 18)

Plant a minute epiphyte, forming disks with a basal layer of closely approximated filaments giving rise to erect assimilative filaments, gametangia and hairs; basal cells 9 to 18μ long, vegetative filaments 7.5 to 11.3μ in diameter, the cells 9.4 to 13.1μ long, the filaments generally 3 to 4 cells high; hairs about 9.4μ in diameter, to 7.5μ at the base, about 50μ long; gametangia 15 to 16.9μ in diameter, 28 to 30μ long, obovoid or oval; (sporangia ovate to subpyriform, 18 to 27μ by 30 to 40μ, short, stalked or sessile on the basal layer).

Frequent on *Zonaria*, Bush Key, 1924. Sporangia found at Tortugas seemed to be on plants of somewhat different character, too sparse to be determinable and perhaps not of this variety.

PHYCOCŒLIS Strømfelt

Thallus a minute epiphyte, cushion-shaped, with peripheral growth; forming a basal layer 1 or 2 cells thick, which may bear erect simple or occasionally branched assimilative filaments, or these may be absent; gametangia formed in close-placed groups on the basal layer or upon the erect filaments, mostly plurilocular, or of a single cell series; paraphyses absent, sporangia unknown.

Phycocœlis floridana n. sp.

(Plate 14, fig. 19)

Plant a minute epiphyte, with decumbent branches ramifying over the host or closely associated to form a disk; becoming 2 cells thick, giving rise to erect assimilative filaments and gametangia, and rarely to hairs; basal cells 7.2 to 10.8μ, generally 9μ in diameter, and 10.8 to 19.8μ, generally 16μ long, erect filaments 8.46 to 10.34μ in diameter, cells 17.5 to 25μ long, the filaments averaging about 12 cells in length; gametangia 12.5 to 30.0μ, generally 24μ in diameter, and 50 to 80μ long, spindle-shaped, obtuse to acute at the apex; hairs scarce, 8.5μ in diameter, about 100μ long.

Here newly described from Florida.

Abundant on *Zonaria*, Bush Key, 1924.

ASPEROCOCCACEÆ Foslie

Plants of moderate to large size, hollow and inflated, growth mostly intercalary, structure parenchymatous; gametangia and sporangia formed from surface cells of the thallus, sometimes associated with paraphyses; hairs present, in tufts.

1. Thallus tubular, branched .... Rosenvingea (111)
1. Thallus expanded, lobed 2

2. Thallus sub-spherical inflated to expanded, continuous .... Colpomenia (110)
2. Thallus early expanded, clathrate to lacunose-spongy .... Hydroclathrus (110)

COLPOMENIA Derbès and Solier

Plant hollow, sub-spherical to irregular; parenchymatous; bearing cylindrical gametangia in dense superficial sori; hairs in tufts.

Colpomenia sinuosa (Roth) Derbès and Solier

(Plate 7, fig. 1; plate 19, figs. 3, 4)

Plant rounded, inflated, 3 to 5 cm. in diameter, becoming lobed, irregular; solitary or clustered; wall 0.3 to 0.4 mm. in thickness, composed internally of nearly colorless cells, to 180μ diameter, smaller toward the surface which layer is of small cells 3.7 to 7.5μ diameter, richly filled with chromatophores; gametangia forming sori, 18.8 to 30.0μ tall, 3.7 to 7.5μ diameter, with obovate paraphyses reaching 11μ diameter and 47μ tall; hairs in tufts scattered.

Asperococcus sinuosus Bory, Harvey (1852); *A. sinuosus* Bory, Farlow (1876); *Colpomenia sinuosa* (Roth) Derbès and Solier, Børgesen (1914); *C. sinuosus* (Roth) Derbès and Solier, Collins and Hervey (1917); *C. sinuosus* (Roth) Derbès and Solier, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

In 1924 only a very few tiny fragments were found, although carefully searched for, while in 1925 it was frequent over the same areas, shores of Loggerhead and Garden Keys, and Bird Key Reef and was dredged to 13.8 meters on Loggerhead Key Shoal; but it was quite uncommon again in 1926 although secured from Garden and Middle Keys and by dredging to 11 meters in Southwest Channel.

HYDROCLATHRUS Bory

Plant forming round to cushion-shaped masses; clathrate; the structure parenchymatous; sporangia generally distributed over the thallus surface.

Hydroclathrus clathratus (Bory) Howe

(Plate 15, fig. 19; plate 19, fig. 1)

Plant forming expansions to 4 dm. or more in diameter, 1 to 5 cm. thick, clathrate, thallus wall about 0.3 mm. thick, composed of a central parenchyma of cells 50 to 150μ diameter, with smaller ones toward the surface layer, which is of cells 5.5 to 9μ in diameter, distinctly grouped in families, richly provided with chromatophores; hairs in depressed sori.

Hydroclathrus cancellatus Bory, Harvey (1852); *H. cancellatus* Bory, Farlow (1876); *H. cancellatus* Bory, Børgesen (1914); *H. cancellatus* Bory, Collins and Hervey (1917); *H. clathratus* (Bory) Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Abundant on the rocks on the inner side of Bird Key Reef, and dredged to 7.6 meters on Loggerhead Key Shoal, also Garden, Middle, East and Sand Keys.

In June to July 1924 there was no sign of this interesting plant. In June 1925, on the same ground which had been carefully and minutely surveyed the year before, it was exceedingly abundant, and it was common also in 1926.

ROSENVINGEA Børgesen

Plant tubular, cylindrical or compressed, attached by a basal disk, branching sparsely (?) pseudodichotomous; growth intercalary; axis composed of 3 to 4 layers of cells, the outer forming a close epidermis of angular cells with (probably) a single chromatophore, the large inner cells nearly colorless; hairs single, scattered, or aggregated into sori; gametangia sub-cylindrical to clavate, formed by subdivision of the epidermal cells.

Rosenvingea intricata (J. Agardh) Børgesen

(Plate 15, figs. 15 to 17)

Plant tubular, cylindrical or somewhat flattened, alternately or subdichotomously, generally abundantly branching, especially in the upper portion; branches 1 to 10 mm. in diameter, generally contorted, often intricate and adherent, the apices subulate; cells of the epidermis angular, 9 to 19μ in diameter; of the inner layer to 28 or 37μ broad by 56 to 131μ long; height 3 to 4 dm. or more, or low and densely matted and tangled.

Rosenvingea intricata (J. Agardh) Børgesen (1914); *R. intricata* (J. Agardh) Børgesen, Collins and Hervey (1917); *Striaria attenuata* forma *ramosissima* (Kuetzing) Hauck; Collins, Holden and Setchell, Phycotheca Boreali-Americana No. 737.

Florida; Bermuda.

Dredged off Southwest Channel, Dry Tortugas, in 11.0 to 35.5 meters.

CHORDARIACEÆ

Plants of small to large size, showing internal nearly colorless filaments and cortical assimilative filaments which branch and which bear the gametangia, sporangia and hairs.

1. Plants small, pulvinate, epiphytic, without a distinct ascending axis . . . . Elachistea (113)
1. Plants large, of branched, lubricous filaments . . . . Castagnea (111)

CASTAGNEA Derbès and Solier

Plants of moderate size, branching and cord-like in appearance, soft and gelatinous in consistency; structurally composed of an axial strand of closely twisted filaments with few chromatophores, which give rise to closely placed divergent lateral branched filaments, the outer cells of which are rich in chromatophores, frequently bear hyaline hairs and may produce unilocular sporangia or plurilocular gametangia.

1. Plant slender; gametangia 6.6 to 8.3μ in diameter and 10 to 20 cells in length . . . . C. Howei (111)
1. Plant stout; gametangia 13 to 19μ in diameter and few to 10 cells in length . . . . C. Zosteræ (112)

Castagnea Howei, n. sp.

(Plate 15, figs. 1 to 8)

Plants very lubricous, axes 2 to 4 dm. long or probably longer, generally much tangled below; diameter of branches generally 0.3 mm., frequently less, becoming at most 1 mm. in the largest main axes; branching alternate, abundant, especially in younger portions; structure filamentous, the axial strands giving off lateral filaments which form an assimilative cortex; axial cells 132 to 1,410μ long by 58 to 166μ in diameter; lateral assimilative filaments 10 to 16.5μ generally about 12μ toward their summits and 3.2 to 8.0μ, generally about 6.5μ toward their bases, the cells cylindrical below to moniliform or reniform above, containing several small chromatophores, cells few to about 8 to a branch; hyaline hairs present, not abundant, 8 to 10μ in diameter at the base; gametangia and sporangia generally but not invariably on separate plants; gametangia borne near the base of the fascicle of assimilative filaments, replacing branches, up to 10 in a fascicle, 6.6 to 7.5μ in diameter and 36.5 to

66μ in length on a strictly gametangial plant; 1 or 2 cells in diameter, 10 to 20 or more cells in length, somewhat constricted at the transverse walls, never branching; on a plant bearing abundant sporangia there were found many gametangia 6.6 to 8.3μ in diameter and 50 to 78μ long; sporangia replacing assimilative filaments located near the base of a fascicle, 1 to 6, generally not over 2 in a fascicle, spherical to ovoid, straight or asymmetrical, 18 to 37μ in diameter by 20 to 45μ long.

Here newly described from Florida.

At Dry Tortugas found as washed ashore, or abundantly dredged in 7.3 to 34.5 meters, possibly also 91.5 and 110.0 meters. The plant was not found definitely attached to anything, but simply entangled among coarser algæ. Named in appreciation of the services of Dr. Marshall A. Howe in extending our knowledge of the algæ of the Florida-West Indian region. Distinguished from *C. Zosteræ* by its more slender, lubricous habit, its unbranched and much more slender gametangia which are little divided by longitudinal walls, and the rather shorter sporangia.

Castagnea Zosteræ (Mohr) Thuret

(Plate 14, figs. 20 to 22; plate 15, fig. 9)

Plants erect from a small holdfast; paniculately much branched, branches from 0.75 to 2.5 mm. in diameter, the ultimate branchlets somewhat irregular; height to 1.5 to 2 dm.; structure filamentous, the axial strands giving off lateral filaments which form an assimilative cortex, the filaments of which are composed of series of cells about 5.6 to 7.5μ wide and 19 to 28μ long at the base, hardly constricted at the nodes, becoming more deeply and often unilaterally constricted above, where the cells are 11 to 15μ in diameter and 13 to 21μ long; sporangia usually 1 to 3 in the fascicles of assimilative filaments, of varied age, at maturity 30μ to usually 36μ occasionally 38μ diameter, and 56μ to generally 64μ, occasionally 80μ long; gametangia normally on separate plants, formed by the transformation of assimilative filaments; simple to much branched, in some individuals with 12 or more arms; simple gametangia of 5 to 10 moniliform cells about 13μ in diameter; gametangial filament with cells sometimes divided longitudinally, and this type grading into short and broad organs reaching 19μ in diameter and 48μ long, which may be oppositely, alternately or secundly branched; cortical filaments also bearing colorless hairs 7.5 to 15μ in diameter, the cells reaching 150μ long; cells of the axis reaching 50 to 112μ diameter and 200 to 400μ in length.

Castagnea Zosteræ Thuret, Farlow (1876); *C. virescens* Thuret (for Florida record?), Farlow (1876); *C. Zosteræ* Thuret, Farlow (1891); *C. Zosteræ* (Mohr) Thuret, Børgesen (1914); *C. Zosteræ* (Mohr) Thuret *fide* Børgesen, Collins and Hervey (1917); *C. Zosteræ* (Mohr) Thuret, Howe (1920); *C. Zosteræ* (Mohr) Thuret, Hoyt (1920).

New England to Florida; Bermuda; Bahamas; and to the Virgin Islands.

A coarse form was abundant on *Thalassia*, especially around Garden Key, in the early part of the season; East Key and dredged to 11 meters in Southwest Channel.

The *Castagnea* material from warm waters is rather different in aspect from that found on the New England coast, as has been remarked by other students of American tropical algæ for their own districts. This is especially true of the deep-water extreme type, which has the character of a slender *Mesogloia* in its extreme slimyness, and appears to be a new species. Hoyt reports gametangia and sporangia on the same plants. No sporangia were seen on the sexual material at Tortugas; on the sporangial plants the assimilative filaments often had much the aspect of gametangia and even their dense contents, but none showed the longitudinal cell walls, nor the branching form, nor did any seem to have matured and shed their contents. Consequently the presence of sporangia and gametangia on the same plant at Dry Tortugas remains questionable.

Farlow reports *C. virescens* (Carmichael) Thuret from Sand Key, Florida. Such material as the present writer saw in the Farlow Herbarium from Florida, including some from Dry Tortugas collected by Hooper, seems to find its best place under the name *C. Zosteræ* here adopted.

CLADOSIPHON Kuetzing

Plant filiform branched, hollow, the wall composed of a few layers of longitudinally directed filaments, the inner cells longer than wide, the outer more isodiametric or somewhat wider than broad; assimilative filaments tufted, with comparatively short, nearly cylindrical or somewhat constricted ultimate branches; sporangia pyriform or asymmetrically uviform, arising from the base of the assimilative filaments; gametangia cylindrical to cylindrical spindle-shaped, generally of a single cell row, and resulting from metamorphosis of the assimilative filaments.

Cladosiphon? floridana n. sp.

(Plate 15, figs. 10 to 14)

Fragment of plant bearing branches to 6 cm. long, these in turn to 3 times successively alternately or oppositely branched; principal axis and main branches to 1 mm. broad, the ultimate branches about 0.1 mm. broad, tapering to slender tips; structure filamentous, of an axis of longitudinal filaments bearing short radiating rows of assimilative cells and colorless hairs; axis hollow, enclosing a few rather loose slender filaments, those forming the main walls of large and elongate cells to about 256μ long by 90μ in diameter; decreasing outwardly to small cells about 14 to 18μ in length and breadth; assimilative filaments generally 1 to 2 on the smaller outer axial cells, often somewhat laterally compressed, from the surface view generally 7.5 to 9.5μ in diameter, the rows generally of 3 cells and about 25 to 30μ long; reproductive organs gametangia, usually aggregated into sori of rather indefinite extent, borne on 1 to 2 celled stalks and so replacing the outer cells of the potential assimilative filament, usually solitary, sometimes 2 to 3 together on one stalk, of 1 to 2, more generally 4 to 8, rows of cells, diameter 5.7 to 11.4μ, average 9.0μ, length 9.7 to 16.2μ, average 12.2μ; sporangia unknown.

Newly described from Florida.

East Key, Dry Tortugas, on a block of coral in shallow water.

Differs in some respects from *Cladosiphon*, especially in the less-tufted assimilatory filaments and the more sturdy gametangia, which are apparently terminal.

ELACHISTEA Duby

Plant forming a dense tuft of filaments, the basal portion of the group endophytic, usually causing a swelling on the host; free filaments branched only at the base, forming long assimilative filaments which have basal intercalary growth and are of greater diameter in their distal part, and also short filaments of determinate growth which may bear plurilocular gametangia or unilocular sporangia.

Elachistea minutissima n. sp.

(Plate 14, fig. 17)

Plants minute, epiphytic in the cryptostomata of *Sargassum;* basal filaments ramifying throughout the cryptostomata and (?) between the neighboring cells of the host, giving rise to erect, branched filaments; from the lower, branched portion there arise assimilative filaments with basal intercalary growth, paraphyses and gametangia; assimilative filaments reaching 0.425 mm. in length, 9.4 to 13μ in diameter, cells equal or to twice as long as broad, with many rounded chromatophores; paraphyses at maturity 40 to 56μ long, 4.5 to 5.0μ in diameter above, the lower cells sub-cylindrical, the uppermost ovoid, but ovoid moniliform throughout when young; gametangia 3.76 to 5.6μ in diameter, rarely if ever with longitudinal walls, 37.6 to 81μ long, narrowly cylindrical; sporangia not seen.

Here newly described from Florida.

This little plant is much more minute than that described as *Myriactis pulvinata* (Kuetzing) var. *minor* by Farlow from New England and afterward transferred as *E. minor* (Farlow) by Collins. This Farlow reports to have gametangia with a diameter of 7.6μ, paraphyses with a diameter of 7.5 to 18μ, and assimilative filaments as absent. At times in *E. minutissima* gametangia occupied the tip of an otherwise apparently normal assimilative filament some 100μ in length.

SPOROCHNACEÆ

Plants filamentous, coarse at least below, branched, the branches of indefinite growth bearing short, pedicellate, swollen lateral branches which terminate in a tuft of hairs; reproduction by sporangia borne laterally upon the upper portion, or at the base, of branched filaments, and associated in groups.

SPOROCHNUS C. Agardh

Plants consisting of an erect axis with alternate branches and bearing short stalked ramuli which are tipped with tufts of assimilative filaments; growth of the apex of the axis and branches trichothallic, these being tipped with notably large tufts of hairs; reproduction by sporangia borne on branched and stalked filaments upon the ramuli.

1. Ramuli ovoid to short-spindle shape, pedicels short, to 2 mm. long .... S. pedunculatus
1. Ramuli long cylindrical, pedicels to 10 mm. long .... S. Bolleanus

Sporochnus Bolleanus Montagne

(Plate 14, fig. 14)

Thallus in excess of 4 dm. tall, coarse, branched, the branches beset with short ramuli which reach a length of 3.6 mm. diameter of 0.5 mm., on pedicels 8 to 10 mm. long; these tipped with a tuft of assimilative filaments reaching 8 to 10 mm. long when young, but shedding them when older, the leading axes also tipped with a large tuft of assimilative filaments reaching a length of 12 to 15 mm.

Sporochnus Bolleanus Montagne, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

A few fine plants dredged in Southwest Channel in 14.6 to 34.7 meters.

Sporochnus pedunculatus (Hudson) C. Agardh

(Plate 3, fig. 8; plate 14, figs. 15, 16)

Plants in excess of 3 dm. tall, slender, freely branched, and the longer of these branches branched in the second order; the main axis remaining apparent, lateral branches reaching 2 dm. in length; axis and branches of all orders closely (intervals of 2 to 5 mm.) beset with short ramuli; ramuli generally 0.75 to 1.25 mm. long, rarely to 2 mm., 0.5 mm. diameter, on pedicels usually 1 mm. rarely to 2 mm. long, when young tipped with a tuft of assimilative filaments 3 to 4 mm. long; long branches also tipped with a tuft of filaments, which reach 5 mm.; assimilative filaments shed in old plants.

Sporochnus pedunculatus (Hudson) C. Agardh, Hoyt (1920).

Beaufort, North Carolina: newly reported for Florida; of wide distribution.

Frequently dredged at Dry Tortugas in 5.5 to 55.0 and probably 91.5 and 110.0 meters in Southwest Channel. In luxuriant vegetative condition, the material in pieces to over 3 dm. long, but no large entire plants secured.

STILOPHORACEÆ

Erect branching plants of moderate size, growth apical, structure fundamentally filamentous, although appearing parenchymatous; reproductive organs borne laterally on branched supporting structures, generally distributed or in sori.

Stilophora ? tropica n. sp.

(Plate 3, fig. 9; plate 14, figs. 5, 6; plate 19, fig. 2)

Plant in excess of 7 cm. tall, abundantly branched, the lateral branches with a distinct leading axis, papillose, the papillæ crowned with a tuft of brown hairs, having a basal growth; the branches and main axis with a medullary "parenchyma" of large oval cells 75μ or more in diameter, surrounded by smaller elongate cells 27 to 37μ diameter, and externally by a single cortical layer of cells seemingly free from each other laterally; this layer bearing the sporangia, usually 2, sometimes 3 on a stalk cell with, in the middle of the group of sporangia, 1 or 2 large clavate paraphyses containing rounded chromatophores in the broad distal end; sporangial areas largely surrounding the hair tufts; sporangia 30 to 37μ long, 13 to 17μ wide, paraphyses 20 to 26μ wide, 40 to 52μ long, hairs 15 to 20μ in diameter.

Newly described from Dry Tortugas, Florida.

One portion of a plant, dredged in 9.2 to 14.6 meters in Southwest Channel.

RALFSIACEÆ

Plants crustaceous, of filamentous construction, the filaments decumbent below, erect above, and bearing gametangia and sporangia, at least the former lateral on special branched filaments from the surface of the thallus.

RALFSIA Berkeley

Plant filamentous, the filaments united to form a sub-foliaceous or more generally crustaceous, closely adherent disk; structurally with filaments closely united, forming somewhat of a membrane below, where they often are oblique in position; above becoming parallel and erect, somewhat more distinct; in fruiting portions the sterile filaments quite distinct as paraphyses; sporangia and gametangia on separate plants, lateral on the outer part of the erect filaments.

Ralfsia expansa J. Agardh

(Plate 15, fig. 18; plate 37, figs. 1 to 3)

Plants small, forming crusts 2 to 5 mm. in diameter, or indefinite associations, the crusts closely adherent, thin, reaching 30 to 120μ in thickness; composed of closely associated erect filaments 4 to 11 cells long, the end cells somewhat enlarged, 9.5 to 13.5μ in diameter, arising from a rather indefinite basal layer from which rhizoids extend somewhat into the substratum; reproductive organs not found.

Ralfsia expansa J. Agardh, Børgesen (1914).

Virgin Islands; apparently newly reported from Florida.

Abundant on old conch shells and on stones, Garden Key, Dry Tortugas; sterile.

CUTLERIALES

Plants erect, developed from a notable trichothallic margin, or decumbent, developed from a trichothallic margin or a marginal row of apical cells; sexual and asexual plants equal in size or the sporophyte smaller; reproductive cells zoöspores or anisogametes, the female gametes much larger than the male, and sexual plants diœcious.

CUTLERIACEÆ

Plants moderately large, erect, irregularly dichotomously divided and with trichothallic growth, showing medullary and epidermal layers, the latter equal on the two sides, producing anisogametes on separate plants; or, small, decumbent, little divided and with a marginal row of apical cells, showing medullary and surrounding layers, the sub-epidermal layers more developed on the upper side, producing sporangia.

AGLAOZONIA Zanardini

Plants decumbent, more or less firmly attached to the substratum, or in part free; growth marginal, structure showing medullary and epidermal layers, with a distinct dorsiventrality, the cells of the lower epidermis being larger than those of the upper; reproduction by zoöspores; generally considered the sporophyte phase of *Cutleria* but that form not known in this area.

Aglaozonia canariensis Sauvageau

(Plate 15, figs. 23 to 25; plate 37, fig. 4)

Plant decumbent, 1 to 3 cm. or somewhat more in spread; attached at the base and more or less generally over the lower face by rhizoids; thallus little cleft, becoming round-reniform to sub-orbicular; light brown to more often ferruginous or reddish or yellowish, frequently with darker markings, becoming dark brown on drying; showing in structure a marginal row of apical cells and developing a single layer of large medullary cells surrounded by sub-epidermal and epidermal layers of smaller cells, the number of sub-epidermal layers usually 0 to 2 on the lower side and 2 to 3 on the upper side of the blade, which is about 200μ thick; epidermal cells overlying medullary cells about 2 to 4 on one face and 4 to 8 on the other face.

Aglaozonia canariensis Sauvageau, Børgesen (1914); *A. canariensis* Sauvageau, Howe (1920).

Florida; Bahamas and the Virgin Islands.

Dredged on bases of corals and Gorgonians at 9.2 to 13.8 meters on Loggerhead Key Shoal.

DICTYOTALES

Plants with alternation of equal generations; asexual reproduction by tetraspores; sexual reproduction by non-motile eggs and motile sperm.

DICTYOTACEÆ

Plants of moderate to large size, growing from an apical cell or a marginal row of apical cells, forming a fan-like or a strap-shaped branching thallus, composed of cortical and medullary layers of cells; sexual and asexual generations distinct, the plants of the two phases similar in form; sexual reproductive elements eggs, borne singly in the superficial oögonia, and sperm, borne in great numbers in the many-celled superficial antheridia; asexual reproductive elements consisting of tetrasporangia in which, as a result of the maturation divisions, 4 non-motile spores are produced.

1. Thallus branched, branches essentially strap-shaped........................2
1. Thallus entire or lobed, segments essentially fan-shaped........................5

2. Thallus without midrib........................3
2. Thallus with a midrib........................Neurocarpus (121)

3. Thallus narrow (less than 1 cm.) and richly branched........................4
3. Thallus broad (over 1 cm.), sparsely branched........................Spatoglossum (124)

4. Thallus with medulla 1 cell thick, rather translucent........................Dictyota (117)
4. Thallus with medulla 2 cells thick at margin, rather opaque........................Dilophus (122)

5. Apical margin of thallus rolled inward........................Padina (123)
5. Apical margin of thallus straight........................Zonaria (124)

DICTYOTA Lamouroux

Plants erect, attached by an irregular holdfast and often by secondary holdfasts developed on such branches as come into contact with the substratum; much branched, each branch developing from a shallow, convex apical cell; thallus with a single medullary layer covered with a cortex 1 cell thick; reproductive organs as typical for the family, the gametangia produced in sori, the tetrasporangia scattered; inconspicuous hairs in sori on the face of the thallus.

1. Ultimate branching pinnate........................D. dentata (119)
1. Ultimate branching dichotomous or cervicorn........................2

2. Thallus margin with sub-cylindrical teeth........................D. ciliolata (119)
2. Thallus margin entire or somewhat proliferous........................3

3. Thallus branching essentially dichotomous throughout........................4
3. Thallus branching cervicorn to irregular........................D. cervicornis (118)

4. Thallus to 1 or 2 mm. broad below, but filiform at least above........................D. divaricata (120)
4. Thallus broader, not greatly narrowed above........................5

5. Internodes less than 4 times longer than broad, upper dichotomies broad (about 80°)....D. Bartayresii (117)
5. Internodes more than 4 times longer than broad, upper dichotomies narrower (about 10° to 60°)........................6

6. Internodes 5 to 10 times as long as broad........................7
6. Internodes 15 to 20 times as long as broad........................D. indica (120)

7. Plants larger, lower portions little darker below, upper angles about 15° to 45°.........D. dichotoma (119)
7. Plants smaller, lower portions darker and stiff, angles 45° to 90°..................D. pardalis (120)

Dictyota Bartayresii Lamouroux

(Plate 16, fig. 16; plate 19, fig. 10)

Plants usually low, dense, branches when young frequently complanate, later strongly crisped, entangled, 2 to more usually 4 to 6 mm. broad, internodes 1 to 4 times as long as broad, dichotomies equal, angle 45° to 90°, usually about 80°, translucent and not much darker in lower portions of tuft.

Dictyota Bartayresiana Lamouroux, Harvey (1852) at least *p.p.; D. Bartayresiana* Lamouroux, Farlow (1876), *p.p.; D. Bartayresiana* Lamouroux, Børgesen (1914); *D. Bartayresii* Lamouroux, Collins and Hervey (1917); *D. Bartayresii* Lamouroux, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

This species at Dry Tortugas is primarily a form of the rocky bottom, being abundant in shallow water on Bird Key Reef, reaches especial luxuriance of habit on the rocky parts of the flats between Bird Key and Bird Key Reef occurring in the beds of Gorgonians around the islands in general, and was dredged to 32.9 meters.

As delimited here, this species is fairly easily recognized. It comes rather close to some broad forms which, because of spur-like branches, are placed in *D. cervicornis*, but which may perhaps be closely related to this species. It is often abundantly proliferous below, or on injured tips.

Dictyota cervicornis Kuetzing

(Plate 16, fig. 17)

Plants of medium height, branches of erect habit, but the slender forms rather tangled below; branching sub-dichotomous to notably irregular, the reduced numbers of each dichotomy frequently short and spur-like; in the typical plant branches very slender, 1 to 2.5 mm. wide, the internodes 1 to 3.5 cm. long, occasionally twisted; very generally proliferous along the middle of the blade, plants about 1 to 2 dm. tall.

Dictyota fasciola Lamouroux (?) in Harvey (1852); *D. fasciola* Lamouroux, Farlow (1875); *D. acutiloba* C. Agardh, Farlow (1875) is probably *D. cervicornis* Kuetzing forma *spiralis fide* specimens in U. S. National Herbarium collected by Hooper at Key West; *D. cervicornis* Kuetzing, Collins and Hervey (1917); *D. cervicornis* Kuetzing, Howe (1920).

1. Branches slender, to 1 or 1.5 mm. wide........................2
1. Branches broader..3

2. Erect and tufted, angles narrower, little twisted................D. cervicornis
2. Matted and entangled, angles broad, notably spirally twisted....fa. spiralis

3. Branches narrower, upper angles about 60°....................fa. pseudodichotoma
3. Branches broader, upper angles about 90°.....................fa. pseudobartayresii

Forma spiralis n. fa.

(Plate 16, fig. 10)

Branches slender, 1.5 to 2 mm. broad, the internodes 1 to 1.5 cm. long, notably spirally twisted; the plants low, dense, about 5 cm. tall.

Forma pseudodichotoma n. fa.

(Plate 16, fig. 13)

Branches moderately broad, 2 to 2.5 mm., the internodes 1 to 1.5 cm. long, angles about 60°; plants about 1 dm. tall.

Forma pseudobartayresii n. fa.

(Plate 16, fig. 15)

Branches 2 to 4 mm. broad, the internodes usually short, 1 to 2 cm. in length, angles about 90°; plants about 1 dm. tall.

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this species was most frequent on a sandy bottom in rather shallow water, being particularly frequent on the flats west of Garden Key and was collected at East, Sand, and Middle Keys. Forma *spiralis* occurred on rocks, especially on Bird Key Reef, East Key, and the forma *pseudodichotoma* was dredged to 13.8 meters on Loggerhead Key Shoal.

The material which fits the description of the typical form is the only material which the writer is thoroughly satisfied belongs here. That which comes under the forma *spiralis* is of totally different appearance, and only the short branches place it in this species; perhaps it is closer related to *D. volubilis* Kuetzing; that which comes under the forms *pseudodichotoma* and *pseudobartayresii* is so different in habit from the typical that here also only the cervicorn branches cause its retention under this species name, as the resemblances to *D. Bartayresii*, *D. dichotoma* and to *D. indica* Sonder *sensu* Collins are very striking.

Dictyota ciliolata Kuetzing

(Plate 17, fig. 1)

Plant to 15 cm. high or probably more, rather regularly dichotomously branched, the angles narrow and rounded to acute; segments sometimes flat, frequently spirally twisted, breadth to 4 mm. above the forkings and to 8 mm. below them; margins sub-entire to closely and rather regularly ciliate, the projections differing from the proliferations frequent here as elsewhere in the genus in tapering from a broadly triangular base toward the acute apex.

Dictyota ciliata J. Agardh, Harvey (1852); *D. ciliata* J. Agardh, Farlow (1876); *D. ciliata* J. Agardh, Børgesen (1914); *D. ciliata* J. Agardh, Collins and Hervey (1917); *D. ciliolata* Kuetzing, Howe (1918, 1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

Collected by Hooper at Dry Tortugas in 1876; not found by the writer in 1924 or 1925, but in 1926 frequent on the southwest wide of Middle Key, in luxuriant condition.

Dictyota dentata Lamouroux

(Plate 16, figs. 4, 5)

Plants robust, 1 to 2 dm. tall, the branch system showing a well-defined main axis with the lateral branches alternately disposed; main axis reaching 6 mm. broad with primary branches at intervals of 1 to 2 cm., ultimate branches of indefinite growth 2 to 3 mm. broad and bearing alternate spur-like branchlets 1 to 3 mm. long at intervals of 3 to 7 mm., which are either broadly rounded (on young plants or shoots) or more generally erose-dentate or spinulose tipped.

Dictyota dentata Lamouroux, Børgesen (1914); *D. dentata* Lamouroux, Collins and Hervey, (1917); *D. dentata* Lamouroux, Howe (1920).

Florida; Bermuda and probably throughout the West Indies to the Virgin Islands.

This is not a common species at Dry Tortugas; several good collections were made on Loggerhead Key Shoal at depths to 14.6 meters; and it was obtained from Garden and Middle Keys, seemingly most frequent on rocky bottom in about 3.1 meters of water. Easily recognized and very handsome.

Dictyota dichotoma (Hudson) Lamouroux

(Plate 16, fig. 14)

Plants of moderate size, about 1 dm. tall, branches regularly dichotomous, 3 to 4 mm. broad, internodes 1 to 2.5 cm. long, angles of dichotomy narrow, usually 15° to 45°, rarely proliferous except at base, which is in color and texture much like the rest of the plant.

Dictyota dichotoma Lamouroux, Harvey (1852); *D. dichotoma* DeCandolle, Farlow (1876); *D. dichotoma* (Hudson) Lamouroux, Collins and Hervey (1917); *D. dichotoma* (Hudson) Lamouroux, Howe (1920); *D. dichotoma* (Hudson) Lamouroux, Hoyt (1920).

North Carolina and Florida; Bermuda; West Indies to Bahamas; a cosmopolitan species.

At Dry Tortugas typical material is exceedingly scarce; specimens placed under this name are occasional in shallow water about Garden Key.

Early records of *D. dichotoma* are based on a variety of forms, especially *D. Bartayresii* and broad forms of *D. cervicornis*.

Dictyota divaricata Lamouroux

(Plate 16, figs. 6 to 9)

Plants of small to sometimes moderate size, 3 to 7 cm. high; branching regularly dichotomous, the branches at first at least sometimes quite broad, reaching 3 mm., but with continued growth quickly, and frequently very abruptly, narrowed to about 0.2 to 0.1 mm. above, angles of the dichotomies broad, especially in upper portion, generally 90° to 120°, length of internodes 2 to 12 mm.; when young the branches are notably complanate and the whole tuft shows a strikingly regular overlapping of the recurved branches near the margin, and at this time the plants are very beautifully iridescent, but later they may become of more erect habit and looser growth, when they are much tangled and of inconspicuous coloring.

Dictyota linearis (C. Agardh) Greville, Børgesen (1914); *D. divaricata* Lamouroux, Collins and Hervey (1917); *D. divaricata* Lamouroux, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands; seemingly not previously reported for Florida.

At Dry Tortugas this species is very common everywhere on rocky bottom, and especially in shallow water, where the iridescent tufts are usually easily recognized; it was dredged to 13.8 meters.

Dictyota indica Sonder sensu Collins

(Plate 16, fig. 1)

Plants resembling *D. dichotoma,* but the branches 1.0 to 1.5 mm. broad, not tapering, the internodes 1.5 to 4.0 cm. long.

Dictyota indica Sonder, Børgesen (1914); *D. indica* Sonder, Collins and Hervey (1917).

Bermuda; newly reported from Florida.

Occasional in shallow water, particularly in the moat, Fort Jefferson, Garden Key and dredged at 27.5 meters beyond Southwest Channel.

The present writer doubts if this plant is actually cospecific with that described by Sonder; on the other hand he also finds difficulty in accepting it merely as a growth form of *D. dichotoma.* Material listed by Børgesen as *D. indica* Sonder and material listed by Collins as that species appears to be the same as what is here called *D. indica sensu* Collins, whereas oriental *D. indica* does not appear to be very like the present material so far as can be judged from that seen at the Herbarium of the New York Botanical Garden or material at the U. S. National Herbarium from Grand River, Mauritius.

Dictyota pardalis Kuetzing sensu Børgesen

(Plate 16, fig. 12)

Plants resembling *D. dichotoma,* but smaller and to about 7 cm. tall, branches fairly regularly dichotomous, the lower parts of the tuft dark and stiff; abundantly proliferous at the base; branches 2.0 to 2.5 mm. broad, internodes 8 to12 mm. long, angles of the dichotomies 45° to 90°.

Dictyota pardalis Kuetzing, Børgesen (1914).

Virgin Islands; newly reported for Florida.

This plant seems to be that reported by Børgesen from the Virgin Islands, although a little larger; however, its separation from *D. dichotoma* is not absolutely satisfactory to the writer.

Occasional in shallow water, especially near Garden Key.

Neurocarpus Weber and Mohr

Plants of small to large size, growing from an apical group of cells, much branched, the branches strap-shaped, with a pronounced midrib; reproductive organs as typical for the family, the tetrasporangia more or less collected into sori, as are the antheridia, but the oögonia are scattered; hairs in sori on the face of the frond or collected near the midrib.

1. Branches over 1 cm. broad above, dark brown in color .... N. Justii (121)
1. Branches less than 1 cm. wide, light-colored and transparent 2

2. Branching irregularly dichotomous, plants small and rather tangled .... N. delicatulus (121)
2. Branching irregularly alternate, plants larger .... N. plagiogrammus (122)

Neurocarpus delicatulus (Lamouroux) Kuntze

(Plate 17, fig. 7; plate 19, fig. 6)

Plants low, small or indefinitely spreading, with dichotomous to irregular branching with broadly rounded sinuses, the branches somewhat united by rhizoids when in contact; branches 0.5 to 2.0 mm. wide, margin nearly entire, with cells much elongated, 2 cells thick except at the distinct midrib and inconspicuous marginal ribs, the cells between the midrib and the margin in distinct divaricate rows, but not forming pinnate veinlets; sori in single rows on each side of the midrib.

Haliseris delicatula Lamouroux, Harvey (1852); *Dictyopteris delicatula* Lamouroux, Børgesen (1914); *D. delicatula* Lamouroux, Collins and Hervey (1917).

Florida; Bermuda and the West Indies to the Virgin Islands.

At Dry Tortugas only one very small plant of this species was secured. It was found growing on Bird Key Reef among other algæ.

The description and habit sketch are based upon the material collected at Sand Key near Key West, Florida by Thaxter in 1898; the detail of the margin of the thallus is from the Tortugas collection.

Neurocarpus Justii (Lamouroux) Kuntze

(Plate 17, fig. 5)

Plants tall, erect, forming large tufts which reach a height of 4 dm., branching dichotomous, the branches 1.5 to 4.0 cm. broad with a very thick, prominent midrib eventually denuded of the lamina, leaving the stalk-like axis intact; margin appearing finely serrate at the tip, becoming irregularly undulate; hairs in tufts over the lamina, which is dark brown and rather opaque, to 170μ thick above, of 4 cell layers; the medulla of 2 layers of cells 50 to 100μ, rarely to 190μ in diameter, flattened; cortex of one layer on each side, and containing the chromatophores, cells 20 to 30μ deep, 15 to 30μ in surface diameter; midrib 8 to 12 cells thick above, thicker below; tetrasporangia in patches on the upper part of the thallus.

Dictyopteris Justii Lamouroux, Børgesen (1914); *D. Justii* Lamouroux, Collins and Hervey (1917); *Neurocarpus Justii* (Lamouroux) Kuntze, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this plant formed the dominant member of an association which occupied the rocky bottom at a depth of about 3.1 to 9.3 meters or perhaps lower on Loggerhead Key Shoal south of the island, and was dredged in Southwest Channel at 11 meters. It was in fine vegetative condition in June 1925 and 1926 and in rich tetrasporic fruit, although somewhat frayed, in late July 1924. The aspect of the colony was that of a bed of *Fucus*.

The plant does not reach, at Dry Tortugas, the splendid breadth of frond seen in some collections, where it may measure up to 8 cm.

Neurocarpus plagiogrammus (Montagne) Kuntze

(Plate 17, fig. 8; plate 19, fig. 8; plate 28, fig. 3)

Plants erect, profusely branching to a height of about 2 dm., pale in color and transparent; branching notably alternately pinnate to somewhat irregular, the sinuses rounded, narrow, the branches eventually denuded to the midrib below; above 3 to 6 mm. wide with a prominent midrib and delicate pinnate veinlets running obliquely toward the margin; blade in general 1 cell thick, the cells between the veinlets not in divaricate rows; margin entire, with cells not much elongated; sori of hairs in irregular rows beside the midrib; tetrasporangia irregularly scattered beside the midrib, 80 to 120μ in diameter.

Dictyopteris plagiogramma (Montagne) Vickers, Børgesen (1914); *D. plagiogramma* (Montagne) Vickers, Collins and Hervey (1917).

Florida; Bermuda and the West Indies to the Virgin Islands.

At Dry Tortugas this extremely beautiful plant was secured in quantity on one occasion at a depth of 12.4 to 9.3 meters at a station 1.25 miles north-northwest of Loggerhead Key. It was in good condition, tetrasporic in part (June 1925). In 1926 it was dredged in small fragments in 11.0 and 18.3 meters in Southwest Channel.

DILOPHUS J. Agardh

Plants erect, attached by an irregular holdfast, producing a main axis with alternate primary branches, the ultimate branches usually closely dichotomous and complanate; thallus with a medullary layer which is at least 2 cells thick near the margins, although often but 1 cell thick at the center of the frond.

1. Plant small, segments 0.3 to 1.0 mm. broad..D. guineensis (123)
1. Plant larger, segments 1.0 to 3.0 mm. broad..D. alternans (122)

Dilophus alternans J. Agardh

(Plate 16, figs. 2, 3; plate 19, fig. 7)

Plants of moderate size, 1.0 to 1.5 dm. tall, the main axis 2 to 4 mm. broad, bearing alternate, closely set primary branches, which terminate in densely dichotomous ultimate branches 1 to 3 mm. broad; plants of dense habit, rather opaque and yellowish iridescent in appearance, and with the flattened groups of ultimate branches often regularly overlapping.

Dilophus alternans J. Agardh, Børgesen (1914); *D. alternans* J. Agardh, Howe (1920).

Florida, north to Miami (Brooks); Bahamas through the West Indies.

At Dry Tortugas this species is not abundant, and was overlooked or absent in 1924, but was frequent on rocks on the west side of Loggerhead Key in shallow water in 1925, was also present on the east side and was once dredged at 13.8 meters on Loggerhead Key Shoal, 2 miles north of the island. A small form was common on Bush Key in 1926 and the plant was dredged at 11.0 meters in Southwest Channel.

This species was collected by Hooper on Dry Tortugas about 1870, and this material is in the Farlow Herbarium under that name and under *Dictyota Bartayresii* as well. It is not particularly closely branched in the distal parts, but perhaps came from deeper water, for the dredged Tortugas material of 1925 and the Miami material collected by Brooks in 1923 showed the same peculiarity.

Dilophus guineensis (Kuetzing) J. Agardh

Plant of small size, 0.5 to 1.0 dm. tall, the main axis 0.75 to 1.5 mm. broad, bearing alternate primary branches, which terminate in densely dichotomous or alternate terminal branches about as broad as the axis; habit dense, plants often irregular; apices of branches from somewhat obtuse to acute.

Dilophus guineensis (Kuetzing) J. Agardh, Børgesen (1914); *D. guineensis* (Kuetzing) J. Agardh, Collins and Hervey (1917); *D. guineensis* (Kuetzing) J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

PADINA Adanson

Plants of small to moderate size, tufted; growing from an inrolled margin with a marginal row of apical cells; originally rounded, becoming split and forming proliferous rounded or spatulate lobes; attached by an irregular holdfast and rhizoids developed from the lower portions of the blades; blades 2 to 8 cells thick, marked by concentric rows of hairs and bearing antheridia, oögonia and tetrasporangia; these sometimes in sori and in rows, sometimes scattered; more or less coated with lime on the under surface.

1. Thallus strongly calcified below, hair lines 2 mm. or less distant; in center 2 cells thick; tetrasporic sori just above every second hair line .... P. Sanctæ-Crucis
1. Thallus little or not calcified, hair lines 3 mm. or more distant; in center 3 or more cells thick; tetrasporic sori irregularly or regularly in lines between all hair zones. P. Vickersiæ

Padina Sanctæ-Crucis Børgesen

(Plate 17, fig. 6)

Plants forming tufts reaching 1 dm. high, the originally sub-orbicular thallus becoming subdivided and proliferous, but the lower parts of the segments not split to narrow stalk-like rhizoid covered bases; lobes usually 5 to 9 cm. broad, brown on the upper surface, but white from a considerable incrustation of lime in the under surface, 2 cells thick, and in the lower part covered with rhizoids; hairs forming a broad fringe on the apical margin; hairs or hair scars forming concentric lines on the thallus surface, at intervals of 1.5 to 2.0 mm., the tetrasporic sori forming lines just above each second row of hairs, covered with an evanescent indusium.

Padina Pavonia Lamouroux, Harvey (1852) *p.p.; P. Pavonia* Lamouroux, Farlow (1876) *p.p.; P. Sanctæ-Crucis* Børgesen (1914); *P. Sanctæ-Crucis* Børgesen, Collins and Hervey (1917); *P. Sanctæ-Crucis* Børgesen, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this species is frequent and in places abundant in shallow quiet water on a sandy or rocky bottom, and was dredged to 13.8 meters on Loggerhead Key Shoal and in Southwest Channel. In the field the close hair zones with the white under surface offer easy characters for identification in typical specimens, but a considerable bulk of the material from the reefs, which is often much dwarfed, is difficult of determination.

Padina Vickersiæ Hoyt

(Plate 17, fig. 9)

Plants forming tufts 10 to 15 cm. tall, the originally sub-orbicular thallus becoming subdivided and proliferous, the lower parts of the segments eventually split to narrow, stalk-like bases; lobes usually 5 to 10, sometimes 15 cm. broad, brown on both surfaces, or sometimes very lightly coated with lime on the under surface; thallus 4 cells thick except at base and apex, the lower parts somewhat covered with rhizoids; hairs rarely conspicuous on the apical margin, hairs or hair scars forming concentric lines on the thallus surface at intervals of 2 to 7 mm., usually about 4 mm., the tetrasporic sori forming an irregular line in the middle of the interpilar zone, or scattered.

Padina Pavonia Lamouroux, Harvey (1852) *p.p.; P. Pavonia* Lamouroux, Farlow (1876) *p.p.; P. variegata* (Lamouroux) Hauck, Børgesen (1914); *P. variegata* (Lamouroux) Hauck, Collins and Hervey (1917); *P. Vickersiæ* Hoyt, Howe (1920); *P. Vickersiæ* Hoyt (1920).

North Carolina; Florida; Bermuda; Bahamas to the Virgin Islands.

At Dry Tortugas this species appeared at first uncommon; one small, healthy colony was present in the moat of Fort Jefferson on Garden Key, it was rather abundant southwest of the landing wharf on Garden Key, another small colony was present on the piles of the Laboratory wharf on Loggerhead Key, and it was dredged to 13.8 meters on Loggerhead Key Shoal. It grew on very rocky bottom. In 1926 it was frequent about Garden, Middle and Sand Keys.

SPATOGLOSSUM Kuetzing

Plant of broad, flat, pinnately or palmately divided lobes, the margins entire or dentate; reproduction by tetraspores and by scattered oögonia.

Spatoglossum Schroederi (Martens) J. Agardh

(Plate 17, fig. 2)

Plant 1 to 3 dm. in height, (in the living state iridescent), medium to dark brown and moderately adherent to paper on drying; blades 1 to 2.5 cm. broad, the margin entire to undulate or irregularly dentate, the teeth in part aristate; margin often proliferous; branching irregularly dichotomous or palmate.

Taonia? Schroederi Agardh, Harvey (1852); *T.? Schroederi* Agardh, Farlow (1876); *Spatoglossum Schroederi* (Martens) J. Agardh, Collins and Hervey (1917).

Florida and Bermuda.

ZONARIA Draparnaud

Plants of small to large size, tufted, margin plane, growing from a marginal row of apical cells, originally rounded, becoming split and forming spatulate to cuneate lobes; attached by an irregular holdfast and rhizoids developed from the lower portions of the blades; blades showing cortical and medullary layers of cells, not calcified.

1. Thallus zonate, iridescently banded, erect .... Z. zonalis (125)
1. Thallus not zonate, or obscurely so, simply brown in color, prostrate to erect .... Z. variegata (124)

Zonaria variegata (Lamouroux) C. Agardh

(Plate 15, figs. 20 to 22; plate 17, fig. 4)

Plant to 6 cm. tall, attached principally by rhizoids from the base of the thallus lobes; decumbent to erect, thallus little cleft, becoming broadly triangular to sub-orbicular, lobes 1 to 4 cm. broad; blades light brown, not much change in color in drying; showing structurally a marginal row of apical cells which develop a single layer of large medullary cells surrounded by 1 or 2 sub-epidermal layers, and an epidermal layer of smaller cells; the number of sub-epidermal layers usually equal on both sides of the blade, which is 100 to 300μ thick; epidermal cells overlying medullary cells about 8 on one face and 4 on the other.

Zonaria variegata (Lamouroux) Mertens, Børgesen (1914); *Z. variegata* (Lamouroux) Mertens, Collins and Hervey (1917); *Z. variegata* (Lamouroux) C. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this plant is occasional in dredgings, coming up on masses of coral and the bases of Gorgonians from 4.6 to 13.8 meters. Often associated with *Aglaozonia canariensis,* which it resembles.

Zonaria zonalis (Lamouroux) Howe

(Plate 17, fig. 3)

Thallus to 2 dm. tall, or taller, attached by an irregular holdfast and rhizoids on the bases of the branches of the thallus; thallus quickly cleft into segments which are narrowly cuneate to linear from a slender stalk-like base, more rarely broadly triangular, blades strikingly banded and iridescent when living, becoming blackish on drying, lobes 1 to 5, rarely to 15 cm. broad; sporangia bordering the hair zones.

Zonaria lobata C. Agardh, Harvey (1852); *Z. lobata* C. Agardh, Farlow (1876); *Z. lobata* C. Agardh, Børgesen (1914); *Z. lobata* C. Agardh, Collins and Hervey (1917); *Z. zonalis* (Lamouroux) Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas this beautiful plant is very abundant, generally in the waters outside the outer reefs, especially to the east and southeast of the group of islands, growing on rough bottom among Gorgonians and coral. Dredged to 36.6 meters off Southwest Channel, but mostly in 1.5 to 6.2 meters of water.

FUCALES

Plants of moderate to large size, showing the characters of the single family.

FUCACEÆ

Thallus of moderate to large size, growing from an apical cell or cell group, forming a complex tissue system, in part filamentous, in part apparently parenchymatous, frequently developing an axis bearing lateral leaf-like members; reproductive elements micro- and megasporangia borne in cavities (conceptacles); the microsporangia, by reason of a succession of gametophytic mitoses following immediately on the maturation divisions, giving rise to many (probably generally 64) sperm cells; the megasporangia undergo the maturation divisions and one additional mitosis, but in some genera only part of the 8 nuclei formed function in egg formation; the eggs are borne within the megasporangia; on extrusion the sperm become motile with 2 unequal lateral cilia, while the eggs are non-motile; fertilization gives rise to a new sporophytic plant.

1. Receptacles appearing axillary 2
1. Receptacles not appearing axillary .... Cystoseira (125)

2. Leaves filiform or blade-like .... Sargassum (126)
2. Leaves turbinate (obconical) .... Turbinaria (131)

CYSTOSEIRA C. Agardh

Plants of moderate size, attached by rhizoidal holdfasts, developing several erect shoots from the base and also a main trunk, in turn branched; main axes and branches elongated, cylindrical, angular or compressed, often spinulose or toothed, bearing branchlets more or less clearly differentiated as of definite or indefinite growth, the former often reduced to spines; bladders if present as simple inflations of the branchlets; receptacles formed in the more or less metamorphosed terminal branchlets, monœcious or diœcious, the megasporangia producing a single egg.

Cystoseira Myrica (S. G. Gmelin) J. Agardh

Stem short, bearing somewhat pinnate, densely muriculate branches about a foot in length; vesicles solitary, ellipsoid to spherical; receptacles cylindric-clavate, 4 to 9 mm. long.

Cystoseira Myrica (S. G. Gmelin) J. Agardh, Howe (1920).

Florida and the Bahamas.

SARGASSUM Agardh

Plants with an erect axis and radially disposed foliaceous leaf-organs which usually show a midrib or costa and hair-filled pits (cryptostomata), and bearing the conceptacles in specialized slender, usually forking axillary branches, the megasporangia producing but a single egg.

1. Floating and sterile; cryptostomata absent, leaves lanceolate to linear....2
1. Normally attached; cryptostomata generally present, if absent leaves ovate....3 (but note *S. cymosum*)

2. Leaves linear, teeth aculeate....S. natans (128)
2. Leaves lanceolate, teeth broad....S. fluitans (127)

3. Stems generally muriculate....4
3. Stems nearly or quite smooth....7

4. Leaves linear, rarely broader on robust young shoots....5
4. Leaves lanceolate or broader....6

5. Leaves on sterile shoots to 50 times width, costa ridged to alate....S. pteropleuron (130)
5. Leaves on sterile shoots shorter, to 25 times width, costa inconspicuous...S. vulgare (130)

6. Plants open and diffusely branching....S. polyceratium (129)
6. Plants of exceedingly dense habit....S. polyceratium var. ovatum (129)

7. Leaves linear to lanceolate, thin, soft and light brown....S. Filipendula (127)
7. Leaves broadly ovate, stiff and dark brown....8

8. Plants diffusely branched....S. Hystrix (128)
8. Plants little branched, densely leafy....S. Hystrix var. buxifolium (128)

Sargassum cymosum J. Agardh?

Plants loosely branched, branches somewhat virgate, quite smooth above, but spiny below; leaves thick, linear, to 10 cm. long and about 2 to 3 mm. wide, the margin entire to slightly dentate, the costa smooth; bladders short-stalked, pedicels 1 to 3 mm. long, the bladders 6 to 7 mm. in diameter, occasionally showing scattered spines.

Florida.

The description is based upon one piece collected by the writer at Key West, 2 dm. in length, and upon specimens in the U. S. National Herbarium. The name is suggested by Dr. M. A. Howe as the most probable, but it is understood that the typical *S. cymosum* is different in appearance. At the National Herbarium there is material collected on the Florida coast by E. Palmer and labeled *S. dentifolium* Ag. It has more dentate leaves than the material found by the present writer and the bladders are notably spinose, but otherwise it is similar. In the same herbarium there are also specimens collected by A. H. Curtiss at Key Largo, Florida, and issued in the *Algæ Floridanæ* under the name of *S. bacciferum* which seem to belong here—certainly not to *S. bacciferum.* The stem goes farther toward the base of the plant than that of the piece in the writer's collection, and is quite spiny, while that of the writer's is not notably so, and is encrusted with corallines, bryozoa, etc. It would seem that if more material should appear, and if it should not give any better connection with *S. cymosum,* it would be better to segregate this material under a new name.

Sargassum Filipendula C. Agardh

(Plate 18, fig. 5; plate 19, fig. 17)

Plants growing attached, erect, reaching 1 meter or more in length, main axis slender with many shorter side branches, branches smooth; leaves borne on ordinary branches of the second or third orders, rather than on condensed spur-branches, thin and membranous to flaccid, often slimy, linear to lanceolate, the basal sometimes forked; 1.5 to 7.5 cm. long, generally about 4 to 5 cm., and 2 to 7 mm., generally 3 mm. wide, dentate to serrate, the petiolate base of the leaf slightly asymmetrical and tapering, apex acute and tapering, costa narrow but distinct, cryptostomata small, numerous, in one row in the narrower leaves, but scattered in the broader ones; bladders numerous on the upper part of the plant, 3 to 6 mm. diameter, pedicellate, pedicels slender, 1 to 2 mm. long, never aristate; receptacular branches axillary or sub-axillary, loosely forking, sometimes bearing bladders and small leaves.

Sargassum vulgare C. Agardh, Harvey (1852); *S. vulgare* C. Agardh and *S. Filipendula* in Farlow (1876) *p.p.* respecting Florida material; *S. vulgare* C. Agardh, Farlow (1881).

New England to Bermuda (variety *Montagnei*); Bahamas and Florida.

At Dry Tortugas generally secured washed ashore after storms, but dredged abundantly at 22.0 and 32.9 meters in Southwest Channel. Probably a plant of deep water here. While most of the material is of very constant appearance, fragments showing peculiar variations were not infrequent.

An examination of *Sargassum* in the Farlow Herbarium showed considerable material under other names which probably belongs here. A sheet labeled *S. cymosum* C. Agardh collected at Indian River, Florida, by E. Palmer, 1874, is very suggestive of *S. Filipendula* fa. *subedentatum* J. Agardh, while other material under this name might well pass as *S. vulgare* C. Agardh. Material treated by Farlow as *S. Filipendula* but which earlier writers called *S. affine*, as for instance specimens in *Algæ Floridanæ*, may be distinct. The material collected by Hooper at Key West, Florida, and labeled *S. vulgare*, is probably all *S. Filipendula*, while material labeled *S. vulgare* variety *furcatum* and collected by Hooper at Tortugas, 1876, and by Lieutenant J. M. Ingalls at Tortugas in 1873 and at other times, is probably a forked-leafed type of *S. Filipendula*. The writer found similar forms at Dry Tortugas, and they are frequent at Woods Hole and Falmouth, Massachusetts. Additional aberrant types found by the writer at Dry Tortugas include slender specimens with the habit of *S. Filipendula* var. *Montagnei* but with serrate leaves and non-aristate bladders, also material with rather broad leaves, rather regularly and finely serrate, more obtuse than usual at the tip, or even broadly rounded.

Sargassum fluitans Børgesen

(Plate 18, fig. 9; plate 19, fig. 5)

Forming but slightly tangled masses, individual plants generally 3 to 8 dm. in diameter, frequently branched but with prominent main axes; branches smooth; leaves thick and firm, linear-lanceolate to lanceolate, 2 to 6 cm. long and 3 to 8 mm. wide, irregularly and strongly serrate, the teeth sharp pointed; sessile or shortly petiolate, the base of the leaf frequently notably asymmetrical and tapering; the apex acute in narrower leaves to rounder in broader ones, costa present, cryptostomata absent (reported sometimes present and inconspicuous by Børgesen and Collins); bladders numerous on the short ultimate branchlets, spherical to slightly ovoid, 2 to 6 mm. diameter, never aristate, on pedicels

2 to 3 mm. long, frequently distinctly margined and sometimes broadly serrate-alate; receptacles unknown.

Sargassum fluitans Børgesen (1914); *S. fluitans* Børgesen, Collins and Hervey (1917); *S. fluitans* Børgesen, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands; apparently newly reported for Florida. In earlier accounts generally placed under *S. natans.*

Only found drifting or washed ashore at Tortugas; this plant is a very general companion of *S. natans* in off-shore water, usually far exceeding it in abundance, and was drifted ashore abundantly. In general the plant as found at Dry Tortugas is very considerably larger than that described by Børgesen, but intermediates in all degrees were common. Rarely leaves were found which bore a narrow, spiny wing on the face of the costa, like *S. pteropleuron.*

Sargassum Hystrix J. Agardh

Plants growing attached, erect to 3 to 5 dm. from a somewhat disk-like holdfast, branching freely from near the base, the main branches with frequent long side branches which are smooth; leaves dark, borne loosely on the main branches, or later on branches of succeeding orders, firm, broadly lanceolate to oval, 1.5 to 6.0 cm. long, 4 to 13 mm. wide, notably large and broad on the vigorous short basal shoots; margin undulate, entire or slightly and finely serrate near the tip, the base of the leaf broadly obtuse, asymmetrical, the apex on smaller leaves somewhat tapering but on larger leaves broadly rounded; costa slender, not conspicuous, cryptostomata lacking, or few and small, near the margin; bladders numerous, 2 to 8 mm. diameter, round or slightly oval, on pedicels 0.5 to 1.0 mm. long; receptacular branches on older parts of the plant rather crowded and densely forking, occasionally terminating in bladders or tiny leaves.

Sargassum Hystrix J. Agardh, Harvey (1852); *S. Hystrix* J. Agardh, Børgesen (1914); *S. Hystrix* J. Agardh, Collins and Hervey (1917); *S. Hystrix* J. Agardh, Howe (1920).

Var. buxifolium (Chauvin) J. Agardh

(Plate 18, fig. 1; plate 19, fig. 9)

Plants differing from the species in having the lateral branches generally short, bearing the leaves closely crowded; leaves more generally entire.

North Carolina; Bermuda; Bahamas; Virgin Islands; apparently not previously definitely recorded from Florida, although Harvey in the *Nereis* cites Agardh as recording it from Mexico to Newfoundland.

At Dry Tortugas only secured as frequently washed ashore, especially on Loggerhead Key. The dark broad leaves make it a conspicuous object in the surf among the other paler Sargassa. The lower part of the main axis and primary branches often become denuded. The variety is more easily distinguished in the living than in the pressed state, as this obscures the comparatively loose leaf arrangement of the typical form. It is characteristically a plant with one long straight main axis, closely beset with short branches bearing densely placed nearly entire leaves. Sometimes there are formed a few main leading branches. It intergrades and at Dry Tortugas is more frequent than the species, but also is only found as washed ashore.

Sargassum natans (Linnæus) Meyen

(Plate 18, figs. 2 to 4; plate 19, fig. 13)

Forming tangled masses, individual plants generally 2 to 4 dm. in diameter, frequently and irregularly branching without dominant main axes; the branches smooth; leaves firm, linear to linear-lanceolate, 2.5 to 5.0 cm. long, and 2.0 to 3.5 mm. broad, irregularly and strongly serrate with the teeth sometimes filiform and projecting; the base of the leaf sometimes asymmetrical; a costa present but cryptostomata absent; bladders abundant on the short ultimate branchlets, spherical to slightly ovoid, 3 to 5 mm. diameter, generally distinctly aristate, with tip generally sharp but sometimes foliaceous expanded, pedicellate, pedicels 3 to 5 mm. long, occasionally slightly alate; receptacles unknown.

Sargassum bacciferum C. Agardh, Harvey (1852); *S. bacciferum* C. Agardh, Farlow (1876); *S. bacciferum* C. Agardh, Farlow (1881); *S. natans* Linnæus, Børgesen (1914); *S. natans* (Linnæus) Meyen, Collins and Hervey (1917); *S. natans* (Linnæus) Meyen, Howe (1920); *S. natans* (Linnæus) Meyen, Hoyt (1920).

Generally distributed in the Gulf of Mexico and among adjoining islands, drifting northward with the Gulf Stream.

Only found drifting or washed ashore at Tortugas; this, although generally considered the dominant algal macroplanktont of off-shore waters in the district, is sometimes outnumbered by individuals of *S. fluitans*, as at Loggerhead Key in June 1925, when it was very rare and *S. fluitans* was very abundant.

Sargassum polyceratium Montagne

(Plate 18, fig. 12; plate 19, fig. 14)

Plants growing attached from a rather irregular disk-like holdfast, erect, reaching a length of over 4.5 dm.; strong lateral branches numerous, finally producing short spur-branches, branches of all degrees sparsely to generally abundantly muriculate; leaves at first on the main axes, later closely set on the spur branches, characteristically with one margin toward the axis, length 1.5 to 3.5 cm., breadth 5 to 10 mm., sessile, the base very broadly rounded or even transverse, asymmetrical, the apex broadly obtuse to rather acute, margin densely and deeply dentate-serrate; bladders numerous, nearly sessile to more seldom on pedicels reaching 6 mm. long, spherical; receptacular branches axillary, short and forking, not densely massed nor conspicuous.

Sargassum polyceratium Montagne, Howe (1920).

Apparently not previously reported from Florida.

Var. ovatum (F. S. Collins)

(Plate 18, figs. 7, 10; plate 19, fig. 16)

Differing from the species in habit; the main axes are very densely beset with short spur-branches bearing closely crowded leaves, younger branches moderately to slightly muriculate; leaves smaller than in the species, 1.5 to 2 cm. long by 3 to 8 mm. wide, obtuse at base and apex, strongly asymmetrical, greatly crisped, frequently forked; bladders frequently lacking; rather inconspicuous among the leaves, round, 3 to 5 mm. diameter, on pedicels usually short but reaching 2 mm., pedicels sometimes alate; receptacles densely branching, in abundant axillary masses.

Sargassum vulgare fa. *ovata* F. S. Collins, *Marine Algæ of Jamaica.*

Reported from Jamaica by Collins; seemingly not previously reported from Florida.

At Dry Tortugas the species is generally secured as washed ashore, but dredged to 13.8 meters 2 miles north of Loggerhead Key. The variety is the most abundant *Sargassum* attached to coquina and coral rocks in shallow water, being especially luxuriant along Bush Key and Bird Key Reefs, growing well up to low-tide level; also dredged on Loggerhead Key Shoal to 13.8 meters depth.

At the New York Botanical Garden this kind of material (var. *ovatum*) is filed under *S. foliosissimum* (Lamouroux), which Howe, (1920), as *Fucus foliosissimus* Lamouroux, considers a synonym of *S. polyceratium.* It is certainly more closely related to *S. polyceratium* than to *S. vulgare* but is generally very distinct at Dry Tortugas, and therefore is kept under a separate name.

Sargassum pteropleuron Grunow

(Plate 18, fig. 6; plate 19, fig. 15)

Plants growing attached, branching abundantly from a disk-like holdfast, erect to a height of 17.5 dm., generally 6 to 9 dm.; main axis distinct, but with long side branches, all orders being slightly to abundantly muriculate; leaves on main branches or on short spur-branches, generally linear to narrowly lanceolate, but on vigorous basal branches sometimes broadly lanceolate, 2.5 to 9.5 cm. long and 2.5 to 4.0 mm., rarely 7.5 mm., wide, strongly but generally irregularly serrate-dentate, the base sub-sessile, tapering asymmetrical, the leaf generally set with one edge toward the axis, the apex sharply tapering, or in the broadest leaves somewhat obtuse, the costa distinct, especially highly ridged below, becoming raised to a notably serrate wing; bladders numerous, spherical, 3 to 8 mm. diameter, sub-sessile to very shortly stalked; receptacular branches in loose axillary clusters.

Sargassum pteropleuron Grunow, Howe (1920).

Florida; Bermuda and the Bahamas.

At Dry Tortugas very frequently washed ashore; found growing attached at points on Loggerhead and White Shoals to 3.1 meters and deeper.

Rather a puzzling species in the field, especially because forms with few spines on the stems and with moderately small lanceolate leaves which seem to lack the serrate costal ridge are difficult to distinguish from *S. polyceratium* and *S. vulgare* in extreme types of those species. This ridge is quite generally not particularly conspicuous, and though it can sometimes be more easily recognized by sectioning, the ready character really is the presence of the large teeth. These are not infrequently very hard to find, being mostly lacking in the higher parts of the plant, but can be most readily located on leaves from vigorous and young branches near the base of the plant. On old plants the fertile portion appears to become denuded of leaves and of most of the bladders, giving the appearance of a terminal panicled fruiting portion of great size. On vigorous basal shoots forked leaves may be occasionally found.

Sargassum vulgare C. Agardh?

(Plate 18, fig. 11; plate 19, fig. 12)

Growing attached, erect to a height of 4 dm. or more, the main axis with few to many long side branches, branches of all orders muriculate, especially in the younger parts; leaves firm, narrowly lanceolate, 1.5 to 3 cm. long, 2 to 4 mm. wide, sharply serrate or sub-entire below, tapering to an often asymmetrical base and to the apex, the costa distinct, cryptostomata small and scattered; bladders numerous, spherical, 2.5 to 4.5 mm. diameter, on pedicels 0.5 to 2.0 mm. long; receptacles much branched, axillary or growing out into fruiting branches bearing bladders and small leaves and reaching a length of 2 to 3 cm.

Sargassum vulgare C. Agardh was variously interpreted by early authors, including specially *S. Filipendula* C. Agardh, but probably not a large proportion of material like that here placed under that name. *S. vulgare* C. Agardh, Howe (1920); possibly *S. vulgare* C. Agardh, Børgesen (1914).

Bahamas; possibly also the Virgin Islands; Florida, the earlier records doubtful.

Quite scarce; washed ashore on Loggerhead Key, and dredged at 1.5 to 6.2 meters on White Shoal.

It appears that there is considerable uncertainty as to the plant named by J. Agardh, the original collection not being available. The material here named *S. vulgare* C. Agardh agrees tolerably with a collection of *S. vulgare* made by Liebmann at Vera Cruz, Mexico, and determined by J. Agardh, as represented in the herbarium of the New York Botanical Garden, and seems to be the thing placed under this name by Howe from the Bahamas, though perhaps not the same as that reported by Børgesen from the Virgin Islands, which, by specimens in the same collection, appears to have much broader leaves. The Dry Tortugas material is generally much more branched than the Vera Cruz specimens, which are notably virgate, but some of it agrees in this particular, and intermediate conditions occur.

TURBINARIA Lamouroux

Plants with an erect branched axis and with obconic leaf-organs borne on ridged pedicels and with the broad distal end extended into a membrane, and centrally sometimes hollow, with cryptostomata; receptacular branches densely forking and aggregated.

Turbinaria turbinata (Linnæus) Kuntze

(Plate 18, fig. 13)

Plants erect to 4 dm. or more in height from a branching holdfast, virgate or with long branches and beset with shorter spur-branches bearing the leaves; leaves obconic, petiolate, reaching 1 cm. long and 1 cm. broad on fertile branches, or somewhat larger where sterile, petiole and lower part of the leaf with 3 smooth-winged ridges, distal part of leaves generally hollow, the flattened distal end margined with a fairly broad membranous expansion having a dentate margin; cryptostomata numerous, scattered; receptacles abundant, densely forking, axillary or between the leaves.

Turbinaria vulgaris C. Agardh, Farlow (1876); *T. trialata* Kuetzing, Børgesen (1914); *T. turbinata* (Linnæus) Kuntze, Howe (1920).

Florida; Bahamas and the Virgin Islands.

At Dry Tortugas a single small sterile fragment with a few leaves is all that has appeared of this genus. This was found washed ashore on Garden Key. It agreed with a good specimen collected by R. Thaxter at Cocoanut Grove, Florida, from which this description is drawn.

RHODOPHYCEÆ

Plants unicellular, filamentous or parenchymatous; cells uninucleate to multinucleate, with stellate to strap-shaped or one to many lenticular chromatophores containing chlorophyll more or less masked by phycœrythrin; cell division mitotic; growth apical or intercalary; multiplication by cell division, fragmentation of the parent plant, by marginal or similar proliferations or by flagellar offsets; the life cycle showing 1, 2, or 3 recognizable phases; asexual reproduction by somewhat ameboid monospores or tetraspores, or in the carposporophyte (sporocarp) by carpospores; sexual reproduction by non-flagellate colorless spermatia and carpogonia, the latter in some associated with a complicated supporting and nutritive mechanism.

BANGIACEÆ

Thallus of filaments, disks, or sheets; cells with a single stellate chromatophore and a single nucleus; asexual reproduction by spores discharged from converted vegetative cells, occasionally by akinetes; sexual reproduction by spermatia shed from the male organs and by enlarged carpogonial cells fertilized in place in the female plants or female parts of monœcious plants; fertilization producing about 8 carpospores, or sometimes a single spore; sexual and asexual plants not always clearly distinct.

1. Thallus plate-like 3
1. Thallus filamentous, filaments laterally free 2

2. Cells at maturity with individual sheaths, shed terminally from the filament .... Asterocystis (132)
2. Cells without individual sheaths .... Erythrotrichia (132)

3. Thallus minute, adnate, of radiating filaments .... Erythrocladia (132)
3. Thallus large, attached at one point .... Porphyra (133)

ASTEROCYSTIS Gobi

Plant, arising from a convex lobed hapteron, of falsely dichotomously branched filaments; cells rounded in a heavy gelatinous matrix, chromatophore stellate; reproduction by the formation of akinetes from the cells of the distal branches.

Asterocystis ramosa (Thwaites) Gobi

(Plate 20, figs. 1, 2)

Plant epiphytic, the hapteron somewhat hemispherical, of short, obscure branches with very thick walls; erect filaments sparsely to freely branched, the branches of a single series of cells, the filaments (0.5 to 1.0 mm.) long, 13 to 19μ (to 28μ) in diameter, cells oval to elliptical, 6.0 to 7.5μ (5.0 to 10.0μ) by 9.0 to 19.0μ; chromatophores stellate, blue-green; akinetes rounded to oval.

Asterocystis ramosa (Thwaites) Gobi, Børgesen (Nov. 1915); *A. ramosa* (Thwaites) Gobi, Howe (1920).

New England; Bahamas; Virgin Islands; newly reported for Florida.

Infrequent at the Dry Tortugas, but fragments or isolated filaments were occasionally found on the softer algæ in various places; rather frequent on Zonariæ on Bird Key Reef. In this region the filaments reached a length of but 235μ.

ERYTHROCLADIA Rosenvinge

Plant filamentous, the decumbent filaments with apical growth, laterally adherent to form an epiphytic disk; at first and on the margins of the disk cells radially arranged, but becoming pseudoparenchymatous toward the center; reproduction by monospores produced from the older cells of the thallus; sexual reproduction unknown.

Erythrocladia subintegra Rosenvinge

(Plate 20, fig. 3)

Forming small epiphytic disks, the decumbent filaments somewhat irregular, the irregular cells forking and cutting off one or the other of the arms by a wall; cells about 4 to 6μ in diameter, branches somewhat widely spaced.

Erythrocladia subintegra Rosenvinge, Børgesen (Nov. 1915); *E. subintegra* Rosenvinge, Collins and Hervey (1917).

Bermuda and Bahamas; newly reported for Florida.

On Sertularians, Bird Key Reef, Dry Tortugas, forming patches 30 to 50μ in diameter.

ERYTHROTRICHIA Areschoug

Plant filamentous, the filaments unbranched above the hapteron base, forming monospores by oblique walls from the vegetative cells; chromatophore somewhat stellate; antheridia single celled; carpogonia consisting of enlarged vegetative cells.

Erythrotrichia carnea (Dillwyn) J. Agardh

(Plate 20, figs. 4, 5)

Plant of a basal branched hapteron ramifying between the outer cells of the host, giving rise to one or more erect unbranched vegetative filaments which reach a diameter of 15 to 19μ, usually 17μ; cells of variable length, usually about as long as broad or to about one-third longer or shorter; height 3 to 5 mm.

Erythrotrichia carnea (Dillwyn) J. Agardh, Børgesen (Nov. 1915); *E. carnea* (Dillwyn) J. Agardh, Collins and Hervey (1917); *E. carnea* (Dillwyn) J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Frequent at Dry Tortugas on other algæ, especially in the moat of Fort Jefferson, Garden Key.

PORPHYRA C. Agardh

Thallus erect, foliaceous, flat and thin, the margin entire or irregular, base substipitate; at first a simple filament, later developing a broad sheet, 1 or 2 cells thick.

Porphyra vulgaris C. Agardh

Porphyra vulgaris C. Agardh, Melvill (1875).

Reports are made of *Porphyra* from South Carolina and by inference from Florida, but with respect to the latter the record is doubtful.

NEMALIONACEÆ

Thallus filamentous, the filaments free-branched or associated in twisted strands to thalli of specific form, a central axis of comparatively colorless filaments contrasting with a cortex of branches with conspicuous chromatophores; texture generally soft gelatinous; asexual reproduction generally by monospores or tetraspores; spermatia formed on the ends of short often crowded branches; carpogonia borne on short carpogenic branches, the fertilized egg giving rise to gonimoblasts, the terminal and sometimes sub-terminal cells of which produce carpospores; sporocarp generally without a special involucre.

1. Small, filaments not enclosed in a jelly.. Acrochætium (133)
1. Larger, filaments forming substantial mucilaginous, commonly more or less calcified thalli.. Liagora (135)

ACROCHÆTIUM Naegeli

Plants filamentous, branched, usually epiphytic or more or less endophytic; axis and branches monosiphonous, chromatophore stellate, or multiple and peripheral; cells uninucleate; reproduction generally by monospores borne laterally or terminally on short stalks; antheridia and simple 1 to 3 celled carpogonia also sometimes present.

This genus is abundantly represented at Dry Tortugas, but was rarely in such condition as to be determinable by the present writer. The descriptions here are based on previously published descriptions, but the figures are original and the determinations so far as reported are probably correct, though undoubtedly many other species are not recorded.

1. Plant endophytic.. A. Collinsianum (134)
1. Plant epiphytic.. 2

2. Plant minute, usually less than 50μ tall, densely branched.. A. crassipes (134)
2. Plant larger and loosely branched 3

3. Basal portion of plant a small disk.. A. Sargassi (134)
3. Basal portion of plant not a disk.. A. leptonema (134)

Acrochætium Collinsianum Børgesen

(Plate 20, fig. 6)

(Plant of endophytic vegetative filaments ramifying among the assimilative filaments of the host, not abundantly branched, the branches short; cells sub-cylindrical, dolioform, more or less inflated at the median part, 8 to 14μ broad, about 35μ long; chromatophore stellate, containing a central pyrenoid; hyaline hairs not numerous, terminal; sporangia sessile or pedicellate, single or in pairs, rounded-obovate, about 20μ long and 14μ in diameter.)

Chantransia Liagoræ Børgesen (Nov. 1915); *Acrochætium Collinsianum* Børgesen, Suppl. (Oct. 1920).

Virgin Islands; newly reported for Florida.

In *Liagora pinnata* from Bird Key Reef 1925, Dry Tortugas, Florida.

The Dry Tortugas material seemed rather smaller in all dimensions than those given above for the Virgin Islands specimens; the monospores were but about 15μ long, and the cells of the branches were 6 to 12μ in diameter, rather than 8 to 14μ.

Acrochætium crassipes Børgesen

(Plate 28, fig. 16)

(Plant very small, 50 to 70μ tall, basal cells large, swollen-cylindrical, with thick walls, diameter about 12μ, the erect filaments 1 to few from a single base, the branches uniseriate, moniliform, of 1 to 6 short dolioform to sub-globose cells 5 to 6μ by 5 to 7μ; the branches somewhat attenuate toward the apices, where 4 to 5μ broad, bearing hyaline hairs; monosporangia oval, sessile, lateral, uniseriate, 6 to 8μ by 5 to 6μ; sexual organs unknown.)

Acrochætium crassipes Børgesen (Nov. 1915); *A. crassipes* Børgesen, Collins and Hervey (1917).

Bermudas; Virgin Islands; newly reported for Florida.

At Dry Tortugas very rare, epiphytic.

Acrochætium leptonema (Rosenvinge) Børgesen

(Plant small, numerous erect filaments formed from the repent ones, which are irregularly laterally branched, with somewhat swollen cells, 3 to 4μ in diameter and cells 1.5 to 3.0 times as long; spores germinating to form a parenchymatous disk from which the repent filaments are formed; erect filaments simple to sparsely branched, reaching a length of 300μ; 3 to 4μ in diameter, the cells 2 to 5 times as long, cylindrical to somewhat swollen; mono- (and tetra- ?) sporangia unilateral or terminal, rarely opposite, on branches of the first and second orders, sometimes solitary or paired on unicellular branches; also sessile on the repent filaments, 10.0 to 12.5μ by 5.5 to 6.5μ.)

Acrochætium leptonema (Rosenvinge) Børgesen, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

Occasional at Dry Tortugas.

Acrochætium Sargassi Børgesen

(Plate 22, figs. 1 to 5)

(Plant reaching 0.7 mm. tall, the basal cell forming a small disk, giving rise to an erect filament which branches from the base; upper branching sparse, secund or opposite, branchlets simple or ramifying, attenuate toward the apices, produced into false hairs; cells of lower portions 5.5μ broad, 9 to 18μ long, in the upper part 2 to 3μ broad, 30 to 40μ long; chromatophores parietal; sporangia not abundant, somewhat secund, sessile or pedicellate, obovate, 10μ long, 7μ broad; antheridia opposite, about 2μ in diameter, carpogonia lageniform, sessile.)

Acrochætium Sargassi Børgesen (Nov. 1915).

Virgin Islands: newly reported for Florida.

Common on various algæ, especially Padinas, *Zonaria*, etc.

The material fitted Børgesen's description admirably, except that the antheridia were rather more oval than spherical.

LIAGORA Lamouroux

Plant tufted, segments slender, branching dichotomous or lateral, somewhat mucilaginous or moderately to considerably calcified; structurally composed of a strand of medullary filaments, the lateral fascicles of branches from which form the cortex; carpogonial branches 3- to 6-celled, formed on the inner part of the lateral fascicles; antheridia forming subglobular tufts, or flattened clusters, near the outer ends of the cortical filaments.

1. Branching mainly dichotomous 2
1. Branching mainly monopodial 4

2. Plant rather loose in habit, assimilative filaments 13μ or more in diameter, antheridia compact .... L. farinosa (136)
2. Plant of denser habit, assimilative filaments usually less than 13μ in diameter, moniliform, antheridia loose 3

3. Plant quite densely branched, moderately calcified, cystocarps with poorly developed involucres .... L. ceranoides (135)
3. Plant moderately densely branched, heavily calcified, cystocarps with well-developed involucres .... L. valida (137)

4. Diœcious, lightly calcified, cystocarps slightly involucrate .... L. mucosa (136)
4. Monœcious 5

5. Moderately calcified, antheridia in tufts generally exceeding 25μ in diameter, cystocarps involucrate .... L. pinnata (136)
5. Lightly calcified, antheridia in tufts less than 20μ in diameter, cystocarps slightly or not involucrate .... L. pedicellata (136)

Liagora ceranoides Lamouroux

(Plate 21, fig. 7; plate 32, fig. 6; plate 33, figs. 4, 5)

Plant forming rather compact soft tufts, 4 to 7 cm. in diameter, the branching rather close in distal portions; calcification moderate, farinaceous below; corticating filaments hardly extending beyond the calcification and the plants therefore showing little or no color; assimilatory filaments branched at wide angles, moniliform, 6 to 11μ in diameter; antheridia forming plate-like disks on the terminal filaments, which intermesh so that the antheridia rather completely cover the surface of the plant; cystocarp with a well-developed filamentous involucre.

Liagora ceranoides Lamouroux?, *L. pulverulenta* C. Agardh and *L. leprosa* J. Agardh, Harvey (1853); *L. pulverulenta* C. Agardh, *L. leprosa* J. Agardh, Farlow (1876); *L. pulverulenta* C. Agardh, Børgesen (Nov. 1915); *L. pulverulenta* C. Agardh, Collins and Hervey (1917); *L. ceranoides* Lamouroux, Howe (1920).

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

At Dry Tortugas found on Bird Key Reef, Sand Key and East Key on rocks; a doubtful specimen from Loggerhead Key.

Liagora farinosa Lamouroux

(Plate 21, figs. 2, 8; plate 30, fig. 3)

Plant loosely and widely dichotomously branching, forming rather tangled masses, to 12 cm. or more in diameter; calcification moderate, especially in the distal parts, where the corticating filaments extend beyond the calcification to give a reddish color to the branches; assimilatory filaments cylindrical, the cells very little swollen, 18 to 22μ in diameter; plants diœcious, antheridia forming dense masses toward the tip of the corticating filaments, 40 to 60μ in diameter.

Liagora Cayohuesonica Melvill and *L. farionicolor* Melvill, Farlow (1876); *L. elongata* Zanardini, Børgesen (Nov. 1915); *L. elongata* Zanardini, Collins and Hervey (1917); *L. farinosa* Lamouroux, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Frequent at Dry Tortugas, especially about Loggerhead Key and Bush Key.

Liagora mucosa Howe

(Thallus very soft and mucous, lightly and irregularly calcified, 5 to 20 cm. high, irregularly monopodial, the main divisions somewhat paniculate; the calcification beginning near the central axis and often extending into the extra-peripheral mucous as isolated granules; branches 0.32 to 0.60 mm. broad toward the apex; fascicles of assimilatory filaments mostly 150 to 300μ long, 3 or 4 times dichotomous, branches markedly moniliform, the distal cells 13 to 24μ long, 13 to 19μ broad; apical hairs numerous; plants diœcious, the antheridia forming compact sub-globose or sub-hemispheric tufts 25 to 50μ broad, on ultimate or penultimate segments; carpogenic branch usually on the second or third branching of the fascicle, the cystocarp compact, sub-hemispheric or sub-globose, 100 to 200μ broad with a few rather inconspicuous ascending involucral filaments.)

Liagora mucosa Howe (1920).

Florida and the Bahamas.

This species is reported for Florida by Howe on the basis of collections of Mrs. Hall and Mrs. Curtiss, both of whom collected at Key West. The Florida material, which the writer has seen, is most strikingly characterized by its extreme softness.

Liagora pedicellata Howe

(Plate 21, figs. 4, 5; plate 30, fig. 9)

Plant closely paniculately branched, dense, the calcification light and the plant soft; assimilatory filaments moniliform, 15 to 22μ in diameter; plant monœcious, the antheridia in small tufts less than 20μ in diameter, near or on ends of the cortical filaments; cystocarp naked or with a few usually reflexed filaments representing the involucre.

Liagora pedicellata Howe (1920).

Florida and the Bahamas.

Once collected on Bird Key Reef, Dry Tortugas.

Liagora pinnata Harvey

(Plate 21, figs. 1, 6; plate 30, fig. 1)

Plant paniculately branched, 2 to 3 dm. in diameter, moderately dense, the branches frequently somewhat complanate; calcification moderate, the plant moderately soft but not mucous; assimilative filaments slightly swollen, not moniliform, 17 to 28μ in diameter;

plant monœcious, antheridia in tufts 25 to 40μ broad; cystocarp with a well developed involucre.

Liagora pinnata Harvey (1853); *L. pinnata* Harvey, Farlow (1876); *L. pinnata* Harvey, Børgesen (Nov. 1915); *L. pinnata* Harvey, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

Frequent at Dry Tortugas on Bird Key Reef, Bush Key and on the outer rocks; found also on Sand and Middle Keys.

Liagora valida Harvey

(Plate 21, fig. 3; plate 30, figs. 7, 11)

Plant dichotomously and moderately closely branched, to about 1 dm. in diameter; calcification moderate to heavy, especially in the lower parts, which are stiff and chalk-white; assimilative filaments branching with a rather narrow angle, 11 to rarely 15μ in diameter; somewhat moniliform toward the apices; antheridia forming flattened, somewhat plate-like masses at the end of peripheral branches, and so forming a somewhat complete covering over the thallus; cystocarps with a poorly defined involucre.

Liagora valida Harvey (1853); *L. valida* Harvey, Farlow (1876); *L. valida* Harvey, Børgesen (Nov. 1915); *L. valida* Harvey, Collins and Hervey (1917); *L. valida* Harvey, Howe (1920).

Florida; Bermuda; Bahamas and the West Indies to the Virgin Islands.

Rather abundant at Dry Tortugas on the outer rocks of Bird Key Reef; also found on the western side of Loggerhead Key, on Bush Key and dredged at 6.2 to 9.3 meters on Loggerhead Key Shoal.

CHÆTANGIACEÆ

Thallus cylindrical or compressed, solid or occasionally hollow, dichotomously or laterally branched; structure filamentous, showing a central axis of comparatively colorless filaments and a cortex of branches with conspicuous chromatophores; occasionally calcified; sporocarp immersed, showing a distinct pericarp; the carpogenic branches formed on the inner portion of the cortex, generally short and of about 3 cells, the fertilized carpogonium giving rise to gonimoblasts, the end cells of which form carpospores; antheridia scattered over the surface or forming in sunken conceptacles; asexual spores generally absent, if present superficial, tetrahedral.

1. More or less calcareous, sometimes with free assimilative filaments........................Galaxaura (137)
1. Not calcareous, surface compact and without free assimilative filaments..................Scinaia (141)

GALAXAURA Lamouroux

Plant soft to firm, more or less calcareous-encrusted; branching regularly to irregularly dichotomous, the branches in some segmented at the nodes; structurally composed of a loose medulla of slender, colorless, branching filaments which give rise to the more compact cortex from their lateral branches; cortex composed of a few layers of colorless cells, usually retaining at least partly their relation in filamentous branching succession; assimilative filaments either contracted, forming a compact surface, or elongated and brush-like, giving a hairy appearance to the branches, reproduction by antheridia and carpogonia, usually on separate plants, the antheridia in conceptacles, the cystocarps immersed and discharging through a pore; morphological alternation of generations present, the tetrasporophyte showing differences in character from the gametophyte; tetraspores cruciate, found in nemathecium-like spots.

In treating this genus the recognized forms will be discussed as separate species as a matter of convenience of determination, without thereby raising any question as to the validity of Howe's suggestions as to the relations of some of these as sexual-asexual phases, but merely following his own example in the *Bahama Flora*.

1. Thallus branches terete 2
1. Thallus branches flat . . . . G. marginata (139)

2. Free assimilative filaments covering most of surface of plant 3
2. Free assimilative filaments, where present, mostly deciduous 5

3. Assimilative filaments forming bands around branches . . . . G. subverticillata (141)
3. Assimilative filaments not in bands 4

4. Internodes of branching less than 1 cm., long assimilatory filaments 0.6 to 1.5 mm. in length . . . . G. lapidescens (138)
4. Internodes of branching more than 1 cm., long assimilatory filaments 0.15 to 0.7 mm. in length . . . . G. flagelliformis (138)

5. Thallus continuous, rarely articulate 6
5. Thallus regularly articulate 7

6. Thallus slightly or not annulate, branching above rather narrow-angled; roughened below and occasionally above by free assimilative filaments . . . . G. squalida (140)
6. Thallus distinctly annulate, branching throughout wide angled; smooth throughout . . G. rugosa (140)

7. Main segments 0.8 to 2 mm. in diameter 8
7. Main segments 1.5 to 4.0 mm. in diameter . . . . G. obtusata (139)

8. Branches about 0.8 to 1.5 mm. in diameter . . . . G. cylindrica (138)
8. Branches about 1.0 to 2.0 mm. in diameter . . . . G. oblongata (139)

Galaxaura cylindrica (Solander) Lamouroux

Galaxaura cylindrica (Solander) Kjellman, Børgesen (Oct. 1916); *G. cylindrica* (Ellis and Solander) Lamouroux, Collins and Hervey (1917).

Bermuda; West Indies to the Virgin Islands; South America; *G. stellifera* J. Ag. reported from Florida is probably a proliferous condition of this species, as suggested to the writer by Dr. M. A. Howe.

Galaxaura flagelliformis Kjellman

(Plate 21, fig. 14; plate 30, fig. 4)

Plant coarse, the branches appearing hair-covered from the long assimilative filaments, with hairs extended 2.5 to 3 mm. in diameter, 1.0 to 2.5 cm. between nodes; assimilative filaments 0.15 to 1.6 mm. in length, about 17μ in diameter in the shaft; cortex loose, composed of the 2 to 3 swollen cells of the peripheral filaments, most of which bear free assimilative filaments projecting beyond the calcification; only asexual reproduction known, the probable sexual phase being *G. squalida*.

Galaxaura flagelliformis Kjellman, Børgesen (Oct. 1916); *G. flagelliformis* Kjellman, Collins and Hervey (1917); *G. flagelliformis* Kjellman, Howe (1920).

Florida; Bermuda; Bahamas to the Virgin Islands.

Rare at Dry Tortugas, dredged in 4.6 to 9.3 meters of water off Loggerhead Key, and in Southwest Channel.

Galaxaura lapidescens (Ellis and Solander) Lamouroux

(Plate 21, fig. 13; plate 30, fig. 8)

Plant rather slender, the branches appearing long-hair covered from the long assimilative filaments, with hairs extended 3 to 4 mm. in diameter, 8 to 12 mm. between the nodes, the angle of branching wide; assimilative filaments 0.7 to 1.5 mm. in length, about 14 to 17μ in diameter in the shaft; cortex loose, composed of the 2 to 3 swollen cells of the peripheral filaments, most of which bear free assimilative filaments projecting beyond the calcification; only asexual reproduction known, the probable sexual phase being *G. cylindrica*.

Galaxaura lapidescens (Solander) Lamouroux, Børgesen (Oct. 1916); *G. lapidescens* (Ellis and Solander) Lamouroux, Howe (1920).

Bahamas and through the West Indies to the Virgin Islands; probably newly reported for Florida.

Dredged at Dry Tortugas at 6.2 and 12.4 meters off Loggerhead Key; a few small specimens only.

Galaxaura marginata (Ellis and Solander) Lamouroux

(Plate 21, fig. 12; plate 31, fig. 7)

Plant rather coarse, the branches smooth, dull, flattened, about 1.0 to 2.5 mm. broad on the face, and frequently somewhat transversely banded; branches tipped with a brush of deciduous hairs; structurally the cortex composed of a parenchymatous layer 2 to 3 cells thick, of large, nearly colorless cells, which form on the outer side many ultimate branches consisting of a stalk cell, rather slender, once divided at the summit and bearing on each division in the tetrasporic plants, a single large, rather thick-walled, broad assimilative cell, 26 to 32μ in diameter, by 38 to 40μ long, sometimes apiculate or bearing on the outer side in sexual plants one or more simple, narrowly oval or columnar, apiculate cells.

Galaxaura marginata (Solander) Lamouroux (the tetrasporic phase) and *G. occidentalis* Børgesen (the sexual phase), Børgesen (Oct. 1916); *G. marginata* (Ellis and Solander) Lamouroux, Collins and Hervey (1917); *G. marginata* (Ellis and Solander) Lamouroux, Howe (1920).

Of widespread distribution in warm waters; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Only one very young plant found at Dry Tortugas, dredged at 10.7 to 12.4 meters north of Loggerhead Key; the structure was that characteristic of the tetrasporic plant.

Galaxaura oblongata (Ellis and Solander) Lamouroux

(Plate 21, fig. 15; plate 31, fig. 5)

Plant moderately slender, to 10 or 12 cm. tall, abundantly branched, the branches 1 to 2 mm. in diameter, smooth, moderately calcified below, very lightly calcified above and translucent pink in the living state, shining and whitish opaque when dry, the branches segmented at the forks; structurally the cortex composed of the sub-spherical or oval cells of the outer branches of the longitudinal medullary filaments, forming a cortex 3 to 4 cells thick, the branching-filamentous arrangement of the cells quite obvious; the epidermis composed of flattened, somewhat shield-shaped cells which have a surface diameter of 9 to 18μ, usually 13μ, and which peel off very easily; sexual reproduction only known.

Galaxaura fragilis Lamarck, Børgesen (Oct. 1916); *G. oblongata* (Ellis and Solander) Lamouroux, Howe (1920).

Bahamas, through the West Indies to the Virgin Islands; probably newly reported for Florida.

Not often collected at Dry Tortugas, but in some dredgings abundant; at 3.1 meters and at 10.7 to 12.4 meters off Loggerhead Key.

Galaxaura obtusata (Ellis and Solander) Lamouroux

(Plate 21, fig. 11; plate 31, fig. 2)

Plant of coarse appearance, to about 10 cm. tall, sparingly branched, the branches 1.5 to 4.0 mm. in diameter, smooth, moderately calcified below, generally very lightly calcified above and translucent pink in the living state, opaque when dry, the branches segmented at the forks; structurally the cortex in the tetrasporic plants composed of one row of greatly enlarged cells outwardly supporting short branches composed of a slender stalk cell, bearing 1 to 2 distal cells, which are closely approximated and form the epidermis, 27 to 45μ, generally about 35μ, in diameter, angular on surface view; in the sexual plants the supporting cells of the middle layer, instead of being slender-columnar, are swollen and touch in their middle portions.

Galaxaura obtusata (Ellis and Solander) Lamouroux, Collins and Hervey (1917); *G. obtusata* (Ellis and Solander) Lamouroux, Howe (1920).

Florida; Bermuda; Bahamas and the West Indies.

Occasionally dredged at Dry Tortugas in various stations off Loggerhead Key and Southwest Channel in 6.2 to 13.6 meters.

Galaxaura rugosa (Ellis and Solander) Lamouroux

(Plate 21, fig. 16; plate 30, figs. 2, 10)

Plant cushion-shaped, densely branched, the branches wide-angled, nearly smooth and transversely rugose-annulate at least above; translucent pink in the living state; structurally the cortex is composed of the enlarged outer branches from the medullary filaments, which give a layer 2 cells in thickness, the outer cells of which support the flattened shield-shaped cells of the epidermis, which are angular on surface view and 18 to 32μ in diameter, generally about 25μ; plants sexual, the tetrasporic phase probably *G. subverticillata* Kjellman.

Galaxaura rugosa (Solander) Lamouroux, Børgesen (Oct. 1916); *G. rugosa* (Ellis and Solander) Lamouroux, Howe (1920).

Bahamas through the West Indies to the Virgin Islands; apparently newly reported for Florida.

Material probably of this species was rather frequently secured, and was sometimes approached by rugose forms of *G. squalida;* dredged at 3.1 to 9.3 meters at various points off Loggerhead Key, also Bird Key Reef, Bush Key and at 16.5 to 18.3 meters on White Shoal.

Galaxaura squalida Kjellman

(Plate 21, fig. 18; plate 31, fig. 4)

Plants densely branched, the angles rather variable but narrower than *G. rugosa;* branches smooth above, at times slightly rugose, the internodes 1.0 to 2.5 cm. long, the branches 1 to 2 mm. in diameter; structurally the cortex is composed of the enlarged outer branches of the medullary filaments, which give a layer 2 to 3 cells in thickness, the outer cells of which support the somewhat hemispherical cells of the epidermis, which are rounded-angular on surface view and 18 to 27μ, generally 23μ, in diameter, or else the locally abundant assimilatory filaments which are generally 17 to 20μ in diameter; plants sexual, the tetrasporic phase probably being *G. flagelliformis.*

Galaxaura squalida Kjellman, Børgesen (Oct. 1916); *G. squalida* Kjellman, Collins and Hervey (1917); *G. squalida* Kjellman, Howe (1920).

Bermuda; Bahamas through the West Indies to the Virgin Islands; apparently newly reported for Florida.

Material of this species is very abundant on Bird Key Reef and Bush Key, and was dredged in comparatively shallow water off Loggerhead Key.

Galaxaura stellifera J. Agardh

(Plant smooth, quickly becoming encrusted and fragile; branches dichotomous, patent, by proliferation from the upper axils becoming substellately branched; branches slightly constricted at their bases, in the older generally articulate; joints cylindrical, generally truncate at the apices, about 5 times longer than the diameter, the terminal segments upon collapsing slightly wrinkled. Near *G. cylindrica,* but more slender, and 3- to 6-chotomous.)

Florida (Curtiss, according to De Toni). Not well known; perhaps a form of *G. cylindrica.*

Galaxaura subverticillata Kjellman

(Plate 21, fig. 17; plate 31, fig. 6)

Plant coarse and densely branched, cushion-shaped or nearly spherical; branches 5 to 12 mm. between nodes, covered with short reddish hairs which are obviously in rings in the younger parts of the plant; cortex loose, composed of the swollen 3 outer cells of the peripheral filaments, which bear the free assimilative filaments that project beyond the calcification, and are 12 to 17μ, generally 14μ, in diameter; only tetrasporic plants known, the sexual phase probably being *G. rugosa.*

Galaxaura subverticillata Kjellman, Børgesen (Oct. 1916); *G. subverticillata* Kjellman, Howe (1920).

Florida; Bermuda; from the Bahamas through the West Indies to the Virgin Islands.

Very abundant at Dry Tortugas on Bird Key Reef and in shallow water about Loggerhead Key.

SCINAIA Bivona

Plant soft, dichotomously branched, the branches composed of a slender central strand of twisted filaments, from which the sparse lateral filaments form the very loose inner cortex; toward the surface the ends of the filaments become approximated, forming an outer layer a few cells thick, of which the outermost cells are very considerably enlarged, closely placed, forming an epidermis; antheridia superficial; carpogenic branch short, about 3 cells, forming an immersed cystocarp which discharges through a pore to the surface.

Scinaia complanata (Collins) Cotton var. intermedia Børgesen

(Plate 21, fig. 19)

Plant 3 to 7 cm. or more in height, in the young specimens, the branches about 4 to 6 mm., but reaching 12 to 15 mm. between the forkings; branches cylindrical or slightly flattened, especially below the forks, 1.0 to 2.5 mm. in diameter; the median strand visible in the older dried specimens, but not in the younger ones; colorless epidermal cells close-placed, angular on surface view, 18 to 30μ in diameter; pigmented sub-epidermal cells obviously in rather loosely branching filaments.

Scinaia complanata (Collins) Cotton var. *intermedia* Børgesen (Oct. 1916).

Florida and the Virgin Islands.

At Dry Tortugas secured by dredging only; depths recorded are 14.6, 18.3, and 64.0 to 67.7 meters on White Shoal and beyond Southwest Channel.

Just how far this material is distinct from *S. complanata* may be doubtful, but certainly the nearly terete thallus, with other minor points would confirm its relationship to Børgesen's variety. It was collected at Dry Tortugas by Mrs. G. A. Hall in January 1895, and by Dr. H. H. M. Bowman in July 1915 at 31.2 meters, specimens from these collections being in the herbarium of the New York Botanical Garden under Collins' name.

GELIDIACEÆ

Thallus developed from an apical cell, which originates a median cell series, forming an axis and lateral segments which produce side branches that are either closely laterally united to give rise to a more or less firm thallus, or are free; rhizoidal filaments developed from the base of the branches may also surround and form a secondary corticating zone; sexual and asexual reproduction present, the latter by tetraspores which are in some species aggregated into sori; antheridia spread over the surface of the thallus or aggregated into clusters; carpogenic branches generally 3-celled, lateral on the inner part of the corticating assimilative branches or on the central axis, the fertilized carpogonium fusing laterally with neighboring cells before the formation of the gonimoblast; cystocarp lateral or terminal on the ultimate branches; end cells of the gonimoblast filaments form spores.

1. Thallus delicate-filamentous 3
1. Thallus firm, rather cartilaginous, the determinate lateral branchlets united to a firm tissue 2

2. Thallus at maturity flattened, lanceolate, the medulla of very slender filaments .... Gelidium (142)
2. Thallus cylindrical throughout, medulla with stout filaments .... Wurdemannia (145)

3. Determinate lateral branchlets free .... Wrangelia (144)
3. Determinate lateral branchlets united by a very soft jelly .... Naccaria (143)

GELIDIUM Lamouroux

Thallus cylindrical or flattened, usually pinnately branched, of firm consistency; structurally developed from an apical cell, showing central longitudinal filaments and assimilative filaments arranged radially to form a cortex, in which the filamentous structure is largely lost; tetrasporangia in sori, usually in terminal portions of the axis or branches, which may be flattened; cystocarps of bilateral construction, opening on one or both sides of the thallus; spermatia inconspicuously developed from surface cells, in patches.

1. Small, the erect branches irregularly branched .... G. pusillum (142)
1. Larger, the erect branches pinnately branched at least when sterile 2

2. Branches flat .... G. corneum (142)
2. Branches cylindrical or somewhat clavate .... G. rigidum (143)

Gelidium corneum (Hudson) Lamouroux

(Plate 28, fig. 2)

Plant 3 (to 50) cm. tall, flat, 2- to 3-pinnately branched, the branches 0.5 to 2 mm. broad, somewhat contracted at the base and with a broadly rounded apex.

Gelidium corneum (Hudson) Lamouroux, Børgesen (Oct. 1916); *G. corneum* (Hudson) Lamouroux, Collins and Hervey (1917); *G. cærulescens* Kuetzing (?), Howe (1918).

Bermuda; Bahamas (?); Virgin Islands; newly reported for Florida.

One small tuft, not well developed, but obviously different from the other Tortugas species and from *G. crinale*. Rocks, western side of Loggerhead Key.

Gelidium pusillum (Stackhouse) LeJolis

(Plate 20, fig. 8; plate 22, fig. 7; plate 23, fig. 3)

Plant small, solitary, or sparsely associated or forming loose turfs, creeping below, giving rise to erect blades 5 to 15 mm. in length, sub-cylindrical below, flattened to 0.5 to 0.75 mm. broad above, sparsely proliferating; central part composed of slender colorless filaments with exceedingly thick confluent walls, outward the inner cortex of short, large cells and the epidermal layer of rounded angular cells elongated lengthwise of the axis, about 4 to 13μ, generally about 8μ, in diameter.

Gelidium pusillum (Stackhouse) LeJolis, Collins and Hervey (1917).

Var. conchicola Piccone and Grunow

(Plate 20, fig. 7)

Plant very small, hardly 5 mm. tall, forming dense turfs, the blades flattened throughout, otherwise as in the species; mature tetrasporangia 18 to 24μ in diameter, arranged in somewhat irregularly pinnate rows in the broader blades.

Gelidium pusillum (Stackhouse) LeJolis var. *conchicola* Piccone and Grunow, Collins and Hervey (1917).

Bermuda; newly reported for Florida.

The species common and inconspicuous on rocks about Loggerhead and Garden Keys in the littoral and sub-littoral, usually so covered with calcareous sand as to expose only the tips of the blades. The blades frequently showed injuries and related proliferations. The variety formed considerable masses on shells and on concretework, Garden Key. The material agreed fairly well, except that the blades were not flattened throughout in most cases.

Gelidium rigidum (Vahl) Greville

(Plate 22, figs. 8, 9; plate 23, fig. 4)

Plant to 5 or 7 cm. high, the branches generally arcuate to recurved and rooting at the apex; main branches irregularly and sparingly alternately branched; ultimate ramuli on the sterile shoots pinnate, alternate, frequently secund, 2 to 6 mm. in length, filiform; texture wiry and tough, the cells of the inner cortical region 15 to 25μ in diameter, thick-walled; cells of the epidermis 3 to 5μ in diameter; tetrasporic plants with the ultimate ramuli irregularly rather than pinnately disposed, the fertile ones cylindrical to clavate-swollen from a contracted base, the sporangia occupying a band below the conical tip.

Gelidiopsis rigida (Vahl) Weber, Collins and Hervey (1917); *G. rigida* (Vahl) Weber, Børgesen (Oct. 1920); *Gelidium rigidum* (Vahl) Greville, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common at Dry Tortugas on coquina rock, or on rock compacted of old corals, although generally in a quite dwarfed state; well developed around Loggerhead Key and on Bush Key and Bird Key Reef, in shallow water and to 7.6 meters; sterile and tetrasporic.

NACCARIA Endlicher

Thallus erect, terete, laterally branched, mucilaginous; a central axis of a single cell series is surrounded by rhizoidal corticating cells and bears alternate lateral ramuli which are more or less abundantly divided; antheridia as small tufts on the lower segments of the lateral ramuli; carpogenic branch 3-celled, on the axis.

Naccaria corymbosa J. Agardh

(Plant from a very firm stalk, much corymbose-decompound, sub-oppositely branched and segmented, ecorticate above, the verticels of ramelli making the plant elegantly plumose; firmly corticate below by decurrent filaments; villous with rather simple ramelli emitted between the verticels; joints of the cylindrical branches 3 to 4 times as long as broad, of the somewhat moniliform ramelli length about equal to diameter.)

Naccaria corymbosa J. Agardh, Collins and Hervey (1917); *N. corymbosa* J. Agardh, Howe (1918).

Florida; Bermuda.

WRANGELIA C. Agardh

Plant retaining the filamentous character; the apical cell developing a persistent central axis of rather large cells, with the indeterminate main branches from it usually 2-ranked; the main axes corticated by filaments developed from the nodes and the bases of the determinate lateral branchlets, which cortex may assume a parenchymatous appearance at full maturity; reproductive organs tetrasporangia, antheridia and carpogonia borne on the ultimate branchlets and toward the apex of the main axes; tetrasporangia tripartite, pedicellate, surrounded by a few involucral filaments; antheridia in spherical clusters, terminal on short special branchlets developed from the nodes, surrounded by a few involucral filaments; cystocarps terminal on the ultimate branchlets, densely surrounded by slender involucral filaments.

1. Plant solitary or clustered, not turf forming....................................2
1. Plant generally turf-forming, 1.0 to 1.5 cm. tall...................................W. Argus (144)

2. Plant large, regularly branched in 2 ranks, axis becoming completely corticated by regular longitudinal filaments..W. penicillata (145)
2. Plant smaller, irregularly few branched, axis corticated about the nodes by irregular tangled filaments...W. bicuspidata (144)

Wrangelia Argus Montagne

(Plate 20, fig. 13; plate 22, fig. 6; plate 32, fig. 4)

Plant turf-forming, 1.0 to 1.5 cm. tall, plumose-branched in 2 indistinct ranks; axis not corticated or corticated by a very few filaments about the nodes; determinate lateral branchlets terminating in attenuate cells, occasionally in single spine-like cells, or the attenuate cells deciduous, leaving the blunt supporting cells; tetrasporangia abundantly produced at the nodes, 60 to 70μ in diameter, surrounded by involucral filaments; sexual plants probably with the general generic characters.

Wrangelia plebeja J. Agardh, Harvey (1853); *W. Argus* Montagne, Børgesen (Oct. 1916); *W. Argus* Montagne Howe (1920).

Florida; Bahamas; through the West Indies to the Virgin Islands.

Very abundant at Dry Tortugas on rocks on the eastern side of Loggerhead Key in the littoral zone, where it forms a striking purple-red turf; less abundant on the western side, and only noted sporadically elsewhere; tetrasporic plants only found.

Wrangelia bicuspidata Børgesen

(Plate 20, figs. 14, 20; plate 32, fig. 2)

Plant lax, sparsely and seemingly irregularly alternately branched, the axis to about 8 cm. in length; axis corticated at the nodes by tangled filaments; determinate branches terminating in attenuate cells, frequently single or double spine-tipped, or these deciduous, leaving the blunt lower cells; tetrasporangial group to 60μ diameter, surrounded by a few involucral filaments; sexual reproduction not seen.

Wrangelia bicuspidata Børgesen (Oct. 1916); *W. bicuspidata* Børgesen, Howe (1920).

Florida north to Miami Beach (Brooks), Miami (Hall); Bahamas; Virgin Islands.

Occasionally dredged in small amount in shallow water about Long Key, Loggerhead Key and White Shoal to 9.3 meters, growing on *Thalassia* or on other coarser algæ; tetrasporic only.

This plant was distributed by Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 891* as *Sphondylothamnion multifidum* (Hudson) Naegeli, collected at Key West by Mrs. G. A. Hall.

Wrangelia penicillata C. Agardh

(Plate 20, figs. 11, 12, 19; plate 32, figs. 1, 7)

Plant sturdy, widely and regularly alternately branched in 2 ranks, the axis to about 1 dm. in length, the branches with a spread of 1 to 2 dm.; axis corticated by the downgrowth of filaments from the nodes, these filaments becoming approximated and giving rise to a rather regularly parenchymatous cortex; determinate branchlets terminating in attenuate cells, frequently in single spine-like cells, or these deciduous, leaving the blunt lower cells; tetrasporangial group to 80μ in diameter; antheridial cluster terminal on short lateral branchlets developed from the nodes, 55 to 60μ in diameter, surrounded by a few stout involucral filaments; cystocarp terminal on short lateral branches, surrounded by very many slender incurved involucral filaments.

Wrangelia penicillata C. Agardh, Harvey (1853); *W. penicillata* C. Agardh, Børgesen (Oct. 1916); *W. penicillata* C. Agardh, Collins and Hervey (1917); *W. penicillata* C. Agardh, Howe (1920).

Florida; Bermuda; Bahamas; through the West Indies to the Virgin Islands.

Occasionally dredged, sometimes in considerable quantity, at Dry Tortugas; 4.6 to 7.6 meters on White Shoal; male, female and tetrasporic plants.

WURDEMANNIA Harvey

Thallus cylindrical, slender, sparsely branching, the branches somewhat attenuate, of firm consistency; axis of stout filaments with thick, coalescent walls; inner cortex of large cells, epidermis of oval-angular cells; tetrasporangia in nemathecia formed below the tips.

Wurdemannia setacea Harvey

(Plate 20, figs. 9, 10)

Plant of a cylindrical, firm, sparsely branched axis, the branches somewhat attenuate toward the tips; axis of stout filaments with thick, coalescent walls; inner cortex of large cells, epidermis of oval-angular cells 9 to 19μ long and 5.5 to 9.0μ broad.

Wurdemannia setacea Harvey (1853); *W. setacea* Harvey, Collins and Hervey (1917); *W. setacea* Harvey, Børgesen (Nov. 1919).

Florida and Bermuda.

Forming dense and broad turfs to 3 cm. thick on the moat wall, Fort Jefferson, Garden Key, Dry Tortugas; frequent in sparser growth elsewhere about Garden and Loggerhead Keys near the littoral zone; dredged in loose tangled growth in 3.1 to 12.4 meters, and possibly to 18.3 meters about Loggerhead Key.

GIGARTINACEÆ

Plant generally tough, terete or flattened, simple or variously branched; structurally fundamentally filamentous, although this often obscured; tetrasporangia usually cruciate, sometimes zonate, scattered, assembled into sori or borne in special branchlets or nemathecia; antheridia generally scattered over the thallus surface, sometimes in conceptacles; carpogonia generally rather aggregated in fertile portions of the thallus, the 3-celled carpogenic branch associated with a definite auxiliary cell as a procarp; the carpogonium fuses with the auxiliary cell by a projection, and the auxiliary cell then gives rise to ramifying gonimoblast filaments consisting of fertile and sterile elements, the apical and sometimes the sub-apical cells forming carpospores.

1. Thallus of broad lobes .... Kallymenia (146)
1. Thallus narrowly branched (in Florida species) .... Gigartina (146)

GIGARTINA Stackhouse

Thallus flat, or to terete at least below, irregularly dichotomously to alternately branched, cartilaginous; structure filamentous, the outer radiating branches united to form a distinct cortical layer; sporangia cruciate; cystocarps somewhat unilaterally protruding, the spores scattered among sterile filaments.

Gigartina acicularis (Wulfen) Lamouroux

(Cæspitose, entangled, spreading over rocks; forming repent and erect branches from scutate holdfasts; branches 3 to 8 cm. long, 0.5 mm. thick, irregularly dichotomous or subpinnate, cylindrical to the acuminate tapering apices, the upper of which may be recurved; branches attenuate at the base; cystocarps sessile, unilateral in the middle of the branches, sub-globose, generally solitary, sometimes 2 to 4 together, the sterile apex deflexed; tetraspores collected into sori, causing frequently a unilateral swelling of the branch; substance firm, coriaceous; color purple to blackish.)

Gigartina acicularis Lamouroux, Farlow (1876); *G. acicularis* (Wulfen) Lamouroux, Collins and Hervey (1917); *G. acicularis* (Wulfen) Lamouroux, Børgesen (Nov. 1919).

Florida; Bermuda; Virgin Islands.

KALLYMENIA J. Agardh

Thallus flat or foliaceous, entire or lobed, sometimes marginally proliferous, sometimes perforated and sieve-like; structurally of a more or less spongy medulla of branching filaments, with a cortex of inwardly large, outwardly smaller cells, which are closely placed at the surface; cystocarps distributed over the thallus, immersed, opening on one or both sides; terminal segments of the auxiliary cell compactly paniculately branched, the spores forming large racemose masses in the periphery of the cystocarp.

1. Thallus soft, large, perforated...K. perforata
1. Thallus firm, small, lobed but not perforated....................................K. Limminghii

Kallymenia Limminghii Montagne

(Plate 20, fig. 18)

Thallus foliaceous, reaching a length of 3 cm.; texture firm, color dark to bright rosy-red; form irregularly rounded and lobed; the medulla very dense, with little space between the mostly coalescent walls of the filaments.

Kallymenia Limminghii Montagne, Howe (1920).

Bahamas; newly reported for Florida.

Dredged in comparatively shallow water off Loggerhead Key, 1924; similar, perhaps identical material dredged in 32.9 and in 73.2 meters off Southwest Channel in 1924 and 1925.

The determination of the Loggerhead Key material was made by the kindness of Dr. M. A. Howe, who indicated certain divergences from the typical form.

Kallymenia perforata J. Agardh

(Plate 20, figs. 15 to 17)

Plant large, 1 to 2 dm. or more in diameter, texture soft, gelatinous, color very pale pink; form irregularly orbicular, reniform or lobed, rather regularly perforate with small holes in young blades, these in part larger in older plants; blade moderately thick, the medulla very open, the spaces filled with mucilage; epidermal cells small.

Kallymenia perforata J. Agardh, Collins and Hervey (1917); *K. perforata* J. Agardh, Børgesen (Nov. 1919).

Florida; Bermuda; Virgin Islands.

Dredged off Southwest Channel, Dry Tortugas, in 1924 at 36.6 meters and in 1925 at 32.9 meters, the quantity on the latter occasion considerable.

RHODOPHYLLIDACEÆ

Plant terete or flattened, dichotomously or laterally branched; structure parenchymatous, rarely filamentous; tetrasporangia usually scattered, sunken, generally zonate; antheridia in patches scattered over the surface; carpogonia usually numerous in the fertile portions of the thallus, usually distant from the auxiliary cells and fusing with them by oöblastema filaments; sporocarp immersed, the gonimoblast suspended from the upper wall of the cystocarpic cavity and divided into radiating lobes, forming spores from the apical and sometimes the sub-apical cells of the filaments.

1. Thallus cylindrical, branched........2
1. Thallus usually somewhat flattened........4

2. Plants large, coarse and cartilaginous........Eucheuma (148)
2. Softer and apparently hollow........3

3. Ultimate branches short........Rhabdonia (150)
3. Ultimate branches slender, elongate........Agardhiella (147)

4. Plant broadly foliaceous........Meristotheca 149)
4. Ligulate to closely branched and terete........Eucheuma ((148)
4. Plant branched; branches of loment-like segments........Catenella (148)

AGARDHIELLA Schmitz

Thallus cylindrical, alternately branched, structurally showing a medullary cavity with a few anastomosing medullary filaments loosely contained, surrounded by a cortex of 2 to 4 layers of cells, the inner quite large and colorless, and with a surface layer of small epidermal cells; reproduction by tetraspores in tetrasporangia which are of the linear type, and by spermatia and cystocarps, the spermatia borne on small plants, the cystocarps immersed in the branches or slightly emergent, formed from auxiliary cells activated by sporogenous filaments ramifying from the fertilized carpogenic branches.

Agardhiella tenera (J. Agardh) Schmitz

(Plate 23, fig. 1)

Plants to 2.0 to 2.5 dm. tall, freely branching, irregularly alternate, the ultimate branches sometimes long, diameter 2 to 4 mm., the medullary cavity, at least above, occupying the larger part of the axis; epidermal cells in groups of 3 to 4, rounded angular, about 12 to 18μ in diameter.

Solieria chordalis J. Agardh, Harvey (1853); *Rhabdonia tenera* J. Agardh, Farlow (1881); *Agardhiella tenera* (J. Agardh) Schmitz, Børgesen (Nov. 1919); *A. tenera* (J. Agardh) Schmitz, Howe (1920); *A. tenera* (J. Agardh) Schmitz, Hoyt (1920).

New England to Florida; Bahamas; through the West Indies to the Virgin Islands.

Once dredged, a small plant, on White Shoal, Dry Tortugas.

The specimen secured at White Shoal was immature, tetrasporic. The description has been largely drawn from northern material.

CATENELLA Greville

Thallus cylindrical or flattened, radially or laterally branched, constricted into loment-like segments; tetrasporangia limited to special segments, the cystocarps generally solitary in shortened, terminal thallus segments, discharging by a terminal or lateral pore.

Catenella Opuntia (Goodenough and Woodward) Greville, var. pinnata (Harvey) J. Agardh

(Plate 22, fig. 18)

(Plant pulvinate-cæspitose, with repent branches, 2- to 3-chotomous, divided into segments, the segments compressed, ellipsoid to ovate, 3 to 5 times longer than broad; plants to 3 cm. tall, the lateral branches similar to the axis, of 1 to several segments, notably pinnate in arrangement; segments bearing cystocarps obovate to spherical, those with tetraspores acute; substance membranous, color dull purple.)

Catenella pinnata Harvey (1853); *C. pinnata* Harvey, Farlow (1876); *C. Opuntia* (Goodenough and Woodward) Greville var. *pinnata* (Harvey) J. Agardh, Collins and Hervey (1917); *C. Opuntia* (Goodenough and Woodward) Greville, Børgesen (Oct. 1920); *G. Opuntia* (Goodenough and Woodward) Greville, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

EUCHEUMA J. Agardh

Plant with a cylindrical or flattened axis and branches, radially or secundly branching, more or less beset with blunt nodules or spines; medulla of slender branching colorless filaments, cortex internally of very large cells, grading to small-celled epidermis; cystocarps mostly in the papillæ, more seldom in the flat portion of the thallus, opening on one side, formed of a great central cell with radiating filaments, from the ends of which are formed the carpospores.

1. Plant richly branched..2
1. Plant sparingly branched, branches coarsely nodulose, spinose or smooth ....E. isiforme (149)

2. Plant large, rather soft, main axis little flattened...............................E. acanthocladum (148)
2. Plant smaller, main axes often broadly flattened...............................3

3. Branches relatively broad, dichotomous to palmate.............................E. echinocarpum (149)
3. Branches relatively narrow, irregular to pinnate...............................E. Gelidium (149)

Eucheuma acanthocladum (Harvey) J. Agardh

(Plate 31, fig. 1)

Plant large, reaching a height of 3 dm. or more, and widely spreading, the color pale reddish; branching usually abundant, but not crowded, to 5, 6, or higher orders; main axis and branches cylindrical to oval or slightly flattened in section, branching irregularly alternate to somewhat dichotomous in appearance, often distinctly secund, the ultimate divisions frequently cervicorn, sometimes flagelliform; general texture firmly gelatinous, but not cartilaginous.

Chrysymenia acanthocladia Harvey (1853).

Florida.

At Dry Tortugas one magnificent plant several decimeters in diameter was found on the moat wall, Fort Jefferson, Garden Key in 1924; the species was found also at Bird Key and it was occasionally dredged in small amount at 3.1 to 9.3 meters on White Shoal and Bird Key Reef. The plants dredged from deeper water were firmer in texture and more slender than the material from the warm moat at the Fort.

Eucheuma echinocarpum Areschoug

(Frond flat throughout, sub-dichotomous to sub-palmate or pinnately decompound at the margins, the primary axis at first much expanded, when mature more linear, 4.0 to 7.5 cm. long, to 4 to 8 mm. broad, the marginal pinnules of irregular length intermixed with short spines; when mature evidently pinnate, or the main branches somewhat palmate; ultimate ramuli complanate; when young rather gelatinous, becoming thick and firmer at maturity.)

Eucheuma echinocarpum Areschoug; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 745.*

Florida.

Eucheuma Gelidium (J. Agardh) J. Agardh

(Plate 30, fig. 6; plate 32, fig. 5)

Plant to 1 to 2 dm. tall, branching moderate to abundant, the main axis and main branches quite flat, branching tending to be marginal, in one plane, the ultimate divisions spine-like to somewhat elongated and cervicorn; general texture sub-cartilaginous.

Eucheuma Gelidium J. Agardh, Collins and Hervey (1917).

Florida; Bermuda.

At Dry Tortugas collected in comparatively shallow water off Loggerhead, Long, Garden, Bush and Bird Keys, and also dredged in 9.2 to 32.9 meters in and off Southwest Channel.

Eucheuma isiforme (C. Agardh) J. Agardh

(Plate 36, fig. 2)

Plant large, reaching a height of 3 to 5 dm.; color usually pale straw, yellowish brown or reddish drying to dark brown or red; branching sparse, to the second or sometimes the third order, the main branches similar to and often equaling the axis; branches cylindrical, or roughened by large papillæ or spines which may be scattered or whorled, reaching a diameter of 6 to 8 mm.; structurally of a small-celled epidermis, the cells narrowly oval and radiating, the cortex small-celled without, very large thick-walled celled within, with small cells associated with the large ones; axis occupied by a medulla of slender, close-placed, thick-walled filaments.

Eucheuma isiforme J. Agardh, Harvey (1853); *E. denticulatum* (Burman *f.*) F. S. Collins, Collins and Hervey (1917); *E. isiforme* (C. Agardh) J. Agardh, Børgesen (Oct. 1920); *E. isiforme* (C. Agardh) J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas; through the West Indies to the Virgin Islands.

A few large patches found inside Bush Key and southeast of Bird Key in shallow water and occasionally dredged at Dry Tortugas off Loggerhead Key and White Shoal in 7.6 meters to 11.0 to 45.8 meters off Southwest Channel.

MERISTOTHECA C. Agardh

Thallus flat, the margin irregularly lobed and sometimes proliferous, the surface (in the female) coarsely papillose; tetraspores zonate, scattered; cystocarps in the papillæ, prominent, with a dense pericarp.

Meristotheca Duchassaignii J. Agardh

(Plate 23, fig. 5; plate 24, figs. 1, 2)

(Blade flat, sub-palmately laciniate, the segments sub-cuneate, the margins bearing similar lacinulæ, and all dentate-roughened; tetraspores cruciate.)

Meristotheca Duchassaignii J. Agardh, Collins and Hervey (1917); *M. Duchassaignii* J. Agardh, Howe (1920); *M. Duchassaignii* J. Agardh; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 884.*

Florida; Bermuda; Bahamas.

Some doubt seems to exist as to the correctness of the assignment of this plant to this genus, for the genus ordinarily has the tetraspores zonate.

RHABDONIA Harvey

Frond nearly terete, alternately branched, tubular, the axial region traversed by longitudinal anastomosing filaments; tetrasporangia scattered over the thallus, zonate; cystocarps immersed, rather prominent, the auxiliary cell sending a thick process into the cystocarpic cavity and forming the carpospores on its summit.

Rhabdonia ramosissima (Harvey) J. Agardh

(Frond compressed, decomposite-branched, branches alternate, patent, sub-distichously disposed, of long and short intermixed; ultimate branches attenuate; cystocarps sparse, almost immersed in the branches; height 20 to 30 cm., membranous to somewhat gelatinous.)

Rhabdonia ramosissima J. Agardh, Farlow (1876).

Var. dilatata J. Agardh

Branches short, to 1 cm. in diameter, beset with frequent short slender branches.

Rhabdonia ramosissima var. *dilatata* J. Agardh; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 1397.*

Florida. The variety not known to the writer otherwise than by the Phycotheca specimen.

SPHÆROCOCCACEÆ

Plant terete or flattened, dichotomously or laterally branched, the structure parenchymatous or somewhat filamentous; tetrasporangia zonate or cruciate, scattered in the cortical layer or aggregated into nemathecia; carpogenic branches usually numerous in the fertile portions of the thallus, closely associated with the cells which, after fertilization, give rise to the auxiliary cells; cystocarps often prominent, even apparently stalked, with a thick pericarp, the gonimoblast arising from the base, frequently supported by sterile strands with the pericarp, richly branched, forming spores singly or in chains from the apices of the fertile filaments.

1. Tetraspores and cystocarps in swollen ultimate ramuli, plants comparatively delicate....... Hypnea (155)
1. Tetraspores and cystocarps throughout the plant, plants often quite coarse............... Gracilaria (150)

GRACILARIA Greville

Plant branched, branches and axis cylindrical or flattened; structurally composed of a central medulla of large colorless cells surrounded by a cortex of smaller cells covered by the epidermis; tetrasporangia cruciate; cystocarps forming prominent swellings, the center occupied by a cellular mass from the surface of which the spores are formed.

This genus is rather abundant at Dry Tortugas, but the determination of several of the forms has caused much difficulty—not, however, in differentiating them from each other at Dry Tortugas, but in identifying them with previous descriptions. It is hoped that the descriptions and figures will be adequate for the recognition of material similar to that at the disposal of the writer.

1.	Thallus essentially cylindrical throughout, or at most oval in section	2
1.	Thallus decidedly flattened in section	7
2.	Thallus with filiform ultimate branches, epidermal cells large	G. confervoides (152)
2.	Thallus with coarser ultimate branches	3
3.	Ultimate branches short, dense, acute	6
3.	Ultimate branches longer, less densely placed	4
4.	Branching cervicorn to irregular, the branches broadest at base, plant cartilaginous on drying, cortex and medulla not sharply distinct	G. cornea (152)
4.	Branches scanty or abundant, alternate to paniculate, at least smaller branches contracted at base, the narrow cortex and medulla sharply distinct	5
5.	Branching scanty, branches thick, often arcuate	G. cylindrica (153)
5.	Branches frequent to abundant, slender	G. Blodgettii (151)
6.	Branching dichotomous, aspect corymbose	G. damaecornis (154)
6.	Branching pinnate, aspect pyramidal	G. ferox (154)
7.	Thallus cartilaginous, irregularly narrow	9
7.	Thallus sub-membranaceous	8
8.	Thallus narrow, rather thick and abundantly branched	G. cervicornis (152)
8.	Thallus strap-shaped to foliaceous	9
9.	Plant large, 2 to 4 dm	G. Curtissiæ (153)
9.	Plant smaller, about 1 dm	G. mamillaris (154)
10.	Thallus involved, irregularly branched, thick and coarse	G. crassissima (153)
10.	Thallus erect, narrow, irregularly pinnately branched	G. compressa (152)
10.	Thallus erect, narrow, mostly unequally dichotomously branched	G. laciniata (155)

Gracilaria Blodgettii Harvey

(Plate 23, fig. 9; plate 33, fig. 6)

Plant erect, to about 2 dm. tall, abundantly branched, rather bushy, branches cylindrical, at least the younger markedly constricted at the base, alternate, patent or ascending; main axes to about 2 mm. diameter, ultimate branchlets about 0.5 to 1.0 mm. diameter; structurally showing a medulla of very large (to 930μ) colorless cells, walls little thickened, passing abruptly to a cortex of 1 to 2 layers of much smaller cells and the epidermis of irregular rounded angular cells 12 to 20μ in diameter; tetrasporangia cruciate, to 30μ (probably immature) in diameter; cystocarps often abundant, projecting considerably from the axis; light pink in color, adhering well to paper.

Gracilaria Blodgettii Harvey (1853); *G. Blodgettii* Harvey, Børgesen (Oct. 1920).

Florida; Key West (Blodgett) and Miami (Brooks); Virgin Islands.

Material approaching this species was abundantly dredged at Dry Tortugas, mostly at about 12.4 to 13.9 meters on the slopes of Loggerhead Key Shoal, but also frequently at 11.0 to 36.6 meters in and beyond Southwest Channel.

This species, described by Harvey from Key West, would contain much Florida material usually placed as *G. confervoides*. To the present writer it appears sufficiently distinct in typical specimens, than which little more can be claimed in this genus. Material in the writer's herbarium collected at Miami by M. M. and S. C. Brooks, and part of the Tortugas material, duplicates exactly specimens from the original collection preserved in the Farlow Herbarium and which had passed through Harvey's hands. Further difficulty arises, however, in connection with *G. cylindrica,* to which reference should be made. The specimens labeled *G. Blodgettii* from the Virgin Islands by Børgesen and preserved in the herbarium of the New York Botanical Garden are in general coarser than the plants which the writer has assigned to that species, and more like the troublesome intermediates which he finds to grade toward *G. cylindrica.*

Gracilaria cervicornis (Turner) J. Agardh

(Frond 15 to 20 cm. long, pinnately to sub-dichotomously branched below, these branches dichotomously or somewhat pinnately divided, distinctly flattened, 2 to 4 mm. broad, the branchlets about half as broad; texture on drying thickish-membranaceous.)

Gracilaria cervicornis J. Agardh, Harvey (1853); *G. cervicornis* J. Agardh, Farlow (1876); *G. cervicornis* (Turner) J. Agardh, Børgesen (Oct. 1920); *G. cervicornis* (Turner) J. Agardh, Howe (1920).

Florida; Bahamas; Virgin Islands and Jamaica.

Gracilaria compressa (C. Agardh) Greville

(Plate 33, fig. 1)

Plant 1.5 to 2 dm. tall, bright rosy, adhering well to paper; moderately alternately branched, axis and branches in part cylindrical, in part flattened, to 3 mm. broad, bearing the lateral branchlets in the flattened regions on the margins.

Gracilaria compressa Greville, Harvey (1853); *G. compressa* Greville, Farlow (1876); *G. compressa* (C. Agardh) Greville, Børgesen (Oct. 1920).

Florida and the Virgin Islands.

One good-sized piece dredged at Dry Tortugas in comparatively deep water.

Gracilaria confervoides (Linnæus) Greville

(Plate 23, fig. 10)

Plant 2 to 5 dm. in height, slender and slenderly branched, branches not constricted at the base, flexuous, irregularly alternate; the ultimate segments sub-filiform, cylindrical throughout; axial medullary cells rather thin-walled and large above, somewhat thicker walled in lower portions, attaining a diameter of about 100μ, fairly distinct from the 2- to 4-layered cortex of irregularly rounded cells, outside of which lies an epidermis of 1 to 2 layers of narrow cells radially placed, which show on surface view as elongated, oval, about 10μ long and 4.5μ broad.

Gracilaria confervoides Greville, Harvey (1853); *G. confervoides* Greville, Farlow (1876); *G. confervoides* Greville, Farlow (1881); *G. confervoides* (Linnæus) Greville, Collins and Hervey (1917); *G. confervoides* (Linnæus) Greville, Børgesen (Oct. 1920).

Florida; Bermuda; West Indies to the Virgin Islands.

Not found at Dry Tortugas.

Structurally the species most nearly approaching this one are *G. cylindrica* and *G. Blodgettii;* they differ in their lesser cortical development, and thinner, larger medullary cells; in aspect they are widely different when well developed. The figure and description here given were based on Jamaica material.

Gracilaria cornea J. Agardh

(Plate 23, fig. 6; plate 36, fig. 4)

Plant reaching a height of 2 dm., pale straw-colored to pinkish in the living state, drying dull grayish brown, not adhering well to paper, horny when dry; abundantly branched, the lower branching irregularly alternate, cervicorn above, the ultimate segments short, acute to elongated, flagelliform; structurally showing a medulla of large, thick-walled cells which gradually grades into the cortex of somewhat smaller cells and the epidermis; medullary cells 240 to 320μ; epidermal cells about 5.4 to 7.5μ in diameter, rounded or oval; cystocarps somewhat elongated, 2 to 3 mm. broad, to 1 mm. high.

Gracilaria Poitei Lamouroux, Harvey (1853); *G. Wrightii* (Turner) J. Agardh, Collins and Hervey (1917) *G. Wrightii* (Turner) J. Agardh, Børgesen (Oct. 1920); *G. cornea* J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common at Dry Tortugas on the shallow flats on inner side of Garden Key; one piece dredged in shallow water off Loggerhead Key; Middle Key; tetrasporic and cystocarpic plants. Quite variable in habit.

Gracilaria crassissima Crouan

(Plate 23, fig. 8; plate 31, fig. 3)

Plant dull, pale reddish brown to almost colorless when living, shrinking enormously on drying, and losing altogether its habit of growth; 1.0 to 1.5 dm. in diameter, branched, the branches cylindrical to flattened, to 5 mm. thick, to 2 cm. broad, coarsely and closely irregularly alternately branched, or somewhat cervicorn, the branches tangled together, often recurved; structurally showing a medulla of large, thick-walled cells reaching a diameter of 460μ, generally about 380μ; epidermal cells radially compressed, about 3.6μ in diameter on surface of plant.

Gracilaria horizontalis Collins and Hervey (1917); *G. crassissima* Crouan, Howe (1920).

Bermuda; Bahamas; West Indies; newly reported for Florida.

Infrequent at Dry Tortugas; specimens collected in 1924 were destroyed as of no importance, thinking they were worn fragments of some more familiar thing; collected on rocks between the Marine Laboratory and Lighthouse, Loggerhead Key, near East Key, on Bush Key and on Bird Key Reef, in shallow water and dredged at 3.1 to 9.3 meters on Loggerhead Key Shoal and to 11.1 meters in Southwest Channel.

Gracilaria Curtissiæ J. Agardh

(Plate 23, fig. 11)

Plant to 4 dm. tall, foliaceous, the segments strap-shaped or lanceolate to 3.5 cm. broad and 0.75 to 1.0 mm. thick, branching sub-dichotomously, the branches sometimes contracted at the base; structurally showing a medulla of colorless ovoid cells reaching 420μ in diameter, the surface cells flattened, about 5.6 to 7.5μ, the sub-surface cortex cells about 13 to 15μ, also flattened; tetraspores in sori, the groups reaching about 60μ (immature); cystocarps scattered irregularly over the frond.

Florida.

Represented at Dry Tortugas by one very young tetrasporic plant, three-lobed, only 3 cm. tall, dredged at 6.2 to 9.3 meters on Loggerhead Key Shoal.

The habit description is based on the collection made at Atlantic, Florida, by Mrs. G. A. Hall and issued as *P.B.-A. 432;* the drawings and description of structure are based on the Tortugas plant after comparison with the Atlantic specimens.

Gracilaria cylindrica Børgesen

(Plate 33, fig. 9)

Plant erect, to 3 dm. tall, sparingly branched, the branches cylindrical, approaching the primary axes in diameter, at least the smaller ultimate branches constricted at the base, alternate, ascending, often arcuate; axis to 3 to 4 mm. in diameter; structurally showing a sharply differentiated medulla of large cells and a narrow cortex, in general resembling *G. Blodgettii*, but somewhat more thick-walled throughout.

Gracilaria cylindrica Børgesen (Oct. 1920).

Virgin Islands; newly reported from Florida.

Material approaching this species was dredged at 7.6 and 13.8 meters off Loggerhead Key Shoal, but the more typical material all came from 14.6 to 32.9 meters, where frequently dredged in and beyond Southwest Channel; beyond the channel in still deeper water it was secured at perhaps 110 meters.

The coarser specimens of this material duplicate very closely specimens collected by Børgesen and preserved in the herbarium of the New York Botanical Garden; on the other hand gradations of coarseness make a distinction from those here listed as *G. Blodgettii* almost impossible. The present writer has had hundreds of individual plants of these forms to study. The bluntly rounded tips of *G. cylindrica* described by Børgesen are not a notable feature of any of the Tortugas plants, but do occur under conditions not precluding previous injury to the tip and partial healing.

Gracilaria damæcornis J. Agardh

(Frond terete, sub-dichotomously branched, branches sub-secund, elongate-arcuate, somewhat horizontally expanded, to 10 cm. tall, the ultimate segments short to 5 cm. long; substance cartilaginous.)

Gracilaria damæcornis J. Agardh, Harvey (1853); *G. damæcornis* J. Agardh, Farlow (1881); *G. damæcornis* J. Agardh, Collins and Hervey (1917); *G. damæcornis* J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas.

Gracilaria ferox J. Agardh

(Plate 33, fig. 2)

Plant erect, to 8 or 10 cm. tall, densely branched and bushy, main branches 1.0 to 1.5, occasionally 2 mm. in diameter, cylindrical or slightly flattened, branching pinnate or alternate below to sub-dichotomous or cervicorn in the close, short, acute ultimate segments, irregular throughout; surface cells rounded angular, 8 to 20μ, generally about 14μ in diameter; medullary cells 250 to 350μ in the center, smaller toward the surface; cystocraps very prominent, 0.75 to 1.25 mm. diameter, appearing sessile upon, rather than immersed within, the branches; not adhering well to paper.

Gracilaria ferox J. Agardh, Collins and Hervey (1917); *G. ferox* J. Agardh, Børgesen (Oct. 1920).

Florida; Bermuda; and the Virgin Islands.

Dredged on White Shoal, Dry Tortugas, in 1.5 to 7.6 meters of water, and also off Middle Key in 4.6 to 7.6 meters, at which points very scarce; in 1926 several large female tufts on old brickwork and stones on the west side of Garden Key.

The description is based on the material from Garden Key and from a considerable collection made at Key West, also in shallow water.

Gracilaria mamillaris (Montagne) Howe

(Plate 23, fig. 7)

Plant to 1 dm. tall, drying reddish, little adherent to paper; repeatedly dichotomously branched above a short compressed or sub-terete stalk, branches flat, sub-foliaceous, to 2 cm.

broad, apices broadly obtuse to tapering and sub-acute; structurally showing a medulla of thick-walled cells 50 to 125μ in diameter, a thin cortex 1 to 3 cells in thickness and an epidermal layer of small oval cells.

Gracilaria dichotomo-flabellata Crouan, Collins and Hervey (1917); *G. dichotomo-flabellata* Crouan; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 334*.

Florida; Bermuda; Guadeloupe.

Occasionally dredged at Dry Tortugas in moderately deep water; 16.5 to 18.3 meters in Southwest Channel.

Gracilaria lacinulata (Vahl) Howe

(Fronds from flat to slightly flattened or rather terete, irregularly dichotomously or polychotomously and laterally branched, 1 to 10 mm. wide, 6 to 36 cm. long, the branches short or long, sometimes almost simple; tetrasporangia immersed among the cortical cells of the upper segments or over the greater part of the frond; cystocarps very prominent, scattered over the greater part of the frond; texture coarse, substance cartilaginous, color rose purple to greenish.)

Gracilaria multipartita J. Agardh, Harvey (1853); *G. multipartita* J. Agardh, Farlow (1876, 1881); *G. multipartita* (Clemente) Harvey, Collins and Hervey (1917); *G. lacinulata* (Vahl) Howe (June 1920); *G. lacinulata* (Vahl) Børgesen (Oct. 1920); *G. multipartita* (Clemente) J. Agardh, Hoyt (1920).

New England to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

HYPNEA Lamouroux

Thallus cylindrical, branching in all directions, generally bearing many short acute ultimate branches; structurally showing a more or less well-defined segmented central axis, surrounded by a cortex with larger cells toward the center, smaller toward the surface, which has an epidermis of small flattened cells; growth from an apical cell; tetrasporangia in local sori, cruciate; cystocarps on the ultimate branches, protruding.

1. Apices of main branches generally hamate	H. musciformis (156)
1. Apices of main branches straight	2
2. Spines simple throughout	3
2. Spines in part cornute	H. cornuta (156)
3. Vegetative plant matted, reproductive portions longer and free	H. pannosa (156)
3. Mostly erect throughout	H. cervicornis (156)
	H. alopecuroides (155)

Hypnea alopecuroides Kuetzing

(Plant intricate-cæspitose, the larger branches alternately branched, spinulose except toward the apices; spines radiating on all sides, tapering from broad bases, simple, to 2.2 mm. long, rigid; fertile spines similar, the tetrasporiferous thickened toward the tip, sterile toward base and apex; cystocarps 3 to 4 on a ramulus; plants drying whitish.)

Hypnea divaricata Greville, Harvey (1853); *H. divaricata* Greville, Farlow (1876).

Florida.

Dr. M. A. Howe has suggested to the writer that the above name based on a plant from Vera Cruz is the most promising valid name for the Florida plant currently called *H. divaricata*.

Hypnea cervicornis J. Agardh

(Plate 22, fig. 11)

Plant to about 5 to 8 cm. tall, the main axis freely alternately or sub-dichotomously branched, the ultimate segments largely apparently dichotomously forked, the main axes and to lesser extent the upper portions often closely beset with short spine-like ramelli; in habit forming a rather involved mass.

Hypnea cervicornis J. Agardh, Collins and Hervey (1917); *H. cervicornis* J. Agardh, Børgesen (Oct. 1920).

Florida; Bermuda and the Virgin Islands.

Common about Garden Key in shallow water, also from Bird Key Reef and dredged to 3.1 to 7.6 meters off Loggerhead and East Keys; tetrasporic and sterile.

The disposal of the Tortugas material tentatively placed under this name is quite unsatisfactory to the present writer, because of a lack of decision regarding the identity of *H. pannosa* and *H. divaricata.* Much of the material from deeper water is dichotomous almost throughout, while that from shallower water is more alternate below, and the lower part covered with the short ramelli, while the axes of that from deeper water are almost bare.

Hypnea cornuta (Lamouroux) J. Agardh

(Plate 22, fig. 12)

Plant to about 2 dm. tall, the axis freely alternately branched to about the second or third degree, branches of all orders bearing short, spine-like branchlets, many of which bear deflexed barbs.

Hypnea cornuta J. Agardh, Harvey (1853); *H. cornuta* J. Agardh, Farlow (1876); *H. cornuta* (Lamouroux) J. Agardh, Børgesen (Oct. 1920).

Florida; the Virgin Islands.

In fair quantity, mixed with *H. musciformis* and *Spyridia filamentosa* near the Laboratory wharf, Loggerhead Key, Dry Tortugas, loosely attached to the sandy bottom in 0.6 to 1.5 meters of water; also from East and Middle Keys and abundant about Bird Key.

Hypnea musciformis (Wulfen) Lamouroux

(Plate 22, fig. 10; plate 23, fig. 12)

Plant to about 2 dm. tall, irregularly alternately branched, the upper branches divaricate; axes and ultimate branches beset with short, acute ramuli, the ultimate branches generally terminating in a swollen hamulus.

Hypnea musciformis Lamouroux, Harvey (1853); *H. musciformis* Lamouroux, Farlow (1876); *H. musciformis* (Wulfen) Lamouroux, Collins and Hervey (1917); *H. musciformis* (Wulfen) Lamouroux, Børgesen (Oct. 1920); *H. musciformis* (Wulfen) Lamouroux, Howe (1920); *H. musciformis* (Wulfen) Lamouroux, Hoyt (1920).

New England to Florida; Bermuda; Bahamas and throughout the West Indies to the Virgin Islands.

Abundant at Dry Tortugas in clear, shallow water, well protected from wave action; west side of Garden Key especially about the moat sluice, and west side of Loggerhead Key near the Laboratory wharf; also Bird and Middle Keys; sterile and tetrasporic plants.

In general the plant was shorter, more spinulose and with more swollen tips than the New England material.

Hypnea pannosa J. Agardh

(The sterile plant pulvinate, intricately branched, the branches about 1 mm. thick, much attached to each other; fertile branches emerging from the mat, naked below, pyramidal-branched above; tetrasporangiate ramuli somewhat unilaterally thickened; color purple, substance fleshy.)

Hypnea pannosa J. Agardh, Harvey (1853); *H. pannosa* J. Agardh, Farlow (1882).

Florida.

RHODYMENIACEÆ

Plant terete or flattened, solid or hollow, furcate or laterally branched, frequently lobed or proliferous, structure parenchymatous; tetrasporangia embedded in the outer cortex, scattered or in nemathecia, cruciate, tripartite or zonate; carpogonia closely associated with cells, which, after fertilization, form the auxiliary cells; cystocarp rather prominent, the pericarp thick, the gonimoblast lobed, arising from a large stalk cell in the middle of the basal placenta, most of the cells forming carpospores.

1. Branches solid....................5
1. Branches hollow....................2

2. Plants large, tubular or locally inflated....................Chrysymenia (158)
2. Plants small, generally under 5 cm....................3

3. Branches sometimes moniliform; segmented by diaphragms....................Champia (157)
3. Branches narrow, not conspicuously segmented....................4

4. Plant wiry, forming dense iridescent mats....................Cœlothrix (160)
4. Plant soft, tufted....................Lomentaria (161)

5. Branches broad, flat....................Agardhinula (157)
5. Branches wiry, only apparently solid....................Cœlothrix (160)

AGARDHINULA De Toni

Thallus flat, dichotomously branched, structure parenchymatous, the medullary portion of several series of large rounded cells, decreasing to the small-celled surface layer, toward which the cells may appear in vertical rows; tetrasporangia in sori scattered over the surface, immersed in the thicker portions of the cortical layer, cruciately divided; cystocarps prominent, scattered, hemispherical, opening by an apical pore, the gonimoblast attached by a few filaments to the base of the cavity, forming a rounded compact mass of carpospores, loosely enclosed by branching filaments running from the wall of the cystocarp.

Agardhinula Browneæ (J. Agardh) De Toni

Thallus decompound, dichotomous to palmate, sometimes marginally proliferous, 10 to 30 cm. or more tall, the divisions 1.0 to 5.5 cm. wide, thick; tapering below to a cuneate base; segments spreading above rounded sinuses, the lower ones wide, the upper narrower, linear below, dilated above, apices truncate or blunt; texture cartilaginous-gelatinous, color light pink.

Agardhinula Browneæ (J. Agardh) De Toni, Hoyt (1920).

North Carolina and Florida.

CHAMPIA Desvaux

Plant branched, the axis and branches cylindrical, hollow, septate by cellular membranes across the cavity; growth from an apical cell from which are produced the walls, the septæ and certain longitudinal filaments traversing the cavities near the walls and bearing mucilage glands; reproduction by tetraspores in sporangia formed by extension of wall cells into the cavities; cystocarps directly inserted upon the branches.

1. Thicker branches of the plant rarely over 1.5 mm., generally 0.5 to 1.0 mm....................C. parvula (158)
1. Thicker branches of the plant 2.0 to 3.5 mm. in diameter....................C. salicornioides (158)

Champia parvula (C. Agardh) Harvey

(Plate 24, fig. 3)

Plant 5 to 8 cm. tall, tufted, freely paniculately branched, the branches cylindrical, to dolioform segmented, the segments as long as broad to several times as long in more slender specimens, diameter 0.5 to 1.5 mm., generally not over 1.0 mm., tetraspores scattered over the segments, cystocarps on female plants very prominent, 0.3 to 0.5 mm. in length.

Champia parvula Harvey (1853); *C. parvula* Harvey, Farlow (1876); *C. parvula* (Agardh) Harvey, Collins and Hervey (1917); *C. parvula* (C. Agardh) Harvey, Børgesen (Oct. 1920); *C. parvula* (C. Agardh) Harvey, Howe (1920).

New England to Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

Frequent at Dry Tortugas, though usually rather slender in comparison to the New England material; on *Thalassia* or on other algæ about Loggerhead, Bush, Bird and Garden Keys in shallow water; dredged from White Shoal and Loggerhead Key Shoal in 4.6 to 7.6 meters, and off Southwest Channel in 32.9 meters; sterile, tetrasporic and female plants.

Champia salicornioides Harvey

(Plate 24, fig. 4)

Plant rather small, to 3 or 5 cm., closely paniculately branched, the segments thick, markedly swollen, 1.5 to generally 2.0 to 3.5 mm. in diameter, and about as broad.

Champia salicornioides Harvey (1853); *C. salicornioides* Harvey, Børgesen (Oct. 1920); *C. salicornioides* Harvey, Howe (1920).

Florida; the Bahamas and Virgin Islands.

At Dry Tortugas dredged on Loggerhead Key Shoal at 7.6 meters, and off Southwest Channel at 32.9 meters, also East Key; single small specimens in all cases, sterile.

CHRYSYMENIA J. Agardh

Thallus cylindrical or flattened, locally or completely hollow, frequently locally constricted; medulla in the solid portions of elongated slender or stout cells, becoming dispersed and hardly recognizable in the hollow portions; cortex of enlarged cells, becoming smaller toward the surface to the small-celled epidermis; tetrasporangia scattered over the surface, cruciate; cystocarps scattered, protruding.

1. Plant with slender stem axis and pyriform to spherical appendages 2
1. Plant of elongated cylindrical segments .... C. Enteromorpha (159)
1. Plants more or less flattened 3

2. Axis several centimeters long, with many bladders .... C. uvaria (160)
2. Axis short, plant at most about 2 to 3 cm. tall with few bladders .... C. pyriformis (159)

3. Much branched, segments moderately compressed .... C. halymenioides (159)
3. Sparingly branched, the lobes foliaceous 4

4. Segments narrow, to about 2.5 cm. broad .... C. Agardhii (158)
4. Segments broad, to several centimeters .... C. planifrons (159)

Chrysymenia Agardhii Harvey

(Plate 24, fig. 5)

(Frond flat, thickish, dichotomously to sub-pinnately laciniately lobed, 10 to 20 cm. long, tapering from a broadly cuneate base to a short stipe; segments 2.0 to 2.5 cm. broad, linear-cuneate, undulate, margins commonly erose-dentate, approximate above the axils; tetraspores in the cortical layer, cruciate, to 27μ in diameter.)

Chrysymenia Agardhii Harvey (1853); *C. Agardhii* Harvey, Farlow (1876); *C. Agardhii* Harvey, Collins and Hervey (1917); *C. Agardhii* Harvey, Børgesen (Oct. 1920).

North Carolina to Florida; Bermuda; Virgin Islands.

Chrysymenia Enteromorpha Harvey

(Plate 22, fig. 15)

Plants to several centimeters high, of inflated ovoid to cylindrical segments; branching, the branches from constricted sub-stipitate bases; segments to 1 cm. in diameter and more than 10 cm. long.

Chrysymenia Enteromorpha Harvey (1853); *C. Enteromorpha* Harvey, Farlow (1876); *C. Enteromorpha* Harvey, Collins and Hervey (1917); *C. Enteromorpha* Harvey, Børgesen (Oct. 1920); *C. Enteromorpha* Harvey, Howe (1920); *C. Enteromorpha* Harvey, Hoyt (1920).

Beaufort, North Carolina; Florida; Bermuda; Bahamas; West Indies to Virgin Islands.

Frequently dredged at Dry Tortugas, although generally badly damaged; Southwest Channel, 14.6 to 18.3 meters and beyond the channel to 32.9 and 55.0 meters; sterile, tetrasporic and cystocarpic.

Chrysymenia halymenioides Harvey

(Plate 23, fig. 13; plate 24, figs. 6, 7, 9)

(Plant 7 to 10 cm. tall, moderately flattened, dichotomously sub-flabellate—fastigiate, the segments sub-linear, 5 to 10 mm. broad, tubular, thick, erect above rounded axils, with obtuse apices; cystocarps scattered, prominent.)

Chrysymenia halymenioides Harvey (1853); *C. halymenioides* Harvey, Farlow (1876); *C. halymenioides* Harvey, Collins and Hervey (1917).

Florida.

One small piece dredged at Dry Tortugas; tetrasporic.

Chrysymenia planifrons (Melvill) J. Agardh

(Plate 24, fig. 8)

(Frond flattened, gelatinous, thickish, broadly expanded from a short stalk, with broadly triangular pinnate lobes; margins entire, when young the lobes separate at the base, when older more closely approximate.)

Chrysymenia planifrons (Melvill) J. Agardh, Collins, Holden and Setchell, *P.B.–A. No. 388.*

Florida.

Chrysymenia pyriformis Børgesen

(Plate 22, fig. 14; plate 23, figs. 14, 16, 17, 20)

Plant 1 to 2 cm. tall, few-branched, the rather long pedicels or branches terminating in pyriform bladders 4 to 9 mm. long, generally 2 to 5 or 6 to a plant; bladders show structurally an inner layer of large, nearly colorless and rather thick-walled cells 55 to 130μ, generally 95μ, in diameter and angular from surface view, occasionally interspersed with smaller sub-spherical cells bearing 4 to 8 clavate gland cells; externally the bladders are covered by an epidermal layer of spherical-compressed cells 4 to 8μ in diameter; cells of intermediate size border the large interior cells between the inner and outer layers and form a nearly or quite complete intermediate layer across their faces.

Chrysymenia pyriformis Børgesen (Oct. 1920).

Virgin Islands; newly reported for Florida.

Occasionally dredged at Dry Tortugas; Loggerhead Key Shoal 3.1 to 12.4 meters; Southwest Channel 16.5 to 18.3 meters; never in large quantity and inconspicuous, easily mistaken for stunted or young *C. uvaria*, but usually darker in color; the glands on the inner surface seem to be decisive, and the structure of the intermediate layer almost equally so; sterile.

Chrysymenia uvaria (Linnæus) J. Agardh

(Plate 22, fig. 13; plate 23, fig. 15)

Plant to 2 dm. tall, the axis frequently branched, wiry, bearing frequent shortly pedicellate ovoid-pyriform to sub-spherical bladders to 4 or 5 mm. long, radially or bilaterally disposed; structurally the bladders show an inner layer of large, nearly colorless and rather thin-walled cells, 55 to 110μ, generally about 80μ, in diameter, and angular from surface view, frequently bearing a small gland cell on the inner face; externally the bladders are covered by an epidermal layer of spherical-compressed cells 8 to 14μ in diameter; between the inner and outer layers cells of intermediate size border the large interior cells, but do not form a complete cell layer.

Chrysymenia uvaria J. Agardh, Harvey (1853); *C. uvaria* J. Agardh, Farlow (1876); *C. uvaria* (Linnæus) J. Agardh, Collins and Hervey (1917); *C. uvaria* (Linnæus) J. Agardh, Børgesen (Oct. 1920); *C. uvaria* (Linnæus) J. Agardh, Howe (1920); *C. uvaria* (Linnæus) J. Agardh, Hoyt (1920).

Beaufort, North Carolina, to Florida; Bermuda; Bahamas; through the West Indies to the Virgin Islands.

Frequently dredged at Dry Tortugas, sometimes in fair amount; Loggerhead Key Shoal at 4.6 to 7.6 meters; Southwest Channel 11.0 to 18.3 meters, and beyond the channel to 32.9 meters; sterile.

CŒLOTHRIX Børgesen

Plant of rigid filiform branches, which frequently become united; hollow, wall composed of two layers, the outer a simple epidermis, the inner of cells of graded size; glands extending into the cavity; tetraspores in swollen enlargements at the end of short branches.

Cœlothrix irregularis (Harvey) Børgesen

(Plate 22, fig. 19; plate 23, fig. 18)

Plant 2 to 3 cm. high, loosely to densely entangled, notably bluish-iridescent, the branches cylindrical, somewhat tapering, frequently interadherent and fusing, 0.50 to 0.75 mm. in diameter; structurally somewhat hollow, showing a medulla of a few filaments of stout, elongated cells with very gelatinous walls loosely connected with the cortex, and ovoid-clavate mucilaginous gland cells projecting into the cavity; cortex of thick-walled cells reaching 45 to 80μ in diameter, and 120 to 200μ in length, surrounded by an epidermis of rather elongated cells, 18 to 27μ in diameter by 45 to 54μ in length; reproduction by tetraspores carried in short swollen ovoid pedicellate branches.

Cordylecladia ? irregularis Harvey (1853); *C. ? irregularis* Harvey, Farlow (1876); *C. ringens* (C. Agardh) Collins and Hervey, Collins and Hervey (1917); *Cœlothrix irregularis* (Harvey) Børgesen (Oct. 1920); *Cordylecladia irregularis* Harvey, Howe (1920).

Florida; Bermuda; Bahamas; through the West Indies to the Virgin Islands.

Occasional at Dry Tortugas, forming firm iridescent mats in crevices of rocks, especially about the moat, Fort Jefferson, Garden Key; also on rocks on Bird Key Reef and Loggerhead Key, and dredged to 6.2 to 9.3 meters off Loggerhead Key.

LOMENTARIA Lyngbye

Plant branched, the axis and branches cylindrical, hollow, occasionally septate by constriction of the thallus; structurally developing from the apical cell a wall of one-cell layer and a medulla of a few filaments lying close to the wall and provided with mucilage gland cells; reproduction by tetraspores scattered over the wall or by cystocarps borne externally.

Lomentaria uncinata Meneghini

(Plate 22, fig. 17)

Plant rosy in color, to 5 (to 12) cm. in height, often intricate, the branches frequent, arcuate, somewhat contracted at the base and about 0.2 to 0.5 mm. diameter.

Chylocladia Baileyana Harvey (1853); *Lomentaria Baileyana* Farlow (1876); *L. uncinata* Meneghini, Collins and Hervey (1917).

New England to Florida; Bermuda.

At Dry Tortugas occasional little tufts of only one or two filaments of this are seen, rarely enough together to preserve a collection, but more substantial amounts were secured on *Valonia* in the moat, Fort Jefferson, Garden Key, and at 32.9 meters off Southwest Channel on *Chrysymenia uvaria*.

DELESSERIACEÆ

Plant generally flat, entire or in some fenestrate, simple or branching, frequently proliferous; structure parenchymatous-membranous, generally nervate; tetraspores tripartite, usually in sori in locally thickened cortex tissue; antheridia in sori upon the thallus surface, giving rise by successive divisions to several spermatia; carpogonia closely associated with the cells which function as the auxiliary cells; cystocarps prominent, sessile, pericarp present, gonimoblast arising from a large basal stalk cell and sometimes connected with the pericarp by sterile filaments; carpospores formed in chains or groups from the terminal cells of the gonimoblast filaments.

1. Plant of comparatively broad or irregular lobes....................2
1. Plant narrower, of rather definite leaf-like segments with a midrib....................3

2. Plant broadly lobed, lobes in part of grid-like structure....................Martensia (163)
2. Plant broadly lobed, lobes continuous....................Nitophyllum (163)

3. Plant small, rooting at nodes; tetrasporangia in divergent rows, cystocarps on one side of midrib....................Caloglossa (161)
3. Plant larger, tetrasporangia not in rows, cystocarps protruding on both sides, scattered...Delesseria (162)

CALOGLOSSA (Harvey) J. Agardh

Thallus foliaceous, irregularly branched, narrowed at the forkings, and frequently proliferous; membranous, with a midrib; tetrasporangia in the upper thallus segments, in divergent rows; cystocarps on the upper branches on the under side of the midribs.

Caloglossa Leprieurii (Montagne) J. Agardh

(Plant violet in color, the frond regularly dichotomous, the segments proliferating from the costa, lanceolate linear to long attenuate, articulately constricted, rooting at the nodes and giving rise to similar leaves; plant 4 to 5 cm. broad, the width of the blades to 2.0 to

2.5 mm., becoming sub-fastigiate in arrangement, linear-lanceolate in shape; lamina of one cell layer, the cells in parallel rows running obliquely from costa to margin; tetraspores in lines following the cell rows; cystocarpic conceptacles sessile on the costa.)

Delesseria Leprieurii Montagne, Harvey (1853); *D. Leprieurii* Montagne, Farlow (1876, 1881); *Caloglossa Leprieurii* (Montagne) J. Agardh, Collins and Hervey (1917); *C. Leprieurii* (Montagne) J. Agardh, Børgesen (Nov. 1919); *C. Leprieurii* (Montagne) J. Agardh, Howe (1920).

New York to Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

DELESSERIA Lamouroux

Plant of flat segments, mostly becoming stipitate below by disintegration of the lamina; entire or branched above from the margins or proliferating from the face of the lamina, where there is a mid-rib often with side ribs; lamina apart from the ribs one to several cells in thickness, in latter cases with well-defined epidermal and central layers; growth from a transversely dividing apical cell; tetrasporangia cruciate, mostly grouped beside the midrib; cystocarps scattered, sometimes on small proliferating lateral branches.

1. Plant small, leaflets narrow, 1 to (rarely) 2.5 cm. long, habit dense ....D. involvens (163)
1. Plant larger, leaflets to 3 cm. long and 3.5 mm. broad, habit open...................D. Hypoglossum (162)

Delesseria Hypoglossum Harvey

(Plate 24, figs. 10 to 13)

Plant small, to about 7 or 8 cm. tall, and spreading; color light pink to greenish or nearly colorless, darkening little on drying; main blades to 3 cm. long and 2.5 to 3.5 mm. broad, oblong to oblanceolate, the apex sub-acute to broadly obtuse, the midrib hardly visible to naked eye except in basal blades; proliferous branching from the face of the blade, usually regular, the attached blades frequently closely overlapping; structurally showing a prominent apical cell which cuts off antical lunate segments, from which are developed the median and the lateral series; blade 1 cell thick in the wings, the cells in oblique rows to near the margin, which is bordered by about 2 rows of smaller cells; cells on each side of the midrib distinctively larger, in two superimposed series; midrib originally 3 cells in thickness, the central row remaining undivided but the outer rows divided and extending irregularly lengthwise of the axis to form a strengthening cortex; reproduction by tripartite tetrasporangia formed in sori toward the tip of the blade, on the sides of the midrib, giving the naked-eye appearance of a bright red fleck on the pale green blade.

Delesseria Hypoglossum Harvey (1852); *Hypoglossum hypoglossoides* (Stackhouse) Collins and Hervey (1917); ? *D. tenuifolium* Harvey, Børgesen (Nov. 1919).

Florida; Bermuda; West Indies.

Frequently dredged at Dry Tortugas, but never in large quantity and generally sterile; 4.6 to 9.3 meters on Loggerhead Key Shoal, 14.6 to 18.3 meters in Southwest Channel and 32.9 meters beyond.

The specimens of *Delesseria tenuifolium* collected at the Virgin Islands by Børgesen and preserved at the herbarium of the New York Botanical Garden are very close to those of the writer, which correspond to type duplicates of Harvey, except that they are somewhat more sturdy and in this resemble European material of *D. Woodwardii* which may be synonymous, although that plant sometimes attains a much greater size than those at Tortugas. Børgesen figures his plant as having but one series of the large cells on each side of the midrib, while these have two, superimposed.

Delesseria involvens (Harvey) J. Agardh

(Frond costate, articulate, proliferating from one side of the costa, the habit fastigiate and sub-globose; leaflets delicate, 1 to 2.5 cm. long, narrowly linear-lanceolate to lanceolate, the base obtuse and the apex acuminate and involute-circinnate; tetrasporangia in sori beside the costa; cystocarps strongly convex, upon the costa.)

Delesseria involvens Harvey (1852); *D. involvens* Harvey, Farlow (1876).

Florida.

MARTENSIA Hering

Plant flat, thin, dichotomously or irregularly branched, without ribs; in zones divided longitudinally into narrow bands which are often oriented with their faces at right angles to the plane of the thallus; growth intercalary or by a marginal row of apical cells; sporangia over the upper part of the thallus, especially over the grid-like bands, in sori; cystocarps, on the margin of the grid-bands, projecting.

Martensia Pavonia J. Agardh

Plant to 3 or 4 cm. high, often entangled in other algæ, the segments to 2 to 10 mm. wide, frequently altered from the simple membrane to a grid of parallel or anastomosed bands, and often rather irregular.

Martensia Pavonia J. Agardh, Børgesen (Nov. 1919).

Florida and the Virgin Islands.

One small piece dredged at 6.2 meters on Loggerhead Key Shoal, showing the typical structure, but sterile.

NITOPHYLLUM Greville

Thallus foliaceous-membranous, sessile or stipitate, simple or irregularly to dichotomously branched, nervate or enervate, the nerves sometimes branched and anastomosing; growth at first apical, later intercalary; tetraspores tripartite, in rounded sori prominent on both surfaces of the frond; cystocarps scattered, sessile, prominent on both surfaces, opening by an apical pore.

Nitophyllum punctatum (Stackhouse) Greville var. ocellatum (Lamouroux) J. Agardh

(Frond affixed by a minute disk, sub-sessile, thinly membranous, dichotomously fastigiate; flabellate, the segments linear, apices emarginate; tetrasporic sori rounded, carposporic sori to 1 mm. in diameter, sparsely distributed over the surface; color bright rosy purple.)

Nitophyllum punctatum var. *ocellatum* Greville, Harvey (1853); *N. punctatum* var. *ocellatum* Greville, Farlow (1876).

Florida.

RHODOMELACEÆ

Plant terete or flattened, dichotomously or laterally branched, structure filamentous or parenchymatous, usually with a conspicuous polysiphonous axis composed of an axial series of cells and associated pericentral segments, frequently corticated; monosiphonous branched filamentous outgrowths (trichoblasts) frequently present; tetrasporangia formed from the pericentral cells and protected by special cover cells, scattered over the thallus or in special branches (stichidia), tripartite; antheridia borne on trichoblasts or apparently on a polysiphonous branch as compact bodies with a central axis bearing the spermatangia; carpogonia associated with the cells which, after fertilization, produce the auxiliary cells;

the cystocarp external, conspicuous, becoming surrounded by a pericarp, the compact gonimoblast arising from a basal placenta and forming from the end cells elongate carpospores or rarely chains of round carpospores.

1. Plant with colored monosiphonous ramuli..2
1. Plant without colored monosiphonous ramuli..8

2. Ramuli uniting to form a network..Halodictyon (175)
2. Ramuli not in a network..3

3. Vegetative branches without periclinal cells..Dasyopsis (174)
3. Vegetative branches with periclinal cells..4

4. Growth sympodial..5
4. Growth monopodial..6

5. Radially branched; tetraspores not covered by outer cells of stichidium............Dasya (171)
5. Dorsiventrally branched, tetraspores enclosed completely in stichidium............Heterosiphonia (178)

6. Colored monosiphonous ramuli persistent..7 (also Murrayella)
6. Colored ramuli soon deciduous..Wrightiella (187)

7. Ramuli long and soft; stichidium with monosiphonous base........................Lophocladia (181)
7. Ramuli short, stiff; stichidium with polysiphonous base........................Brongniartella (167)

8. Plant in part delicately filamentous..9
8. Plant stouter, in part heavily corticated or flattened..............................16

9. Plant not corticated..10
9. Plant corticated..14

10. Pericentral siphons 3 in number..Falkenbergia (175)
10. Pericentral siphons 4 or more..11

11. Axis beset with short spine-like branchlets..Bryocladia (168)
11. Branchlets not notably different from the potential axes........................12

12. Plants with distinct rhizomatous habit..13 (also Amphibia)
12. Rhizome not distinct..Polysiphonia (182)

13. Erect axes branching, at least in fertile parts..Lophosiphonia (181)
13. Erect axes unbranched..Herposiphonia (176)

14. Plant radially branched..15
14. Plant dorsiventral in organization..Amphibia (166)

15. Habit alopecuroid, axis closely beset with short branches........................Digenea (174)
15. Axis not densely covered with short branches..Polysiphonia (182)

16. Branches flattened, dorsiventral..17
16. Branches angular or cylindrical..18

17. Membrane bordering midrib but 2 cells thick..Amansia (165)
17. Membrane corticated, plant more firm in texture..Vidalia (186)

18. Plant beset with spine-like branchlets..19
18. Plant not spinulose..21

19. Habit alopecuroid, ultimate branchlets several times as long as broad..............Digenia (174)
19. Ultimate branches short-spinose..20

20. At least the penultimate branches flat or angular-compressed......................Bryothamnion (168)
20. Branches cylindrical..Acanthophora (165)

21. Ramuli generally with contracted bases, the point of growth usually emergent.......Chondria (169)
21. Ramuli not contracted, the point of growth sunken in the tip.....................Laurencia (178)

ACANTHOPHORA Lamouroux

Thallus erect, cylindrical, laterally branched, the lateral branches of indefinite growth simulating the axis, or short, of limited growth, completely or partially provided with short, spirally alternating spines; structure firm, parenchymatous, derived from a polysiphonous main axis with 5 pericentral cells; monosiphonous hyaline filaments occasional, principally about the branch apices and the reproductive organs; tetrasporangia in short lateral branches; antheridia stalked, disciform; pericarp sessile in the axil of a spine.

1. Main axis and indefinite branches without spines .... A. spicifera
1. Main axis and branches as well as short branches bearing spines .... A. muscoides

Acanthophora muscoides (Linnæus) Bory

(Plate 26, fig. 7; plate 34, fig. 9)

Plant bushy, from slender branching holdfast strands; branching pyramidal, spreading, irregular, the axis reaching a diameter of 2.0 to 2.5 mm.; axis and main branches bearing short spur-branchlets about 1 mm. long; main and spur branches with short spines spirally disposed.

Acanthophora Delilei Lamouroux, Harvey (1853); *A. muscoides* C. Agardh, Farlow (1876); *A. muscoides* (Linnæus) Bory, Børgesen (Nov. 1918); *A. muscoides* (Linnæus) Bory, Howe (1920).

Florida; Bahamas; Virgin Islands.

Rare at Dry Tortugas; dredged at 6.2 to 9.3 meters on Loggerhead Key Shoal and at 11.0 meters in Southwest Channel.

Acanthophora spicifera (Vahl) Børgesen

(Plate 26, figs. 5, 6; plate 34, fig. 7)

Plant erect to 2 dm., usually rather sparingly branched, the branches long, somewhat arcuate; axis and branches to 3 mm. diameter, bearing short spur-branchlets, which have short spines spirally disposed.

Acanthophora Thierii Lamouroux, Harvey (1853); *A. Thierii* Lamouroux, Farlow (1876); *A. spicifera* (Vahl) Børgesen, Collins and Hervey (1917); *A. spicifera* (Vahl) Børgesen (Nov. 1918); *A. spicifera* (Vahl) Børgesen, Howe (1920).

Florida; Bermuda; Bahamas; Virgin Islands.

Common at Dry Tortugas, especially in and about the moat of Fort Jefferson on Garden Key, Bird Key Reef; dredged on White Shoal and Loggerhead Key Shoal, and out Southwest Channel to 3.1 meters; sexual and tetrasporic plants observed.

AMANSIA Lamouroux

Thallus upright, membranous, ligulate, sometimes with a midrib prominent on the under side; axis polysiphonous, with 5 pericentral cells, laterally developing a broad 2-layered membrane; principal axes showing recurved rolled apices, branching alternate, lateral, pinnate, the ultimate divisions marginally dentate or ciliate; tetraspores in lateral stichidium-like proliferations from the blade margins.

Amansia multifida Lamouroux

(Plate 29, fig. 5)

(Frond ecorticate, flat, linear, costate below, pinnately subdivided and sparsely branched proliferations emerging from the costa; margins serrate-pinnate, pinnules with incurved apices, linear, becoming transformed into linear stichidia; plant to 10 cm. high, cæspitose, the stalk terete, affixed by a radicular disk; blades 2 to 5 mm. broad, tapering to base and apex.)

Amansia multifida Lamouroux, Harvey (1853); *A. multifida* Lamouroux, Farlow (1876); *A. multifida* Lamouroux, Howe (1920).

Florida; Bahamas and West Indies.

AMPHIBIA Stackhouse

Thallus decumbent, sometimes partly erect, filamentous; branched, the main branches bearing short pinnate branchlets, and with frequently in-rolled apex; pinnate branchlets often terminating in hyaline hairs; structure primarily polysiphonous and segmented, with several pericentral cells, later forming a somewhat parenchymatous cortex; reproduction by tetraspores formed in swollen somewhat stichidia-like branches and by antheridia formed on the swollen ends of branchlets and pericarps.

1. Main axis ecorticate 2
1. Main axis corticate 3

2. Plants larger, loosely branched .... A. rivularis (167)
2. Plants smaller, more closely distichously branched .... A. Moritziana (166)

3. Long monosiphonous ramelli present .... A. tenella (167)
3. Only at most a few terminal segments monosiphonous 4

4. Pericentral cells in 1 to 3 layers .... A. pectinata (166)
4. Pericentral cells in 3 to 7 layers .... A. Montagnei (166)

Amphibia Montagnei (Harvey) Kuntze

(Plate 24, figs. 14, 15)

Frond ascending, 2.5 to 5.0 cm. long, distichously decompound and pinnate, the main branches corticated with 3 to 7 series of pericentral cells, the lower pinnules naked and stiff, the incurved ecorticate apices blunt or with very short monosiphonous tips about 26μ in diameter by 21 to 30μ long, stichidia of partly transformed lanceolate pinnæ; substance rigid, not adhering well to paper; color dark purplish-brown.

Bostrychia Montagnei Harvey (1853); *B. Montagnei* Harvey, Farlow (1876); *B. Montagnei* Harvey, Collins and Hervey (1917); *Amphibia Montagnei* (Harvey) Kuntze, Howe (1920).

Florida; Bermuda; through the Bahamas to the West Indies.

Amphibia Moritziana (Sonder) Kuntze

(Plant erect, 2 to 6.5 cm. long, axis slender and tapering, pinnately decompound-branched to 5 to 6 times, ecorticate; beset with ramelli about 2.2 mm. long, pinnately sub-fastigiate in arrangement, erect-patent and distichous; ramelli and younger branches monosiphonous, but older branches with 7 to 8 pericentral cells and more rigid, the younger ramuli patent, the older recurved or, where persistent, hanging from the oldest branches; joints of the polysiphonous branches equal or to half as long as broad, the cells of the monosiphonous ramelli 1.5 as long as broad or longer; cortex absent.)

Florida and the West Indies.

Amphibia pectinata (Kuetzing) Howe

(Plant comparatively small, the sections of the main axes showing 1 to 3 series of pericentral cells; branchlets without monosiphonous tips or if present these short, and of cells only 15 to 26μ long; bi-tripinnate or quadrifarious through the development of 2 rows of ventral branches near the bases of the lateral branches; ultimate branchlets 200 to 750μ (12 to 40 segments) long; main branches deflexed or drooping.)

Amphibia pectinata (Kuetzing) Howe (1920).

Florida; Bahamas; West Indies.

Amphibia rivularis (Harvey)

(Plants forming dense tufts 1.0 to 4.0 cm. high, arising from creeping filaments attached by hapteræ to the substratum; capillary, rather rigid, alternately pinnate and usually distichous, the lower branches horizontal spreading, the upper erect and rather fastigiate with incurved apices and incurved branchlets that are polysiphonous to the tip or terminate in a monosiphonous prolongation; pericentral cells 6 to 8 in the principal branches, divided once transversely and so half as long as the central siphons, ecorticate; tetrasporangia in stichidium-like branchlets; cystocarps terminal on the short naked lower branchlets; color brownish purple.)

Bostrychia rivularis Harvey (1853); *B. rivularis* Harvey, Farlow (1876); *B. rivularis* Harvey, Collins and Hervey (1917); *B. rivularis* Harvey, Hoyt (1920).

New England to Florida; Bermuda; West Indies.

Amphibia tenella (Vahl) Kuntze

(Plate 24, fig. 19; plate 25, figs. 6, 7)

Plant forming mats 1 to 2 cm. thick, intricately branched, the branches mainly naked below, above dorsiventral with alternate pinnate or secund branchlets, which in the younger parts bear long incurved monosiphonous hyaline hairs, 25 to 35 cells long, about 21μ in diameter, the cells 30 to 45μ in length; main branches becoming broadly corticated with 3 to 4 rows of pericentral cell layers.

Bostrychia calamistrata Montagne, Harvey (1853); *B. calamistrata* Montagne, Farlow (1876); *B. tenella* (Vahl) J. Agardh, Collins and Hervey (1917); *B. tenella* (Vahl) J. Agardh, Børgesen (Nov. 1918); *Amphibia tenella* (Vahl) Kuntze, Howe (1920).

Florida; Bermuda; the Bahamas to the Virgin Islands.

A few luxuriant tufts on the inner wall of the moat, Garden Key, in 1925 but absent in 1924.

This material was larger than most of the samples seen, although quite typical in detailed appearance, except that the cross-section of the main stems showed a thicker pericentral area (to 4 cells) than usual. It grew on a vertical brick wall about high-tide line and represents one of the notable appearances of algæ in 1925 and 1926 that had been lacking in 1924, for from its position on the nearly bare wall it could not have been overlooked.

BRONGNIARTELLA Bory

Plant branched, the branches cylindrical, polysiphonous, becoming corticated, except in the lower parts radially beset throughout with spirally alternate dichotomously branched monosiphonous filaments of definite growth; reproduction by sporangia in stichidium-like branchlets; sexual organs resembling those of *Polysiphonia*.

Brongniartella mucronata (Harvey) Schmitz

(Plate 27, figs. 5, 6)

(Plant producing one to several axes from a basal disk to 1 cm. broad, these becoming 15 to 20 cm. long, decompound above, the larger branches naked, the younger clothed with squarrose ramuli, especially toward the apices; diameter reaching about 1 mm., corticated with descending ramuli, containing 5 pericentral cells; ramuli monosiphonous, densely divaricately dichotomous, the terminal cells mucronate; tetraspores inserted spirally in little modified branches.)

Dasya mucronata Harvey (1853); *D. mucronata* Harvey, Farlow (1876); *Brongniartella mucronata* (Harvey) Schmitz, Collins and Hervey (1917); *B. mucronata* (Harvey) Schmitz, Hoyt (1920).

North Carolina to Florida; Bermuda.

BRYOCLADIA Schmitz

Thallus ascending or erect from a decumbent rhizome, alternately branched; structure polysiphonous with 6 to 12 pericentral cells, uncorticated; the main axis and branches beset with small spinose ramuli; adventitious lateral branches developed endogenously; sporangia developed in numbers in the spinose ramuli; cystocarps borne between the ramuli.

1. Elongate main branches directly clothed with stout, short, simple branchlets............B. cuspidata
1. Main branches with short, cymose or racemose divided branchlets.....................B. thyrsigera

Bryocladia? cuspidata (J. Agardh) De Toni

(Plant erect cæspitose, 2 to 5 cm. long, the axes not corticate, scantily branched; the branches beset with alternate patent ramuli about 1 mm. long, rigid and sharply tapering, somewhat incurved; segments in the branches somewhat shorter than broad, with 8 pericentral siphons.)

Polysiphonia cuspidata J. Agardh, Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 637.*

Florida.

Bryocladia thyrsigera (J. Agardh) Schmitz

(Plant cæspitose, the filaments united below by rhizoidal filaments, 4 to 8 cm. tall, rigid, drying blackish and hardly adhering to paper; erect filaments little branched, beset with erect appressed ramuli, densely alternately disposed, generally curved, usually simple; main branches about 2.5 cm. long; the tetraspores in single series, few to a branch, the branches densely corymbiform; segments in main branches about 0.5 as long as broad, in the slender branches equal; pericentral siphons 10.)

Polysiphonia thyrsigera J. Agardh, Harvey (1853); *P. thyrsigera* J. Agardh, Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 492.*

Florida.

BRYOTHAMNION Kuetzing

Plant erect, alternately branched, firm of texture, the axis cylindrical or angled, the primary axis with 6 to 8 pericentral cells which become broadly corticated; main branches bearing more or less forked spur-branches of limited growth; reproductive organs borne on lateral branches which also bear monosiphonous hyaline hairs; tetrasporangia in clustered ramuli, cystocarps apparently stalked.

1. Axis three-angled, the spur-branches radial, with few short ramuli....................B. triquetrum (169)
1. Axis cylindrical or flattened, the spur-branches with two rows of ramuli...............B. Seaforthii (168)

Bryothamnion Seaforthii (Turner) Kuetzing

(Plate 26, figs. 8, 9)

(Plant to 8 to 15 cm. long, branches few to densely fastigiate above, compressed and more or less pinnately decompound, pinnæ marginal or surrounding the axis, each pinnately compound, the ultimate segments subulate, rigid.)

Bryothamnion Seaforthii Agardh, Farlow (1876); *B. Seaforthii* (Turner) Kuetzing, Børgesen (Nov. 1918).

Forma disticha

Branches flat, with pinnules on the margin.

Forma imbricata J. Agardh

Branches cylindrical, with pinnules investing the axis.

Florida; Virgin Islands and West Indies.

Bryothamnion triquetrum (Gmelin) Howe

(Plate 26, fig. 10)

Plant bushy, to 10 to 15 cm. tall, the branches cylindrical below, 3-angled above, about 1 to 2 mm. diameter, originally 7 to 8 (or 9 ?) siphonous, but immediately heavily corticated, bearing somewhat spiral series of short branchlets which usually carry 3 to 5 spine-like teeth.

Alsidium triangulare J. Agardh, Harvey (1853); *A. triangulare* J. Agardh, Farlow (1876); *Bryothamnion triquetrum* (Gmelin) Howe, Børgesen (Nov. 1918); *B. triquetrum* (Gmelin) Howe (1920).

Florida; Bahamas; Virgin Islands.

Exceedingly rare at Dry Tortugas in 1924, represented by a few fragments dredged on Loggerhead Key Shoal in 4.6 to 7.6 meters; in 1925 a large tuft was dredged in 13.8 meters on the same bank, and the plant was quite abundant on rocks in shallow water between the Laboratory and the Lighthouse, west side, which were minutely inspected in 1924 and 1926 without detecting any trace of the plant.

CHONDRIA (C. Agardh) Harvey

Plants erect, cylindrical, abundantly alternately branched, firm or somewhat delicate of texture, the axis with 5 primary pericentral cells, becoming parenchymatous-corticated; apices clothed with hyaline, branched hairs; reproduction by tetraspores in short ultimate ramuli, or by antheridia, which are stalked, flat, and cystocarps which are oval and lateral upon the fertile ramulus.

1. Color pale to light purple or brownish 2
1. Color dark purple or purple-brown, of notably dense habit .... C. atropurpurea (170

2. Apices of ultimate ramuli acute, growing point exposed 3
2. Apices of ultimate ramuli obtuse, growing point immersed 5

3. Plants small, to 3 cm. tall, slender .... C. polyrhiza (212)
3. Plants large, to 2 dm. or taller 4

4. Main axis grading to rather similar main branches; of virgate habit .... C. tenuissima (171)
4. Main axis sharply distinct and stouter than main branches, becoming dark yellow-brown on drying .... C. littoralis (170)

5. Ultimate ramuli sharply distinct 6
5. Branches rather indefinitely grading to ultimate ramuli, which lack obvious hair tufts. . C. floridana (170)

6. Branching often markedly complanate, ramuli short and without conspicuous hair tufts, generally drying greenish or pinkish .... C. sedifolia (171)
6. Branching rarely somewhat complanate, generally pyramidal, ramuli elongate and with conspicuous tufts of hairs which stain paper brown on drying; whole plant becoming brown on drying .... C. dasyphylla (170)

Species of uncertain position .... C. leptacremon (170)

Chondria atropurpurea Harvey

(Plant to 10 cm. or more high, widely branching, the main branches pyramidal, in the last degree 2 to 3 cm. long, attenuate toward the ends; adult ramuli 4 to 6 mm. long, similar to the branchlets; color dark purple.)

Chondria atropurpurea Harvey (1853); *C. atropurpurea* Harvey, Farlow (1876); *C. atropurpurea* Harvey, Collins and Hervey (1917); *C. atropurpurea* Harvey, Børgesen (Nov. 1918); *C. atropurpurea* Harvey, Howe (1920); *C. atropurpurea* Harvey, Hoyt (1920).

North Carolina to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Chondria dasyphylla (Woodward) C. Agardh

(Plate 34, fig. 1)

Plants 1 to 2 dm. tall, pyramidally branched, the long branches bearing oblong clavate ramuli 2 to 5 (to 20) mm. long with truncate apices and contracted bases, tipped by abundant hairs; plant and especially hair tufts turning brown and discoloring the paper.

Chondria dasyphylla (Woodward) C. Agardh, Harvey (1853); *C. dasyphylla* (Woodward) C. Agardh, Farlow (1876); *C. dasyphylla* (Woodward) C. Agardh, Collins and Hervey (1917); *C. dasyphylla* (Woodward) C. Agardh, Børgesen (Nov. 1918); *C. dasyphylla* (Woodward) C. Agardh, Howe (1920) *p.p.*; *C. dasyphylla* (Woodward) C. Agardh, Hoyt (1920).

New England to Florida; Bermuda; Bahamas to the Virgin Islands.

Collected at Dry Tortugas in very small amount on Loggerhead, East, Bird and Garden Keys in very shallow water; tetrasporic and female; the plants were of a small form, but thrifty in habit.

Chondria floridana (F. S. Collins) M. A. Howe n. sp.

(Plate 34, fig. 3)

Plants to 1 to 2 dm. tall, alternately branched, pyramidal, grading from the main divisions to the ultimate ones, the main branches to 2 to 3 mm. in diameter, the ultimate ramuli, which are cylindrical or somewhat tapering to the blunt tip, straight or curved, 0.3 to 0.5 mm. in diameter and 5 to 10 mm. long, without a conspicuous hair tuft; tetraspores as a band about 1 to 2 mm. below the tip of the fertile ramulus and scattered throughout the rest of it; color pinkish or yellowish, intensified on drying.

Chondria dasyphylla (Woodward) C. Agardh forma *floridana* F. S. Collins, Collins, Holden and Setchell, *Phycotheca Boreali-Americana XX, No. 996*, 1902.

Florida; originally described from Jupiter Inlet.

Dredged at Dry Tortugas at 4.6 to 13.8 meters at Loggerhead Key, Bird Key and White Shoal; very scarce; the plants were somewhat smaller than those issued by Collins in the *Phycotheca*, upon which this description is primarily based.

Chondria leptacremon (Melvill) De Toni

(Plant somewhat cæspitose at the base, frond extremely slender and graceful, simply branched; ramuli elongate, apices slightly clavate or sub-attenuate, constricted at the base.)

Chondriopsis leptacremon Melvill, Murray (1888–1889); *Chondria leptocremon* (Melvill) De Toni, Howe (1920).

Type from Florida; Bahamas.

Chondria littoralis Harvey

Plants tufted, pale or somewhat purplish, 1 to 3 dm. or more tall, the main axes 1 to 2 mm. in diameter, becoming denuded below, virgate above, where more or less densely and rather narrowly paniculately branched, the ultimate indefinite branches beset with elongate tapered ramuli with contracted bases, 1 to 15 (to 25) mm. long and 0.5 mm. diameter, themselves bearing smaller ramuli of the same type, terminating in prominent hair tufts; tetraspores in the ramuli or the more slender branchlets, the groups 100 to 120μ in diameter.

Chondria littoralis Harvey (1853); *C. littoralis* Harvey, Farlow (1876); *C. littoralis* Harvey, Børgesen (Nov. 1918); *C. littoralis* Harvey, Howe (1920).

New England to Florida; Bahamas and West Indies to the Virgin Islands.

Rather abundant at Dry Tortugas, with *C. sedifolia* the commonest *Chondria;* this species growing mostly on rocks or old corals; Loggerhead Key, shallow water to 6.2 to 9.3 meters on the outer shoals; White Shoal at 1.5 to 6.2 meters; Garden Key at 0.6 meters; East Key.

Chondria sedifolia Harvey

(Plate 34, fig. 11)

Plants 0.5 to 1.0 dm. tall, pale or somewhat rosy, paniculately or more often notably complanately alternately branched, the branches long below, giving a broadly triangular shape to the frond; main branches to 2 mm. in diameter, to 0.5 to 1.0 dm. long; ramuli to 0.5 mm. broad, 1 to 3 mm. long, tapering to the base from a notably obtuse apex, when old becoming longer but then bearing ramuli of a succeeding series with similar characters; tetraspores forming a band below the apex of the ramuli.

Chondria sedifolia Harvey (1853); *C. sedifolia* Harvey, Farlow (1876); *C. dasyphylla* (Woodward) C. Agardh, Howe (1920); *C. sedifolia* Harvey, Hoyt (1920).

New England to Florida; Bahamas.

Frequent about Dry Tortugas upon *Thalassia* or larger algæ; Bird, Garden and Loggerhead Keys, and dredged on White Shoal; tetrasporic.

The complanate arrangement of the main branches and the broad frond are the characters most readily distinguishing this from *C. dasyphylla* in the field.

Chondria tenuissima (Goodenough and Woodward) Agardh

(Plate 35, fig. 3)

(Plants about 15 to 20 cm. tall, pyramidally branched below and rather slender, the branches more attenuate above; principal branching patent, more abundant below and more simple above, the ultimate branches elongate and somewhat digitate, virgately beset with sub-lanceolate-cylindrical ramuli, 4 to 10 mm. or longer, these more or less attenuate toward both ends, issuing at an angle of 45° to 90°, and either simple or forming a further series of ramuli.)

Chondria tenuissima Agardh, Harvey (1853); *C. tenuissima* Agardh, Farlow (1876, 1881); *C. tenuissima* (Goodenough and Woodward) Agardh, Hoyt (1920); *C. tenuissima* (Goodenough and Woodward) Agardh, Howe (1920).

New England to Florida; Bahamas.

Occasional at Dry Tortugas; off Loggerhead and Bird Keys in 1.8 to 13.8 meters of water.

DASYA C. Agardh

Plant erect, of radial organization, the polysiphonous axis with 5 pericentral cells, becoming notably corticated by filaments from the bases of the lateral branchlets; alternate or whorled, monosiphonous, simple, or more usually branched filaments more or less cover the axis, sometimes arising in clusters from spine-like branchlets; tetraspores in prominent stichidia; antheridia borne among the free filaments; cystocarps usually stalked.

1. Monosiphonous ramuli irregularly placed on the corticated axis....................2
1. Monosiphonous ramuli spirally placed on the axis................................4
1. Monosiphonous ramuli in whorls on the corticated axis............................D. mollis (173)

2. Plant large, sparsely branched, of virgate habit ....D. pedicellata (173)
2. Plant moderately large, densely branched, of soft, bushy habit ....D. Harveyi (173)[1]
2. Plant smaller, rather densely tufted 3

3. Branching sub-dichotomous, axes becoming denuded below, stichidia translucent after dehiscence..D. Crouaniana (173)
3. Branching irregular, not denuded except in old fruiting plants, stichidia opaque after dehiscence..D. ramosissima (174)

4. Main axis showing little cortication except at the base, 0.1 to 0.3 mm. in diameter.....D. rigidula (174)
4. Main axis corticated throughout, except near tip, 0.25 to 0.75 mm. in diameter........5

5. Ramuli markedly tapering from base to apex..6
5. Ramuli not markedly tapering from base to apex...................................D. arbuscula (172)

6. Ramuli forming distinct sub-corymbose tufts.......................................D. corymbifera (172)
6. Ramuli not forming little tufts, apices notably ocellate...........................D. Collinsiana (172)

Dasya arbuscula (Dillwyn) C. Agardh

(Plant 2 to 10 cm. tall, densely cæspitose, dull purple to reddish and sub-spongiose in texture; scantily branched below, densely branched above and sub-pinnate; axis showing 5 pericentral cells, densely corticated by descending branches from the bases of the ramuli; ramuli monosiphonous, dichotomous, becoming incurved and intricate above, the cells 1.5 to 4 times as long as broad; stichidia on the outer divisions of the ramuli, 1.3 to 4 times as long as broad, oblong-acuminate; cystocarps stalked on the sub-terminal ramuli, round ovate.)

Dasya arbuscula (Dillwyn) C. Agardh, Collins and Hervey (1917); *D. arbuscula* (Dillwyn) C. Agardh with var. *subarticulata* J. Agardh, Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 1097a;* probably not *No. 493* or *1097b.*

Florida; Bermuda.

Dasya Collinsiana Howe

(Plate 32, fig. 3)

Plant small, to 5 cm. tall, the axis dichotomous-corymbosely branched, the ramuli somewhat densely grouped at the apex, about 1.0 to 1.25 mm. long; axis 0.25 to 0.75 mm. in diameter, reaching 1.0 to 1.5 mm. with the ramuli, corticated to near the apex; (basal cells of the mature ramuli 100 to 130μ in diameter, shorter than broad, the upper cells 45 to 55μ, about twice as long as broad).

Dasya Collinsiana Howe (1918, 1920).

Bermuda and Bahamas; newly reported for Florida.

Dredged sparsely in 1924 and 1925 on Loggerhead Key Shoal at about 13.8 meters; the 1924 material rather coarse.

Dasya corymbifera J. Agardh

Plant bushy, dense, paniculately branched, to 4 to 5 cm. tall; the main axes to about 0.75 mm. diameter and nearly naked of ramuli, distinctly corticated, especially below; distal branches with spirally inserted ramuli which individually form small sub-corymbose tufts; ramuli with lower cells 50 to 70μ in diameter and 70 to 90μ long, the dichotomies broad, tapering to ultimate slender divisions with cells about 10μ in diameter and 100 to 120μ long.

[1] Position in key uncertain.

Dasya corymbifera J. Agardh, Børgesen (Nov. 1919); *D. corymbifera* J. Agardh, Collins and Hervey (1917).

Florida; Bermuda; West Indies including the Virgin Islands.

Two sturdy tufts found on the outside of the wall of the moat, Fort Jefferson, Garden Key; both were sterile.

Dasya Crouaniana J. Agardh

(Plate 35, fig. 5)

(Plant small, to 6.0 or 6.5 cm. tall, branches cylindrical with radiating ramuli, widely sub-flabellately dichotomous, the axes corticated to the apex, and for some distance below penicillate-villous; the ramuli arising from the cortex, monosiphonous, branching dichotomously, tapering from the base to the acute apices, mucous, the segments 4 times as long as broad or longer; stichidia on the lower forks, oval-lanceolate, the stalks monosiphonous.)

Dasya Crouaniana J. Agardh, Howe (1920).

Florida; Bahamas; Guadeloupe.

Dasya Harveyi Ashmead

(Plant 20 to 25 cm. tall, much alternately branched to secund, the branches of firm consistency, densely corticated, the surface cells considerably elongate; branches of the last orders closely beset with slender flaccid dichotomous ramuli 1 to 2.5 cm. long, the cells several times as long as broad; stichidia from the lower forks of the ultimate ramuli, slender and tapering to each end, with 2 rows of tetraspores; color rose red.)

Dasya Harveyi Ashmead, Harvey (1858); *D. Harveyi* Ashmead, Farlow (1876).

Florida.

Dasya mollis Harvey

(Plate 26, fig. 13)

Plant small, reaching 3 to 4 (to 15) cm., bushy, without a well-defined main axis, the axes branching irregularly; branches bearing closely placed ramuli in rather ill-defined whorls which are most distinct toward the apex, and which may be somewhat corticated toward the base; main branches well corticated.

Dasya mollis Harvey (1853); *D. mollis* Harvey, Farlow (1876); *D. mollis* Harvey, Børgesen (Nov. 1919); *D. mollis* Harvey, Howe (1920).

Florida; Bahamas to the Virgin Islands.

Rare at Dry Tortugas; two fair female plants dredged at 7.6 meters on White Shoal in 1924, and one fragment dredged at 32.9 meters off Southwest Channel in 1925.

Dasya pedicellata (C. Agardh) C. Agardh

(Plate 35, fig. 7)

Plant to 3 dm. or more tall, the axis alternately, often somewhat pinnately, branched; the branches long, flexuous, axis and branches becoming corticated and reaching a diameter of 4 mm.; at first clothed with abundant branching ramuli, which reach a length of 3.0 to 3.5 mm., but these often lost below; cystocarps pedicellate.

Dasya elegans Agardh, Harvey (1853); *D. elegans* C. Agardh, Farlow (1876, 1881); *D. pedicellata* C. Agardh, Collins and Hervey (1917); *D. pedicellata* C. Agardh, Børgesen (Nov. 1919); *D. pedicellata* C. Agardh, Howe (1920).

New England to Florida; Bermuda; Bahamas and West Indies to the Virgin Islands.

Occasional about the Dry Tortugas on Loggerhead Key Shoal and White Shoal in 6.2 to 9.3 meters, and dredged at probably 110 meters off Southwest Channel (1924).

Dasya ramosissima Harvey

(Plate 26, figs. 1, 12)

Plants of moderate size, reaching 2 dm., abundantly branched, the main axis dividing to many slender, corticated sub-percurrent branches, which are largely naked; ramuli mostly on the ultimate branchlets, 1.0 to 1.5 mm. long, ramuli to 35μ in diameter, cells to twice as long as broad below and 5 to 6 times above; stichidia rather opaque after the dehiscence of the sporangia.

Dasya ramosissima Harvey (1853); *D. ramosissima* Harvey, Farlow (1876); *D. ramosissima* Harvey, Collins and Hervey (1917); *D. ramosissima* Harvey, Howe (1920).

Florida; Bermuda and Bahamas.

A few small fragments dredged about Dry Tortugas; at 32.9 and at 55 meters off Southwest Channel.

Dasya rigidula (Kuetzing) Ardissone

(Plate 26, fig. 2)

Plant to about 5 cm. long, decumbent or tangled among other algæ, the branching irregularly dichotomous, the axis slender (to 300 to 500μ below with 5 pericentral cells), lightly corticated, especially below; ramelli divaricately dichotomously branched, spirally placed on the axis.

Dasya rigidula (Kuetzing) Ardissone, Howe (1920).

Bermuda and Bahamas; newly reported for Florida.

Once secured on Loggerhead Key Shoal in small quantity.

This small plant is readily overlooked and difficult to distinguish from *Heterosiphonia Wurdemanni* without direct comparison or microscopic examination for the cortications which readily distinguish it from that species.

DASYOPSIS Zanardini

Thallus erect or decumbent, of radial organization, cylindrical, angular or compressed, of filamentous construction but the vegetative axis without pericentral cells, directly corticated by rhizoids, which cortex may give rise to secondary branchlets; tetrasporangia 5 to 7 in a stichidium, each outwardly half covered by the 3 neighboring pericentral cells of the segment.

Dasyopsis antillarum Howe

(Plants dark purplish to reddish, 4 to 10 cm. high, abundantly irregularly to sub-pinnately branched, the principal branches with sub-spinescent branchlets 1 to 3 mm. long; branches and branchlets with more or less tufted, dichotomous, monosiphonous often early deciduous ramuli, arising from slightly elevated spots, the segments 15 to 26μ in diameter, 3 to 6 times as long as broad; cortex cells of branches short, 12 to 70μ long, 1 to 5 times as long as broad; stichidia fusiform, 300 to 450μ long, 75 to 150μ in diameter, on 1-celled pedicels.)

Dasyopsis antillarum Howe (1920).

Florida (Brooks); Bahamas.

DIGENEA C. Agardh

Thallus erect, cylindrical, alternately or dichotomously branched, firm and bearing densely placed short corticated ramuli with 6 to 8 pericentral cells in the polysiphonous axis;

reproductive organs developed upon the ramuli, the sporangia in the upper, largely uncorticated portion; antheridia mostly near the summit of the ramuli; cystocarps near the middle or toward the summit.

Digenea simplex (Wulfen) C. Agardh

(Plate 24, fig. 20; plate 33, fig. 7)

Plants to 4 or 5 (25) cm. tall, irregularly dichotomously branched, the axis and main branches heavily corticated and densely clothed above with slender, stiff, in part corticated, polysiphonous ramelli 5 (to 15) mm. long; tetraspores borne in nodulose ramelli near the upper part of the branches.

Digenea simplex Wulfen, Harvey (1853); *D. simplex* C. Agardh, Farlow (1876); *D. simplex* (Wulfen) C. Agardh, Collins and Hervey (1917); *D. simplex* (Wulfen) C. Agardh, Børgesen (Nov. 1918); *D. simplex* (Wulfen) C. Agardh, Howe (1920).

Florida; Bermuda and Bahamas to the Virgin Islands.

Very common at Dry Tortugas on rocks and corals in shallow, rather rough water, generally in a dwarfed condition, the axis hardly branched; occasionally in well-developed condition, as on the outer rocks of Bird Key Reef, in 0.6 meters of water and on the rocks about Loggerhead Key; female and tetrasporic plants.

FALKENBERGIA Schmitz

Thallus cylindrical, filamentous, delicate, alternately radially branched, widely extending, weak, the polysiphonous axis without hairs or cortications, composed of a central axis and 3 pericentral cells developed from an apical cell; reproduction unknown.

Falkenbergia Hillebrandii (Bornet) Falkenberg

(Plate 25, figs. 4, 5)

Plant weak, decumbent, entangled among other algæ, the main axis often not very clearly distinguishable, reaching 30 to 80μ, with cells 1.5 to 2.0 times as long as broad; branches of all orders frequently attached by branched multicellular hapteræ to other filaments or to foreign objects.

Falkenbergia Hillebrandii (Bornet) Falkenberg, Collins and Hervey (1917); *F. Hillebrandii* (Bornet) Falkenberg, Børgesen (Nov. 1919); *F. Hillebrandii* (Bornet) Falkenberg, Howe (1920).

Bermuda; Bahamas; West Indies to the Virgin Islands; newly reported for Florida.

Scattered filaments of this species were very frequently encountered among other algæ at Dry Tortugas, and the plant occasionally appeared in considerable quantity, as at 3.1 to 14.3 meters off Loggerhead Key, and also at a station off Bush Key.

HALODICTYON Zanardini

Thallus in the form of a network of irregular mesh in three dimensions, the filaments monosiphonous, branches from one filament attaching to another at points of cell juncture; reproductive organs on short, free, polysiphonous branches with 4 pericentral cells, the tetrasporangia in short stichidia; antheridia flattened, oval, with marginal band of sterile cells; procarp, from the second pericentral cell, small, producing a cystocarp with a thin wall.

Halodictyon mirabile Zanardini

(Plate 25, fig. 1)

(Plant rosy, with a simple base to 6 or 8 cm. tall, furcate-dichotomous above, forming a soft net, the meshes irregular polygonal, of cells in length 3 to 6 times the diameter; cystocarps formed in the lower part of the frond, projecting from the reticulum; stichidia in the distal part of the frond, generally sessile, single or paired.)

Halodictyon mirabile Zanardini, Howe (1920).

Florida; Bermuda and Barbadoes.

At Dry Tortugas apparently very rare; two minute pieces secured; one at 3.1 meters off Long Key and the other off Loggerhead Key, which is figured.

HERPOSIPHONIA Naegeli

Plant decumbent or entangled among other algæ, attached by holdfasts, with a basal rhizomatous axis, alternately branched, and with dorsiventral organization, bearing two rows of ramuli which carry hyaline trichoblasts near or on the often recurved apex; axis and ramuli polysiphonous, uncorticated; reproductive organs consisting of antheridia, cystocarps and tetrasporangia borne on the ramuli, the latter generally in long rows.

1. A main branch or rudiment from each node....................................2
1. Some nodes of main axes regularly without branches or ramuli....................3

2. Branches strongly recurved, ramuli with about 10 segments......................H. Pecten-Veneris (176)
2. Branches nearly straight..4

3. Plant repent, rather closely attached, dark in color, main axes 100 to 130μ in diameter..H. secunda (176)
3. Some nodes with little trace of ramuli, plant in large part free-floating, attached below, main axes often yellow, ramuli bright rose, main axes 120 to 160μ in diameter..H. sp.? (177)

4. Ramuli with 8 to 12 segments, 35 to 60μ in diameter, 9 to 10 pericentral siphons.....H. sp.? (177)
4. Ramuli with 12 to 45 segments, 65 to 90μ in diameter, 12 to 14 pericentral siphons...H. tenella (177)

Herposiphonia Pecten-Veneris (Harvey) Falkenberg

(Plant moderately small, 2 to 10 cm., alternately widely branched, creeping below but erect above, the more remote branches unilaterally pectinate with short secund ramuli arising from each node; main branches flexuous, the ultimate branches strongly recurved (convexity dorsal); internodes 1.5 to 2 times as long as broad in the branches with 9 to 10 pericentral siphons; ramuli 8 to 10 segments long, the internodes somewhat longer than broad.)

Polysiphonia Pecten-Veneris var. *a* Harvey (1853); *P. Pecten-Veneris* Harvey, Farlow (1876); *Herposiphonia Pecten-Veneris* Harvey, Collins and Hervey (1917); *H. Pecten-Veneris* (Harvey) Falkenberg, Howe (1920).

Florida; Bermuda; Bahamas.

Herposiphonia secunda (C. Agardh) Ambronn

(Plate 25, figs. 8 to 10)

Plant small, usually about 1 to 2 cm. long, closely attached to the substratum, sometimes forming close mats, or entangled upon and attached to masses of other algæ; color dark reddish-brown throughout, the cell membranes often yellowish-brown; branching of the main axes irregularly alternate, the apices strongly curved toward the dorsal surface, but the older axes nearly straight; axes 100 to 130μ in diameter, with 7 to 8 pericentral siphons; ramuli from every fifth or sixth node, an indeterminate branch or a rudiment may precede each ramulus at the next node; ramuli with 7 to 8 pericentral siphons, 60 to 70μ in diameter; cystocarps solitary near the summit of a ramulus, displacing the apex from the vertical line.

Polysiphonia secunda Montagne ?, Harvey (1853); *P. secunda* C. Agardh, Farlow (1876); *Herposiphonia secunda* (C. Agardh) Falkenberg, Collins and Hervey (1917); *H. secunda* (C. Agardh) Falkenberg, Børgesen (Oct. 1920); *H. secunda* (C. Agardh) Ambronn, Howe (1920).

Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

Common in small amounts among other algæ at Dry Tortugas, but occasionally the dominating element in a mixed growth, as on Bird Key Reef in 3.1 meters of water, and in 1.5 to 6.2 meters on White Shoal; on the steel casings of the pier piling, Laboratory Wharf, Loggerhead Key, forming a practically pure growth as a widespread mat; female and tetrasporic.

Herposiphonia tenella (C. Agardh) Ambronn

(Plate 25, fig. 11)

Plant small, closely attached to the substratum, usually forming close mats; color purplish; branching of the main axes irregularly alternate, infrequent, the apices slightly up-curved, the older portions straight; axes 100 to 150μ in diameter, either an erect ramulus or an indefinite branch, or a rudiment of one, from each node, 1 to 3 ramuli alternating with each indefinite branch; ramuli 35 to 45 (12 to 30) segments, long to 5 or 7 mm. in height, 65 to 90μ in diameter, with 12 to 14 pericentral siphons; tetrasporangia to 60μ in diameter in long series of 15 to 20 in a ramulus.

Polysiphonia Pecten-Veneris var. β, Harvey (1853); *P. Pecten-Veneris* Harvey, *p.p.*, Farlow (1876); *Herposiphonia tenella* (C. Agardh) Naegeli, Collins and Hervey (1917); *H. tenella* (C. Agardh) Naegeli, Børgesen (Nov. 1918); *H. tenella* (C. Agardh) Ambronn, Howe (1920).

Florida; Bermuda; Bahamas; through the West Indies to the Virgin Islands.

At Dry Tortugas only clearly recognized at Garden Key, forming tufts in crevices of brickwork, moat, Fort Jefferson, in good tetrasporic condition.

Herposiphonia sp.?

(Plate 25, fig. 12)

Plant attached in older parts, but mostly free, the ramuli rosy, the axis often yellow; main axes slightly curved toward the upper surface; the branching of the axes alternate to markedly pinnate; ramuli or branches from nearly every node, usually a leading branch from each fourth node, intervening with ramuli; main axis 120 to 160μ (? 250μ) in diameter with 9 to 10 pericentral siphons; ramuli with 8 to 12 nodes, these 35 to 60μ in diameter, with 6 to 7 pericentral siphons.

Florida.

Common in the moat, Fort Jefferson, Dry Tortugas; also on inner side of Bird Key Reef.

This material offers considerable difficulty in placement. The habit of well-developed specimens is quite like that of Howe's *H. bipinnata*, although frequently rather small. It differs in the diameter of the main axes, although the writer's material in this approaches the limits of Howe's description. But more important is the presence of frequent and regularly naked nodes in his plant, while in that from Tortugas each node bears either a ramulus or a leading branch, or at least the little cluster of cells which represent an abortive branch rudiment. The present material also rather resembles some of Børgesen's *H. tenella*, such as No. 1244 at the New York Botanical Garden.

HETEROSIPHONIA Montagne

Plants usually erect, sometimes recumbent with dorsiventral organization, main stems often flattened, generally corticated, main divisions usually sympodial, secondary divisions frequently pinnate, bearing ultimate ramuli which are alternately branched, monosiphonous or toward the base polysiphonous; axis with 4, 6 or more pericentral cells, which remain undivided, or divide on the lower side; cortication by a mat of rhizoids from the bases of the branches, and from this cortex secondary branches may arise; tetrasporangia in well-developed stichidia, replacing a branch of a ramulus; antheridia similarly placed, generally pointed, and with polysiphonous base; procarps generally developed near the base of the ramuli, the lower part of which furnishes a stalk to the cystocarp.

1. Plant small, uncorticated...H. Wurdemanni
1. Plant large, to 15 cm. or more, main axes corticated.................................H. Gibbesii

Heterosiphonia Gibbesii (Harvey) Falkenberg

(Plate 25, fig. 2; plate 35, figs. 1, 2)

Plant large, the tufts reaching a height of 1 to 2 dm., the main axes sparsely forking except near the base, the long, flexuous branches with alternate pinnate or bipinnate branchlets, which become denudate at the base, but above bear densely placed ramuli which are monopodially branched and polysiphonous below, but branch dichotomously above and are there monosiphonous.

Dasya Gibbesii Harvey (1853); *D. Gibbesii* Harvey, Farlow (1876); *Heterosiphonia Gibbesii* (Harvey) Falkenberg, Howe (1920).

Florida and the Bahamas.

Rare at Dry Tortugas; in 1924 outside the western sluice of the moat, Fort Jefferson, Garden Key, one rock had a small tuft of this species, but in 1925 and 1926 it was quite abundant on several rocks at this one place, but it was not located elsewhere; sterile and male plants.

Heterosiphonia Wurdemanni (Bailey) Falkenberg

(Plate 25, fig. 3)

Plant small, about 1 to 2 cm. long, repent or tangled among other algæ, dichotomously or irregularly branched, the main axis without cortications, to about 200μ diameter (with 6, occasionally 4, pericentral cells); somewhat dorsiventral, with closely placed monosiphonous ramuli which are incurved, dichotomously or in part alternately 2 to 4 times branched, the usually incurved branches about 100μ at base to 50μ in the ultimate ramuli; which are blunt at the apex, the axis with its ramuli about 1.0 to 1.5 mm. in diameter.

Dasya Wurdemanni Bailey, Harvey (1853); *D. Wurdemanni* Bailey, Farlow (1876); *Heterosiphonia Wurdemanni* (Bailey) Falkenberg, Collins and Hervey (1917); *H. Wurdemanni* (Bailey) Falkenberg, Howe (1920).

Florida; Bermuda; from the Bahamas to the Virgin Islands.

Seemingly rare at Dry Tortugas, but easily overlooked; dredged in 1.5 to 7.6 meters on White Shoal, and in shallow water, Loggerhead Key.

This plant resembles *Dasya rigidula*, but is smaller and without cortications.

LAURENCIA Lamouroux

Plant erect, cylindrical or thickened, the tissues of firmly gelatinous to rigid cartilaginous consistency, paniculately to pinnately or otherwise branched; central axis recognizable only near the apex in most species; apical cells protected by trichoblasts and sunken in an apical pit; tetrasporangia distributed over the surface of the ultimate branchlets, which are frequently shorter or ovoid; antheridia united into closely paniculate antheridial stands; cystocarps sessile on the ultimate branchlets.

1. Branching from a well-defined main axis..........2
1. Branching without a well-defined main axis..........6

2. Ramuli close-set or contiguous on ultimate long branches..........L. papillosa (180)
2. Ramuli comparatively widely spaced..........3

3. Branching paniculate, in gradual series to smallest ramuli..........4
3. Branching irregular to pinnate, small ramuli directly on long branches..........L. Poitei (181)

4. Plant small, about 10 cm. or less, rigid..........5
4. Plant large, to 2 dm. or more, soft..........L. obtusa (180)

5. Narrowly pyramidal, without specialized lower branches, adhering somewhat to paper..L. microcladia (179)
5. Broadly pyramidal, at least below, lower branches in part flagelliform, hardly adhering to paper..........L. papillosa *fa.* (180)

6. Semi-cartilaginous, dark, tufted, branches sub-corymbose..........L. corallopsis (179)
6. Soft, rose-pink, often entangled, branching irregular..........L. intricata (179)

Laurencia corallopsis (Montagne) Howe

(Plate 34, figs. 5, 6)

Plants small, to about 3 to 4 cm. high, tufted, dark reddish in color; branching alternate or irregular, the ultimate divisions generally sub-corymbose; diameter of the branches 1 to 2 mm., the apices swollen; in water frequently highly iridescent.

Laurencia cervicornis Harvey (1853); *L. cervicornis* Harvey, Farlow (1876); *L. cervicornis* Harvey, Collins and Hervey (1917); *L. cervicornis* Harvey, Børgesen (Nov. 1918); *L. corallopsis* (Montagne) Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Perhaps rare at Dry Tortugas; dredged at 12.4 meters off Loggerhead Key and in 9.2 to 14.6 meters in Southwest Channel, also in a dwarf form on Bird Key Reef and Loggerhead Key rocks; in the latter form easily overlooked and perhaps not uncommon.

Laurencia intricata Lamouroux

(Plate 34, fig. 8)

Plants to 5 cm. tall, matted or somewhat tufted, rose-pink in color; branching irregular below, without leading axis, but above the last 2 to 3 orders of branches with recognizable axis, the aspect in well-grown plants somewhat paniculate toward the tips, but generally less regular; diameter of the main branches 0.5 to 0.75 mm., about the same at the rather elongate ultimate ramuli.

Laurencia implicata J. Agardh, Harvey (1853); *L. implicata* J. Agardh, Farlow (1876); *L. obtusa* (Hudson) Lamouroux *p.p.*, Collins and Hervey (1917); *L. implicata* J. Agardh, Børgesen (Nov. 1918); *L. intricata* Lamouroux, Howe (1920).

Florida; Bermuda?; Bahamas; West Indies to Virgin Islands.

Very common at Dry Tortugas growing on wave-beaten rocks along the reefs, and generally in a densely matted, dwarf form, especially along Loggerhead Key; also dredged in 9.2 to 36.6 meters along Loggerhead Key and out Southwest Channel; in deeper water rather more luxuriant.

Laurencia microcladia Kuetzing

Plant to about 5 to 10 cm. tall, usually narrowly pyramidal, densely branched; in color generally with greenish pigment in the secondary axes and usually in the main stems also, the ultimate ramuli rose pink; diameter of main branches 0.25 to 1.50 mm., the ultimate ramuli rather smaller; texture firm, wiry, often adhering imperfectly to paper.

Laurencia obtusa var. *gelatinosa* (Desfontaine) J. Agardh, Collins and Hervey (1917); *L. obtusa* var. *gelatinosa* (Desfontaine) J. Agardh, Børgesen (Nov. 1918); *L. microcladia* Kuetzing, Howe (1920).

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

Occasional at Dry Tortugas on rocks in quite shallow water, as about Loggerhead Key and Bird Key Reef.

Laurencia obtusa (Hudson) Lamouroux

(Plate 33, fig. 3)

Plants to 1.5 to 2.0 dm. tall, bushy, in color with a green axis and rose tips or yellow axis and red tips; below showing long main axes which are sparingly alternately branched, above loosely to closely paniculately branched, the ultimate truncate ramuli rather short; diameter of main branches 0.75 to 1.50 mm., the ultimate ramuli 0.5 to 0.75 mm.

Laurencia obtusa Lamouroux, Harvey (1853); *L. obtusa* Lamouroux, Farlow (1876); *L. obtusa* (Hudson) Lamouroux, Collins and Hervey (1917); *L. obtusa* (Hudson) Lamouroux, Børgesen (Nov. 1918); *L. obtusa* (Hudson) Lamouroux, Howe (1920).

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

Common at Dry Tortugas, especially in shallow water, and dredged to 3.1 to 9.3 meters on Loggerhead Key Shoal.

Laurencia paniculata J. Agardh

This appears to the writer to be a doubtful Florida record, but occurs in Farlow (1876).

Laurencia papillosa (Forskal) Greville

(Plate 35, fig. 4)

Plant bushy, to about 1 dm. tall, the main axes frequently alternately branched, the branches beset with closely placed tubercle-like ramuli; color pale yellowish to dull olive-green; diameter of main branches about 1 to 2 mm., of the branches with the ramuli to 5 mm.

Laurencia papillosa Greville, Harvey (1853); *L. papillosa* Greville, Farlow (1876); *L. papillosa* (Forskal) Greville, Collins and Hervey (1917); *L. papillosa* (Forskal) Greville, Børgesen (Nov. 1918); *L. papillosa* (Forskal) Greville, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common at Dry Tortugas on rocks in shallow water, well-developed in quiet places, as in and about the moat, Fort Jefferson, Garden Key, but dwarfed on exposed rocks; also from Long, Bush and Loggerhead Keys and Bird Key Reef.

Laurencia papillosa (forma)

Plant to 5 to 6 cm. tall, narrowly to broadly pyramidal, in color dark brownish to greenish purple; lower branches frequently flagelliform, attaching to the substratum and similar offshoots produced from some of the upper branches, uniting them to each other or the substratum; branching alternate, radial, the main branches narrowly pyramidal in form, the ultimate ramuli varied, tuberculate or somewhat elongate; plant wiry, not adhering to paper, of rather dense habit.

Rocks, western side, Loggerhead Key, Dry Tortugas.

Laurencia Poitei (Lamouroux) Howe

(Plate 34, figs. 4, 10)

Plant to about 1 dm. tall, sparse to bushy, in color pale buff to pinkish, alternately branched from the main axis, the branches often approximating the primary axis in length, arranged radially or in part marginally on the flattened axis; ultimate ramuli short, truncate, not closely packed, opposite or alternate on the last indeterminate branches; radially placed or marginal along flattened branches, or frequently both conditions in parts of the same plant, branches 1.0 to 1.5 mm. in diameter, where flattened reaching a width of 2 mm.

Laurencia tuberculosa J. Agardh, Harvey (1853); *L. gemmifera* Harvey *p.p.* ? (1853); *L. gemmifera* Harvey *p.p.*?, *vide* specimens Farlow Herbarium, Farlow (1876); *L. Poitei* (Lamouroux) Howe, Collins and Hervey (1917); *L. Poitei* (Lamouroux) Howe, Børgesen (Nov. 1918); *L. Poitei* (Lamouroux) Howe (1920).

Florida; Bermuda; Bahamas; West Indies to the Virgin Islands.

Frequent about Dry Tortugas, especially in dredge hauls; Loggerhead Key Shoal to 13.8 meters, White Shoal to 7.6 meters, Southwest Channel 9.2, 14.6, and 16.5 meters.

This plant is especially discussed by Collins (8), who questions the flattened character of the branches. This feature is quite frequent at Dry Tortugas; often a branch, or even the distal part of a branch, on a generally cylindric-radial plant will be flattened and pinnate. It differs in its much smaller character from *L. pinnatifida*, which is also branched in this way, and of course the intergrading forms of branches on the same plant are decisive.

LOPHOCLADIA Schmitz

Thallus of radial organization, above clad with spirally alternate trichoblasts which are alternately or sub-dichotomously branched; axis with 4 pericentral cells, naked or covered with rhizoidal downgrowths; tetrasporangia borne in small, monosiphonous stalked, naked stichidia.

Lophocladia trichoclados (Mertens) Schmitz

(Plant to 7 to 10 cm. long, widely dichotomously branched, obsoletely to distinctly articulate, with 4 pericentral cells; naked below, the upper portions villous with lax penicillate ramuli about 2 mm. long, monosiphonous, dichotomous, the angles acute, branches slender and soft; stichidia single on each tuft, distorted flexuose, acuminate, with a single series of 6 to 8 irregularly placed tetraspores; color rosy.)

Dasya lophoclados Montagne, Harvey (1853); *D. lophoclados* Montagne, Farlow (1876); *Lophocladia trichoclados* (Mertens, C. Agardh) Schmitz, Børgesen (Nov. 1918); *L. trichoclados* (Mertens) Schmitz, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

LOPHOSIPHONIA Falkenberg

Thallus decumbent and attached by rhizoidal hapteræ, cylindrical, laterally branched, dorsiventrally organized, apex at first somewhat curved, later straight; erect filaments of limited growth, simple or sparsely branched, the apices curved, the convex side bearing a series of deciduous trichoblasts; tetrasporangia in the upper branches of more freely branched filaments.

Lophosiphonia obscura Auct.

(Plants cæspitose, reaching 1 to 2 cm. tall, filaments decumbent below, erect above, the erect filaments simple or with a few sub-secund branches, the apex elongate and bare; branching more abundant on fruiting plants, the branches patent above, generally with recurved apices; tetraspore bearing branches obtuse, with a longitudinal series of numerous tetraspores; segments of branches equal or somewhat longer than broad, with 6 pericentral siphons in the upper portions, or in the thicker parts with 12 to 18 pericentral cells; color purplish, drying blackish.)

Lophosiphonia obscura (C. Agardh) Falkenberg, Børgesen (Nov. 1918); *L. obscura* Auct., Howe (1920).

POLYSIPHONIA Greville

Plant erect, or recumbent below, with usually a freely branching habit; axis and branches at first monosiphonous from the apical cell, but quickly developing 4 to several pericentral cells about the axial row, and in some species by continued divisions becoming heavily corticated; branching alternate or somewhat dichotomous in appearance, the branches elongate or in some species short, spine-like, frequently bearing lateral trichoblasts (colorless hairs) which may bear a specific relation to the appearance of branches, and which furnish the organs which become the antheridia; secondary branches of endogenous origin may be present; tetrasporangia in normal branches, in long series, or in somewhat shortened tetrasporangial branches; antheridia on trichoblasts, when fully developed usually elongate, solid; procarps on the second segments of reduced trichoblasts, the cystocarps oval or urn-shaped, short-stalked.

The bracketed descriptions of species under this genus are very largely simple compilations and are not immediately based upon Tortugas material.

1. Pericentral siphons 12 to 20 or more.......................................P. opaca (185)
1. Pericentral siphons 8 to 10...2
1. Pericentral siphons 4...4

2. Branchlets sparse, distant..P. exilis (183)
[2. Branchlets abundant, densely clothing the axes.............................3—Bryocladia] (168)

[3. Elongate main branches directly clothed with stout, short, simple branchlets........B. cuspidata] (168)
[3. Main branches with short, cymose or racemose divided branchlets.................B. thyrsigera] (168)

4. Main axes strongly corticated...5
4. Main axes naked or with few corticating cells...............................6

5. Branchlets sub-equal, short, abundant along virgately clothed branches............P. ramentacea (185)
5. Branchlets mostly not markedly differentiated, grading into main branches, a few short lateral branchlets scattered on main branches..........................P. ferulacea *fa*? (183)

6. Trichoblasts absent...P. subtillissima (185)
6. Trichoblasts present..7

7. Branching monopodial..8
7. Branching sub-dichotomous below...11

8. Lateral branches in axils of trichoblasts...................................9
8. Lateral branches arising independent of trichoblasts........................10

9. Main axes 50 to 90μ, color purplish.....................................P. havanensis (184)
9. Main axes 100 to 300μ, color brownish...................................P. Binneyi (183)

10. Main axes or basal filaments not over 150μ, forming a soft, even-topped growth 2 to 3 cm. high...P. macrocarpa (184)
10. Main axes or basal filaments 330 to 400μ, forming tufts 3 to 5 or 10 cm. high.........P. ferulacea (183)

11. Plant small, reaching 0.5 to 2.5 cm., chiefly epiphytic....................P. Gorgoniæ (184)
11. Plant larger, about 0.5 to 1.0 dm. in height, beset with sub-spinescent ramuli........12

12. Plant rigid, internodes shorter than broad, uncorticated...................P. echinata (183)
12. Plant soft, internodes as long as broad, a few corticating cells below................P. hapalacantha (184)
12. Plant rigid, internodes as long as broad...................................P. fracta (183)

Polysiphonia Binneyi Harvey

Plants 2 to 4 cm. tall, yellowish to purplish in color, rigid; branching frequent, wide angled, the main branches arising in the angles of trichoblasts, monopodial, diameter 200 to 350μ, in the ultimate segments to 150μ, the segments considerably shorter than broad to generally sub-equal; uncorticated, apices tipped by an abundance of trichoblasts.

Polysiphonia Binneyi Harvey (1853); *P. Binneyi* Harvey, Howe (1920).

Florida and the Bahama Islands.

A few tufts dredged in 9.2 meters off Long Key to the northward, sterile; they were rather thicker in the filaments than the standard description calls for. Also from Sand, Bush and Garden Keys, often abundant in shallow water on rocks.

Polysiphonia echinata Harvey

(Plants 6 to 10 cm. long, sub-dichotomously branched, the branches patent, 1.0 to 2.5 cm. distant, in upper portion 2.0 to 2.5 cm. long; plants rigid, hardly adhering to paper; branches, at least above, beset with erect ramuli 1 mm. long and about 1 mm. distant, nodose and dark in color, the siphons broad and the transverse membranes thick, segments shorter than long.)

Polysiphonia echinata Harvey (1853); *P. echinata* Harvey, Farlow (1876).

Florida.

Polysiphonia exilis Harvey

(Plants densely cæspitose, the basal filaments intricate, with lateral radicular branches and erect branches about 22 to 24 mm. long; the segments short, about half as long as broad, with 8 to 10 siphons; branches slender, beset with numerous unequal ramuli, the apex generally bare, trichoblasts few and inconspicuous; tetraspores in distorted tangled branches; color dull brownish purple, substance firm.)

Polysiphonia exilis Harvey (1853); *P. exilis* Harvey, Farlow (1876); *P. exilis* Harvey, Howe (1920).

Florida; Bahamas.

Polysiphonia ferulacea Suhr, J. Agardh

(Plate 24, figs. 16–18; plate 25, fig. 15; plate 26, figs. 11, 15)

(Plant erect to 5 to 6 cm. high, rather abundantly branched, sub-dichotomous below, virgate to sub-fastigiate above, the axils commonly acute at least above; with 4 siphons, the segments sub-equal or shorter than broad; uncorticated; tetraspores unilateral in swollen fastigiate ramuli; cystocarps sessile below the tips of the upper branches, ovate-globose.)

Polysiphonia breviarticulata Harvey (1853); *P. breviarticulata* Harvey, Farlow (1876); *P. ferulacea* Suhr, J. Agardh, Collins and Hervey (1917); *P. ferulacea* Suhr, J. Agardh, Børgesen (Nov. 1918); *P. ferulacea* Suhr, J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Moderately frequent at Dry Tortugas; in 1.5 to 13.8 meters on Loggerhead Key and Long Key Shoals, and also dredged to 29.3 and 36.6 meters off Southwest Channel.

Polysiphonia fracta Harvey

(Growth cæspitose to expanded, laxly intricate, the filaments several centimeters long, capillary, irregularly flexed and curved, here and there with rhizoidal hapteræ; shorter branches patent to vertical, sometimes secund, sometimes divaricate; main branching sub-dichotomous, the branches bearing numerous scattered horizontally patent thorn-like ramuli about 2 mm. long; segments shorter than broad, with 4 pericentral siphons, ecorticate; plants rigid, dull brownish purple, and imperfectly adhering to paper.)

Polysiphonia fracta Harvey (1853); *P. fracta* Harvey, Farlow (1876).

Florida.

Polysiphonia Gorgoniæ Harvey

(Filaments scattered, rarely cæspitose, 0.5 to 3.0 cm. tall, sub-setaceous below, attenuate toward the apex, dichotomously furcate near the base and 2 to 3 times above, irregularly multifid and fastigiate-capillary toward the summit; branches patent, segments with 4 pericentral siphons, shorter than the diameter in the branches, to 1.5 to 2.0 as long; the ramuli short; cystocarps depressed globose, sessile or short pedicellate; color dull ochre-brown, substance soft, closely adhering to paper on drying.)

Polysiphonia Gorgoniæ Harvey (1853); *P. Gorgoniæ* Harvey, Farlow (1876); *P. Gorgoniæ* Harvey, Howe (1920).

Florida; Bahamas.

Polysiphonia hapalacantha Harvey

(Plant to 4 to 15 cm. tall, erect, the filaments thick below, capillary above, dichotomously fastigiate, the branches patent, beset more or less closely with attenuate ramuli about 2 mm. long; segments on the main axis 1.5 times longer than broad, in the smaller branches and ramuli equal or shorter than broad, with 4 pericentral siphons; color brownish, specimens closely adhering to paper.)

Polysiphonia hapalacantha Harvey (1853); *P. hapalacantha* Harvey, Farlow (1876); *P. hapalacantha* Harvey, Howe (1920).

Florida; Bahamas.

Polysiphonia havanensis Montagne

(Plant erect, elongate, the filaments quite slender, sub-dichotomously branched and attenuate, of 4 siphons, uncorticated, the segments 0.5 longer than broad below, to 2 to 3 times as long as broad in the middle branches, tetrasporangia few to 2 or 3 in the fertile branch; cystocarps small, ovate, erect and sessile on the upper branches.)

Polysiphonia havanensis Harvey (1853); *P. havanensis* Harvey, Farlow (1876); *P. havanensis* Montagne, Børgesen (Nov. 1918); *P. havanensis* Montagne, Howe (1920); *P. havanensis* Montagne, Hoyt (1920).

Forma mucosa J. Agardh

(Plate 25, figs. 16 to 18)

(More delicate and soft than the species, the segments 1 to 4 times as long as broad, cystocarps globose below to broadly urceolate above; rosy and adhering closely to paper.)

North Carolina; Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

The forma *mucosa* probably represents this species at Dry Tortugas, where it was found forming a widespread turf on the hull of the U.S.L.H.S. "30," attached to the lighthouse on Loggerhead Key. In full female, male and tetrasporic fruit, although the boat had been scraped and freshly painted but two months previously, so that the growth and maturation must have occupied much less than two months.

Polysiphonia macrocarpa Harvey

(Plant densely tufted, decumbent below, above erect to 2 to 10 cm. tall; decumbent filaments 100 to 150μ thick, the segments about 150μ long; erect filaments sub-fastigiately alternately branched above, the branches not related to the trichoblasts, to 100μ thick below and 20 to 25μ above, segments 1.5 to 2.0, or less usually 3 to 4, times as long as broad; tetrasporangia in long rows in the simple or sometimes forked tips of the ramuli; antheridial stands cylindrical, to 400 to 500μ long and 100 to 110μ in diameter; cystocarps urceolate, about 250μ long and 150μ broad; rosy and adhering closely to paper.)

Polysiphonia macrocarpa Harvey, Collins and Hervey (1917); *P. macrocarpa* Harvey, Børgesen (Nov. 1918).

Bermuda and Virgin Islands; newly reported for Florida.

Found at Dry Tortugas growing upon corals in the moat, Fort Jefferson, Garden Key.

Polysiphonia opaca (C. Agardh) Moris and DeNotaris

(Plants pulvinate or sub-globose, growing on little submerged rocks, reaching 10 cm. tall, dull purple, drying blackish brown; hardly adherent to paper; branching sub-dichotomous below, alternate above, the branches beset with short ramuli 1 to 4 mm. in length, patent, the axes becoming denudate below; trichoblasts numerous; segments somewhat longer than broad to 1.5 as long; 12 to 24 pericentral siphons; cystocarps sub-globose, sessile on the branches.)

Polysiphonia opaca (Agardh) Zanardini, Collins and Hervey (1917); *P. opaca* (C. Agardh) Moris and DeNotaris, Howe (1920).

Florida; Bahamas.

Polysiphonia ramentacea Harvey

(Plate 25, fig. 13; plate 26, fig. 16)

Tufts 3 to 5 (to 10) cm. tall, primary filaments moderately coarse, frequently to scantily laterally branched, the branches tapering; axis and branches moderately to densely clothed with simple to generally divided ramuli which have a general uniformity of length on a given branch, 2 to 5 mm., the apices bare or with trichoblasts; main axis and principal branches corticated with small cells, with 4 primary pericentral siphons; (tetraspores on the upper contorted ramuli, few; cystocarps scanty, rounded ovoid, single or grouped; antheridia ovate-lanceolate, fascicled at the tips of the ramuli); color brownish purple, drying brownish to purple.

Polysiphonia ramentacea Harvey (1853).

Florida.

At Dry Tortugas a small dense plant, probably this species, secured on the shore of Middle Key; another larger and looser specimen dredged off Southwest Channel in 33 meters.

De Toni reduces this species to synonymy under *P. fœniculacea*, but this does not seem a satisfactory disposal of the present material, which is therefore assigned the old name of Harvey, even though the original material was unavailable to directly verify the determination.

Polysiphonia subtilissima Montagne

(Plate 25, fig. 14; plate 26, fig. 14)

(Plant erect, elongate to 5 to 10 cm., soft and of slender filaments, which are decumbent below, erect, and densely dichotomously branched to virgate above, the segments 4-siphonous, short and equal or one-half longer than broad below to 1.5 to 3.0 times as long above; tetraspores in series in the middle of the filaments, color blackish purple, not adhering well to paper.)

Polysiphonia subtilissima Montagne, Harvey (1853); *P. subtilissima* Montagne, Farlow (1876); *P. subtilissima* Montagne, Howe (1920).

Massachusetts to Florida and the West Indies.

At Dry Tortugas dredged on White Shoal.

The Tortugas material showed lower segments 63 by 294μ, no trichoblasts; branching sparse, especially below.

VIDALIA Lamouroux

Thallus erect, fleshy-cartilaginous, ligulate-flattened, sometimes with a midrib prominent on the under side, twisted; axis polysiphonous with 5 pericentral cells, laterally expanded into a membrane of 2 layers; apices inrolled, margin proliferous and pinnate-toothed, the midribs also proliferous; tetrasporangia in stichidia-like projections from the margins of the lateral leaflets; antheridia and cystocarps on the apices of the upper pinnæ of marginal or median lateral leaflets.

Vidalia obtusiloba (Mertens) J. Agardh in De Toni

(Frond linear, plane, 10 to 15 cm. long, 4 to 7 mm. broad, serrate-pinnate from the margin and proliferous from the costa; fruiting in prolonged marginal teeth, the stichidia linear and incurved, the cystocarps sub-globose, sessile.)

Vidalia obtusiloba (Mertens) J. Agardh; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 695.*

Florida; Martinique.

WRIGHTIELLA Schmitz

Plant erect, of radial organization, the long axes beset with alternate monosiphonous trichoblasts; polysiphonous main branches with 4 pericentral cells, becoming thickly corticated by rhizoidal downgrowths from the branches and from a side outgrowth beside each trichoblast which develops to a short corticated spine or to an indefinite branch; reproductive organs produced upon the trichoblasts, the tetraspores on monosiphonous-stalked stichidia, the procarp from near the base of simplified trichoblasts, developing to a polysiphonous-stalked cystocarp.

1. Main branches percurrent, the distal bearing subulate ramuli in 4 rows............W. Blodgettii (186)
1. Main branches deliquescent to filiform ramuli, subulate ramuli scarce.............W. Tumanowiczii (187)

Wrightiella Blodgettii (Harvey) Schmitz

(Plate 26, figs. 3, 4)

Plant to 1 to several dm. in length, alternately branched, the lower axes smooth, heavily corticated, the final leading branches beset with 4 rows of subulate ramuli which are simple or forked or with short polysiphonous spinules and 1 to 5 mm. long; ramuli with alternately branched monosiphonous trichoblasts, which have a distinctive small cell at the base of each branch.

Alsidium Blodgettii Harvey (1853); *A. Blodgettii* Harvey, Farlow (1876); *Wrightiella Blodgettii* (Harvey) Schmitz, Collins and Hervey (1917); *W. Blodgettii* (Harvey) Schmitz, Howe (1920).

North Carolina to Florida; Bermuda; Bahamas.

Rare at Dry Tortugas; twice dredged on Loggerhead Key Shoal, to 7.6 meters; also from 32.9 and 36.6 meters off Southwest Channel.

Wrightiella Tumanowiczii (Gatty) Schmitz

(Plate 23, fig. 19)

(Plants arising from bases with rhizoidal hapteræ, 30 cm. or more tall, cæspitose, denuded of branchlets below, decompound above, the long branches erect-patent, with soft short branches near the tips, and bearing short, hardly visible spines which intergrade with the smaller branches; naked when young, corticate and penicillate when older; ramuli monosiphonous, alternately branched; main axes with 4 pericentral cells not readily distinguishable from the cells of the cortex; stichidia in the penicillate tufts, from transformed branches, single or rarely branched, the large tetraspores in spirally ascending lines; cystocarpic conceptacles shortly stalked on the ultimate branches, ovate or sub-urceolate.)

Dasya Tumanowiczii Gatty, Harvey (1853); *D. Tumanowiczii* Gatty, Farlow (1876); *Wrightiella Tumanowiczii* (Gatty) Schmitz, Collins and Hervey (1917); *W. Tumanowiczii* (Gatty) Schmitz, Børgesen (Nov. 1919); *W. Tumanowiczii* (Gatty) Schmitz, Howe (1920).

Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

Plants collected by the writer at Key West liberated during the process of drying an extraordinary amount of hydrogen sulphide.

CYCLOSPORA J. Agardh

Frond terete compressed, much branched below, branches distichously pinnate-decompound from near the rounded margin, the axis above more nearly bare, often subcaudate; apparently with immersed costa and with transverse oblique zones of two layers, with interior larger cells always disposed around a central cell in a circle forming a costa, and outside of this passing into a single series of cells toward the margin, on both sides (in respect to the leaves) covered with smaller cells forming toward the interior a polysiphonous layer having an almost gelatinous close cortical layer with smaller subcortical seriated cells. Cystocarps unknown. Tetrasporangia numerous at the nodes, verticillate, tripartite, formed within lanceolate hardly modified stichidia, resembling regular densely disposed series going out from the costa to the margin. Poorly understood; of doubtful position.

Cyclospora Curtissiæ J. Agardh

(Frond compressed, pinnately decompound, with many distichous pinnæ from near the margin, above nearly bare, the apex often prolonged, but below densely and irregularly pinnulate, the pinnæ and minor ramuli transformed into stichidia; fragments 4 to 7 cm. long, purple, not adhering well to paper, and with aspect of a *Gelidium*); branches and stichidia contracted at the base.

Florida, Mrs. Curtiss.

The writer has seen a portion of the original material at the New York Botanical Garden. In aspect it certainly seemed different from anything else catalogued here, but the material was too scanty to allow the risk of a detailed morphological study with the object of more accurately determining its systematic position. In De Toni, *Sylloge Algarum*, the genus is placed at the end of the Rhodomelaceæ.

CERAMIACEÆ

Plant generally terete, frequently filamentous, dichotomously or laterally branched; structure usually of an axial filament more or less completely corticated; tetrasporangia scattered or in groups, sometimes in special branches, external or in the cortical layer, cruciate or tripartite; antheridia scattered over the thallus, bearing crowded spermatangia;

carpogonia external, usually closely associated with cells which, after fertilization, produce the auxiliary cells, which are often paired; cystocarps external or partly sunken, naked or enclosed by special filaments; gonimoblasts forming carpospores from almost every cell.

1. Filaments regularly corticate from the nodes 7
1. Filaments ecorticate or covered with rhizoids 2

2. Plant differentiated into median axis and cortical ramuli . . . . Crouania (193)
2. Median axis not specially differentiated 3

3. Branching alternate 4
3. Branching opposite 6

4. Branches moniliform, not tapering to filiform tips . . . . Griffithsia (194)
4. Branches nearly cylindrical, often tapering to filiform tips 5

5. Seirospores present . . . . Seirospora (195)
5. Seirospores absent . . . . Callithamnion (188)

6. Conspicuously complanate-pinnate . . . . Gymnothamnion (194)
6. Not conspicuously complanate . . . . Antithamnion (188)

7. Nodes surrounded by a row of spines . . . . Centroceras (189)
7. Nodes not surrounded by spines . . . . Ceramium (190)

ANTITHAMNION Naegeli

Plant filamentous, the long axes dichotomously branched, the short lateral branches alternate or whorled, generally subdivided and frequently bearing gland cells; tetraspores cruciate, lateral upon the branches; antheridia branched, clustered at the ends of the branches; carpogenic branch lateral on the basal cell of the lateral branches; cystocarp apparently terminal, occasionally sheathed by secondarily developed filaments.

Antithamnion sp.?

(Plate 27, fig. 11)

One small fragment among other algæ, distinctly opposite branched, axis about 10 to 15μ in diameter, cells 2.5 times as long as broad; branches about 8μ thick, cells 1.5 to 2 times as long as broad; glands on the upper side of the branches of the first order, generally on the third cell from the base, about 15μ long by 12μ broad and 7μ thick.

One small fragment on *Dasya* at 33 meters off Southwest Channel, Dry Tortugas.

This seems to differ from *A. antillarum* Børg. in that the glands are not on branches of the second order, and in other features. The number of fragments of *Antithamnion* in sterile and otherwise unidentifiable condition seen at Dry Tortugas suggests that the genus may, when studied at a more propitious season, prove to be fairly well represented there.

CALLITHAMNION Lyngbye

Plant erect, abundantly dichotomously or laterally branched; axis a simple series of multinucleate cells; the principal axis corticated below by rhizoids; sporangia tripartite, antheridia densely clustered, branched, like the sporangia on the upper forks of the branchlets; procarps on the upper branches of the axis, occasionally appearing terminal; cystocarp appearing lateral upon a branch, naked, with two gonimoblasts.

1. Axis corticated by descending rhizoidal branches . . . . C. dasytrichum (189)
1. Axis not corticated 2

2. Axis to 200μ in diameter . . . . C. Halliæ (189)
2. Axis not over 140μ in diameter . . . . C. byssoides (189)

Callithamnion byssoides Arnott

(Plant with a main axis 140μ in diameter, cells 3 to 4 times as long as broad; branching alternate and lateral below, above in the minor divisions sub-dichotomous; trichoblasts and cortications [?] lacking; tetrasporangia generally tripartite, 35 to 40μ in diameter.)

Callithamnion byssoides Arnott, Børgesen (Oct. 1917); *C. byssoides* Arnott, represented by variety *Jamaicense* Collins, Collins and Hervey (1917).

Florida; Virgin Islands; Bermuda, as variety *Jamaicense*.

All *Callithamnion* material from Dry Tortugas held in considerable doubt; a field record of this species with a "?" is reported. *Callithamnion* material from Dry Tortugas was frequently secured from about Garden and Loggerhead Keys and on White Shoal from shallow water to 14.6 meters, but never in any considerable amount.

Note that Farlow, Howe and others consider that *C. byssoides* may be corticated, while the above description, which is compiled from Børgesen's text, calls for an uncorticated plant.

Callithamnion dasytrichum Montagne

(Plant large, spirally twisted below, the axis and main branches radiculose, decompound pinnate, branches sub-distichous, patent, the terminal branches erect, sub-corymbose; branchlets attached above the middle of the segments; primary filaments with cells 1.5 to 4 times as long as broad; uppermost cells' length equal to breadth, the tips acute; rosy, drying to purplish, soft in texture.)

Callithamnion dasytrichum Montagne; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 697.*

Florida.

Callithamnion Halliæ Collins

(Plants to 5 cm. tall, the filaments to 200μ thick at the base; usually with a percurrent axis, straight below, becoming flexuous near the top, not corticated, with 1 or 2 series of similar alternate branches, then dividing dichotomously, at first widely, the later series less patent; ultimate divisions 10 to 20μ in diameter, the end cell rounded, without terminal hairs; cells mostly 4 times as long as broad, except where densely forked.)

Callithamnion Halliæ Collins, Collins and Hervey (1917); *C. Halliæ* Collins, Howe (1920); *C. Halliæ* Collins; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 698.*

Florida; Bermuda and Bahamas.

CENTROCERAS Kuetzing

Plant filamentous, branching unequally dichotomous; filaments with a central axis of large cells surrounded by a regular cortex of longitudinally seriate sub-rectangular cells developed from the nodes, which bear short, 1- to 3-celled spines.

Centroceras clavulatum (C. Agardh) Montagne

(Plate 28, figs. 6, 7)

Plant of very variable form, stiff and matted, or forming large, epiphytic floating masses when much intertangled; usually dark purplish red in color, or in exposed places pale; filaments to 50 to 75μ in diameter, the internodes short above, to 0.75 mm. long below; apices forcipate; spines at the nodes generally of 2 cells, most prominent in the apical parts of the branches; tetraspores sub-external generally formed in verticels in the terminal segments of axillary torulose proliferations.

Centroceras clavulatum C. Agardh, Harvey (1853); *C. clavulatum* C. Agardh, Farlow (1876); *Ceramium clavulatum* C. Agardh, Collins and Hervey (1917); *Centroceras clavulatum* (C. Agardh) Montagne, Børgesen (Nov. 1918); *C. clavulatum* (C. Agardh) Montagne, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common about Dry Tortugas, but frequently in a dwarfed state, as on the exposed rocks; luxuriant about Garden and Loggerhead Keys, and on Bird Key Reef; showing good tetrasporic from the first locality, but generally sterile; strictly from shallow water.

CERAMIUM (Roth) Lyngbye

Plant erect, filamentous, the upper branches unequally dichotomous and often proliferating; filaments cylindrical, with large cells in axial series, but corticated at least at the nodes by smaller cells of nodal origin; cortex often showing colorless hairs or spines; tetraspores tetrahedral, forming from the smaller upper cells of the corticating bands; antheridia forming depressed crusts over the surface of the cortex; procarps on the upper branch forkings, cystocarps more or less enclosed by special filaments from the cortex.

1. Internodes completely corticated by irregularly placed cells.............2
1. Filaments corticated at the nodes only...............................3

2. Axis appearing banded...C. rubrum (192)
2. Axis not appearing banded...C. nitens (192)

3. Filaments regularly dichotomous...................................C. tenuissimum (192)
3. Filaments irregularly or not at all dichotomous.........................4

4. Filaments notably and closely complanate, alternate...................C. floridanum (192)
4. Filaments not notably complanate..................................5

5. Apical dichotomies not forcipate...................................C. Deslongchampsii (191) [1]
5. Apical dichotomies forcipate..6

6. Nodal cortication of one row of small and one row of large cells, the former divided in the oldest filaments..................................C. fastigiatum flaccidum (191)
6. Nodal cortication of more than two rows of cells........................7

7. Nodal cells all elongate longitudinally of axis..........................C. corniculatum (191) [1]
7. Nodal cells irregularly placed or some transverse.......................8 (C. diaphanum) (191) [1]

8. Nodal cells distinctly zonate; middle zone of large cells, lower zone of transversely elongate cells..C. byssoideum (190)
8. Nodal cells indistinctly zonate; cells of lower zone not transversely elongate.C. subtile (192)

Ceramium byssoideum Harvey

(Plate 27, figs. 20, 21)

(Frond small, cæspitose, soft, of slender filaments 60 to 80μ in diameter, reaching 2 to 3 cm. in length, sparingly sub-regularly dichotomously branched, the branches recto-patent; lower internodes all 6 to 8 times longer than broad, tetraspores emergent, sub-secund, appearing to inflate the lower portion of the cortical band, up to 60μ in diameter, 1 or 2 at a node; cortication showing a notable series of transversely elongated cells in the lower portion of each band.)

Ceramium byssoideum Harvey (1853); *C. byssoideum* Harvey, Farlow (1876); *C. transversale* Collins and Hervey (1917); *C. transversale* Collins and Hervey, Børgesen (Nov. 1918); *C. byssoideum* Harvey, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

The small form which Collins described as *C. transversale* was found at Bush Key on *Dictyota*, with abundant tetraspores.

[1] Position in key and relation to other species not clear.

Ceramium corniculatum Montagne

(Filaments capillary, dichotomous below, above somewhat lateral with erect, incurved branches, the main filaments 90 to 200μ in diameter; nodal bands not protuberant, the corticating cells with their longer axes lengthwise of the filament; on the lower joints the segments 3 to 4 times longer than broad and the internodes hyaline, but in the ultimate branches the nodal cortications sub-confluent; tetrasporangia verticillate in the central layers of the nodes of the clavate or fusiform incurved lateral branches.)

Ceramium corniculatum Montagne, Howe (1920); *C. corniculatum* Montagne; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 344.*

Florida and the Bahamas.

Ceramium Deslongchampsii Chauvin

(Frond sub-setaceous, decompound-dichotomous, beset with lateral subulate branches; branches erect, the terminal not forked, the lower joints 3 to 4 times as long as broad; internodes naked; tetraspores verticillate, sparse, usually aggregated toward one side of the uppermost branches.)

Ceramium Deslongchampsii Chauvin, Melvill (1875).

Florida.

Ceramium diaphanum Roth

(Frond sub-setaceous, brownish red, 2.5 to 5.0 cm. high, filaments rather stout, distantly forking and bearing lateral dichotomous branchlets; branches erect, terminally forcipate, the segments 3 to 4 times as long as broad, the internodes pellucid; tetraspores few, verticillate, immersed in the central cortical layer of the nodes.)

Ceramium diaphanum Roth, Harvey (1853); *C. diaphanum* Roth, Farlow (1876); *C. diaphanum* Roth, Farlow (1882).

Perhaps from New England to Florida.

Collins in his check-list of New England algæ does not accept the record of its presence from that district; Melvill does accept the Florida record, however. It is probably doubtfully present along our coast.

Ceramium fastigiatum (Roth) Harvey

(Plants lake-red, densely tufted, filaments capillary, to 5 to 12 cm. tall, regularly dichotomous, fastigiate, even-topped, the apices forcipate; lower segments 3 to 4 times as long as broad, the upper internodes largely covered by the nodal cortications; tetraspores secund on the outer sides of the branches, sub-emergent.)

Ceramium fastigiatum Harvey (1853); *C. fastigiatum* Harvey, Farlow (1876, 1881); *C. fastigiatum* Harvey, Melvill (1875); *C. fastigiatum* (Roth) Harvey, Børgesen (Nov. 1918).

New England to Florida; Virgin Islands.

Forma flaccidum H. B. Petersen

(Plate 27, figs. 12 to 16)

(Plant 4 to 5 cm. tall, filaments dichotomous with apices moderately incurved; axial cells 50μ in diameter and to 400μ long; nodes 50μ in diameter and (20μ to) 30 to 40μ long, of 2 (to 3) rows of cells, the upper ones markedly smaller, tetraspores prominent.)

Ceramium fastigiatum forma *flaccidum* H. B. Petersen, Børgesen (Nov. 1918).

Virgin Islands; newly reported for Florida.

On *Hypnea* growing on sand near Laboratory Wharf, Loggerhead Key; perhaps overlooked.

Ceramium floridanum J. Agardh

(Frond slenderly capillary, branches short and densely decompound, the terminal segments acute and sub-divergent; branching notably alternate and complanate, the naked internodes conspicuous, twice as long as broad; tetraspores on the penultimate branches, prominent, verticillate, naked above.)

Ceramium floridanum J. Agardh, Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 297.*

Florida.

Ceramium nitens (C. Agardh) J. Agardh

(Frond setaceous, dichotomously branched, diffuse, the branches erect, above widely secund, the terminal subulate; segments below 2 to 3 times as long as broad, the internodes completely covered by the small corticating cells; tetraspores produced all over the branches, immersed; color red, plants drying cartilaginous.)

Ceramium nitens J. Agardh, Harvey (1853); *C. nitens* J. Agardh, Farlow (1876); *C. nitens* (C. Agardh) J. Agardh, Collins and Hervey (1917); *C. nitens* (C. Agardh) J. Agardh, Børgesen (Nov. 1918); *C. nitens* (C. Agardh) J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Ceramium rubrum (Hudson) Agardh

Farlow (1876) of course includes the Florida east coast in his territory, and under the above species name indicates that the plant is found "Everywhere," but the writer is not familiar with any material of the species from Florida, and Hoyt (1920) appears unwilling to assume that Florida should be included in its range, although recognizing a record as far south as Charleston, South Carolina.

Ceramium subtile J. Agardh

(Plate 27, figs. 17 to 19)

Plant forming soft, more or less tangled tufts to 1.5 dm. long, branching monopodial, to sub-dichotomous above, the apices strongly incurved; lower internodes reaching 120μ in diameter and 1.25 mm. in length, the nodes to 130μ in diameter, and generally shorter than broad; cells of the nodes generally showing 3 series of cells, an upper of small irregularly placed rounded cells, a middle of large irregularly rounded cells and a lower, which at first of a single row of cells rather transversely placed later becomes divided by vertical or oblique walls to a number of irregular cells; nodes with abundant delicate hairs on the younger branches; rhizoids occasional at the nodes; tetraspores surrounded below, but protruding from the node above, usually single, the group of four cells about 60μ in maximum diameter; cystocarps at the upper forks, frequently accompanied by fascicled stunted branches.

Ceramium gracillimum Griffiths and Harvey, Harvey (1853); *C. subtile* J. Agardh, Howe (1920).

Florida, Bahamas.

Common about Garden Key in 1924 on *Chondria*, but scarce in 1925 and 1926; common about Middle Key; occasional at East Key and Bird Key; strictly a plant of shallow water.

Ceramium tenuissimum (Lyngbye) J. Agardh

(Fronds rosy-red, 5 to 10 cm. high, densely tufted, capillary, decompound-dichotomous, branches erect, patent, apices forcipate; tetraspores borne on the swollen nodes, usually on the outer side, often several together; cystocarps lateral, involucrate.)

Ceramium tenuissimum Lyngbye, Harvey (1853); *C. tenuissimum* Lyngbye, Farlow (1876); *C. tenuissimum* (Lyngbye) Agardh, Farlow (1881); *C. tenuissimum* (Lyngbye) J. G. Agardh, Collins and Hervey (1917); *C. tenuissimum* J. Agardh, Howe (1920); *C. tenuissimum* (Lyngbye) J. Agardh, Hoyt (1920).

Var. arachnoideum (C. Agardh) J. Agardh

(Fronds more slender than the type, tetraspores exserted, secund on the outer sides of the branches, solitary or several together.)

Ceramium tenuissimum var. *arachnoideum* Agardh, Farlow (1881); *C. tenuissimum* var. *arachnoideum* (Agardh) J. Agardh, Collins and Hervey (1917).

New England to Florida, Bermuda, and the Bahamas.

CROUANIA J. Agardh

Plant cylindrical, abundantly laterally branched, mucilaginous; the large cells of the central axes beset with overlapping whorls consisting each of 2 to 4 or more abundantly, usually dichotomously, divided ramuli; central axis naked, or corticated by rhizoidal downgrowths; tetrasporangia cruciate, generally single on the basal stalk cell of the ramulus, or several in the upper portions of the ramulus in varying stages of development; cystocarps lateral or apparently terminal on the fertile branch, usually but one on a branch, more or less completely enclosed by the ramuli but without specialized investment.

1. Tetraspores single in each fascicle...C. attenuata
1. Tetraspores several in each fascicle...C. pleonospora

Crouania attenuata (Bonnemaison) J. Agardh

(Plate 27, figs. 7 to 9; plate 32, fig. 9)

Plants 1 to 5 cm. high, in the former tufted on the substratum, in the latter entangled among other algæ, filaments 0.2 to 0.3 mm. in diameter over all; much branched; tetraspores single, on the basal cell of the fascicle of ramuli.

Crouania attenuata J. Agardh, Harvey (1853); *C. attenuata* J. Agardh, Farlow (1876); *C. attenuata* (Bonnemaison) J. Agardh, Børgesen (Oct. 1917); *C. attenuata* (Bonnemaison) J. Agardh, Collins and Hervey (1917); *C. attenuata* (Bonnemaison) J. Agardh, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common at Dry Tortugas; at Garden, Loggerhead, Long and Bird Keys upon stone or brickwork or on *Thalassia* or the larger algæ; tetrasporic, male and female plants; ordinarily a plant of shallow water, but dredged to 7.6 meters on White Shoal.

Crouania pleonospora n. sp.

(Plate 27, fig. 10; plate 30, fig. 5; plate 32, fig. 8)

Plants to 5 cm. high, but often smaller, tufted, moderately branched, the branches markedly contracted at the base, 0.5 to 1.0 mm. in diameter, mucilaginous, very lightly calcified below, rosy above; structurally composed of an axial series of cells reaching 100 to 160μ in diameter and 250 to 420μ long, bearing whorls of branching ramuli shortly below the upper end of each cell; the ramuli erect from the axis, di- to trichotomous, with a basal cell about 30μ in diameter and 50μ long, not specially granular, the cells next in order about 20μ in diameter and somewhat contracted at the middle, 60μ in length, the cells of the end segments about 8μ in diameter and 24μ long; tetrasporangia one to generally several on a fascicle, of varied ages, in the middle or upper (outer) portion; 60 to 90μ in diameter; cystocarps solitary, or two nearby, in smaller, spindle-shaped branches, and usually on smaller plants than the tetraspores.

Here newly described from Dry Tortugas, Florida.

Probably common about Dry Tortugas, generally confused with *Crouania attenuata;* more sturdy, less branched; dredged at 3.1 to 9.3 meters on White and Loggerhead Key Shoals and on Long Key Shoal, and in shallow water near Bird Key.

GRIFFITHSIA C. Agardh

Plant erect, laterally or dichotomously branched; filaments simple series of large, elongate-cylindrical or pyriform to spherical cœnocytes, naked or in part surrounded by very deciduous trichoblasts; tetrasporangia nodal, stalked, tripartite, surrounded by arcuate-cylindric unicellular branchlets; antheridia branched, contiguous, forming a crust on the segments; procarps appearing lateral on the upper segments; cystocarp surrounded by arcuate-cylindric involucral branchlets.

Griffithsia globifera (Harvey) J. Agardh

(Plate 28, fig. 14)

Plant tufted, 2 to 7 cm. high, freely branched; segments pyriform to obovate or sub-cylindric, especially below; 0.5 to 1.2 mm. diameter, 1 to 5 times as long as broad; tetrasporangia in rings at the nodes, cystocarps usually solitary, antheridia forming caps on the broadly obovate upper cells, especially the terminal ones.

Griffithsia corallina C. Agardh variety *globifera* Harvey (1853); *G. corallina*? J. Agardh, Farlow (1876); *G. Bornetiana* Farlow (1881); *G. globifera* (Harvey) J. Agardh, Børgesen (Oct. 1917); *G. globulifera* Harvey, Howe (1920).

New England to Florida; Bermuda; Bahamas and through the West Indies to the Virgin Islands.

Apparently scarce at Dry Tortugas, isolated filaments with 2 to 3 branches and a dozen or two of cells were encountered several times, but usually were lost in returning the material to the laboratory; specimens were preserved from White Shoal and at 32.9 meters off Southwest Channel; sterile.

Since this material was all sterile the determination will remain somewhat uncertain; however the habit as well as the probabilities indicate that the plant is *G. globifera*.

GYMNOTHAMNION J. Agardh

Thallus articulate, monosiphonous and uncorticated, the primary filaments decumbent and rooting below, forming above lanceolate, pinnate plumes, the pinnules simple and opposite, sometimes again pinnate, becoming transformed above into the reproductive organs; favellæ numerous, sub-fasciculately crowded, on the converted axial apex and pinnules; naked, oblong; tetraspores formed on the upper nodes of the pinnules, terminal, pedicellate, tripartite; antheridia from the nodes of the hardly modified lower pinnules, corymbosely branched below.

Gymnothamnion elegans (Schousboe) J. Agardh

(Plate 27, figs. 1 to 4)

Filaments 1 to 4 cm. long, intertwined to form a thin mat over stones, etc.; generally showing a creeping rhizomatous axis bearing erect pinnate branches with descending rhizoids opposite these; the filaments of the main axis 20 to 25μ in diameter, cells generally 2 to 5 times as long as broad, with the forward end usually slightly larger and bearing the branches; branchlets straight or somewhat curved, opposite in pairs on each node or sometimes reduced or absent generally 10 to 15μ in diameter; on the long flagella filaments the alternate branch pairs are rudimentary and have a 90° alternation with each other, but in more developed parts the ramuli are distichous-pinnate, once or twice secund-pinnate, or undivided, very variable in different parts of the same continuous axis; (tetrasporangia tripartite, spherical or slightly ovoid, 30 to 35μ in diameter).

Gymnothamnion bipinnatum Collins and Hervey (1917); *G. elegans* (Schousboe) J. Agardh, Howe (1920).

Bermuda and Bahamas; newly reported for Florida.

Abundant on old bricks in a limited area near the west coal wharves, Garden Key, Dry Tortugas.

SEIROSPORA Harvey

Plant erect, abundantly dichotomously or laterally branched; axis a simple series of uninucleate cells, the principal axis at times corticated below by rhizoids; sporangia cruciate, seldom tripartite, on the upper part of the ultimate branching of the thallus, each solitary on the end of a stalk cell; antheridia densely clustered, branched, like the sporangia on the upper forks of the branchlets; procarps on the upper branches of the axis, occasionally appearing terminal; seirospores produced on asexual or rarely sexual plants, in radiating bundles of spores with the largest most external.

Seirospora occidentalis Børgesen

(Plant bushy, 1 to 2 cm. tall, attached by rhizoids from the base of the axis; axis about 85μ in diameter above, but to 200μ thick close to the base, cells 4 to 5 times as long as broad, the ultimate branchlets 8 to 11μ in diameter, sometimes ending in a hyaline hair; uncorticated, oppositely or alternately branched below, dichotomous in the more ultimate divisions; tetraspores sessile, tetrahedral or cruciate; carpospores formed in radiating clusters, ramified in lower part, the ultimate mature spores 40 to 42μ in diameter; paraspores (seirospores) with the tetrasporangia, of short rows of dense cells, the rows sometimes somewhat branched.)

Seirospora occidentalis Børgesen (Oct. 1917); ? *S. occidentalis* Børgesen, Howe (1920).

Bahamas; Virgin Islands; with some question now reported from Florida.

White Shoal, Dry Tortugas, at 6.2 meters, the determination as made from living material probably correct, but hard to verify from the dried specimen. The description here given was compiled from Børgesen (1915 to 1920).

SPERMOTHAMNION Areschoug

Plant filamentous with decumbent rhizomatous part affixed by rhizoidal hapteræ, producing erect branches which are alternately or oppositely branched; sporangia tetrahedral, single or clustered, on the lateral branchlets of the erect filaments; antheridia spherical, on the upper side of lateral branchlets; cystocarp terminal, enclosed by sheathing filaments.

1. Plant less than 1 cm. high, forming a turf or fringe on larger algæ . . . . S. gorgoneum (195)
1. Plant 2 cm. or more tall, forming rounded tufts . . . . S. Turneri (196)

Spermothamnion gorgoneum (Montagne) Bornet

Plant forming a soft, purple felt on *Codium*, the lower filaments (3 to 5 mm. long) intricate, in part rhizomatous; cells of the erect filaments 20 to 50μ in diameter, 2 to 5 (to 7) times as long as broad; free branches erect, alternately branched; (cystocarps lateral, spherical, to 180μ in diameter on a 1-celled stalk).

Spermothamnion gorgoneum (Montagne) Bornet, Collins and Hervey (1917); *S. gorgoneum* (Montagne) Bornet, Howe (1920).

Bermuda; Bahamas to the Barbadoes; newly reported for Florida.

On *Codium*, Garden Key, Dry Tortugas.

Spermothamnion Turneri (Mertens) Areschoug

(Plant tufted, to 4 cm. tall, with repent primary filaments, the secondary filaments erect, to 30 to 80μ in diameter, naked below, oppositely pinnate, the pinnules patent, simple, the lower opposite, the upper alternate; tetraspores sub-sessile, tripartite, attached to the upper side of short ramuli.)

Callithamnion Turneri Agardh, Harvey (1853); *C. Turneri* Agardh, Farlow (1876); *Spermothamnion Turneri* Areschoug, Farlow (1881); *Spermothamnion Turneri* (Mertens) Areschoug; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 1446*, var. *variabile* Harvey ditto, *No. 843*.

Var. variabile Harvey

(Secondary filaments widely spread, generally alternate to secund, joints short; tetraspores few on abbreviated pinnules, at times solitary.)

New England to Florida.

SPYRIDIA Harvey

Plant erect, abundantly laterally branched; branches cylindrical, with a large-celled central axis and more or less well-developed cortex, continuous on the stronger shoots or partial on the determinate ramuli; each cell of the axis forming at the upper end a whorl of rudimentary ramuli that becomes closely associated laterally to form the corticating ring, which in the stronger shoots, with a more abundant formation of the rhizoidal downgrowths, completes the cortication over the internode; the indeterminate branches become beset by the shorter more or less sturdy branches in alternating series; tetrasporangia tripartite, on the upper part of the cortical ring of determinate branches; procarps on condensed indeterminate branches becoming terminal by transformation of the apex; cystocarp appearing as terminal on a short lateral stalk from the filament, at first 2-lobed, later 3-lobed to irregular.

1. Determinate ramuli without lateral spines at the upper nodes . . . . S. filamentosa (197)
1. Determinate ramuli with 1 or more curved spines on the upper nodes . . . . S. aculeata (196)

Position doubtful, related to *S. filamentosa* . . . . S. ceramioides (196)

Spyridia aculeata (Schimper) Kuetzing var. hypneoides J. Agardh

(Plate 28, figs. 5, 17; plate 33, fig. 8)

Plant to 2.0 to 2.5 dm. tall, very densely bushy, the leading erect main branches bearing alternate branches to the fourth or sixth degree, the ultimate branchlets straight and, as well as the main axes, beset with very numerous determinate ramuli which are considerably shorter and more numerous than those of *S. filamentosa;* main branches generally terminating in part in swollen crooked (uncinate) tips; cortications of the main branches of bands of approximately equal numbers of longitudinally elongated cells; the ramuli showing the cortications as 8 cells at each node and recurved spines at the terminal node and also frequently at the node below it, in addition to the erect spine at the summit.

Spyridia aculeata (Schimper) Kuetzing *p.p.*, Børgesen (Oct. 1917); *S. aculeata* (Schimper) Kuetzing *p.p.*, Collins and Hervey (1917); *S. aculeata* (Schimper) Kuetzing, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Fairly abundant on the piling, Laboratory wharf, Loggerhead Key, Dry Tortugas; also floating at Long Key, and at Middle Key.

Spiridia ceramioides J. Agardh

(Frond terete, irregularly and widely branched, branchlets similar, conspicuously jointed, joints biannulate, the polysiphonous cortex of almost equally long zones; ramuli many, distichous, incurved, cylindrical, the apex ovate-acuminate; the joints of the branchlets twice as long as broad, those of the ramuli 1.5 times as long as broad.)

Florida (Curtiss).

Spyridia filamentosa (Wulfen) Harvey

(Plate 28, figs. 4, 18)

Plant 1 to 2 dm. tall, abundantly dichotomously or more usually alternately branched, in the upper part the long branches abundantly beset with short lateral indeterminate branches; indeterminate branches of all orders with abundant determinate ramuli which are slender and corticated by rings at the nodes; cortications of the main branches showing alternate bands, one zone having cells half as broad as those in the next adjacent zone; the ramuli showing only the erect spine at the summit and 4 cells corticating each node.

Spyridia filamentosa Harvey (1853); *S. filamentosa* Harvey, Farlow (1876); *S. filamentosa* (Wulfen) Harvey, Børgesen (Oct. 1917); *S. filamentosa* (Wulfen) Harvey, Collins and Hervey (1917); *S. filamenotsa* (Wulfen) Harvey, Howe (1920).

New England to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Abundant at Dry Tortugas about Loggerhead Key, especially in the shelter of the island on the west side, and also drifted ashore on the east side after storms rather abundantly from the shallow water of the islands to the east; dredged at 11.0 to 18.3 meters in Southwest Channel and at 29.3 meters beyond it; also from Garden Key and Bird Key; tetrasporic and female.

GRATELOUPIACEÆ

Plant terete or flattened to foliaceous, usually laterally but sometimes dichotomously branched; structure filamentous, though this sometimes obscure; tetrasporangia scattered or in sori, embedded in the thallus or in swollen nemathecia, cruciate; carpogonia and auxiliary cells formed on inner branches of the cortical filaments, becoming enclosed by special enveloping filaments, distinct but intermingled; cystocarps scattered or often aggregated, embedded; gonimoblast arising from a large basal stalk cell and forming numerous carpospores in groups.

1. Sporangia unknown; plant club-shaped from a collar-topped stipe .... Corynomorpha (197)
1. Sporangia in nemathecia, texture rather firm .... Cryptonemia (198)
1. Sporangia scattered, texture soft to gelatinous 2

2. Branching pinnate to irregular, texture firmer, color darker purple .... Grateloupia (198)
2. Branching, if present, dichotomous to irregular, texture soft, color pale to rose .... Halymenia (199)

CORYNOMORPHA J. Agardh

Thallus elongate-clubshaped, sparsely branched or simple, cylindrical below, somewhat compressed or angled above, thick and firmly cartilaginous; in structure obviously filamentous, the pith broad and comparatively dense, of slender filaments intermeshed by rhizoidal outgrowths, the inner cortex inwardly chambered, penetrated by rhizoidal filaments, the outer cortex with anticlinal branched rows of cells; sporangia unknown; cystocarps crowded in greatly swollen thallus tips, small and completely immersed.

Corynomorpha clavata (Harvey) J. Agardh

(Hapteron disciform, thallus above starts with a filiform stipe to a height of 0.5 to 1.2 cm. where it ends in a thickened collar; above the collar the upper thallus extends to a further height of about 5 cm., club-shaped and tapering to the base, obtuse at the apex, simple or with club-shaped branches; color dark purplish red; substance firm, cartilaginous; proliferous from the apex.)

Acrotylus clavatus Harvey (1853); *A. clavatus* Harvey, Farlow (1876).

Florida.

CRYPTONEMIA J. Agardh

Thallus stem-like below, flattened above to a thin, entire or divided blade with a rudimentary or evident midrib, from which, as from the margin, there may arise many proliferating blades, which by destruction of the old lamina may become supported on a branched stem system; tetrasporangia and cystocarps on individual little proliferated blades; tetrasporangia in dense and much thickened nemathecium-like cortical patches; cystocarps mostly in clusters, occasionally only on certain segments of the fruiting blades.

1. Midrib absent..C. crenulata
1. Midrib present..C. luxurians

Cryptonemia crenulata J. Agardh

(Plate 27, fig. 22; plate 28, figs. 9, 12, 13)

Plant 2 to 4 cm. tall, 0.3 to 1.5 cm. broad, stipe short or apparently absent, blade linear to broadly oblong, irregularly dichotomously to palmately divided, the margin usually sharply undulate, and crenate, sometimes proliferous; tips of the blades somewhat indented, the midrib absent; (tetraspores in sori below the rounded apices of the thallus lobes).

Cryptonemia crenulata J. Agardh, Harvey (1853); *C. crenulata* J. Agardh, Farlow (1876); *C. crenulata* J. Agardh, Collins and Hervey (1917); *C. crenulata* J. Agardh, Børgesen (Oct. 1920).

Florida; Bermuda; the Danish West Indies.

At Dry Tortugas dredged once to 13.8 meters on Loggerhead Key Shoal.

Cryptonemia luxurians (Mertens) J. Agardh

(Caulescent, the stem branched above, alate and dividing into linear costate blades; leaflets obovate-oblong, stalked, sub-enervate, developed from costa and margin; tetraspores in small marginal leaflets.)

Cryptonemia luxurians Agardh, Farlow (1876); *C. luxurians* (C. Agardh) J. Agardh, Collins and Hervey (1917).

Florida; Bermuda.

GRATELOUPIA C. Agardh

Plant flattened, dichotomously or laterally branched, branches simple or irregularly divided or proliferous; structure filamentous, the medullary layer of anastomosing filaments, the cortex of vertical moniliform filaments; tetrasporangia scattered, embedded in the outer cortex, cruciate; antheridia forming patches over the surface of the frond; cystocarps scattered or somewhat grouped, small, sunken into the cortical layer.

1. Ultimate segments narrowly linear..G. filicina (198)
1. Ultimate segments strap-shaped, 1 to 4 cm. broad....................................G. Gibbesii (199)

Grateloupia filicina (Wulfen) C. Agardh

(Frond to 25 cm. high, compressed, the lobes linear to strap-shaped, pinnately decompound, with several blades from a rounded disk-like base; pinnules linear, acuminate, the lower longer than the upper and again pinnate, while the upper remain simple; texture membranous, firm; antheridia from peripheral cortical cells, the spermatia 4 to 5μ in diameter; cystocarps scattered over the thallus, about 180μ in diameter; tetraspores also scattered.)

Grateloupia filicina Agardh, Harvey (1853); *G. filicina* Agardh, Farlow (1876); *G. filicina* (Wulfen) C. Agardh, Børgesen (Oct. 1916); *G. filicina* (Wulfen) C. Agardh, Hoyt (1920).

North Carolina to Florida; Virgin Islands.

Grateloupia Gibbesii Harvey

(Frond 15 to 50 cm. long, simple or scantily divided, the divisions linear to lanceolate, flat, 1 to 4 cm. broad, attenuate; branching polymorphic, the margin of the lobes entire to ligulate-dentate; texture membranous, fleshy; color blackish purple.)

Grateloupia Gibbesii Harvey (1853); *G. Gibbesii* Harvey, Farlow (1876); *G. Gibbesii* Harvey, Hoyt (1920).

South Carolina "and southward."

HALYMENIA (C. Agardh) J. Agardh

Thallus cylindrical to angular, flattened or foliaceous, dichotomously to laterally branched or proliferating; gelatinous-membranous; structurally of a thin superficial layer and a loose filamentous medulla; tetrasporangia cruciate, dispersed through the outer cortex; cystocarps dispersed, small, more or less completely sunken.

1. Thallus normally with an undivided blade..2
1. Thallus normally with a divided blade..3

2. Blade gelatinous, fleshy, thick..H. Gelinaria (200)
2. Blade membranous, firm, thin..H. floridana (200)

3. Branches essentially cylindrical..H. Agardhii (199)
3. Branches essentially flattened, to broadly foliaceous and dissected....................H. Floresia (199)

Halymenia Agardhii De Toni

(Plate 26, fig. 18; plate 28, fig. 8)

Plant of moderate size, 1 to 2 dm. tall, somewhat bushy, irregularly and unequally dichotomously branched, the branches cylindrical (to somewhat flattened) 2 to 8 (to 10) mm. in diameter, tapering slightly toward the obtuse tips, expanded below the forkings, substance soft; tetrasporangia cruciate.

? *Halymenia ligulata* Agardh, Harvey (1853); ? *H. ligulata* Woodward, Farlow (1876); *H. Agardhii* De Toni, Collins and Hervey (1917); *H. Agardhii* De Toni, Hoyt (1920).

North Carolina to Florida; Bermuda.

Dredged at Dry Tortugas at 14.6 meters in Southwest Channel.

Halymenia Floresia (Clemente) C. Agardh

(Plate 28, fig. 19; plate 35, fig. 6)

Plant large, to 3 dm. or more across, very soft, gelatinous, pinnately to sub-dichotomously branched, the major divisions usually marginally beset with slender linear branches; diameter of main divisions 5 to 20 mm., occasionally to 35 mm., the main divisions often very slender and the ultimate linear lobes abundant, giving a very bushy plant in contrast to individuals with broad main divisions and few linear divisions.

Halymenia Floresia C. Agardh, Harvey (1853); *H. Floresia* C. Agardh, Farlow (1876); *H. Floresia* (Clemente) C. Agardh, Børgesen (Oct. 1916); *H. Floresia* (Clemente) C. Agardh, Hoyt (1920).

North Carolina to Florida; Virgin Islands.

At Dry Tortugas common in dredgings in moderately deep water at 11.0 to 34.7 meters in and beyond Southwest Channel; once a single piece washed ashore on Loggerhead Key; tetrasporic and female.

Halymenia floridana J. Agardh

(Frond flat, 5 to 20 cm. tall, 4 to 10 cm. wide, borne on a short, narrow, filiform, conspicuous stipe a few millimeters long; at first ovate, entire, but later forming numerous ovate lobes, cuneate at the bases, tapering toward the obtuse apices, finally laciniate, somewhat palmatifid; medulla traversed by many irregularly branched filaments of irregular sizes, segmented occasionally but not conspicuously, frequently anastomosing and forming numerous conspicuous stellate ganglia; cortex 1 to 4 cells thick, the cells usually of fairly uniform diameter, cuticle persistent and conspicuous, surface smooth, cystocarps scattered, forming swellings on both surfaces; texture thin, membranaceous; color rose or purplish.)

Halymenia floridana J. Agardh, Hoyt (1920).

North Carolina to Florida; Bermuda.

Halymenia Gelinaria Collins and Howe

(Plate 26, fig. 19; plate 28, figs. 10, 11, 15)

Plant a generally simple blade 0.5 to 1.5 (6.0) dm. in diameter and 60 to 600μ thick, stalked, the stalk slender, 1 to 2 mm. long, from a small disciform holdfast; base of the blade transverse to broadly obtuse, just at the stalk slightly cuneate; shape of the blade broadly ovate to obovate, margin entire to somewhat irregularly dentate or crenate; texture gelatinously fleshy, color purplish pink, many star-like cells visible below the surface, the tetrasporangia (18 to 26 by 13μ).

Halymenia Gelinaria Collins and Howe, Hoyt (1920).

North Carolina to Florida.

At Dry Tortugas dredged at 64.0 to 67.7 meters and at 82.5 to 159.4 meters off Southwest Channel; also another haul from deep water, not sounded; plants much damaged by the long haul, the margin of largest piece crenate, probably by animal attack.

Halymenia ligulata (Woodward) C. Agardh

(Frond gelatinous membranous, flat, stipitate, sub-simple, laciniate to dichotomous; at the margin and seldom from the face proliferously decompound; proliferations elongate-linear, attenuate, simple to dichotomous; length to 6 dm., breadth of branches linear to 2 mm. and cylindrical compressed to flat and 6 to 9 cm. broad; ramification dichotomous to sub-palmate, the axils rounded; cystocarps scattered over the surface; color red.)

? *H. ligulata* Woodward, Farlow (1876).

Florida?

DUMONTIACEÆ

Thallus cylindrical or flattened, the tissue loose or hollow within, frequently proliferous; structure at least in part evidently filamentous; tetrasporangia cruciate or tetrahedral, scattered in the outer cortex or in special nemathecia; auxiliary cells on special branches; carpogonia separate from the auxiliary cells, communicating with them after fertilization by special oöblastema filaments; auxiliary cells giving rise to the gonimoblasts, most of the cells of which form carpospores.

DUDRESNAYA Bonnemaison

Thallus cylindrical, radially branched, soft-gelatinous, of obvious filamentous structure; central axis of a single series of cells becoming corticated by rhizoidal branches, and bearing radiating whorled branchlets which form a loose cortex; tetraspores scattered; carpogenic branches and auxiliary cells abundant, scattered through the inner part of the cortex; cystocarps completely enclosed, scattered, small, the gonimoblast cells mostly forming carpospores.

Dudresnaya caribæa (J. Agardh) Setchell

(Plants solitary, or somewhat aggregated, light red in color; main axis short, quickly dividing into several main branches, the whole to about 1 dm. long; branches complanate and pinnately distichous, with similar branches to 2 to 3 orders; the ultimate branches fusiform; peripheral filaments moniliform, 2- to 3-chotomous below, dichotomous above; plants monœcious or in part at least diœcious, the auxiliary cell in the middle of the auxiliary branch.)

Dudresnaya caribæa (J. Agardh) Setchell, Collins and Hervey (1917).

Florida and Bermuda.

Originally secured at Dry Tortugas, probably by Mrs. G. A. Hall.

NEMASTOMACEÆ

Thallus cylindrical to foliaceous, dichotomously to laterally branched; structure more or less evidently filamentous; tetrasporangia scattered; carpogonia on the inner border of the outer cortex, the branches 3-celled, separate from the auxiliary cells, which are numerous; carpogonium after fertilization fusing with neighboring cells and then sending out oöblastema filaments which fuse with the auxiliary cells; these in turn form projections that act as central cells in the formation of the gonimoblasts, most of the cells of which form carpospores.

CALOSIPHONIA Crouan

Thallus cylindrical or flattened, richly laterally branched, gelatinous; of a segmented central axis which becomes corticated by rhizoidal branches, and eventually obscured; lateral ramuli forming a cortical layer, the outer cells approximated to form an epidermal layer; sporangia unknown; carpogonia scattered, small, in the inner cortex.

Calosiphonia verticillifera (J. Agardh) Setchell

(Plants 2.5 to 3.0 dm. tall, rosy red in color, pyramidal in shape; blades solitary or few together arising from a discoid (?) base, the principal axis more or less distinct, dividing into the primary branches, which in turn are pinnately branched from the margin, or toward the ultimate segments polystichously divided, the ultimate branches fusiform; branches developed from an apical cell from which is produced a monosiphonous axis with whorls of 4-branched ramelli, the ultimate segments of which approximate to simulate a bounding cortical layer; plants apparently diœcious; antheridia formed all over the blade, the male plants paler than the female; female plants with rather small cystocarps 35 to 45μ in diameter.)

Calosiphonia verticillifera (J. Agardh) Setchell, Collins and Hervey (1917).

Florida and Bermuda.

Originally secured at Dry Tortugas, probably by Mrs. G. A. Hall.

SQUAMARIACEÆ

Thallus foliaceous, crustaceous or partially free, with marginal growth, undivided or variously lobed, attached to the substratum by rhizoids from the lower side of the thallus; structurally filamentous, a basal layer of horizontal filaments supporting a layer of ascending to erect filaments; tetraspores cruciate or paired, scattered over the thallus surface or assembled into depressed nemathecia; antheridia in tufts, distributed over the thallus surface or in depressed nemathecia; carpogenic branches and auxiliary cells mostly collected together, the carpogenic branches mostly 4-celled, often rudimentary, inserted laterally on the erect filaments, as are the auxiliary cells; the fertilized carpogonium giving rise to oöblastema filaments which fuse with one or more auxiliary cells, which then form small gonimoblasts, several usually in near proximity.

1. Tetraspores external to the vegetative frond .... Peyssonnelia
1. Tetraspores immersed in the vegetative frond .... Hildenbrandtia

HILDENBRANDTIA Nardo

Thallus an expanded flat crust, with the under side closely adherent to the substratum; firm, the small cells regularly arranged in vertical rows; the old and young spores and sporangia assembled together in immersed lysigenous conceptacles, with an apical pore, which are scattered through the upper part of the crust.

Hildenbrandtia prototypus Nardo

(Plate 37, fig. 10)

Plant crustaceous, purple-red, forming small blotches or broad membranes, closely adherent to rocks, tetrasporangia oblong, generally cruciate, sometimes obliquely divided.

Hildenbrandtia prototypus Nardo, Børgesen (Oct. 1917); probably *H. rosea* Kuetzing, Farlow (1881).

New England; Virgin Islands; newly reported for Florida.

On rocks by the wharf at the sallyport, Fort Jefferson, Garden Key, Dry Tortugas.

PEYSSONNELIA Decaisne

Thallus flat-foliaceous, at first spreading crustaceous, later in some attached only at local spots on the under side of the thallus, generally spreading by unilateral marginal growth in one-sided overlapping lobes; structurally showing a basal layer with radially extended cell rows, which bear rhizoids downward and closely placed vertical rows of cells upward; gelatine firm; frequently the thallus, especially the lower part, calcified; sporangia cruciate in more or less generally distributed nemathecia; carpogenic branches with auxiliary cells and antheridia in separate nemathecia.

The Dry Tortugas material of this genus has been only partly studied, and it is recognized that there are other species present than the two here listed.

1. Hypothallium with cells in fan-like groups .... P. Dubyi (203)
1. Hypothallium with cells in simple dichotomous rows .... P. rubra (203)

Of uncertain position .... P. atropurpurea (202)

Peyssonnelia atropurpurea Crouan

(Frond coppery, membranous, orbicular-expanded, the lobes slightly sinuate, generally not superposed, the lower surface closely tomentose, adherent, the margin narrowly naked.)

Peyssonnelia atropurpurea Crouan, Farlow (1876).

Florida; the record very doubtful.

Peyssonnelia Dubyi Crouan

(Plant forming rounded crusts 2 to 4 cm. in diameter and 80 to 200μ thick, closely adherent to the substratum, the cells of the lower decumbent layer in dichotomous filaments forming small flabellate groups and from these filaments arise the ascending rows of short cells; fertile sori scattered over the upper surface of the plant; tetraspores ellipsoid, pedicellate, cruciate, shorter than the associated paraphyses.)

Peyssonnelia Dubyi Crouan by Weber van Bosse, Børgesen (Oct. 1916).

Virgin Islands; newly reported for Florida.

Frequent about Dry Tortugas in rather shallow water; Garden and Loggerhead Keys and Bird Key Reef.

Peyssonnelia rubra (Greville) J. Agardh

(Plant forming a more or less completely adherent sub-orbicular or imbricate lobed crust, lobes 12 to 14 mm. in diameter, the lower layer of cells forming simply dichotomous filaments extending from the center of the frond to the margin, bearing abundant rhizoids and the ascending filaments of cells which form the upper part of the thallus.)

Peyssonnelia rubra (Greville) J. Agardh by Weber van Bosse, Børgesen (Oct. 1916); *P. rubra* (Greville) J. Agardh, Howe (1918).

Bermuda; Bahamas; newly reported for Florida.

Frequent about Dry Tortugas as dredged from water of quite moderate depth; Loggerhead Key, 7.3 to 14.6 meters, and Southwest Channel and beyond, 14.6 to 32.9 meters.

CORALLINACEÆ

Plant of varied form, crustaceous, to erect and freely branched, in which case continuous or segmented and terete or flattened; structure filamentous, the filaments closely laterally united and the thallus usually strongly calcified; tetrasporangia in sori embedded within the thallus, or sometimes in groups in definite conceptacles; usually zonate, sometimes only once divided; antheridia in conceptacles opening by a pore; carpogonia and auxiliary cells usually in groups in conceptacles, usually borne together on erect filaments arising from the base of the conceptacle; gonimoblasts numerous, arising from the margin of a large cell formed after fertilization by the fusion of the auxiliary cells; carpospores cut off in acropetal succession.

1. Thallus of segmented branches 2
1. Thallus crustaceous, or if branched not segmented 4

2. Branching pinnate .... Corallina (205)
2. Branching dichotomous 3

3. Conceptacles lateral, sessile on the segments .... Amphiroa (204)
3. Conceptacles terminal, the segment swollen .... Jania (205)

4. Thallus very thin, much swollen over the conceptacles .... Melobesia (210)
4. Thallus of several cell layers in vegetative parts 5

5. Tetraspores in conceptacles with many pores .... Lithothamnium (209)
5. Tetraspores in conceptacles with single pores 6

6. Hypothallus of a single cell layer .... Dermatolithon (206)
6. Hypothallus of more than one cell layer 7

7. Tetraspores throughout the conceptacle .... Goniolithon (207)
7. Tetraspores marginal, the central area of the conceptacle occupied by paraphyses .... Lithophyllum (208)

AMPHIROA Lamouroux

Thallus generally erect from a small basal (fragile, calcareous) disk, more or less richly laterally or di- to trichotomously divided; apical growth periodically interrupted, the branches thoroughly calcified, showing a medulla of longitudinally elongate filaments and a cortex of outwardly curved filaments of short cells, jointed by uncalcified ecorticate constricted nodes; conceptacles at the surface of the branches, sunken or somewhat projecting, scattered tetrasporangia zonate.

1. Branches generally in part flattened, frequently 3 to 5 at a node . . . . A. Tribulus
1. Branches cylindrical, rarely more than 2 at a node 2

2. Branches 0.15 to 0.60 mm. in diameter, nodes at the dichotomies . . . . A. fragilissima
2. Branches 0.45 to 1.40 mm. in diameter, nodes mostly above the dichotomies . . . . A. rigida antillana

Amphiroa fragilissima (Linnæus) Lamouroux

(Plate 29, fig. 11; plate 36, fig. 6)

(Plant pulvinate-cæspitose, 2 to 4 cm. high, the branches slender, sub-regularly dichotomous, 150 to 600μ in diameter, the segments 8 to 10 or occasionally 12 times as long as broad, prominently swollen at the ends, always jointed at the forkings and occasionally elsewhere; medulla of cells 55 to 90μ long, cortex of cells 15 to 30μ long, conceptacles few to several to a segment, swollen; tetrasporangia 50μ long by 25μ broad.)

Amphiroa fragilissima (Linnæus) Lamouroux, Børgesen (Oct. 1917); *A. fragilissima* Lamouroux, Howe (1918); *A. fragilissima* (Linnæus) Lamouroux, Howe (1920); *A. fragilissima* (Linnæus) Lamouroux, Hoyt (1920).

North Carolina to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common in very quiet water about Dry Tortugas; Loggerhead Key, White Shoal at 4.6 to 7.6 meters, and abundant in the moat, Fort Jefferson, Garden Key.

Amphiroa rigida Lamouroux, var. antillana Børgesen

(Plate 29, fig. 1)

(Plant to 6 cm. high, fragile, fairly regularly dichotomous, the branches somewhat attenuate toward the apices, 0.45 to 1.50 mm. in diameter below, about half as thick toward the apices, nodes above the often broadly obtuse dichotomies, the segments sometimes slightly swollen at their ends, 6 to 8 times as long as broad, or shorter below.)

Amphiroa rigida Lamouroux var. *antillana* Børgesen (Oct. 1917); *Amphiroa rigida* Lamouroux var. *antillana* Børgesen, Howe (1920).

Florida: Bahamas to the Virgin Islands.

Commonly dredged about Dry Tortugas, though in small quantity; principally on Loggerhead Key Shoal in 1.5 to 9.3 meters, and Bird Key Shoal and reef in 4.6 to 7.6 meters.

Amphiroa Tribulus (Ellis and Solander) Lamouroux

(Plate 29, figs. 7, 9; plate 36, fig. 1)

(Plant tufted, 2 to 6.5 cm. high, calcified, jointed at the forkings, cylindrical to flattened, with a suggestion of a midrib and with a smooth to verrucose surface and edges.)

Amphiroa Tribulus (Ellis and Solander) Lamouroux, Howe (1920).

Bahamas through the West Indies to the Virgin Islands; newly reported for Florida.

Occasional in the sublittoral and commonly dredged in water of moderate depth about Dry Tortugas; Bird Key Reef, and Loggerhead Key and White Shoals, to 18.3, mostly less than 12.8 meters.

CORALLINA (Tournefort) Lamouroux

Thallus generally erect from a small basal disk, cylindrical or flattened, somewhat dichotomously or laterally, more frequently pinnately, branched; apical growth of the axis proceeding with interruptions, the axis strongly calcified and segmented by uncalcified zones; conceptacles sunken, occupying swollen lateral branchlets.

Corallina cubensis (Montagne) Kuetzing, emend. Børgesen

(Plate 29, fig. 12)

(Plant tufted, 1 to 2 cm. tall, the filaments slender, densely crowded, the main axes irregularly branched; bearing at the upper end of the segments opposite usually pinnate slender branchlets that may be simple or 1 (to 2) times forked; adventitious branchlets also present; axis of cells to 180μ in diameter and 600μ long, the branchlets of cells to 100μ thick below, tapering toward the apex; tetrasporic conceptacles urn-shaped, about 450μ long and 250μ broad, the linear tetraspores about 70 $\times$ 180μ.)

Corallina cubensis (Montagne) Kuetzing, Børgesen (Oct. 1917); *C. cul ensis* (Montagne) Kuetzing, Howe (1920).

Florida; Bahamas to the Virgin Islands.

Frequent about Dry Tortugas; shallow water to 5.5 meters about Loggerhead Key, on *Digenea*, *Galaxaura*, etc.; to 3.1 to 3.7 meters on Long Key; to 18.3 meters on Loggerhead Key Shoal and in Southwest Channel.

Corallina granifera Ellis and Solander

(Frond sub-flaccid, filiform-capillary, above 2- to 3-pinnate, pinnules simple to dichotomously branched, the segments cuneate to sub-clavate, or if unbranched sub-cylindrical, 3 to 4 times longer than broad; conceptacles apical, somewhat urn-shaped, or 2 to 4 slender horned; densely cæspitose, 2 to 4 cm. tall or somewhat taller, red to purple or whitish.)

Reported from Florida as forma *minor* Collins: (seldom over 1 cm. high, usually considerably less; very slender; otherwise like the type).

Corallina granifera Ellis and Solander, forma *minor* Collins; Collins, Holden and Setchell, *Phycotheca Boreali-Americana No. 1450.*

As this species is not otherwise known from America it seems to the writer somewhat dangerous to associate with it the very dwarf material here considered.

JANIA Lamouroux

Thallus generally erect from a small basal disk, cylindrical, dichotomously branched, apical growth of the axis proceeding with interruptions, the axis strongly calcified and segmented by uncalcified zones; conceptacles sunken in swollen terminal segments of the main axes, which often continue growth by branches from the fertile segments.

1. Plant minute, about 3 mm. in diameter .... J. pumila (206)
1. Plant larger 2

2. Branches fastigiate, the angles narrow .... J. rubens (206)
2. Branches spreading, wide-angled 3

3. Segments generally over 100μ in diameter .... J. adhærens (205)
3. Segments generally less than 100μ in diameter .... J. capillacea (206)

Jania adhærens Lamouroux

Plant erect, capillary, 1 to 3.5 cm. high, branching wide-angled (generally 45 to 60° or more), diameter of the branches 100 to 200μ (Miami specimens 110 to 185μ), the segments

2 to 5 times as long as broad (275 to 475μ in Miami specimens), the branch apices conical, acute.

Jania adhærens Lamouroux, Børgesen (Oct. 1917); *J. adhærens* Lamouroux, Howe (1920).

Bahamas and the Virgin Islands; apparently newly reported from Florida (Miami, Brooks).

Jania capillacea Harvey

(Plate 29, figs. 2, 10)

(Plant erect, capillary, 4 to 8 mm. tall, the branches 50 to 100μ (to ? 200μ) in diameter, the segments 4 to 10 times as long as broad, branching regularly dichotomous, the conceptacles found as flattened swellings at or near the ends of the ultimate branches, opening by a distinct apical pore, frequently bearing 2 horn-like projections.)

Jania capillacea Harvey (1853); *J. capillacea* Harvey, Farlow (1876); *J. capillacea* Harvey, Børgesen (Oct. 1917); *Jania capillacea* Harvey, Howe (1920); *Corallina capillacea* (Harvey) Hoyt (1920).

North Carolina to Florida and the Bahamas to the Virgin Islands.

Common at Dry Tortugas upon other larger algæ, not usually in pure growths; Garden Key, Loggerhead Key and Bird Key Reef; dredged to 9.2 to 14.6 meters in Southwest Channel.

Jania pumila Lamouroux

(Plate 29, fig. 8)

(Plant small, whitish, to 2.5 mm. (? cm. De Toni) tall, fragile, branching 2 to 3 times dichotomously, the branches rigid and slender, patent, tangled; branches with 5 to 7 segments which are sub-claviform, 3 to 4 times as long as broad.)

Jania pumila Lamouroux, Børgesen (Oct. 1917); *Corallina pumila* (Lamouroux) Kuetzing, Howe (1918).

Bermuda; Virgin Islands; newly reported for Florida.

Dredged at Dry Tortugas off the southern end of Loggerhead Key in considerable quantity upon *Neurocarpus Justii*.

Jania rubens (Linnæus) Lamouroux

(Plate 29, figs. 3, 6)

(Plant small, densely cæspitose, the angles of dichotomy acute and the branches somewhat curved, segments sub-cuneate at the branchings, otherwise cylindrical, 100 to 160μ in diameter, about 4 to 6 times as long as broad, the branches tapering or acute at the apices; conceptacles borne at the upper forkings, urn-shaped, often with horn-like projections.)

Corallina rubens Linnæus, Howe (1918); *Jania rubens* (Linnæus) Lamouroux, Howe (1920).

Florida; Bermuda; and Bahamas through the West Indies.

Frequent about Dry Tortugas on various algæ; Garden, Long, and Loggerhead Keys, shallow water to 6.2 meters, often growing intimately associated with a small sponge.

DERMATOLITHON Foslie

Thallus forming a small flattened disk, attached by its lower surface to the substratum, calcified; of 2 strata, the lower as a thin hypothallus of a single layer of elongated cells, the upper of several layers of more cubical cells; tetraspores borne in conceptacles somewhat immersed in locally thickened portions, each opening by a single pore, sporangia occupying the sides of the conceptacle, the center occupied by paraphyses; cystocarps in partly immersed conceptacles, the carpospores accompanied by paraphyses.

Dermatolithon pustulatum (Lamouroux) Foslie

(Frond adherent below, thick, flat to convex-pulvinate, sub-orbicular, the disks imbricate to confluent; cystocarpic conceptacles conspicuous, scattered over the frond; color reddish to white, 2 to 10 mm. across, of 1 to few layers, the mamillæform conceptacles 300 to 500μ in diameter.)

Melobesia pustulata Lamouroux, Farlow (1876, 1881); *Lithophyllum pustulatum* (Lamouroux) Foslie, Howe (1920); *Dermatolithon pustulatum* (Lamouroux) Foslie, Hoyt (1920).

New England to Florida; Bahamas.

GONIOLITHON Foslie

Thallus crustaceous, expanded, calcified, adnate to the substratum, of hypothallium and perithallium, the hypothallium of several layers of cells, the perithallium of many layers; tetrasporangia in jug-shaped conceptacles with a prolonged apex, each at maturity with a single pore.

1. Thallus wholly crustaceous...2
1. Thallus at least in part fruticulose..4

2. Thallus somewhat loosely attached, margins free, conceptacles 0.6 to 1.2 mm. in diameter, ostioles rostrate...G. solubile (208)
2. Thallus closely adherent...3

3. Thallus smooth, conceptacles 0.2 to 0.4 mm. in diameter..........................G. accretum (207)
3. Thallus becoming rough, conceptacles 0.3 to 0.4 mm. in diameter..................G. Boergesenii (207)

4. Plant small, branches less than 5 mm. high, basal crust persistent..................G. decutescens (208)
4. Plant large, becoming free and to 1 dm. in diameter..............................G. strictum (208)

Goniolithon accretum Foslie and Howe

(Plate 37, fig. 9)

(Plant pale rosy, drying grayish pink or yellowish, forming rounded crusts of indefinite extent, firmly adherent, 80 to 350μ thick, or by superposition to 1.3 mm. thick; cells of the hypothallus sub-rectangular in vertical section, 14 to 27μ by 8 to 14μ (also reported as smaller); of the perithallus sub-quadrate or rounded, 4 to 9μ broad, or vertically elongated to 10μ; heterocysts 20 to 25μ long, conceptacles about 300 to 400μ in diameter.)

Lithophyllum accretum (Foslie and Howe) Lemoine by Lemoine, Børgesen (Oct. 1917); *Goniolithon accretum* Foslie and Howe, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

At Dry Tortugas collected on the south end of the inner side of Bird Key Reef.

Goniolithon Bœrgesenii Foslie

(Plate 37, figs. 4, 5)

(Plant crustaceous, firmly adherent, smooth or becoming verrucose or mammillate, the surface minutely and irregularly tessellated; hypothallus of a single layer of cells about 20 to 25μ by 8μ, perithallus of irregular cells not in well-defined rows; 7 to 18μ by 8 to 12μ, but also reaching 20 to 25μ by 18 to 20μ; conceptacles 300 to 400μ in diameter.)

Porolithon Bœrgesenii (Foslie) Lemoine by Lemoine, Børgesen (Oct. 1917); *Goniolithon Bœrgesenii* Foslie, Howe (1920).

Florida; Bahamas and the Virgin Islands.

Frequent about Dry Tortugas on old corals and shells, especially Garden Key and Bush Key and Bird Key Reef.

Goniolithon decutescens (Heydrich) Foslie

(Plate 36, fig. 3)

(Plant small, encrusting, the crust bearing erect simple or somewhat branched terete conical projections 1 to 4 mm. long, which sometimes became anastomosed; in section showing rows of cells 12 to 20μ in length and 7 to 10μ and even 15 to 17μ wide.)

Lithophyllum strictum (Foslie) Lemoine variety *nana* Foslie and Howe by Lemoine, Børgesen (Oct. 1917); *Goniolithon decutescens* (Heydrich) Foslie, Howe (1918–1920).

Florida; Bermuda; Bahamas to the Virgin Islands.

Frequent about Dry Tortugas on old corals in shallow water; Garden and Bush Keys, and Bird Key Reef.

Goniolithon mamillare (Harvey) Foslie

Lemoine reports this from Florida on the basis of material sent to Bornet, probably the variety *occidentalis Foslie.* The thallus is reported as of cells somewhat irregular in size and arrangement, and the conceptacles as reaching a diameter of 1.4 mm.

Porolithon mamillare (Harvey) Lemoine, var. *occidentalis* Foslie by Lemoine, Børgesen (Oct. 1917).

Goniolithon solubile Foslie and Howe

(Plate 37, fig. 8)

(Plant forming crusts on rocks, margin lobed, surface smooth; in section showing a hypothallus of rectangular cells 15 to 35μ (to 55μ) long by 7 to 12μ broad; perithallus of rows of cells 7 to 11μ (to 25μ) in height and 5 to 12μ broad; tetrasporangiate conceptacles 0.3 to 1.0 mm. in diameter, cystocarpic conceptacles 0.5 to 1.2 mm., antheridial conceptacles about 0.3 mm.; tetrasporangia 90 to 160μ long by 40 to 60μ in diameter.)

Lithophyllum (?) *propinquum* (Foslie) Lemoine by Lemoine, Børgesen (Oct. 1917); *Goniolithon solubile* Foslie and Howe, Howe (1920).

Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

Common about Dry Tortugas, especially Loggerhead, Garden and Bush Keys and Bird Key Reef, on old corals and on large dead shells.

Goniolithon strictum Foslie

(Plate 36, fig. 5)

(Plant fruticulose, to about 1 dm. in diameter, the primary crust probably disappearing, the plant commonly becoming free; branches erect or irregular and cervicorn, 1 to 2 mm. in diameter, or flattened and expanded to 3 to 5 mm.; in section showing cells 16 to 33μ by 12 to 13μ, or reported in longitudinal section to even 25 to 55μ by 15 to 25μ.)

Lithophyllum strictum (Foslie) Lemoine by Lemoine, Børgesen (Oct. 1917); *Goniolithon strictum* Foslie, Howe (1920).

Florida; Bahamas through the West Indies to the Virgin Islands.

Frequently secured in shallow water at Dry Tortugas, especially rather common on the flats inside of Bush Key and Bird Key Reef.

LITHOPHYLLUM Philippi

Thallus calcified, more or less encrusting, the lower surface in part attached to the substratum, the margin free or loosely attached; structurally composed of two strata, the cells in the lower (hypothallium) large, radiating toward the periphery, those in the upper (perithallium) smaller; tetrasporangia in hemispherical conical conceptacles, which may at first be emergent but later become depressed, discharging by a single central pore; cystocarpic conceptacles bearing carpospores accompanied by short paraphyses.

Lithophyllum intermedium Foslie

Lemoine in Børgesen (Oct. 1917) reports this from Florida on the basis of material sent to Bornet. It is to be distinguished from the succeeding form by the size of the crowded conceptacles (150 to 300μ) and the perithallus of several cell layers.

Lithophyllum prototypum Foslie

(Plate 37, fig. 6)

(Plant crustaceous, thin, showing concentric lines near the lobed margin; at first rounded, later adjacent plants unite to form extensive crusts, which are at first closely adherent, later more free, with secondary layers forming upon the older ones so as to show small laminæ over the surface; tetrasporangial conceptacles little elevated, 350 to 600μ in diameter, the sporangia 60 to 80μ by 35 to 50μ, cystocarpic conceptacles 450 to 550μ, antheridial conceptacles probably 120 to 220μ; structurally showing for each lamina 2 rows of cells, the hypothallic 25 to 35μ in length, occasionally to 40μ, rarely 65 to 85μ in the lower layers and 7 to 20μ above and the perithallic layer 3 to 5μ in height, both series with cells 10 to 15μ broad.)

Lithophyllum prototypum Foslie by Lemoine, Børgesen (Oct. 1917); *L. prototypum* Foslie, Howe (1920).

Florida; Bermuda; Bahamas to the Virgin Islands.

Obtained on a shell, Garden Key, Dry Tortugas.

LITHOTHAMNIUM Philippi

Thallus calcified, more or less incrusting, the lower surface attached to the substratum, sometimes bearing from the upper side wart-like or branched projections; structurally of two strata, the cells more or less regularly arranged; tetrasporangia in superficial or somewhat sunken conceptacles, with each sporangium opening to the exterior by a separate pore, spores zonate; cystocarps and antheridia in similar conceptacles each with a single pore; diœcious.

1. Plant fruticose 2
1. Plant crustaceous .... L. syntrophicum (210)

2. Habit of broad, somewhat appressed lobes .... L. mesomorphum ornatum (210)
2. Habit of more or less terete branches 3

3. Forming large, dense attached masses in shallow water .... L. incertum (209)
3. Forming little clusters, usually free in deep water .... L. occidentale (210)

Lithothamnium incertum Foslie

(Plate 36, fig. 7)

(Plant 2.5 to 5.0 cm. tall and in masses 7 to 15 cm. broad, crustaceous below and closely adherent, above developing erect closely ramified and abundantly anastomosing cylindrical or flattened branchlets 1 to 2 mm. in diameter or somewhat larger; conceptacles appearing externally near the ends of the branches, crowded, about 0.25 to 0.41 mm. in diameter.)

Lithothamnium incertum Foslie, Howe (1918).

Bermuda; probably newly reported for Florida.

Rare at Dry Tortugas, but the writer secured one very good piece some inches in diameter from Bird Key Reef, in shallow water, and dredged a small fragment at perhaps 18.3 meters in Southwest Channel.

Lithothamnium mesomorphum Foslie var. ornatum M. A. Howe

Plant forming somewhat fragile, more or less appressed, broadly rounded and undulate lobes, free except at the basal attachment, smooth above; (much more delicate than in the type, only 150 to 200μ thick, proliferations smaller; medullary cells 11 to 20μ by 7 to 11μ, those near the lower surface often very narrow, 15 to 25μ by 3 to 6μ, with large intercellular spaces; perithallic cells—toward the upper surface—mostly rounded or sub-quadrate-oblong in vertical section, 4 to 9μ in diameter).

Lithothamnion mesomorphum Foslie var. *ornatum* Howe, Lemoine in Børgesen (1917); *L. mesomorphum* Foslie var. *ornatum* Howe (1920).

Bermuda; Bahamas and Virgin Islands; apparently newly reported for Florida.

At Dry Tortugas dredged off Loggerhead Key and in Southwest Channel at from 12 to 32 meters.

Lithothamnium occidentale Foslie

(Plate 37, fig. 11)

(Plant small, to about 2 cm. in diameter, constituted of ramified and often anastomosing branchlets, which are often inflated and hollow at the tips, structurally showing filaments of cells rather separated from each other, 10 to 20μ (to 32μ) in length and 6 to 10μ in diameter; tetraspores to 75 by 180μ.)

Lithothamnium occidentale Foslie by Lemoine, Børgesen (Oct. 1917).

Virgin Islands; newly reported for Florida.

Infrequent at Dry Tortugas, principally secured in decidedly deep dredgings, as at 14.6, 32.9 and 55.0 meters in and beyond Southwest Channel.

Lithothamnium syntrophicum Foslie

(Plate 37, fig. 7)

(Plant crustaceous, to 2.5 cm. or more in diameter and 0.2 to 0.7 mm. thick, the surface somewhat roughened; structurally showing cells in vertical rows without definite horizontal stratification; tetrasporangial conceptacles 0.10 to 0.12 mm. in diameter, discharging through numerous ostioles.)

Lithothamnium syntrophicum Foslie, Howe (1918).

Bermuda; perhaps newly reported for Florida.

Scarce about Dry Tortugas, but dredged at 14.6 and 36.6 meters in and beyond Southwest Channel.

MELOBESIA Lamouroux

Thallus flat, crustaceous, completely adherent, calcified; of one or a few layers of cells, not showing a differentiated hypothallium; conceptacles as local thickenings of the thallus, the covering layer of the conceptacle calcified, the cavity of the sporogenous conceptacle schizogenous in nature, opening above by a central pore.

Melobesia farinosa Lamouroux

(Plant forming small generally circular disks; structurally 1 cell thick in sterile plants but 3 cells thick in fruiting portions, showing radiating rows of cells and frequently colorless somewhat elongated heterocyst cells; cell size varying, especially with the substratum, being especially large on *Zostera* (Virgin Islands), 7 to 30μ long, the heterocysts 22 to 40μ; in fertile parts more than one cell thick; sporangial and cystocarpic conceptacles 140 to 250μ in diameter, antheridial ones 60 to 80μ; tetrasporangia 40 to 90μ by 20 to 50μ.)

Melobesia farinosa Lamouroux and var. *Solmsiana* (Falkenberg) Lemoine by Lemoine, Børgesen (Oct. 1917); *M. farinosa* Lamouroux, Howe (1918); *Fosliella farinosa* (Lamouroux) Howe (1920).

Var. solmsiana (Falkenberg) Lemoine

(Plant of filaments occasionally united or frequently laterally distinct, not forming a regular disk, the heterocysts generally rounded.)

Massachusetts to Florida; Bermuda; Bahamas through the West Indies to the Virgin Islands.

The species common about Dry Tortugas on *Valonia* and other algæ and especially on *Thalassia;* Long and Loggerhead Keys, fertile; the variety not uncommon with the species at Dry Tortugas; on *Valonia* in moat, Fort Jefferson, Garden Key.

Melobesia Lejolisii Rosanoff

Howe (1920), in accrediting this species to Florida and the Bahamas, distinguishes it from *M. farinosa* as having no heterocysts and being constantly found on Thalassia, while the foregoing species with heterocysts is limited in habitat to other algæ. But the completeness of the segregation respecting Florida material is not quite clear to the present writer.

Fosliella Lejolisii (Rosanoff) Howe (1920).

(ADDENDUM TO INTRODUCTION)

It appears that a formal list of American marine algæ containing a few Florida species appeared even earlier than the first issues of Harvey's *Nereis Boreali-Americana.* In a privately printed pamphlet John Hooper (*Introduction to Algology, with a Catalogue of American Algæ, or Seaweeds, According to the latest Classification of Prof. Harvey:* Published by John Hooper, October 1, 1850, Brooklyn, 34 pp.) lists a number of forms, of which he could place many only to genus. Of those which he ventured to assign to definite species 8 were Chlorophyceæ, 10 were Phæophyceæ, and 21 were Rhodophyceæ. As quite a few of his records are decidedly questionable and his citations imperfect it seems best to omit detailed reference to his list.

(ADDENDUM TO DASYCLADACEÆ)

CHALMASIA Solms

Disk terminal, the rays united solely by the incrustation, corona inferior wanting, aplanospores free, with thick calcified membrane.

Chalmasia antillana Solms

(Disk funnel-shaped, 6 mm. diameter, rays 25 to 32; aplanospores globular; hair scars 2 to 3.)

Chalmasia antillana Solms, Collins (1909).

Known from one dredged collection off the Florida coast.

(ADDENDUM TO RHODOMELACEÆ)

Chondria polyrhiza Collins and Hervey

(Frond slender, main axis seldom reaching 0.5 mm. in diameter, with more or less numerous alternate patent flexuose branches to 2 to 3 orders, the last somewhat contracted at the base, the apices tapering, apical pits absent.)

Bermuda (Collins and Hervey 1917).

Dry Tortugas, occasional on *Thalassia,* more erect and regularly branched above than in the original specimens, but with the rhizoidal tufts below and generally agreeing fairly well with the original description.

MURRAYELLA Schmitz

This genus differs from *Lophocladia* and *Brongniartella* in the position of the tetraspores, which are in whorls of 4 in the stichidia, and from the latter genus in the number of pericentral cells (4).

Murrayella periclados (C. Agardh) Schmitz

Florida, Bermuda to northern South America (Howe 1920).

This list includes 460 algæ as representing the Florida flora, of which 60 are varieties and forms represented by the typical species also.

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INDEX

Plate 1

Figs. 1. *Dermocarpa solitaria*, two individuals. × 1200.
2. *Glœocapsa fuscolutea*, three families. × 500.
3. *Chroococcus membraninus*, three families. × 500.
4. *Chroococcus turgidus*, three families. × 500.
5. *Merismopedium convolutum*, portion of colony. × 1060.
6. *Xenococcus Schousbœi*, portion of colony. × 1200.
7. *Gomphosphæria aponina*, three colonies. × 750.
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10. *Hyella cæspitosa*, filaments from decalcified shell. × 500.
11. *Spirulina rosea*, filament. × 500.
12. *Spirulina subsalsa oceanica*, filament. × 1060.
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17. *Hydrocoleum lyngbyaceum*, filaments. × 500; in sheath, × 105.
18. *Symploca profunda*, filaments. × 330, 500.
19. *Lyngbya majuscula*, filament. × 500.
20. *Lyngbya confervoides*, filament. × 500.
21. *Polythrix corymbosa*, branching sheaths from tuft. × 18.
22. *Lyngbya rosea*, filaments. × 200.
23. *Nodularia fusca*, filaments. × 530.
24. *Spirulina subtilissima*, filaments. × 1060.

(For *Polythrix* see also plate 2. Fig. 21 from material collected by M. A. Howe.)

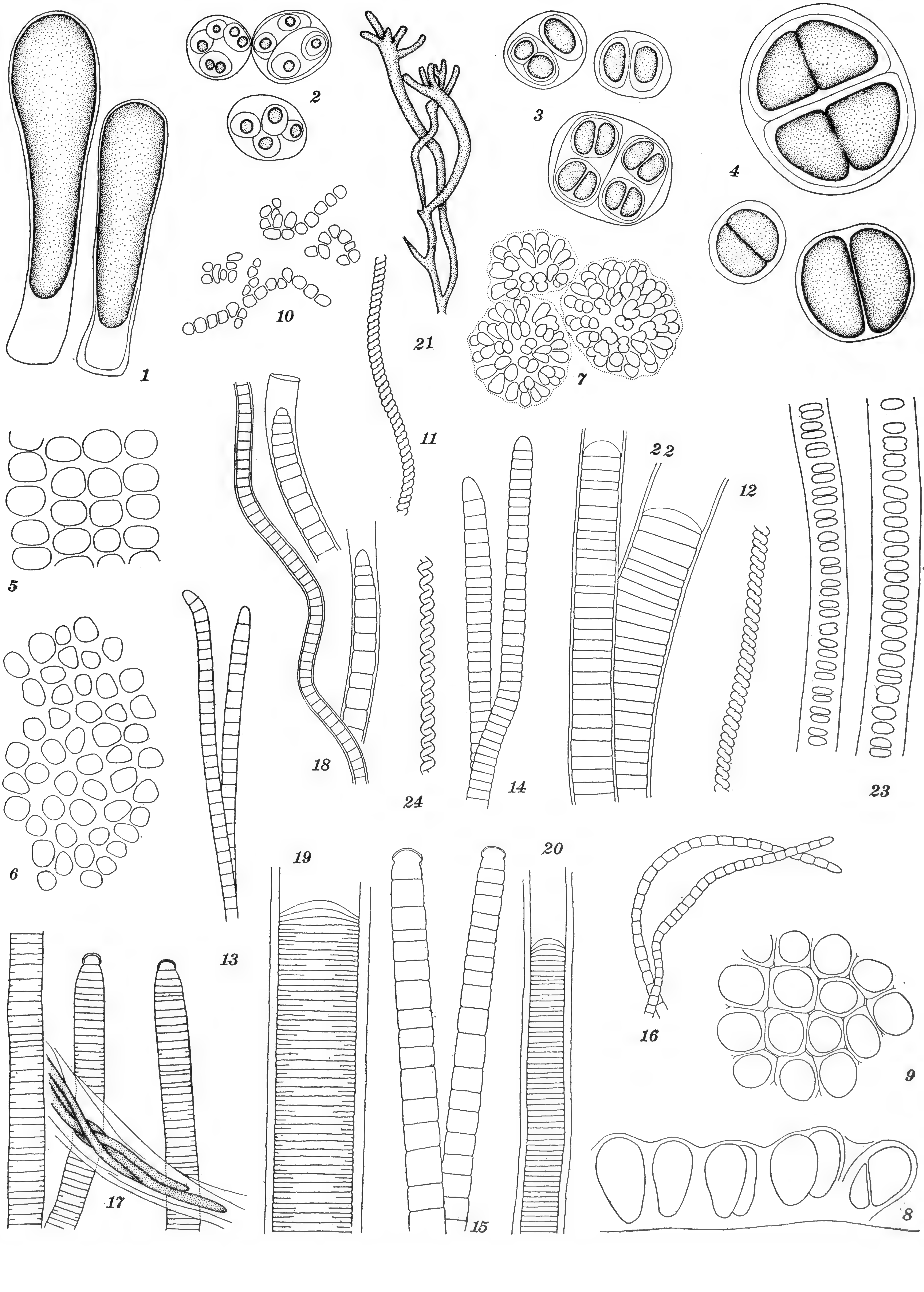
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PLATE 2

FIGS. 1. *Scytonema ocellatum,* filaments showing branching, heterocyst and apex. × 500, 1060.
2. *Mastigocoleus testarum,* filaments showing branching and heterocysts. × 500.
3. *Hormothamnion enteromorphoides,* filaments showing heterocysts and apex. × 500.
4. *Polythrix corymbosa,* filaments showing basal and intercalary heterocysts. × 500.
5. *Rivularia nitida,* filaments showing basal heterocysts. × 500.
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9. *Rivularia polyotis,* filaments showing heterocysts. × 500.
10. *Calothrix crustacea,* filaments showing basal and intercalary heterocysts and apex. × 330, 1060.
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12. *Calothrix rosea,* filaments showing heterocysts and apices. × 500.
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14. *Dichothrix olivacea,* filaments showing basal and intercalary heterocysts and branching. × 500.
15. *Dichothrix fucicola,* filaments showing heterocysts and branching. × 500.

(For *Polythrix* see also plate 1. Figs. 4 and 9 from material collected by M. A. Howe.)

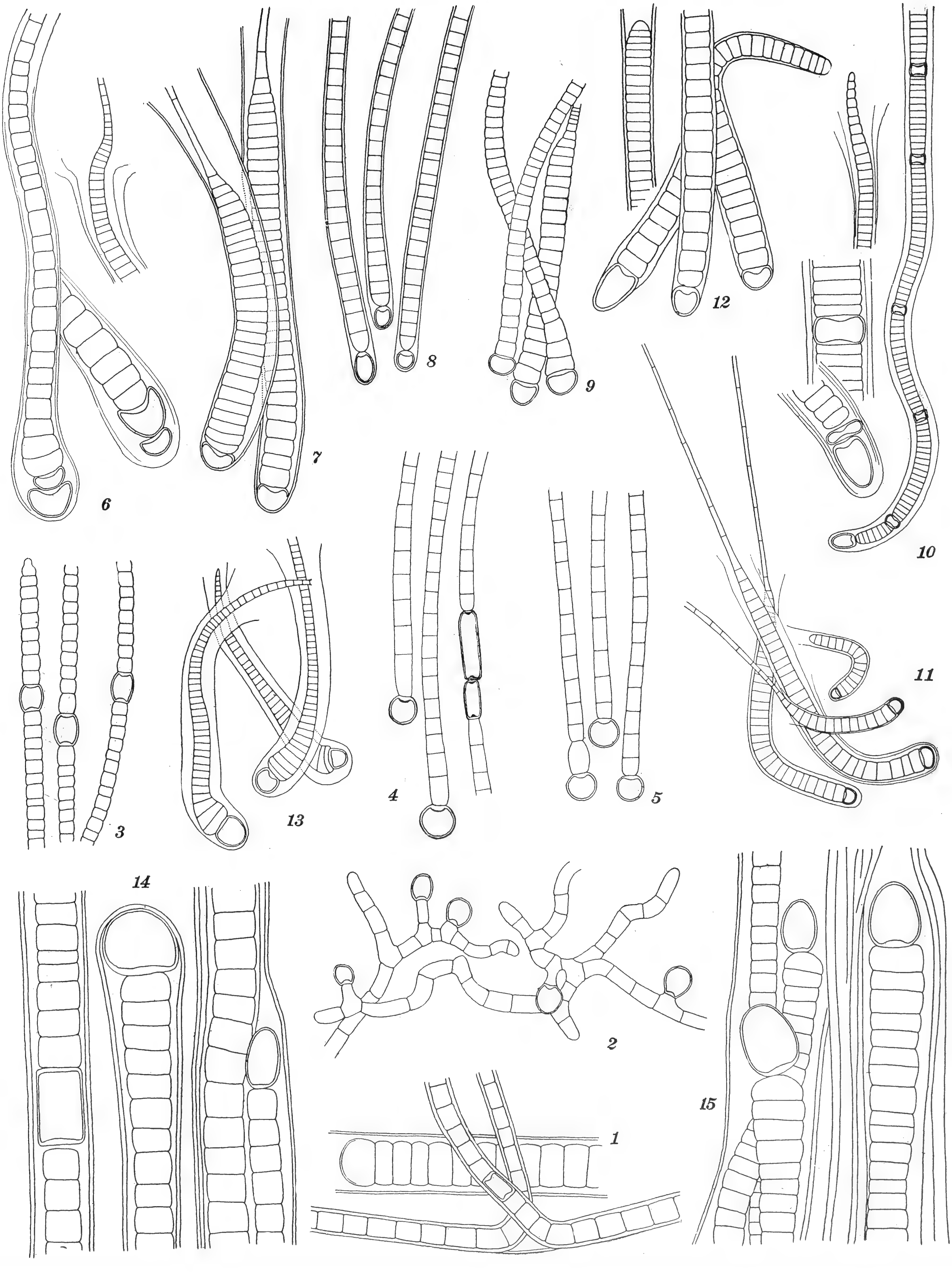
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PLATE 3

FIGS. 1. *Enteromorpha plumosa*, tip of branch and older portion. × 152.
2, 3. *Ulva profunda*, habit of marginal portion of young blades. × 0.6.
4 to 6. *Phæophila floridearum*, filaments with hairs (and spores?). × 265
7. *Rhizoclonium Hookeri*, filaments showing branches. × 56.
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16. *Ulva profunda*, section of thallus. × 200.
17. *Ulva profunda*, surface of thallus. × 200.
18. *Enteromorpha plumosa*, surface of thallus. × 200.
19. *Enteromorpha? prolifera*, surface of thallus. × 200.
20. *Ulva Lactuca* var. *rigida*, surface of thallus. × 300.
21. *Ulva Lactuca rigida*, section of thallus. × 300.

(Additional figures of *Enteromorpha* appear on plate 7; of *Ulva* on plate 7; of *Rhizoclonium* on plate 4; of *Sporochnus* on plate 14; of *Stilophora?* on plates 14, 19; of *Struvea* on plate 6.)

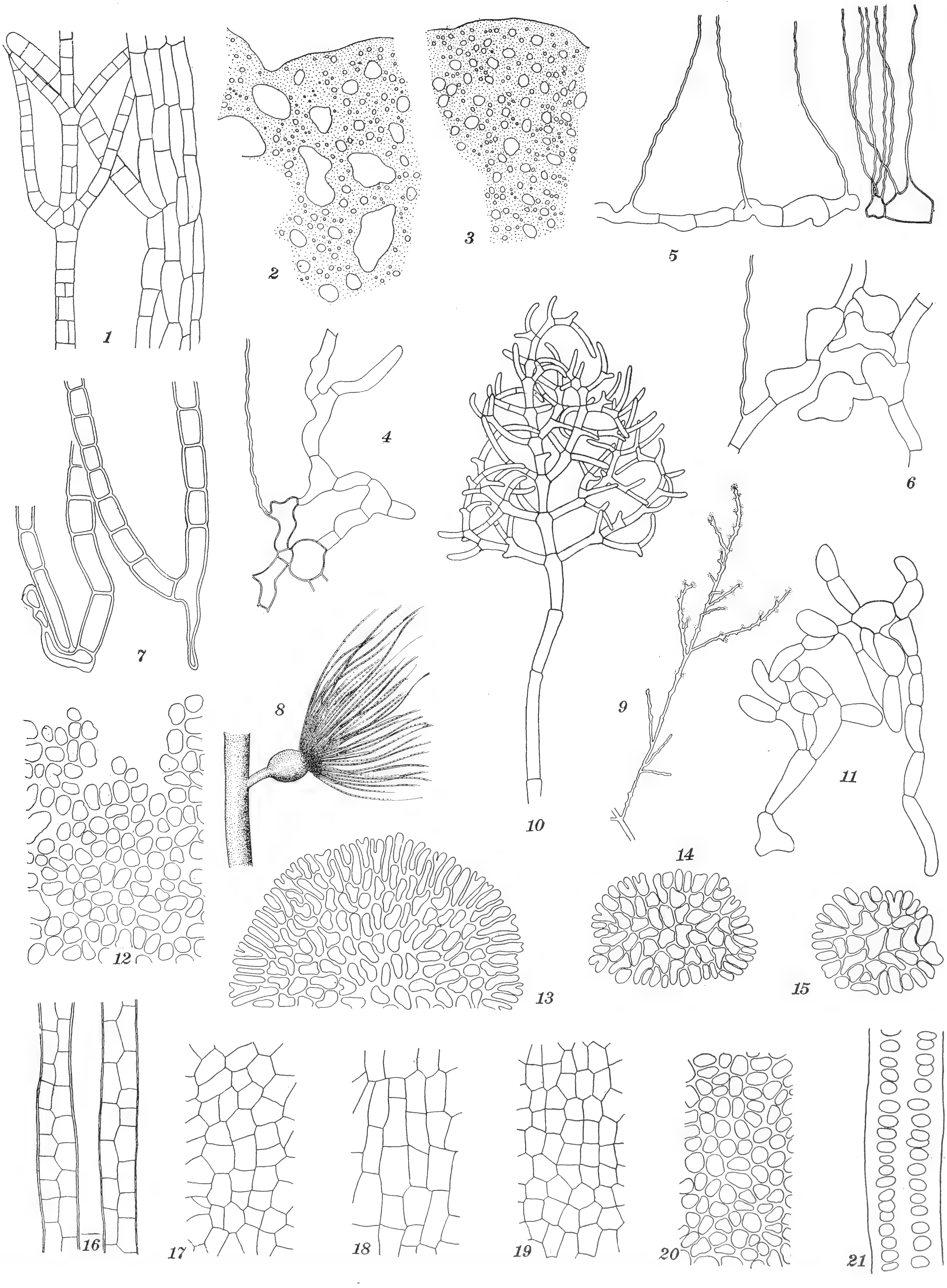
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Plate 4

Figs. 1. *Cladophora gracilis*, tip of branch. × 20.
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3. *Petrosiphon adhærens*, section through thin part of thallus, showing rhizoidal parts.
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15. *Cladophoropsis macromeres*, tip of filament. × 3.3.
16. *Cladophoropsis macromeres*, lower portion of axis. × 3.3.
17. *Petrosiphon adhærens*, portion of margin of thallus. × 33.
18. *Rhizoclonium Hookeri*, portions of filaments. × 32.

(For other figures of *Petrosiphon* see plate 11.)

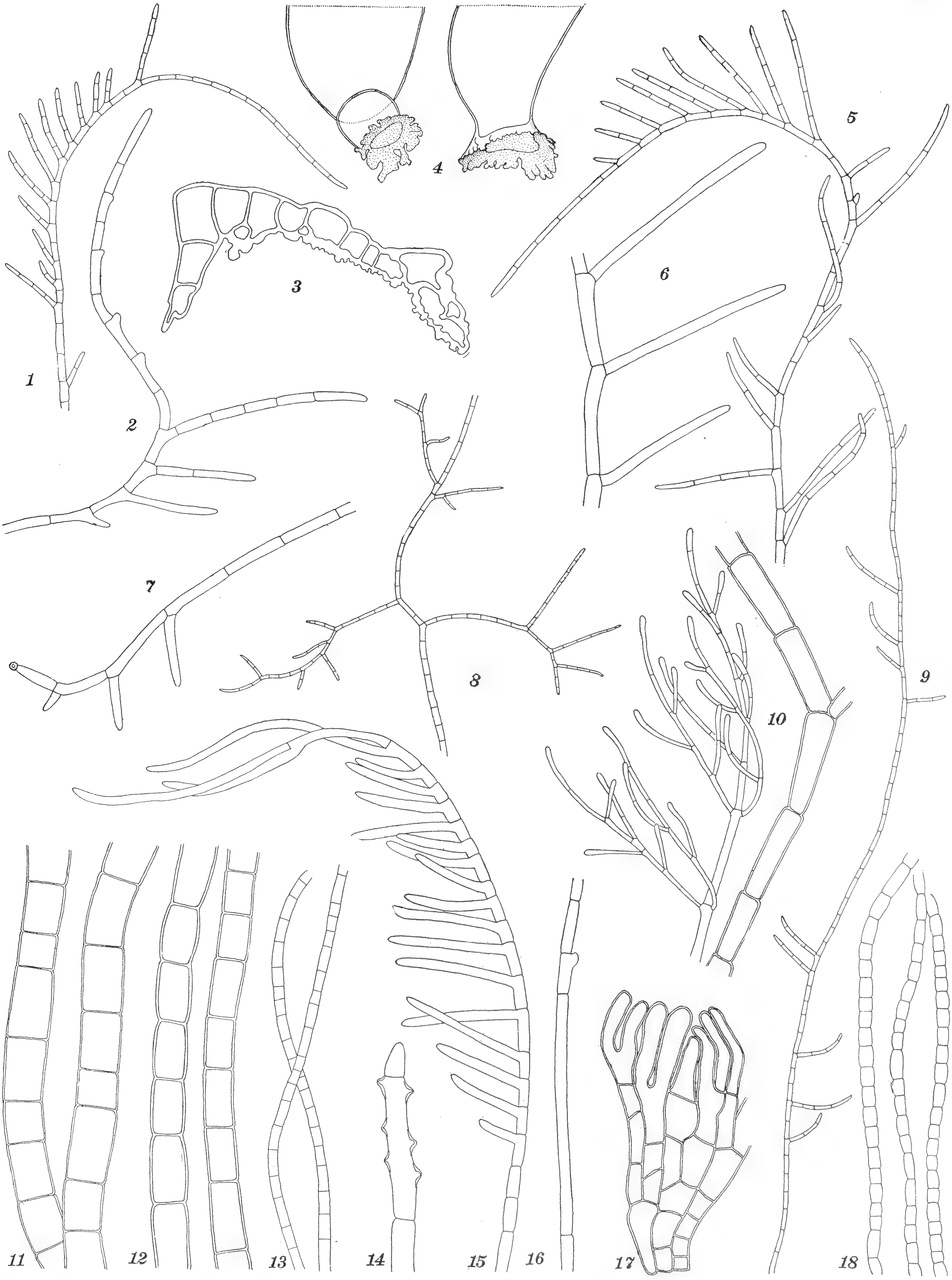
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Plate 5

Figs. 1, 2. *Batophora Œrstedi*, lateral branches with sporangia. × 23.
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11. *Acetabulum crenulatum*, habit. × 1.3.
12. *Anadyomene stellata*, habit. × 1.3.
13. *Cymopolia barbata*, filaments from terminal tufts. × 32.
14. *Neomeris annulata*, habit of plants on coral fragment. × 1.
15. *Batophora Œrstedi*, habit of vegetative and fruiting plants. × 1.
16. *Batophora Œrstedi*, lateral vegetative branch. × 23.
17, 18. *Acetabulum pusillum*, habit. × 13.
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20, 21. *Acetabulum pusillum*, ray segments, vegetative and with spores. × 56.
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25. *Dictyosphæria favulosa*, contact between cells showing hapteræ. × 56.
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(For other figures of *Dictyosphæria* see plate 11; for others of *Anadyomene* see plate 6; for others of *Cymopolia* see plate 10.)

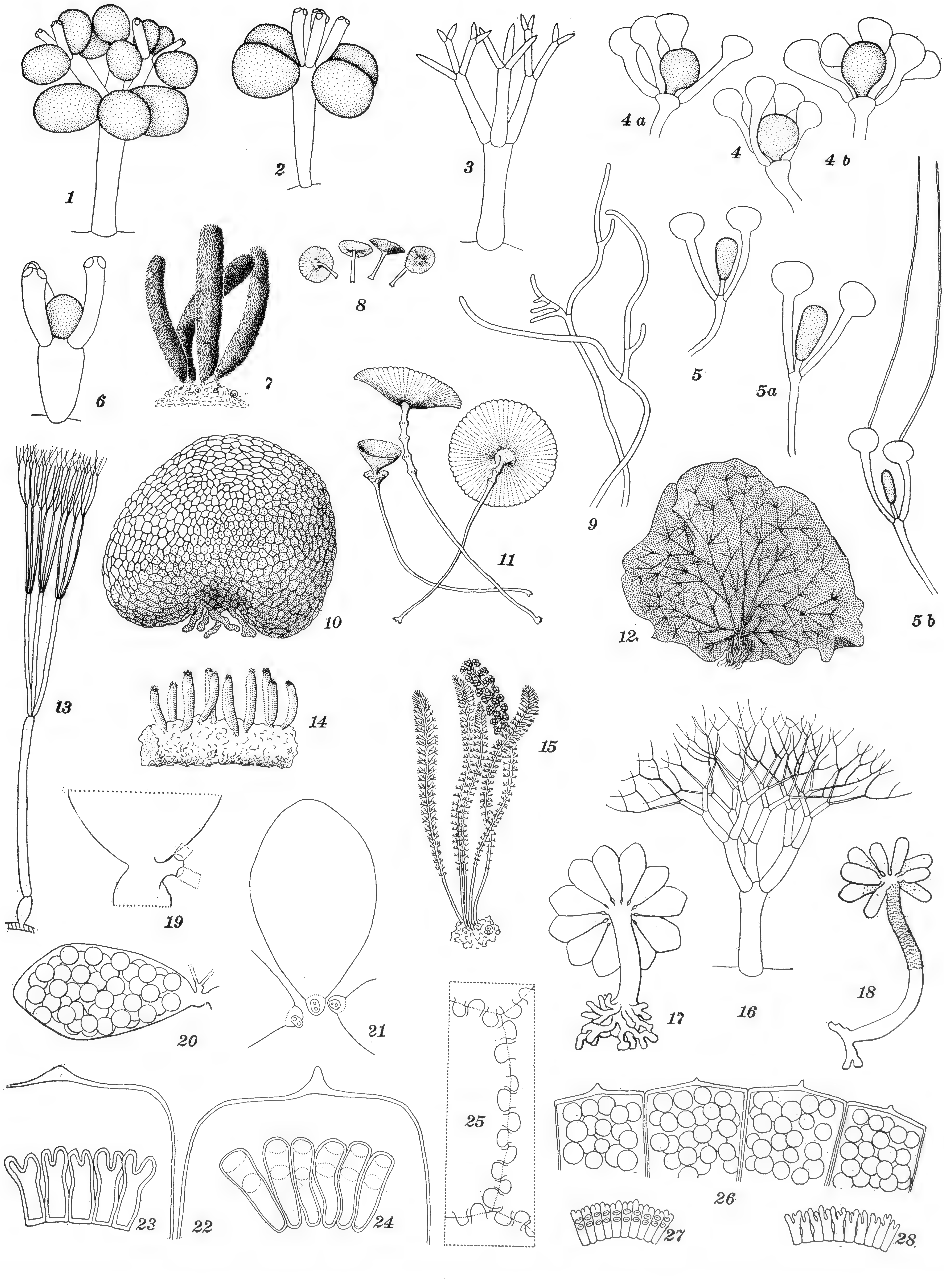
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Plate 6

Figs. 1. *Microdictyon Bœrgesenii,* portion of net. × 32.
2. *Caulerpa paspaloides,* habit. × 1.
3. *Anadyomene stellata,* portion of small plant showing base to margin. × 32.
4. *Ernodesmis verticillata,* portion of branch system. × 2.
5. *Siphonocladus rigidus,* portions of filaments. × 3.3.
6, 7. *Struvea elegans,* blade and stalk of young plant, and portion of somewhat older specimen. × 5.
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9. *Codium Pilgeri,* peripheral utricles. × 40.
10. *Codium isthmocladum,* peripheral utricle with sporangia. × 40.
11, 12. *Codium intertextum,* peripheral utricles. × 40.
13. *Codium intertextum cribrosum,* peripheral utricles, × 40, and areolation from tip, × 500.
14. *Codium decorticatum,* peripheral utricles, one with sporangium. × 40.
15. *Codium isthmocladum,* peripheral utricles. × 40.
16. *Codium tomentosum,* peripheral utricles. × 40.

(For additional figures of *Caulerpa* see plates 12, 13; for *Codium,* plate 7; for *Struvea,* plate 3.)

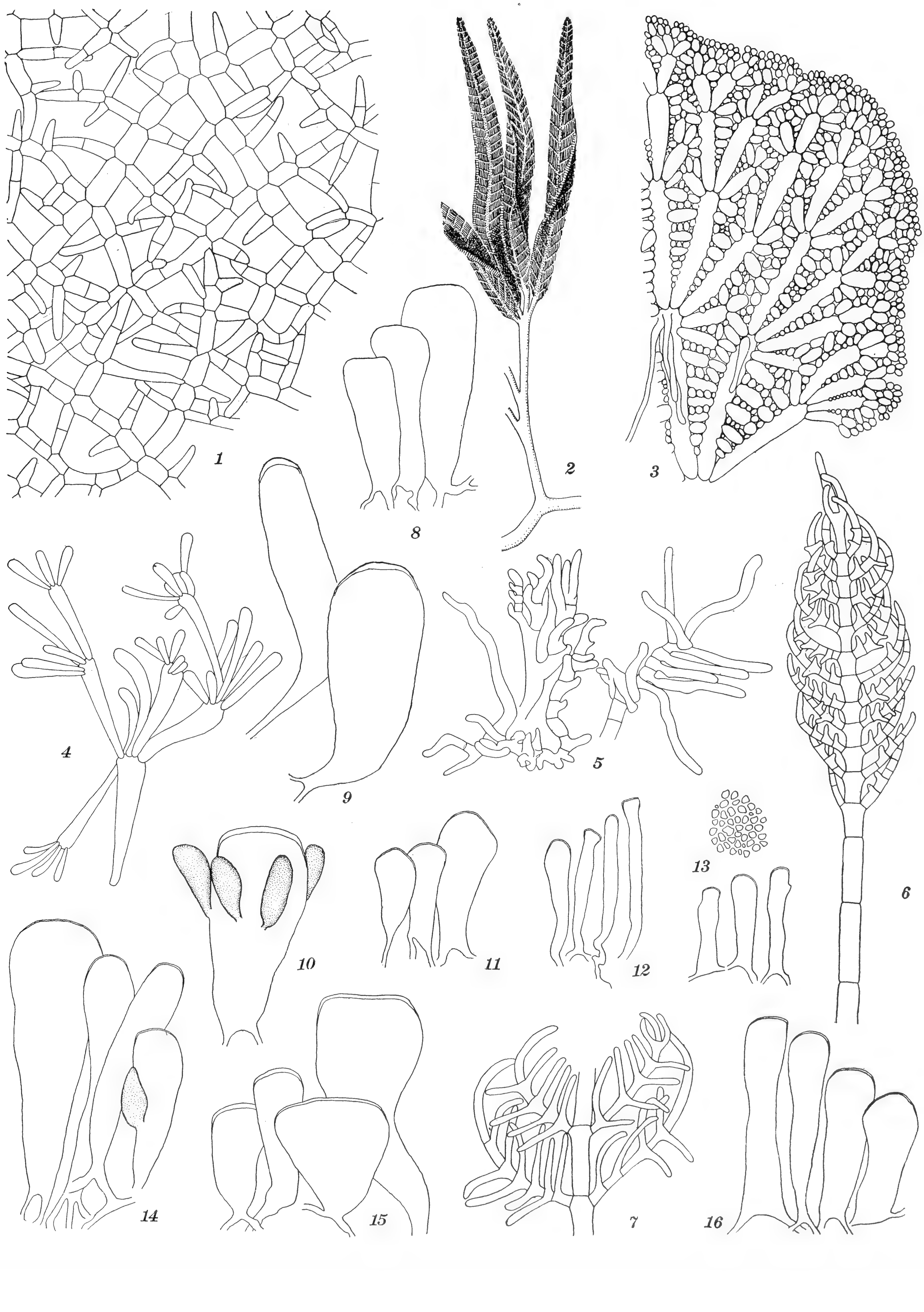
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PLATE 7

FIGS. 1. *Colpomenia sinuosa*, habit. $\times$ 1.3.
2. *Enteromorpha flexuosa*, habit. $\times$ 1.3.
3. *Codium Pilgeri*, habit. $\times$ 0.6.
4. *Codium tomentosum*, habit. $\times$ 0.6.
5. *Codium intertextum*, habit. $\times$ 0.6.
6. *Chamædoris Peniculum*, habit. $\times$ 0.6.
7. *Ulva Lactuca*, habit. $\times$ 1.
8. *Codium repens*, habit. $\times$ 0.6.
9. *Udotea Flabellum*, habit. $\times$ 0.6.
10. *Codium isthmocladum*, habit. $\times$ 0.6.

(For other figures of *Codium* see plate 6; for *Chamædoris* see plate 5; for *Udotea* see plates 8, 9; for *Ulva* see plate 3; for *Colpomenia* see plate 19.)

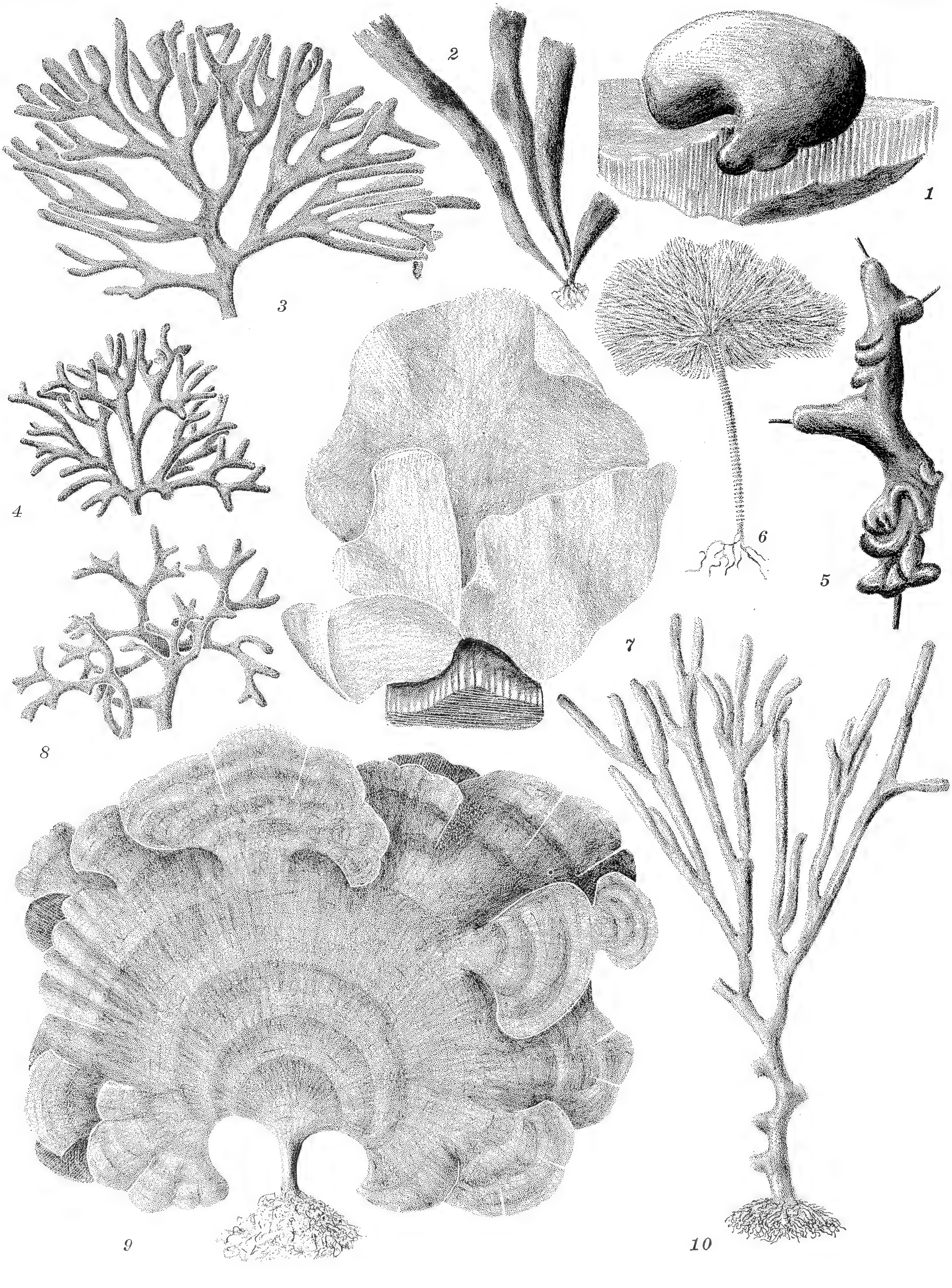
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PLATE 8

FIGS. 1. *Penicillus pyriformis*, habit. $\times$ 0.66.
2. *Penicillus capitatus*, habit. $\times$ 0.66.
3. *Penicillus Lamourouxii*, habit of small specimen. $\times$ 0.66.
4. *Penicillus dumetosus*, habit. $\times$ 0.66.
5. *Penicillus pyriformis explanatus*, habit. $\times$ 0.66.
6. *Rhipocephalus oblongus*, habit of small specimen. $\times$ 0.66
7. *Rhipocephalus Phœnix typicus*, habit. $\times$ 0.66.
8. *Rhipocephalus Phœnix brevifolius*, habit. $\times$ 0.66.
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10. *Avrainvillea nigricans*, habit. $\times$ 0.58.
11. *Avrainvillea levis*, habit. $\times$ 0.66.
12. *Cladocephalus luteofuscus*, habit. $\times$ 0.66.
13. *Udotea conglutinata*, habit. $\times$ 0.66.
14. *Udotea cyathiformis*, habit. $\times$ 0.66.
15. *Udotea spinulosa*, habit. $\times$ 1.0.
16. *Udotea sublittoralis*, habit. $\times$ 1.0.

(For other figures of *Udotea* see plates 7, 9, 11; for *Penicillus* see plate 9; for *Rhipocephalus* see plates 9, 11; for *Cladocephalus* see plate 9; for *Avrainvillea* see plates 9, 11. Fig. 10 from Key West material collected by Thaxter.)

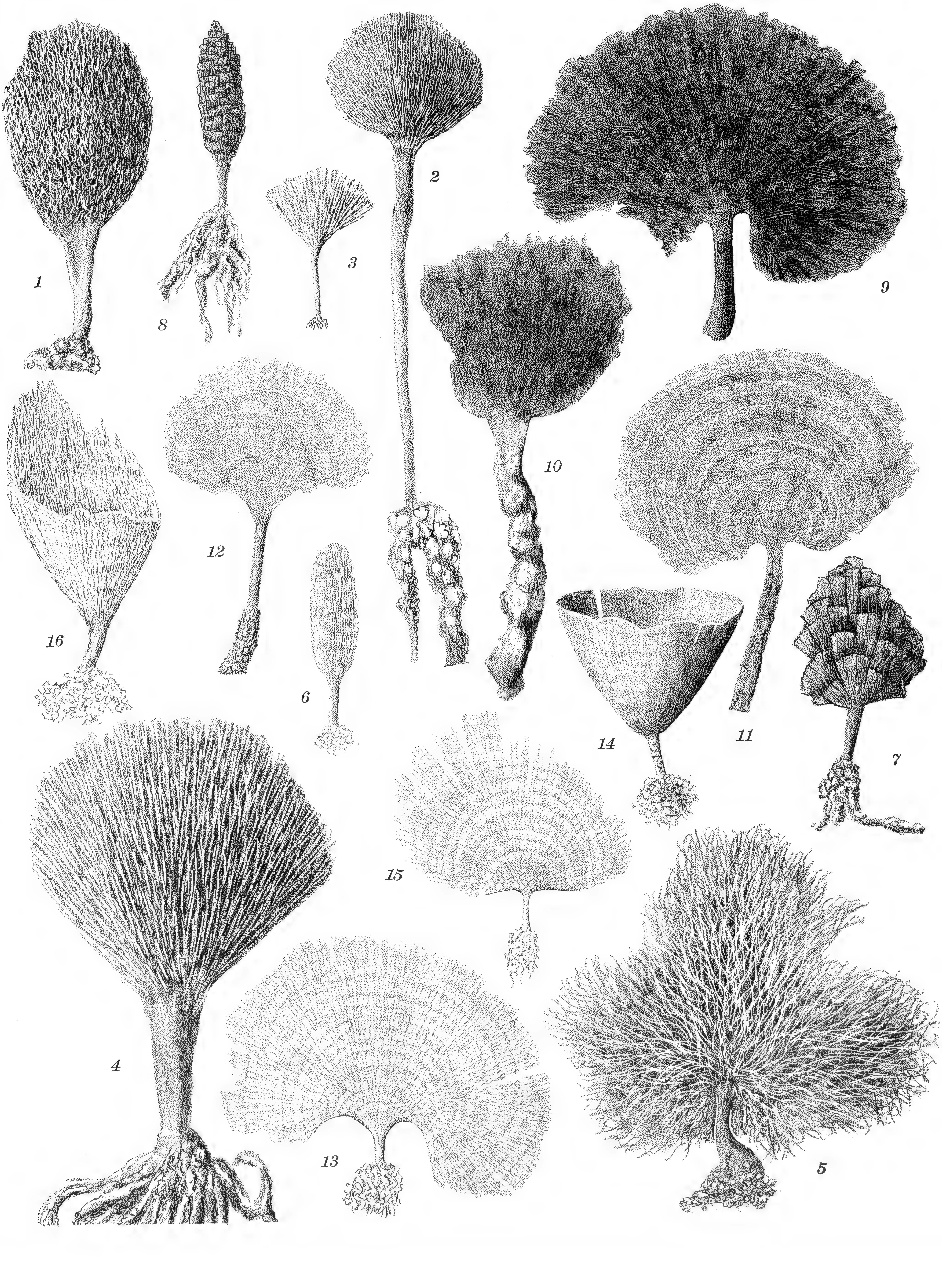
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Plate 9

Figs. 1. *Penicillus dumetosus*, tips of stipe cortex filament. × 102.
2. *Udotea Flabellum*, tips of stipe cortex filament. × 102.
3. *Penicillus Lamourouxii*, tips of stipe cortex filament. × 102.
4. *Penicillus capitatus*, tips of stipe cortex filament. × 102; 4a. × 500.
5. *Rhipocephalus oblongus*, tips of stipe cortex filament. × 102; 5a. × 500.
6. Udotea *Flabellum*, tips of stipe cortex filament, portion. × 500.
7. *Udotea cyathiformis*, tips of stipe cortex filament. × 102.
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10. *Penicillus pyriformis*, tips of stipe cortex filament. × 102.
11. *Udotea conglutinata*, tips of stipe cortex filament. × 105.
12, 13. *Cladocephalus luteofuscus*, tips of flabellum cortex filaments. × 105.
14. *Udotea spinulosa*, tips of stipe cortex filament. × 102.
15. *Udotea spinulosa*, portions of filaments from flabellum showing spines. × 102.
16. *Penicillus capitatus*, filaments from terminal tuft. × 6.6.
17. *Penicillus pyriformis*, filaments from terminal tuft. × 6.6.
18. *Penicillus dumetosus*, filaments from terminal tuft. × 6.6.
19. *Penicillus Lamourouxii*, filaments from terminal tuft. × 6.6.
20. *Rhipocephalus oblongus*, filaments from terminal tuft. × 6.6.
21. *Rhipocephalus Phœnix typicus*, portion of margin flabellum. × 22.
22. *Udotea conglutinata*, branching portion of filament from flabellum. × 102.
23. *Udotea cyathiformis*, branching portion of filament from flabellum. × 102.
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27 to 29. *Avrainvillea nigricans fulva*, portions of filaments from flabellum. × 56.
30. *Avrainvillea asarifolia*, portions of filaments from flabellum. × 56.

(For other figures of *Penicillus* see plate 8; for *Udotea* see plates 7, 8, 11; for *Cladocephalus* see plate 8; for *Rhipocephalus* see plates 8, 11; for *Avrainvillea* see plates 8, 11.)

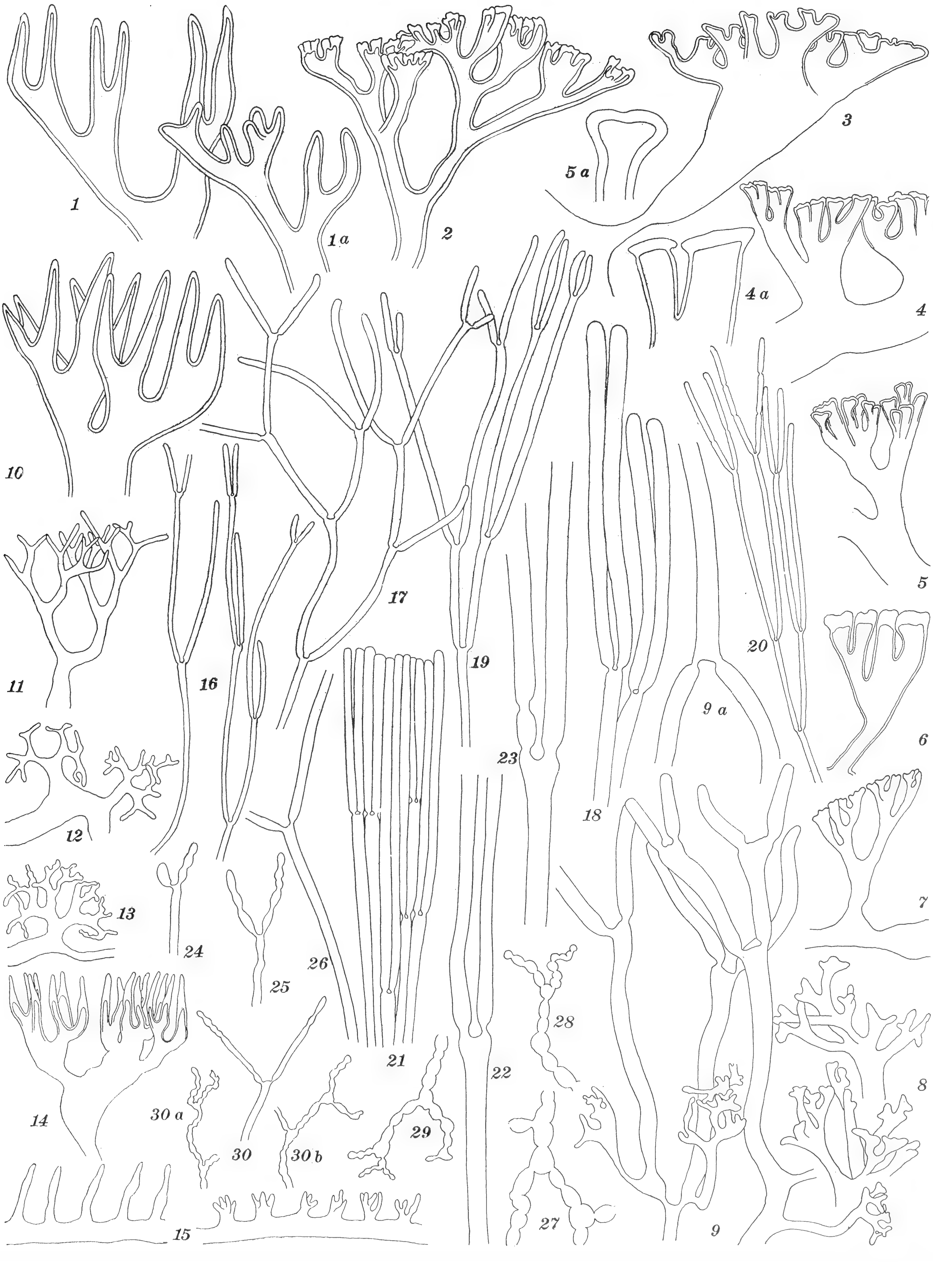
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PLATE 10

FIGS. 1. *Halimeda Monile robusta*, habit of plant. × 0.66.
2. *Halimeda Opuntia triloba*, branches from lower portion of plant. × 1.3.
3, 4. *Halimeda Opuntia minor*, portions of plants. × 1.3.
5. *Halimeda Opuntia typica*, portion of plant. × 0.66.
6, 7. *Halimeda Opuntia typica*, portions of plants. × 1.3.
8. *Halimeda Tuna typica*, portion of plant. × 0.66.
9. *Halimeda scabra*, portion of plant. × 0.66.
10. *Halimeda scabra*, portion of plant showing sporangia in position. × 0.66.
11. *Cymopolia barbata*, habit. × 0.66.
12. *Halimeda simulans*, portion of plant. × 0.66.
13. *Halimeda Tuna platydisca*, portion of plant. × 0.66.
14. *Halimeda tridens*, two groups of sporangia. × 20.
15. *Halimeda scabra*, two groups of sporangia. × 20.
16. *Halimeda tridens tripartita*, habit of portion of plant. × 0.66.
17. *Halimeda discoidea*, habit of plant. × 0.66.
18. *Halimeda scabra*, group of sporangia. × 20.
19. *Halimeda tridens typica*, habit of portion of plant. × 0.66.

(For other figures of *Cymopolia* see plate 5; for other figures of *Halimeda* see plate 11.)

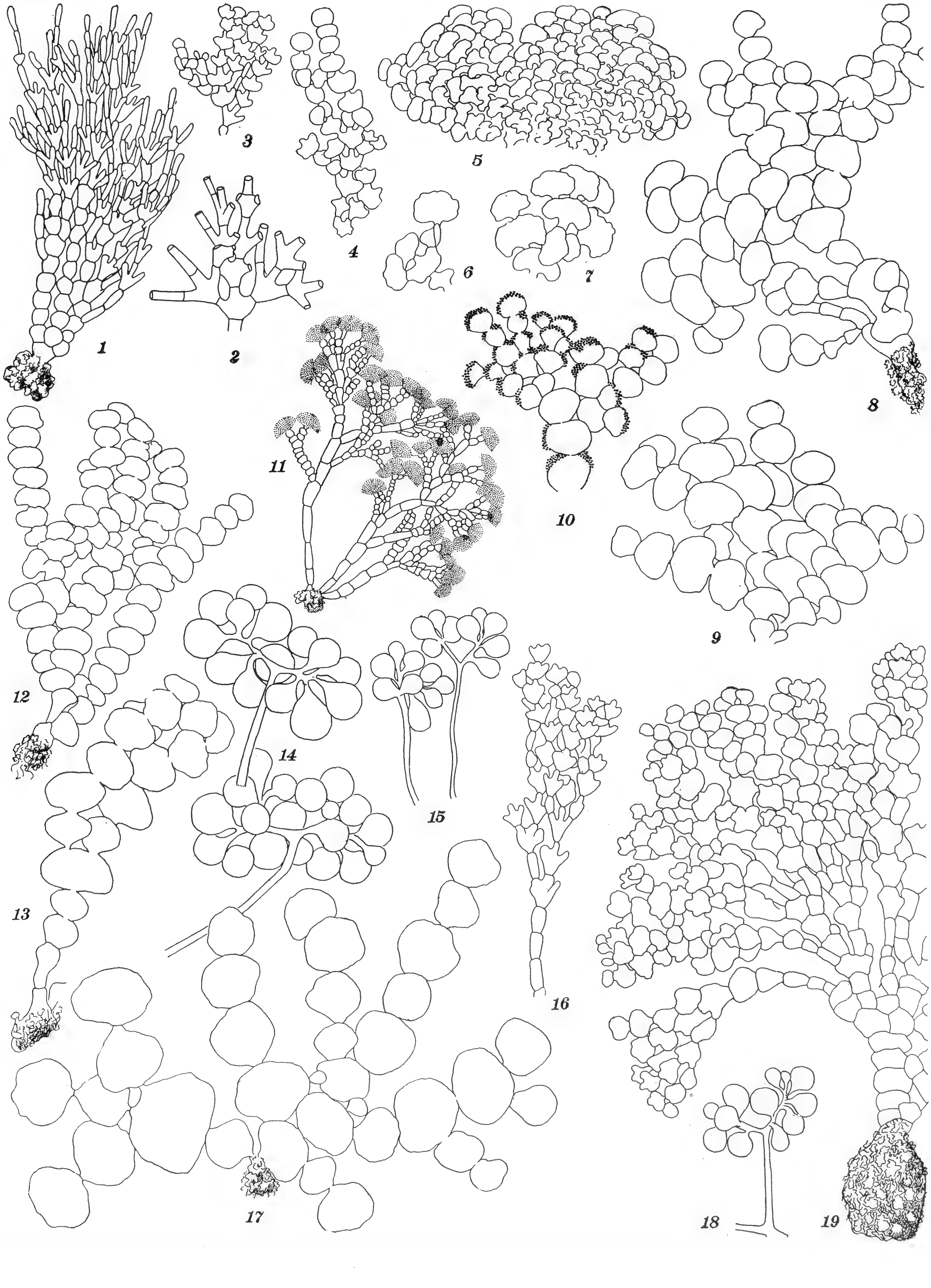
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PLATE 11

FIGS. 1, 2. *Derbesia fastigiata*, tips of filaments. × 102.
3. *Derbesia fastigiata*, lower portions of filaments. × 102.
4 to 7. *Udotea Wilsoni*, portions of filaments from flabellum. × 200.
8. *Avrainvillea nigricans*, portions of filaments from flabellum. × 56.
9. *Halimeda scabra*, peripheral utricles of segment, side view. × 200.
10. *Bryopsis pennata secunda*, branch with ramuli. × 6.6.
11. *Bryopsis pennata secunda*, branch with ramuli. × 1.3.
12. *Bryopsis pennata secunda*, attachment of ramuli to branch. × 105.
13. *Bryopsis pennata*, branch with ramuli. × 1.3.
14. *Bryopsis plumosa*, branch with ramuli. × 1.3.
15. *Dictyosphæria favulosa*, portion of surface showing internal formation of new utricles. × 16.
16. *Petrosiphon adhærens*, portion of margin of thallus. × 13.
17. *Halimeda Opuntia typica*, surface of segment showing shape of utricles. × 265.
18. *Halimeda simulans*, fused filaments from node. × 56.
19. *Halimeda simulans*, surface of segment showing shape of utricles. × 256.
20. *Halimeda tridens typica*, surface of segment showing shape of utricles. × 256.
21. *Halimeda Tuna typica*, surface of segment showing shape of utricles. × 256.
22. *Halimeda scabra*, surface of segment showing shape of utricles. × 256.
23. *Halimeda discoidea*, surface of segment showing shape of utricles. × 256.

(For other figures of *Udotea* see plates 7, 8; for others of *Avrainvillea* see plates 8, 9; for others of *Halimeda* see plate 10; for others of *Dictyosphæria* see plate 5; of *Petrosiphon* see plate 4.)

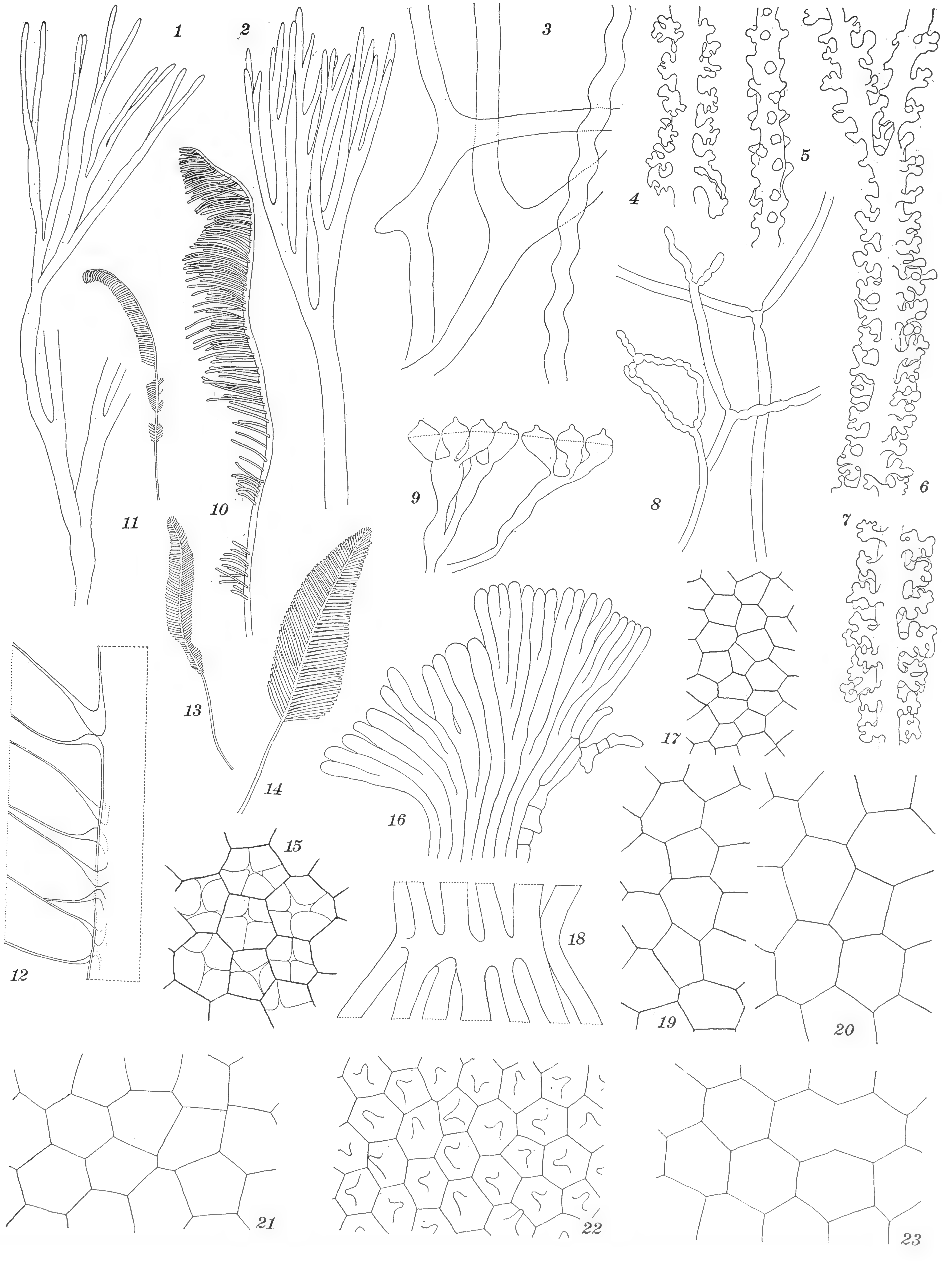
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Plate 12

Figs. 1. *Caulerpa Webbiana*, habit of portion of plant. × 1.
2. *Caulerpa sertularioides brevipes*, habit of foliar branch. × 1.
3. *Caulerpa racemosa macrophysa*, habit of branch. × 1.
4. *Caulerpa lanuginosa*, habit of rhizome and branch. × 1.
5. *Caulerpa racemosa occidentalis*, habit of branch, rhizome and rhizoids. × 1.
6. *Caulerpa racemosa uvifera*, habit of branch. × 1.
7. *Caulerpa verticillata*, portion of plant. × 1.3.
8. *Caulerpa racemosa clavifera*, habit of branch. × 1.3.
9. *Caulerpa peltata*, portion of plant. × 1.7.
10. *Caulerpa crassifolia typica*, habit of foliar branch. × 1.
11. *Caulerpa Ashmeadii*, habit of foliar branch. × 1.
12. *Caulerpa fastigiata*, habit of portion of plant. × 1.3.
13. *Caulerpa sertularioides forma*, habit of two foliar branches. × 1.
14. *Caulerpa racemosa microphysa*, habit of branch. × 1.
15. *Caulerpa prolifera*, habit of two foliar branches on rhizome segments. × 1.
16. *Caulerpa sertularioides longipes*, habit of foliar branch. × 1.
17. *Caulerpa sertularioides brevipes*, habit of foliar branch, small type. × 1.
18. *Caulerpa cupressoides flabellata*, habit of branch. × 1.
19. *Caulerpa cupressoides typica*, habit of branch. × 1.
20. *Caulerpa Vickersiæ luxurians*, habit of portion of plant. × 8.
21. *Caulerpa crassifolia mexicana*, habit of foliar branch. × 1.

(For other figures of *Caulerpa* see plates 6 and 13.)

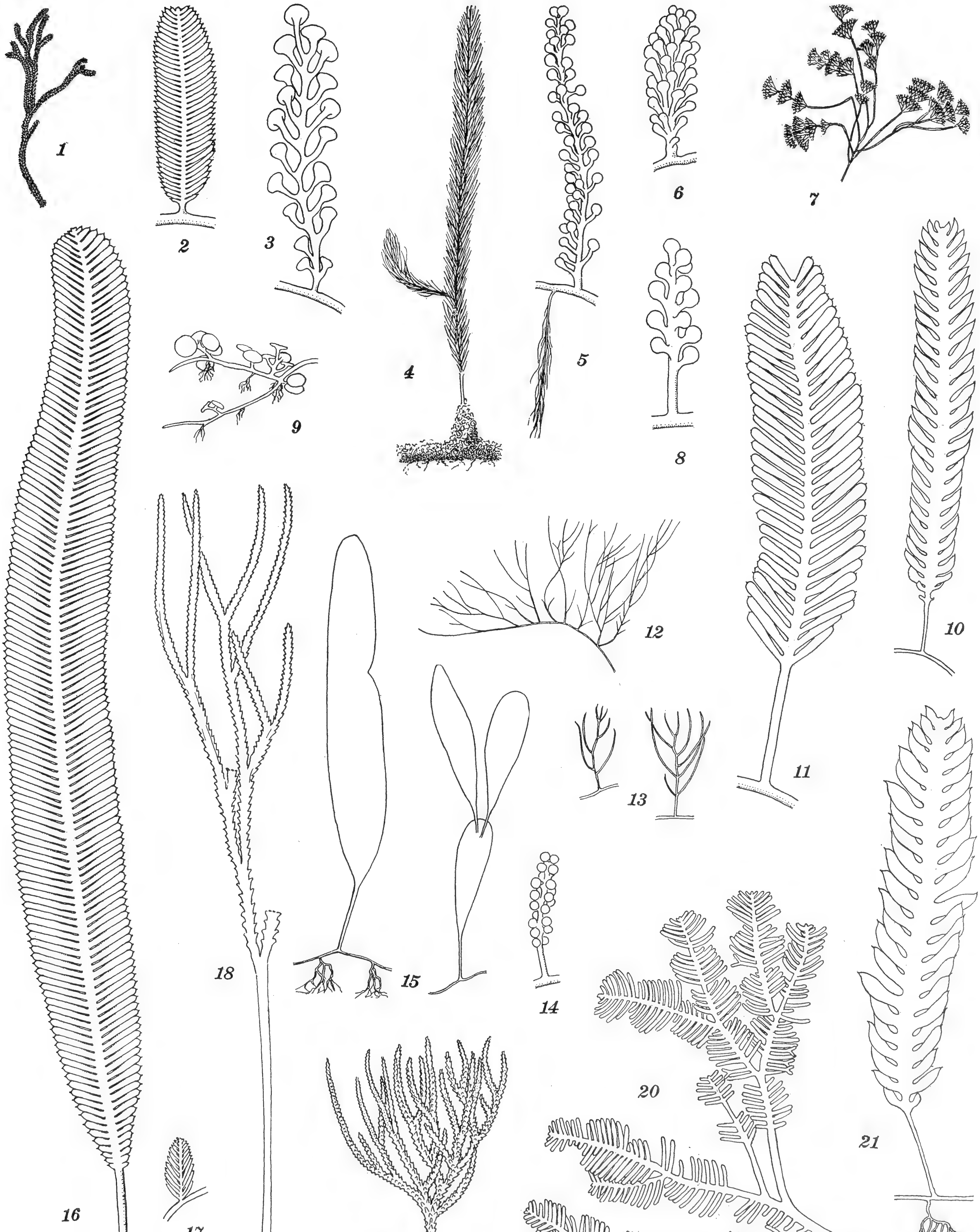
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Plate 13

Figs. 1. *Caulerpa Ashmeadii*, portion of branch showing ramuli. × 4.6.
2. *Caulerpa verticillata*, portion of branch showing ramuli. × 4.6.
3. *Caulerpa racemosa uvifera*, portion of branch showing ramuli. × 4.6.
4. *Caulerpa cupressoides flabellata*, portion of branch showing ramuli. × 4.6.
5. *Caulerpa sertularioides*, portion of branch showing ramuli. × 4.5.
6. *Caulerpa paspaloides*, side view of a lateral ramulus. × 23.
7. *Caulerpa paspaloides*, under view of a lateral ramulus. × 23.
8. *Caulerpa racemosa occidentalis*, portion of a branch with ramuli. × 4.6.
9. *Caulerpa racemosa macrophysa*, a lateral ramulus. × 4.6.
10. *Caulerpa racemosa clavifera*, tip of a branch with ramuli. × 4.6.
11. *Caulerpa racemosa microphysa*, portion of a branch with ramuli. × 4.6.
12. *Caulerpa Vickersiæ luxurians*, portion of a branch with ramuli. × 23.
13. *Caulerpa peltata*, portion of a branch with ramuli. × 4.6.
14. *Caulerpa Webbiana*, portions of two branching ramuli. × 50.
15. *Caulerpa sertularioides forma*, tips of ramuli. × 32.
16. *Caulerpa cupressoides typica*, middle and tip of a branch with ramuli. × 4.6.
17. *Valonia macrophysa*, four plants with branches and rhizoids. × 1.3.
18. *Valonia ventricosa*, two plants with rhizoids. × 1.3.
19. *Valonia utricularis*, two portions of plant. × 2.1.
20. *Valonia ocellata*, three plants showing division and branches. × 2.

(For other figures of *Caulerpa* see plates 6 and 12.)


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PLATE 14

FIGS. 1. *Ectocarpus tortugensis*, portion of plant with empty gametangia. × 265.
2. *Myrionema strangulans*, margin thallus, vegetative. × 265.
3. *Myrionema strangulans*, sporangia. × 265.
4. *Myrionema strangulans*, gametangia. × 265.
5, 6. *Stilophora? tropica*, basal cells from sori, with sporangia and paraphyses. × 600.
7, 8. *Sphacelaria tribuloides*, propagulæ, face views. × 102.
9. *Sphacelaria tribuloides*, edge of triradiate propagulum. × 102.
10. *Sphacelaria tribuloides*, growing apex. × 102.
11. *Ectocarpus Duchassaignianus*, branch with gametangia. × 200.
12. *Ectocarpus elachistæformis*, plants with gametangia. × 102.
13. *Ectocarpus Zonariæ*, branch from tuft with gametangia. × 460.
14. *Sporochnus Bolleanus*, old fertile ramulus, terminal filaments shed. × 6.
15. *Sporochnus pedunculatus*, young branch with filaments intact. × 1.3.
16. *Sporochnus pedunculatus*, old fertile ramuli, terminal filaments shed. × 6.
17. *Elachistea minutissima*, branch showing long and short filaments, and gametangia. × 265.
18. *Myrionema strangulans*, portion of plant showing hairs and regenerating gametangia. × 265.
19. *Phycocœlis floridana*, portion of plant with gametangia. × 265.
20. *Castagnea Zosteræ*, cortical branches with hairs and gametangia. × 200.
21. *Castagnea Zosteræ*, series of gametangia showing transition to the branching type. Shaded portion fertile; darker cells with the contents intact, lighter portion contents discharged. × 500.
22. *Castagnea Zosteræ*, cortical branches with sporangia. × 200.

(For other figures of *Stilophora?* see plates 3 and 19; for others of *Castagnea* see plate 15; for another of *Sporochnus* see plate 3.)

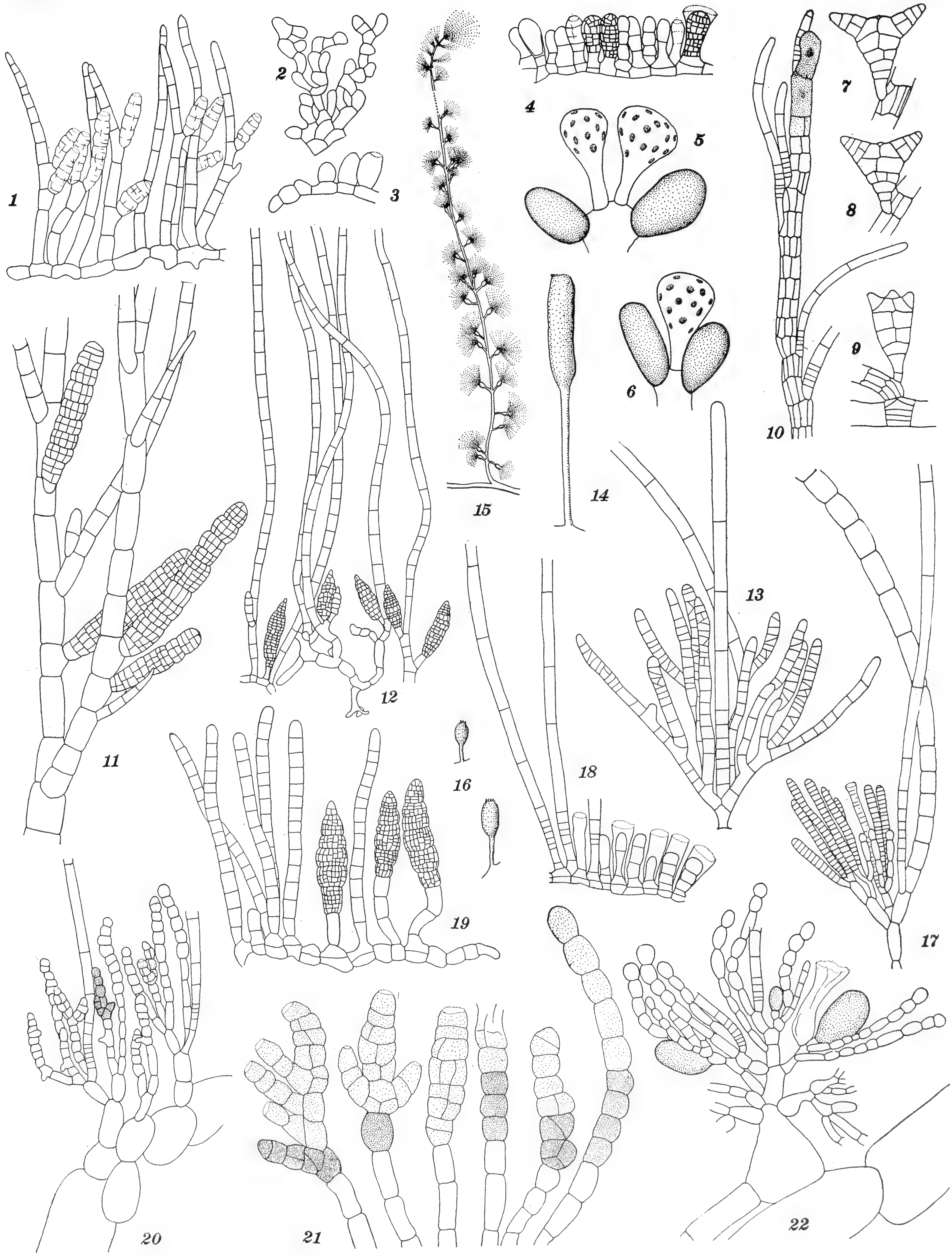
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PLATE 15

FIGS. 1 to 4. *Castagnea Howei*, gametangial filaments. × 500.
5 to 7. *Castagnea Howei*, sporangial filaments. × 500.
8. *Castagnea Howei*, habit of branches. × 1.2.
9. *Castagnea Zosteræ*, habit of branches. × 1.2.
10 to 12. *Cladosiphon? floridana*, gametangial filaments. × 820.
13. *Cladosiphon? floridana*, longitudinal section of branch. × 264.
14. *Cladosiphon? floridana*, transverse section of branch. × 500.
15 to 17. *Rosenvingea intricata*, habit of branches. × 0.6.
18. *Ralfsia expansa*, section of thallus. × 500.
19. *Hydroclathrus clathratus*, portion of thallus. × 0.84.
20. *Zonaria variegata*, section of thallus. × 200.
21. *Zonaria variegata*, upper surface of thallus. × 200.
22. *Zonaria variegata*, lower surface of thallus. × 200.
23. *Aglaozonia canariensis*, section of thallus. × 200.
24. *Aglaozonia canariensis*, lower surface of thallus. × 200.
25. *Aglaozonia canariensis*, upper surface of thallus. × 200.

(Additional figures of *Castagnea* appear on plate 14; of *Hydroclathrus* on plate 19; of *Zonaria* on plate 17; *Aglaozonia* on plate 37.)

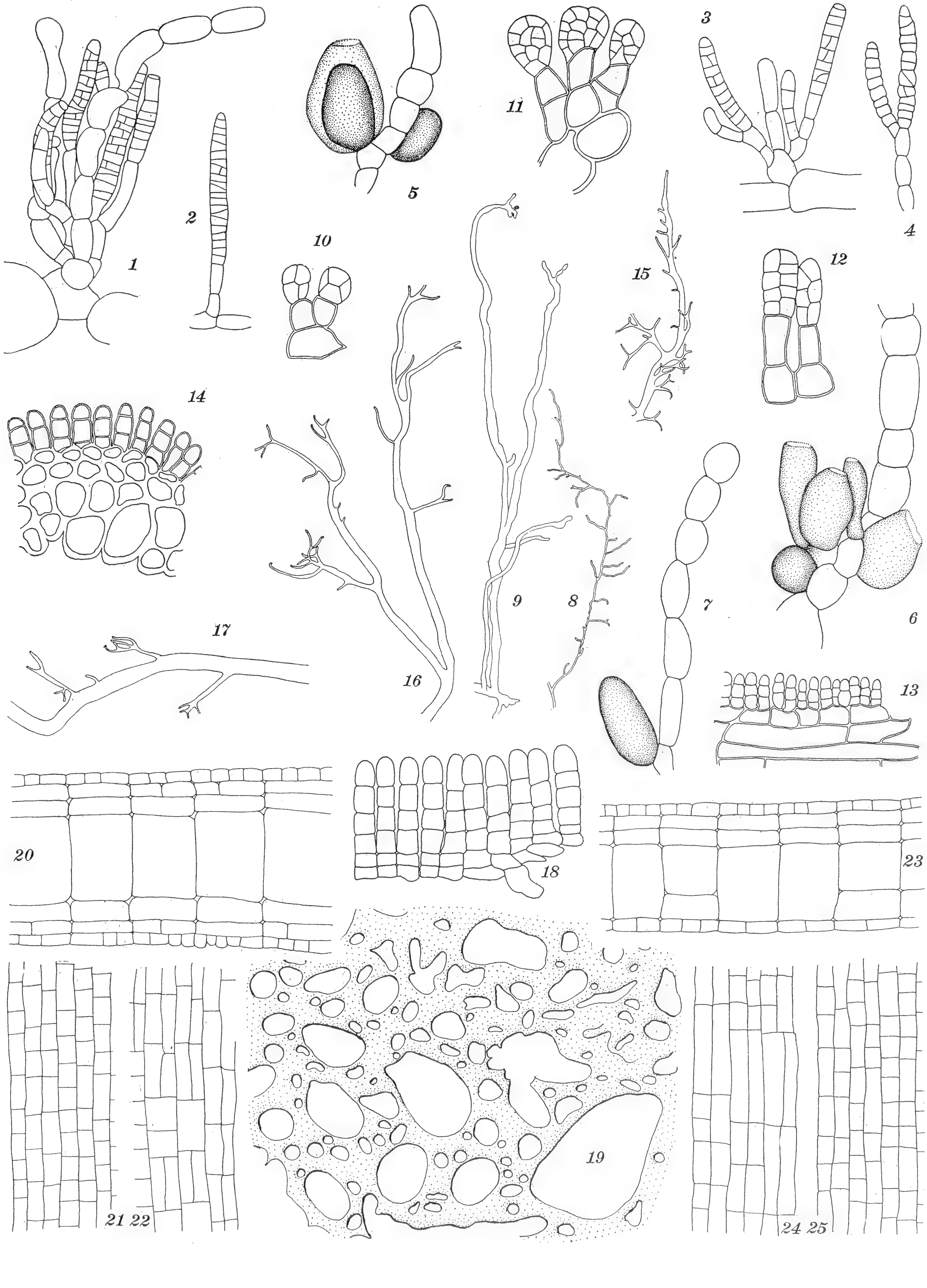
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Plate 16

FIGS. 1. *Dictyota indica,* portion of plant. × 1.
2. *Dilophus alternans,* portion of young plant. × 1.
3. *Dilophus alternans,* mature lateral branches. × 1.
4. *Dictyota dentata,* portion of young plant. × 1.
5. *Dictyota dentata,* portion of mature plant. × 1.
6 to 9. *Dictyota divaricata,* branches showing various degrees of slenderness. × 1.
10. *Dictyota cervicornis spiralis,* portion of plant. × 1.
11. *Dictyota Bartayresii,* portion of plant. × 1.
12. *Dictyota pardalis,* portion of plant. × 1.
13. *Dictyota cervicornis pseudodichotoma,* portion of plant. × 1.
14. *Dictyota dichotoma,* portion of plant. × 1.
15. *Dictyota cervicornis pseudobartayresii,* portion of plant. × 1.
16. *Dictyota Bartayresii,* portion of plant. × 1.
17. *Dictyota cervicornis,* portion of plant. × 1.

(For another figure of *Dictyota* see plate 19.)

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PLATE 17

FIGS. 1. *Dictyota ciliolata*, portion of plant. × 1.
2. *Spatoglossum Schrœderi*, portion of plant. × 1.
3. *Zonaria zonalis*, portion of plant. × 0.66.
4. *Zonaria variegata*, portion of plant. × 1.
5. *Neurocarpus Justii*, portion of plant. × 0.66.
6. *Padina Sanctæ-Crucis*, portion of plant. × 0.66.
7. *Neurocarpus delicatulus*, portion of plant. × 1.3.
8. *Neurocarpus plagiogrammus*, portion of plant. × 0.66.
9. *Padina Vickersiæ*, portion of plant. × 0.66.

(For other figures of *Dictyota* see plates 16, 19; for *Zonaria* see plate 15; for *Neurocarpus* see plates 19 and 28. Fig. 2 from Florida material collected by Mrs. A. H. Curtiss.)


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Plate 18

Figs. 1. *Sargassum Hystrix buxifolium*, tip of branch. $\times$ 1.3.
2, 3. *Sargassum natans*, tips of branches. $\times$ 1.3.
4. *Sargassum natans*, bladder showing foliar tip. $\times$ 1.3.
5. *Sargassum Filipendula*, tip of fertile branch. $\times$ 1.
6. *Sargassum pteropleuron*, tip of branch. $\times$ 1.3.
7. *Sargassum polyceratium ovatum*, bladders with alate pedicles, and one with a foliar tip. $\times$ 1.3.
8. *Sargassum polyceratium fa.*, leaf. $\times$ 1.
9. *Sargassum fluitans*, tip of branch. $\times$ 1.3.
10. *Sargassum polyceratium ovatum*, tip of fertile branch. $\times$ 1.3.
11. *Sargassum vulgare*, tip of fertile branch. $\times$ 1.3.
12. *Sargassum polyceratium*, tip of branch. $\times$ 1.3.
13. *Turbinaria turbinata*, lateral fertile branch. $\times$ 1.6.

(For additional figures of *Sargassum* see plate 19. Fig. 13 from Florida material collected by Thaxter.)

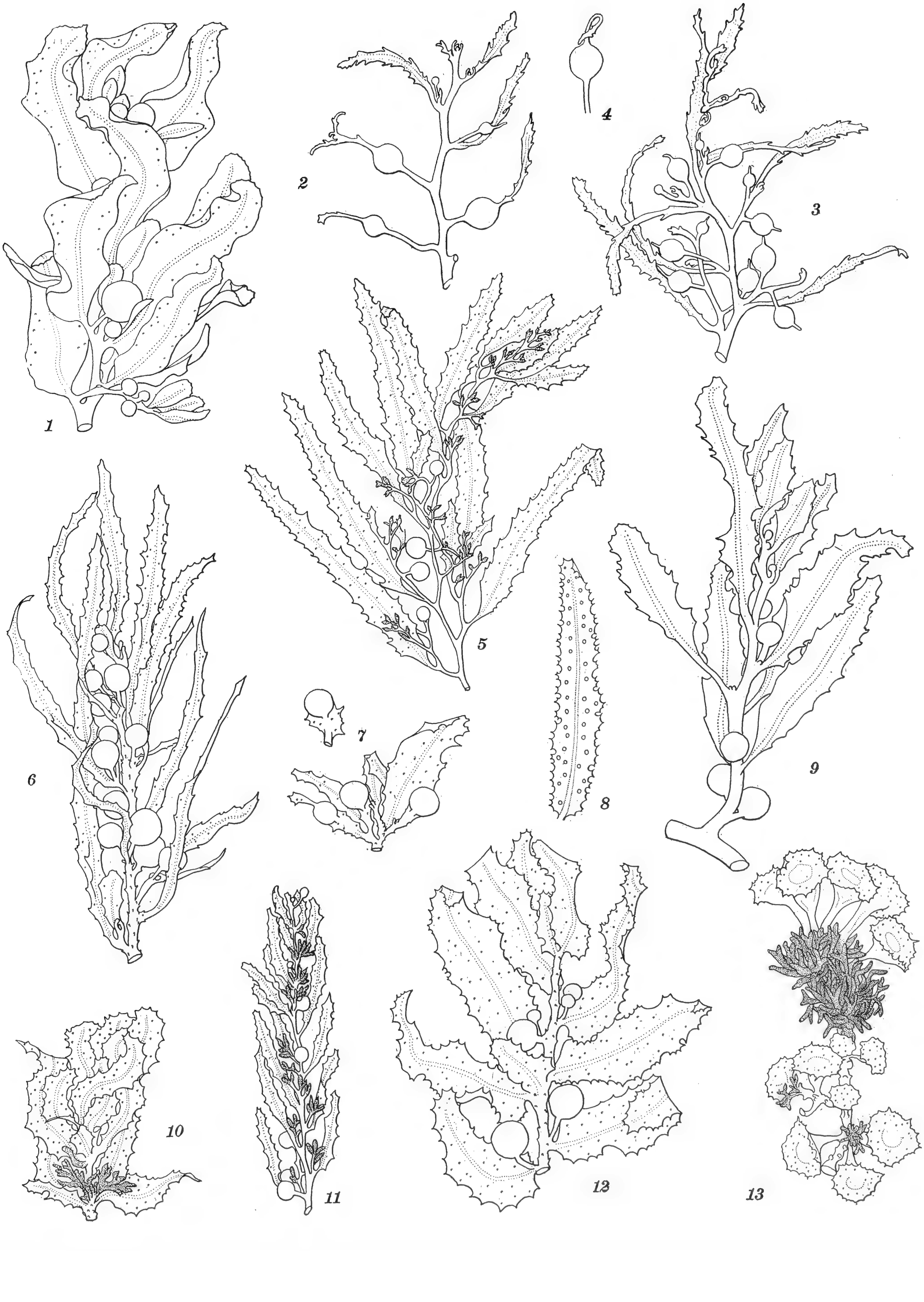
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Plate 19

Figs. 1. *Hydroclathrus clathratus*, section of vegetative thallus. × 200.
2. *Stilophora? tropica*, section of vegetative thallus. × 265.
3. *Colpomenia sinuosa*, section of vegetative thallus. × 200.
4. *Colpomenia sinuosa*, section of gametangial thallus. × 200.
5. *Sargassum fluitans*, series showing leaf variation, one with an alate costa. × 1.3.
6. *Neurocarpus delicatulus*, margin of thallus. × 105.
7. *Dilophus alternans*, section of thallus. × 32.
8. *Neurocarpus plagiogrammus*, margin of thallus. × 105.
9. *Sargassum Hystrix buxifolium*, series showing leaf variation. × 1.3.
10. *Dictyota Bartayresii*, section of thallus. × 32.
11. *Neurocarpus plagiogrammus*, apex of branch showing apical cell area. × 105.
12. *Sargassum vulgare*, series showing leaf variation. × 1.3.
13. *Sargassum natans*, series showing leaf variation. × 1.3.
14. *Sargassum polyceratium*, series showing leaf variation. × 1.3.
15. *Sargassum pteropleuron*, series of leaves showing variation in length, in breadth and in degree of wingedness of costa. × 1.3.
16. *Sargassum polyceratium ovatum*, series of leaves showing variation. × 1.3.
17. *Sargassum Filipendula*, series showing leaf variation. × 1.3.

(For other figures of *Sargassum* see plate 18; for others of *Dictyota* see plates 16 and 17; for others of *Neurocarpus* see plates 17 and 28; for others of *Dilophus* see plate 16; for others of *Hydroclathrus* see plate 15; for another of *Colpomenia* see plate 7; for others of *Stilophora*? see plate 14.)

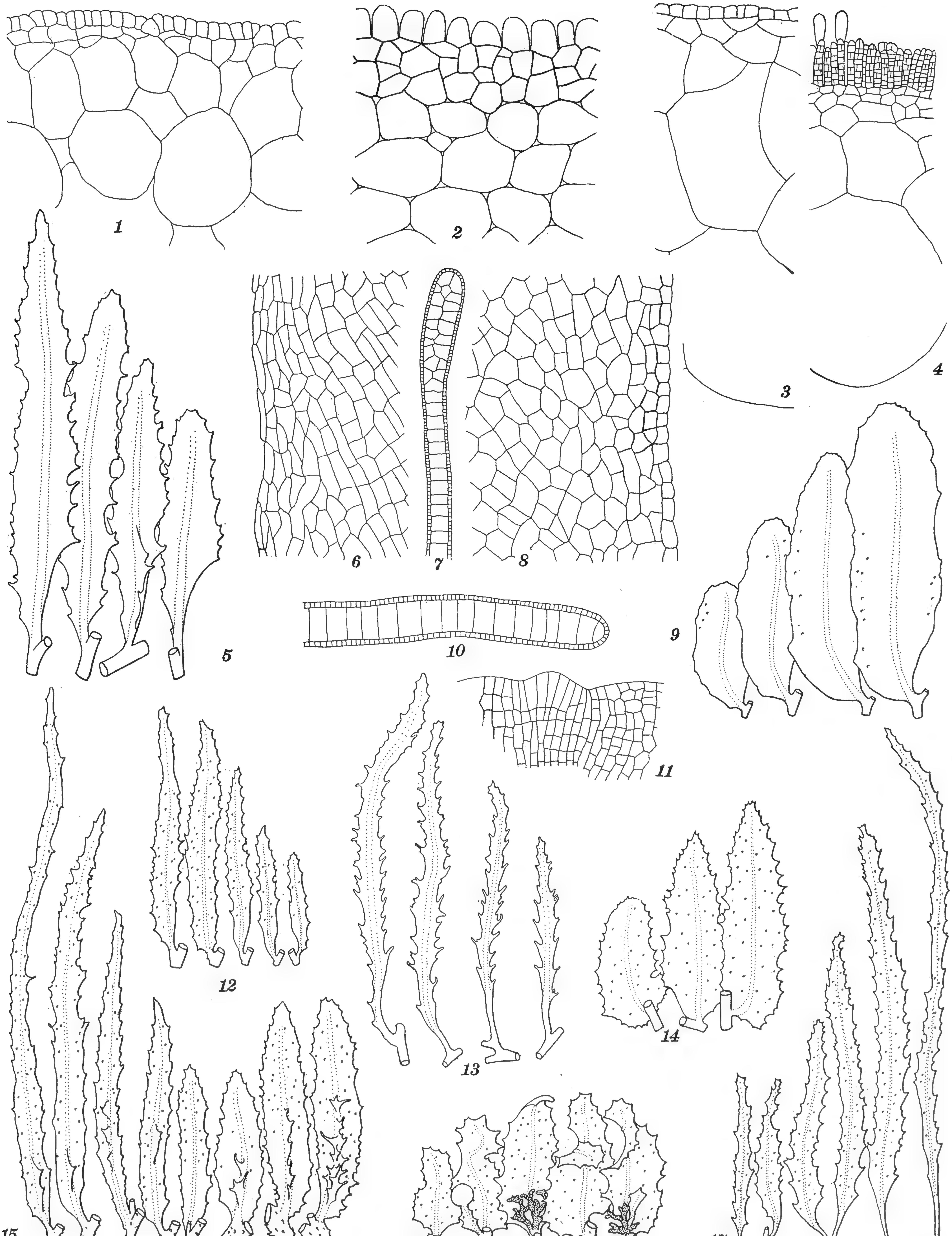
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PLATE 20

FIGS. 1, 2. *Asterocystis ramosa*, showing branching and (2) spores. × 170.
3. *Erythrocladia subintegra*, small thallus. × 330.
4. *Erythrotrichia carnea*, upper portion forming spores. × 500.
5. *Erythrotrichia carnea*, base of plant with hapteron. × 200.
6. *Achrochætium Collinsianum*, plant with spores. × 330.
7. *Gelidium pusillum conchicola*, portion of plant with tetraspores. × 23.
8. *Gelidium pusillum*, l.s. thallus, somewhat schematic. × 500.
9. *Wurdemannia setacea*, habit of portion of plant. × 2.6.
10. *Wurdemannia setacea*, portion of t.s. branch. × 500.
11. *Wrangelia penicillata*, node and lateral branch with antheridial tuft. × 56.
12. *Wrangelia penicillata*, old nodes showing cortication. × 56.
13. *Wrangelia Argus*, node showing lateral branches and tetraspores. × 105.
14. *Wrangelia bicuspidata*, node showing rhizoidal cortication. × 56.
15, 16. *Kallymenia perforata*, habit of margin and central part of thallus. × 0.6.
17. *Kallymenia perforata*, section of thallus. × 100.
18. *Kallymenia Limminghii*, three small plants. × 1.2.
19. *Wrangelia penicillata*, ultimate ramuli of vegetative branch. × 105.
20. *Wrangelia bicuspidata*, tips of ultimate ramuli. × 200.

(Additional figures of *Acrochætium* appear on plate 22; of *Gelidium* on plates 22, 23; of *Wrangelia* on plates 22, 32.)

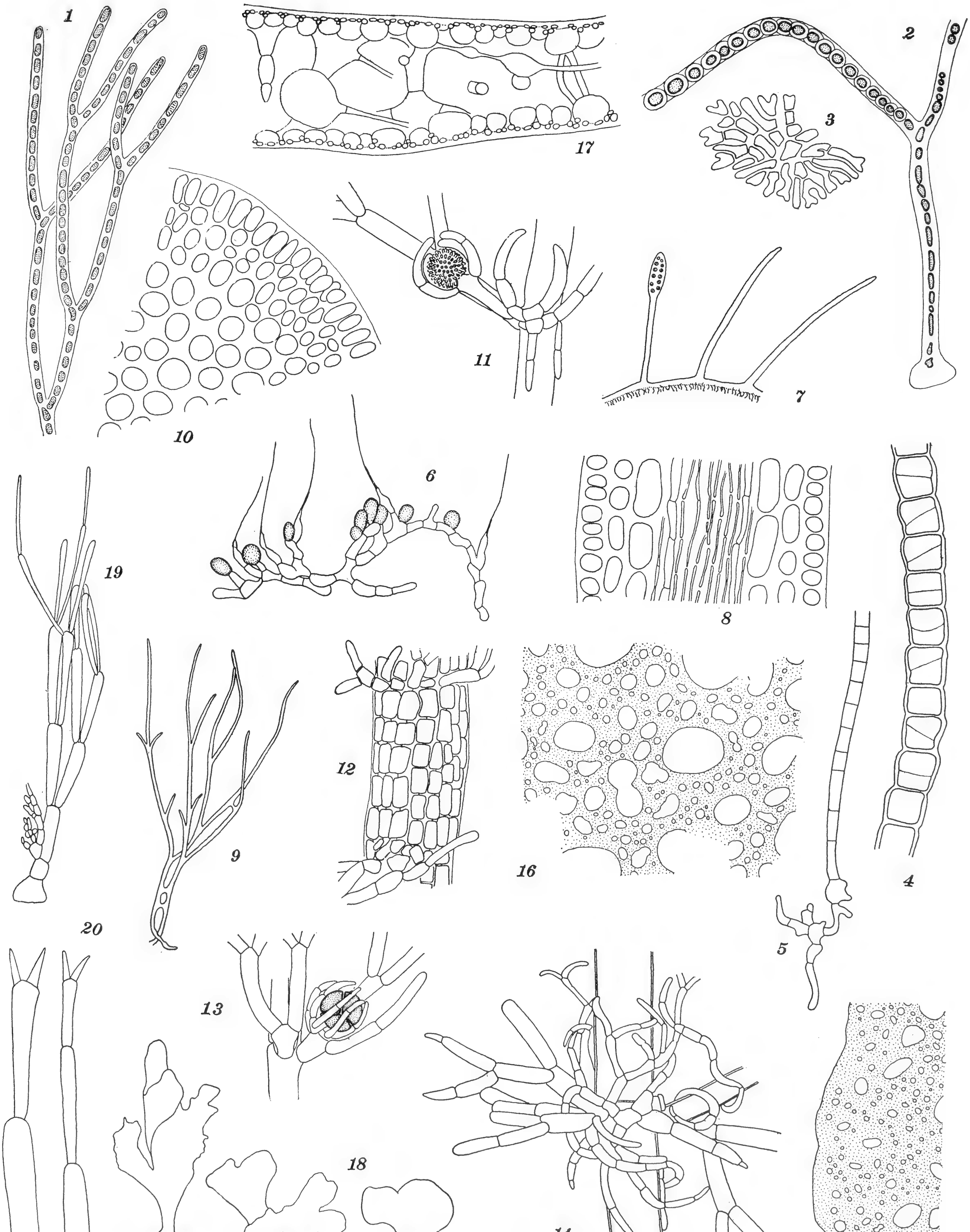
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Plate 21

Figs. 1. *Liagora pinnata*, male branch with spermatia. × 500.
2. *Liagora farinosa*, male branch with spermatia. × 500.
3. *Liagora valida*, assimilative filaments. × 200.
4. *Liagora pedicellata*, male branch with spermatia. × 500.
5. *Liagora pedicellata*, female branch with carpospores. × 330.
6. *Liagora pinnata*, assimilative filaments. × 250.
7. *Liagora ceranoides*, male branch with spermatia. × 500.
8. *Liagora farinosa*, assimilative filaments. × 250.
9, 10. "Monosporangiate Disks" from *Liagora valida*, × 250.
11. *Galaxaura obtusata*, section of portion of cortex. × 330.
12. *Galaxaura marginata*, section of portion of cortex. × 330.
13. *Galaxaura lapidescens*, section of portion of cortex. × 330.
14. *Galaxaura flagelliformis*, filaments from cortex. × 330.
15. *Galaxaura oblongata*, section of portion of cortex (reconstructed). × 330.
16. *Galaxaura rugosa*, section of portion of cortex. × 330.
17. *Galaxaura subverticillata*, section of portion of cortex. × 330.
18. *Galaxaura squalida*, section of portion of cortex. × 330.
19. *Scinaia complanata intermedia*, habit of portion of plant. × 1.2.

(Additional figures of *Liagora* appear on plates 30, 32, 33; of *Galaxaura* on plates 30, 31.)

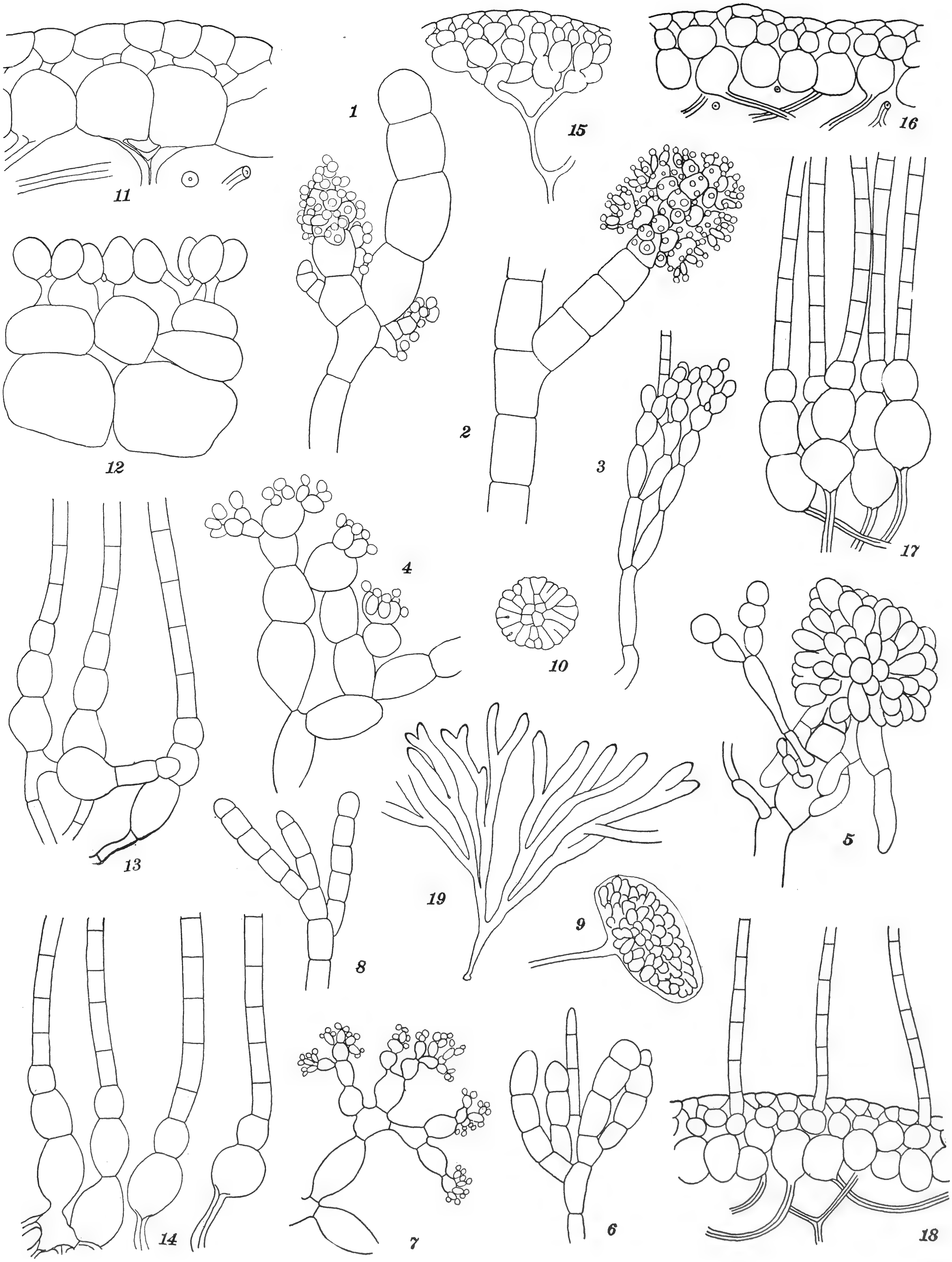
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Plate 22

Figs. 1. *Acrochætium Sargassi*, habit of plant. × 265.
2, 3. *Acrochætium Sargassi*, monosporangia. × 1060.
4, 5. *Acrochætium Sargassi*, antheridia. × 1060.
6. *Wrangelia Argus*, nodes showing rhizoidal cortications. × 56.
7. *Gelidium pusillum*, habit of plants. × 5.3.
8. *Gelidium rigidum*, habit of sterile and fertile branches. × 1.3.
9. *Gelidium rigidum*, habit of fertile tetrasporic branch. × 6.
10. *Hypnea musciformis*, habit of plant. × 1.3.
11. *Hypnea cervicornis*, habit of plant. × 1.3.
12. *Hypnea cornuta*, habit of branch of plant. × 1.3.
13. *Chrysymenia uvaria*, habit of branches with utricles. × 1.
14. *Chrysymenia pyriformis*, habit of plant. × 1.3.
15. *Chrysymenia Enteromorpha*, habit of plant. × 1.
16. *Chrysymenia? halymenioides*, P.B.–A. 385, habit of portion of plant. × 0.6.
17. *Lomentaria uncinata*, habit of tuft of plants. × 2.4.
18. *Catenella Opuntia pinnata*, habit of tetrasporic branches. × 6.
19. *Cœlothrix irregularis*, habit of portion of tetrasporic plant. × 2.4.

(Additional figures of *Acrochætium* appear on plates 20, 28; of *Wrangelia* on plates 20, 32; of *Gelidium* on plates 20 and 23; of *Hypnea* on plate 23; of *Chrysymenia* on plates 23, 24; of *Cœlothrix* on plate 23. Fig. 16 from Florida material collected by Mrs. G. A. Hall.)

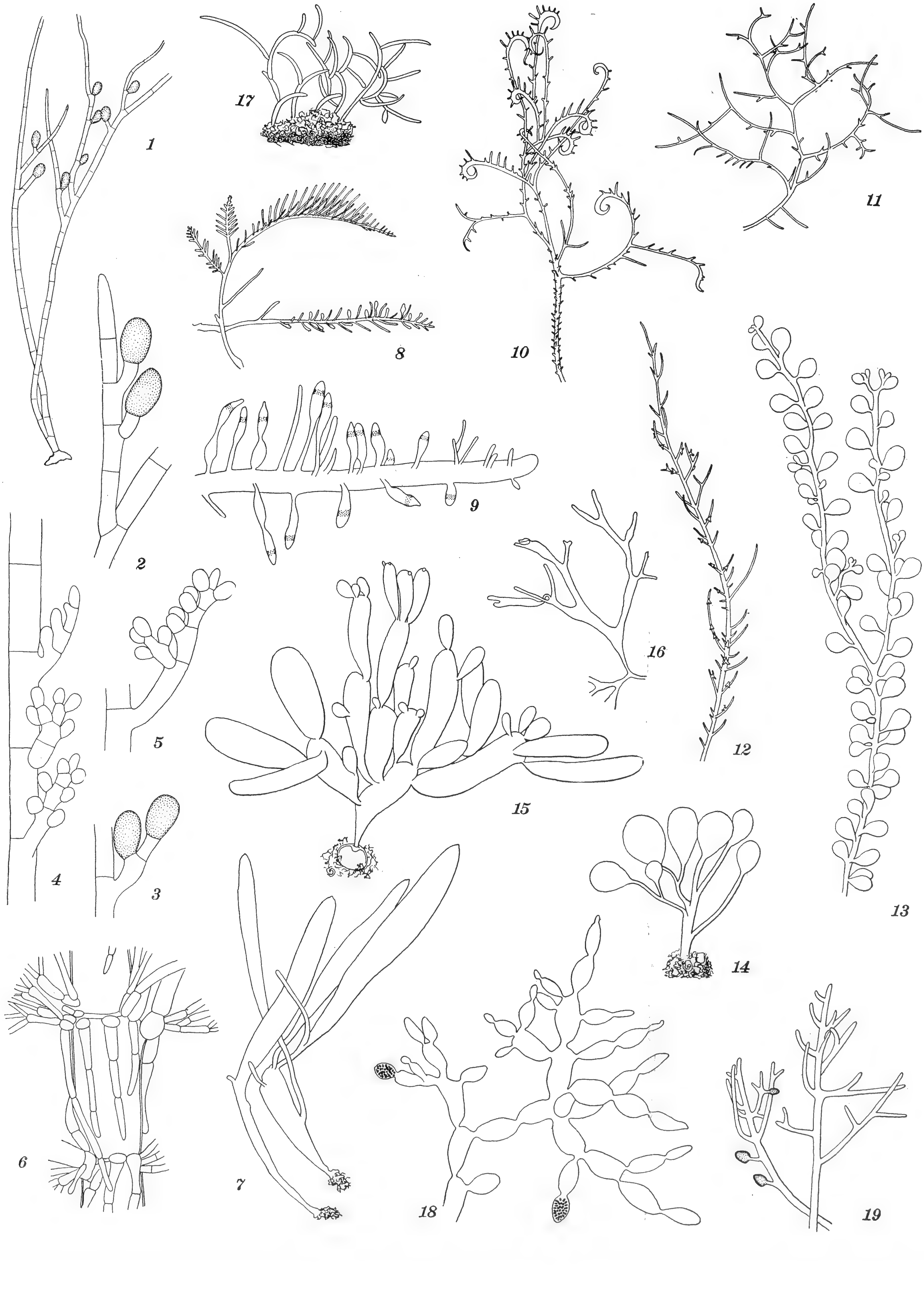
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Plate 23

Figs. 1. *Agardhiella tenera*, transverse section of branch. × 106.
2. *Eucheuma isiforme*, transverse section of branch. × 22.
3. *Gelidium pusillum*, transverse section of branch. × 500.
4. *Gelidium rigidum*, transverse section of branch.
5. *Meristotheca Duchassaignii*, longitudinal section of blade. × 100.
6. *Gracilaria cornea*, transverse section of branch. × 100.
7. *Gracilaria mammilaris*, transverse section of blade. × 100.
8. *Gracilaria crassissima*, transverse section of branch. × 100.
9. *Gracilaria Blodgettii*, transverse section of branch. × 20.
10. *Gracilaria confervoides*, transverse section of branch. × 100.
11. *Gracilaria Curtissiæ*, transverse section of blade. × 56.
12. *Hypnea musciformis*, transverse section of branch. × 105.
13. *Chrysymenia halymenioides*, section of part of thallus wall. × 105.
14. *Chrysymenia pyriformis*, inner cells of utricle. × 102.
15. *Chrysymenia uvaria*, section of part of utricle wall. × 200.
16. *Chrysymenia uvaria*, inner cells of utricle. × 102.
17. *Chrysymenia pyriformis*, section of part of utricle wall. × 200.
18. *Cœlothrix irregularis*, section of branch showing loosely associated interior filaments, cavity and gland. × 150.
19. *Wrightiella Tumanowiczii*, section of main branch showing central polysiphonous axis. × 56.
20. *Chrysymenia pyriformis*, interior cells of utricle, one showing clustered gland group. × 200.

(Additional figures of *Eucheuma* appear on plates 30 to 32, 36; of *Gelidium* on plates 20 and 22; of *Meristotheca* on plate 24; of *Gracilaria* on plates 31, 33, 36; of *Hypnea* on plate 22; of *Chrysymenia* on plates 22 and 24; of *Cœlothrix* on plate 22; of *Wrightiella* on plate 26. Fig. 10 from Jamaica material collected by Wight.)

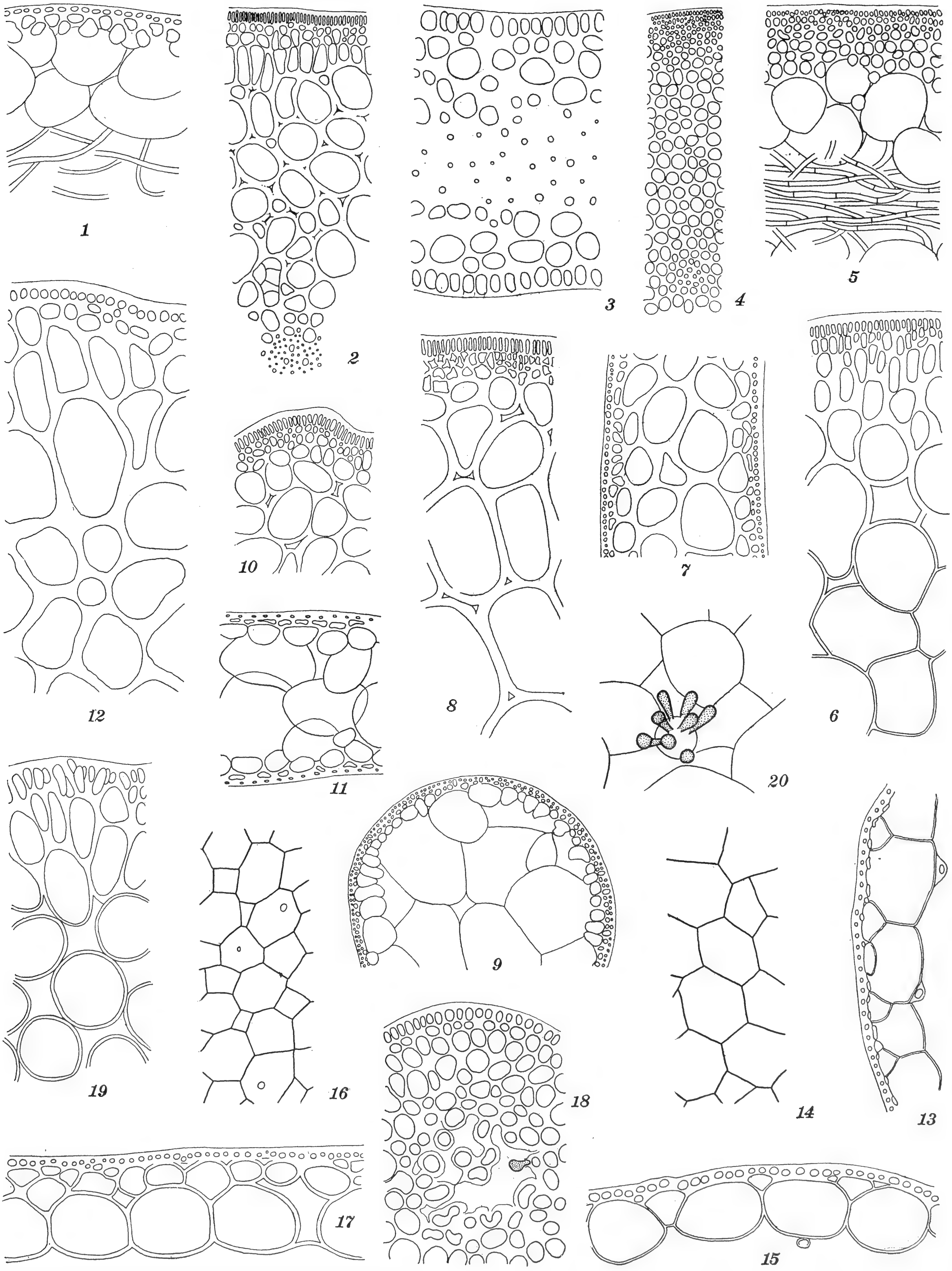
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Plate 24

Figs. 1, 2. *Meristotheca Duchassaignii*, sections of blade through cystocarps. × 5.3.
3. *Champia parvula*, habit from 2 plants. × 1.2.
4. *Champia salicornioides*, habit of plant. × 1.2.
5. *Chrysymenia Agardhii*, habit of portion of plant. × 0.6.
6. *Chrysymenia halymenioides*, habit of portion of tetrasporic plant. × 1.2.
7. *Chrysymenia halymenioides*, habit of portion of female plant. × 0.6.
8. *Chrysymenia planifrons*, marginal lobe of thallus. × 0.6.
9. *Chrysymenia halymenioides*, surface of tetrasporic plant. × 265.
10. *Delesseria Hypoglossum*, habit of branches. × 1.2.
11. *Delesseria Hypoglossum*, margin of blade. × 56.
12. *Delesseria Hypoglossum*, apex of blade. × 500.
13. *Delesseria Hypoglossum*, midrib portion in older blade. × 56.
14. *Amphibia Montagnei*, outline of vegetative branch. × 56.
15. *Amphibia Montagnei*, outline of tetrasporic branch. × 56.
16 to 18. *Polysiphonia ferulacea fa.?*, sections of branches. × 153.
19. *Amphibia tenella*, section of mature axis. × 153.
20. *Digenea simplex*, surface view of branch cells. × 200.

(Additional figures of *Meristotheca* appear on plate 23; of *Chrysymenia* on plates 22, 23; of *Amphibia* on plate 25; of *Polysiphonia* on plates 25, 26; of *Digenea* on plate 33. Fig. 7 from Florida material collected by Mrs. G. A. Hall.)

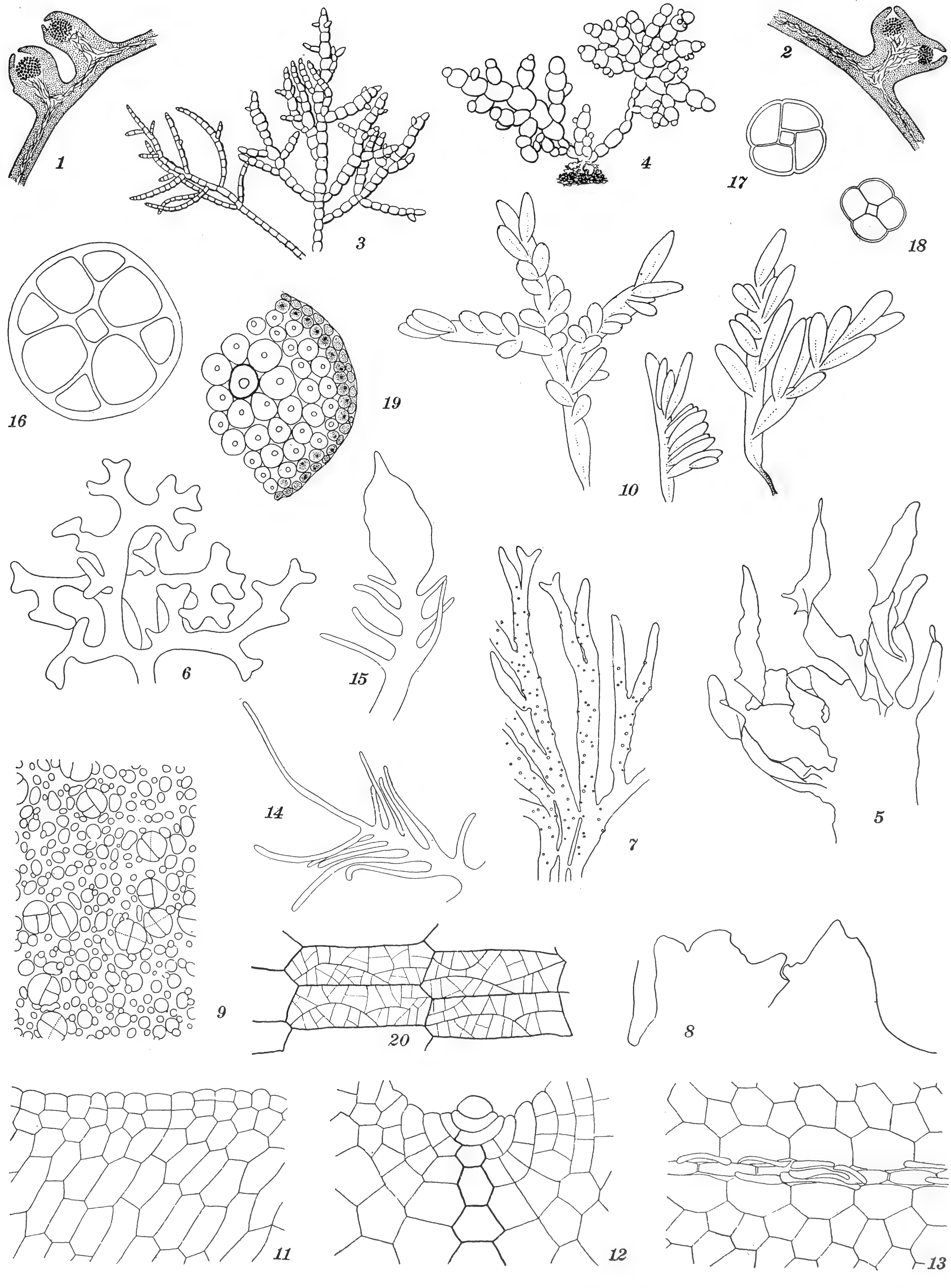
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PLATE 25

FIGS. 1. *Halodictyon mirabile*, portion of plant. × 26.
2. *Heterosiphonia Gibbesii*, branchlet and ultimate ramuli. × 32.
3. *Heterosiphonia Wurdemanni*, branchlet and ultimate ramuli. × 32.
4, 5. *Falkenbergia Hillebrandii*, filaments showing branching. × 156.
6, 7. *Amphibia tenella*, habit of branches. × 56.
8. *Herposiphonia secunda*, habit of stem near tip. × 56.
9. *Herposiphonia secunda*, habit of branching, with pericarp. × 56.
10. *Herposiphonia secunda*, habit of branching, elongate type. × 56.
11. *Herposiphonia tenella*, habit of lateral branches. × 56.
12. *Herposiphonia sp.?*, habit of lateral branch. × 56.
13. *Polysiphonia ramentacea*, habit of branching. × 6.
14. *Polysiphonia subtilissima*, apex of branch. × 500.
15. *Polysiphonia ferulacea fa.?*, apex of tetrasporic branch. × 54.
16. *Polysiphonia havanensis mucosa*, tip of male branch with antheridia.
17, 18. *Polysiphonia havanensis mucosa*, outlines of branches with pericarps. × 56.

(Additional figures of *Amphibia* appear on plate 24; of *Heterosiphonia* on plate 35; of *Polysiphonia* on plates 24, 26.)

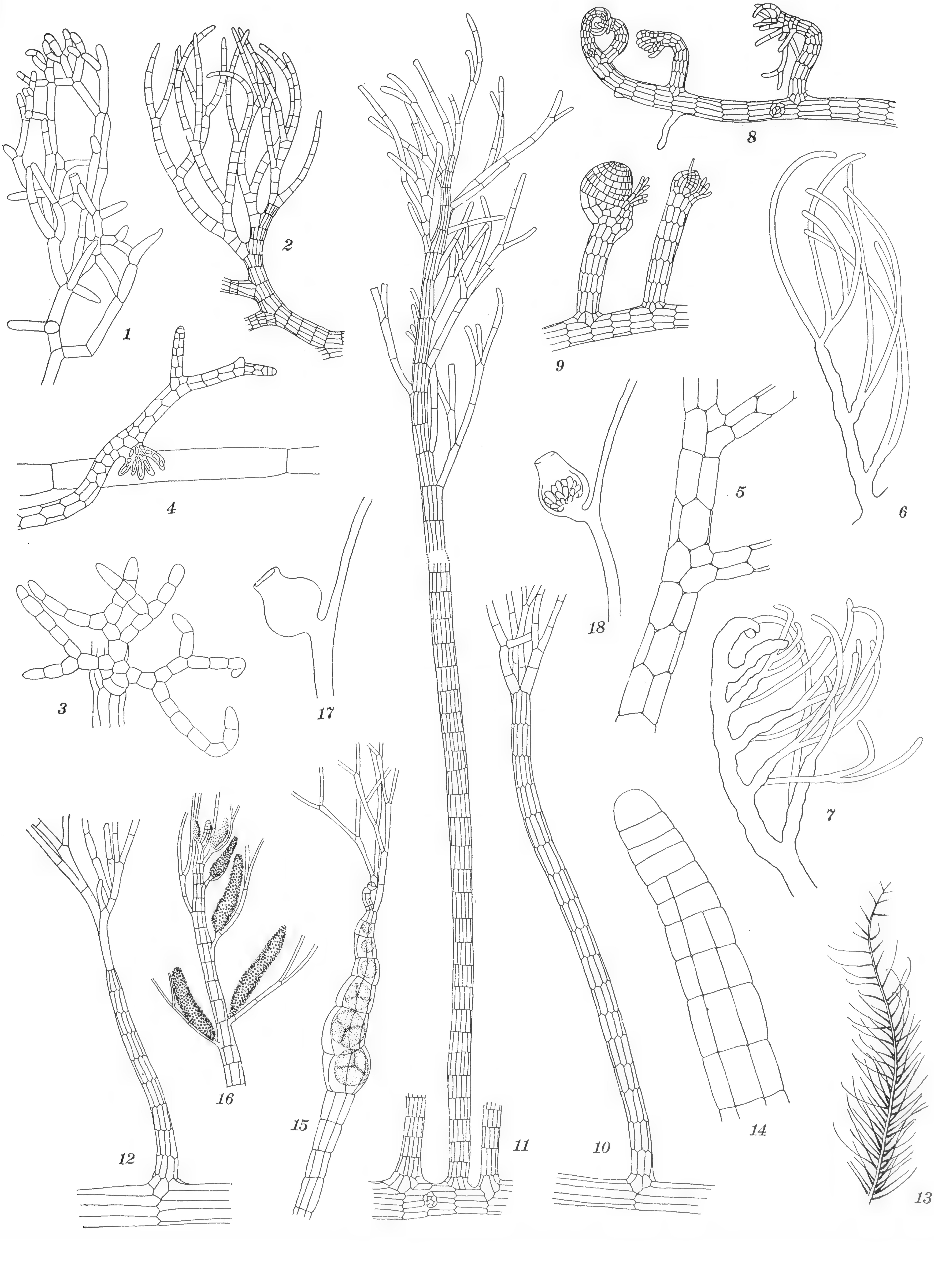
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Plate 26

Figs. 1. *Dasya ramosissima*, branch showing ramuli and cortications. × 106.
2. *Dasya rigidula*, branch showing ramuli and cortications. × 106.
3. *Wrightiella Blodgetii*, evanescent monosiphonous ramuli. × 56.
4. *Wrightiella Blodgetii*, apex of branch with cortications and spinules. × 56.
5, 6. *Acanthophora spicifera*, tip and shaft of branch with short branches. × 5.3.
7. *Acanthophora muscoides*, tip of branch. × 5.3.
8, 9. *Bryothamnion Seaforthii*, branchlets. × 11.
10. *Bryothamnion triquetrum*, forked branch with spinules. × 5.3.
11. *Polysiphonia ferulacea*, tetrasporic branches. × 11.
12. *Dasya ramosissima*, branch showing ramuli and beginning cortication. × 106.
13. *Dasya mollis*, portion of axis showing tuft of ramuli. × 106.
14. *Polysiphonia subtilissima*, portion of axis. × 200.
15. *Polysiphonia ferulacea*, portion of axis showing siphons. × 106.
16. *Polysiphonia ramentacea*, portion of branch showing delicate ramulus. × 53.
17. *Polysiphonia*, portion of surface of axis. × 120.
18. *Halymenia Agardhii*, habit of portion of plant. × 0.6.
19. *Halymenia Gelinaria*, medullary filaments and ganglia. × 132.

(Additional figures of *Dasya* appear on plates 32, 35; of *Wrightiella* on plate 23; of *Acanthophora* on plate 34; of *Polysiphonia* on plates 24, 25; of *Halymenia* on plate 28, 35.)

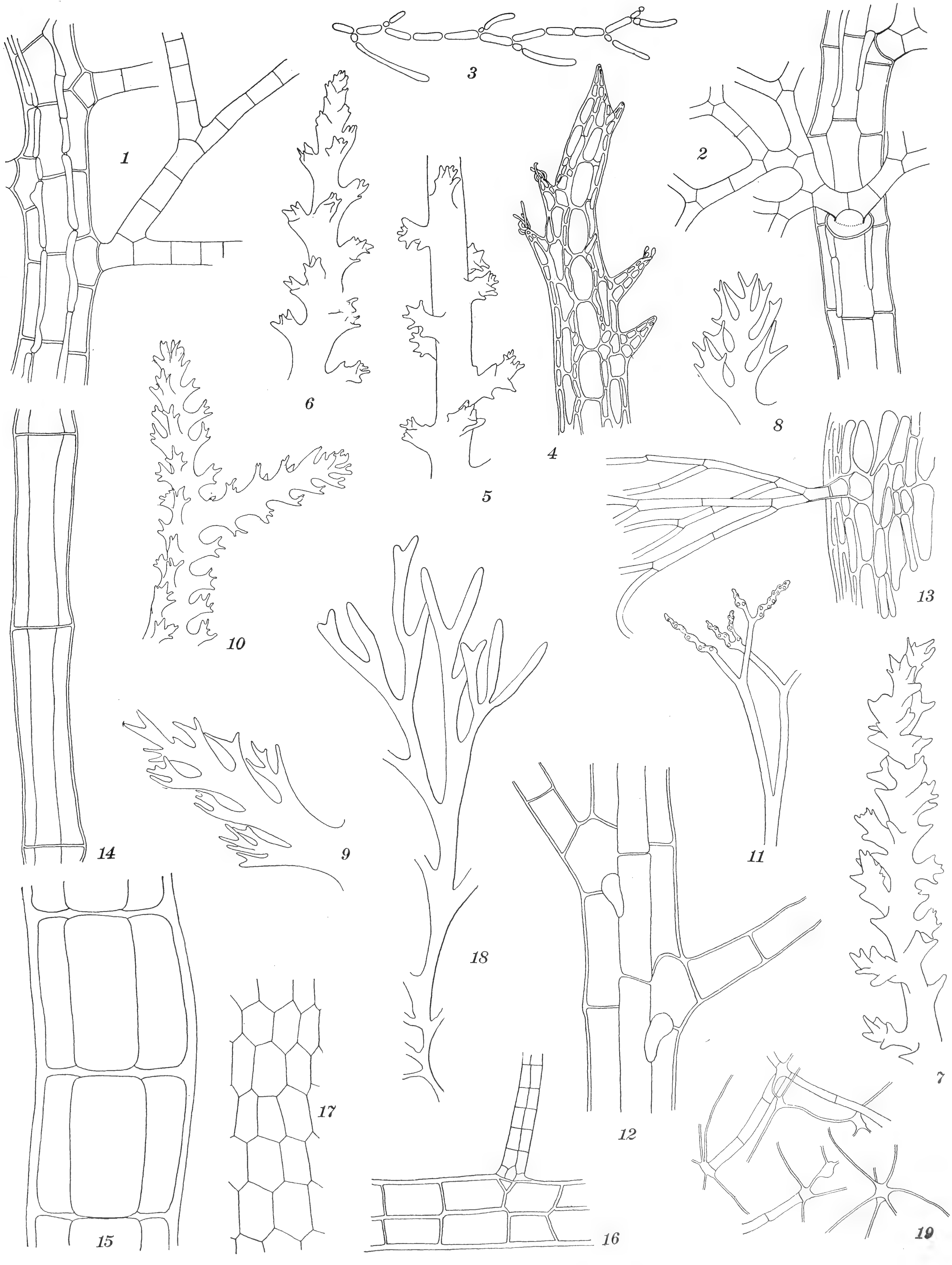
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PLATE 27

FIGS. 1 to 4. *Gymnothamnion elegans*, various types of branching. × 200.
5. *Brongniartella mucronata*, ramuli showing mucronate tips. × 56.
6. *Brongniartella mucronata*, single apex showing thickened mucro. × 105.
7. *Crouania attenuata*, habit of branch of tetrasporic plant. × 32.
8. *Crouania attenuata*, ramuli with spermatia. × 500.
9. *Crouania attenuata*, main axis with ramuli. × 200.
10. *Crouania pleonospora*, main axis with ramuli and tetraspores. × 200.
11. *Antithamnion sp.*?, portion of plant showing glands.
12 to 16. *Ceramium fastigiatum flaccidum*, cortication of nodes. × 264.
17 to 19. *Ceramium subtile*, cortication of nodes. × 264.
20, 21. *Ceramium byssoideum*, cortication of nodes. × 264.
22. *Cryptonemia crenulata*, habit of portion of plant. × 1.2.

(Additional figures of *Crouania* appear on plates 30 and 32; of *Ceramium* on plate 28; of *Cryptonemia* on plate 28.)

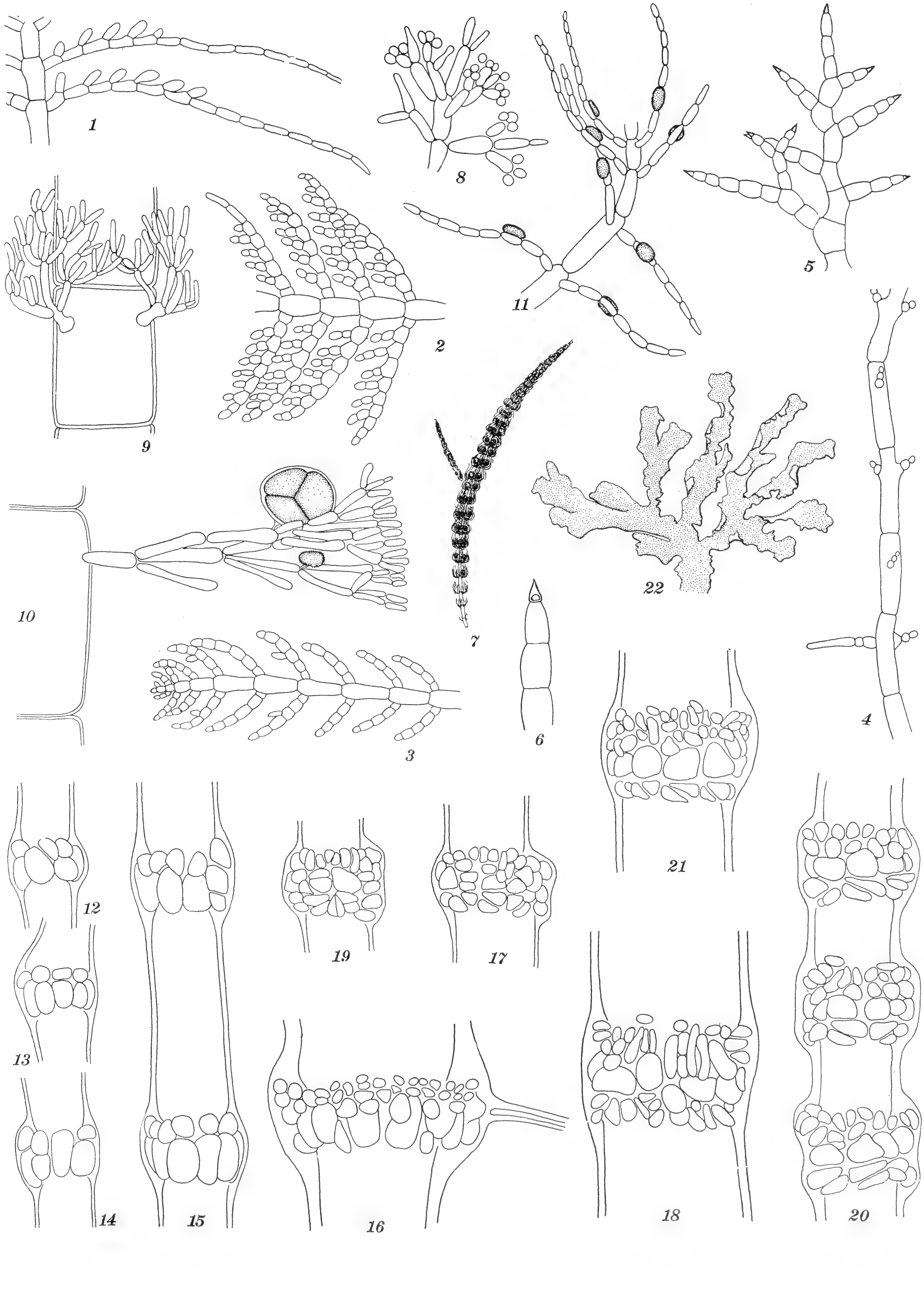
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Plate 28

Figs. 1. *Ceramium nitens*, portion of axis showing central row of cells, area of cortex and hairs. × 264.
2. *Gelidium corneum*, small plant. × 1.2.
3. *Neurocarpus plagiogrammus*, tip of lateral branch showing veins and sori.
4. *Spyridia filamentosa*, apex of ramulus. × 500.
5. *Spyridia aculeata hypneoides*, apex of ramulus. × 500.
6. *Centroceras clavulatum*, portion of branch. × 105.
7. *Centroceras clavulatum*, portion of branch. × 264.
8. *Halymenia Agardhii*, portion of small thallus. × 0.6.
9. *Cryptonemia crenulata*, section of thallus. × 200.
10, 11. *Halymenia Gelinaria*, margin of old, dentate blade. × 0.6.
12, 13. *Cryptonemia crenulata*, margin of thallus. × 56.
14. *Griffithsia globifera*, branching filaments. × 2.3.
15. *Halymenia Gelinaria*, young attached blades, basal parts. × 0.6.
16. *Acrochætium crassipes*, plant. × 500.
17. *Spyridia aculeata hypneoides*, portion of cortex main filament. × 264.
18. *Spyridia filamentosa*, portion of cortex of main filament. × 264.
19. *Halymenia Floresia*, t. s. of thallus. × 106.

(Additional figures of *Ceramium* appear on plate 27; of *Gelidium* on plates 20, 22, 23; of *Neurocarpus* on plate 17; of *Spyridia* on plate 33; of *Halymenia* on plate 26; of *Cryptonemia* on plate 27; of *Acrochætium* on plates 20, 22. Fig. 8 from Florida material collected by Mrs. G. A. Hall.)

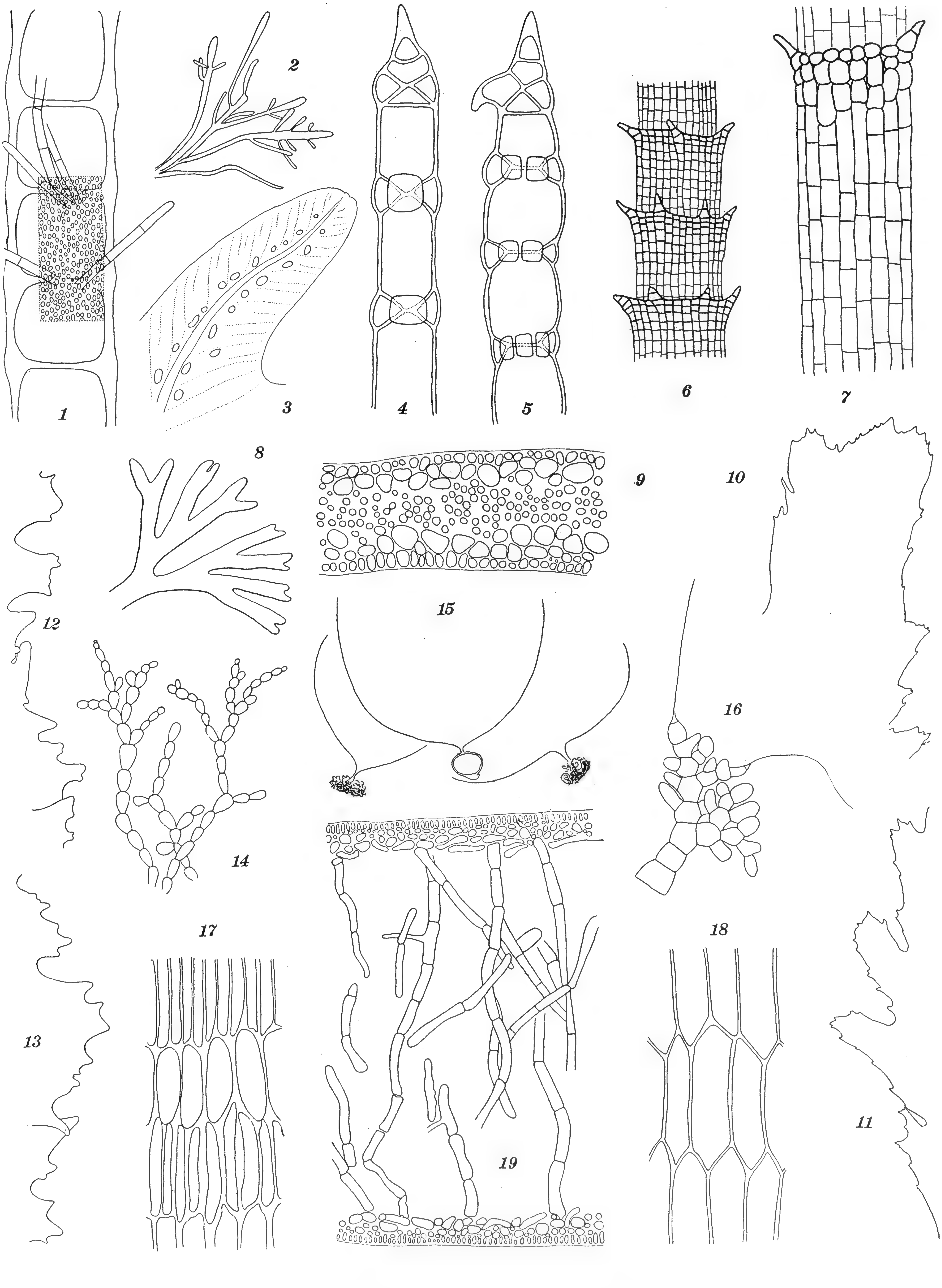
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PLATE 29

FIGS. 1. *Amphiroa rigida antillana,* portions of branches. $\times$ 2.

2. *Jania capillacea,* portion of branch. $\times$ 12.

3. *Jania rubens,* portion of branch. $\times$ 12.

4. *Vidalia obtusiloba,* lateral lobes. $\times$ 3.2.

5. *Amansia multifida,* portion of branch. $\times$ 3.4.

6. *Jania rubens,* tips of branches. $\times$ 32.

7. *Amphiroa Tribulus,* branches from flattened type. $\times$ 1.16.

8. *Jania pumila,* small plant with conceptacles. $\times$ 23.

9. *Amphiroa Tribulus,* branches from sub-cylindrical type. $\times$ 1.16.

10. *Jania capillacea,* tips of branches with conceptacles. $\times$ 32.

11. *Amphiroa fragilissima,* portions of branches with conceptacles. $\times$ 13.

12. *Corallina cubensis,* three fragments showing branching. $\times$ 11.

(Additional figures of *Amphiroa* appear on plate 36. *Vidalia* is from Florida material collected by Mrs. G. A. Hall; *Amansia* from Jamaica by Pease & Butler.)

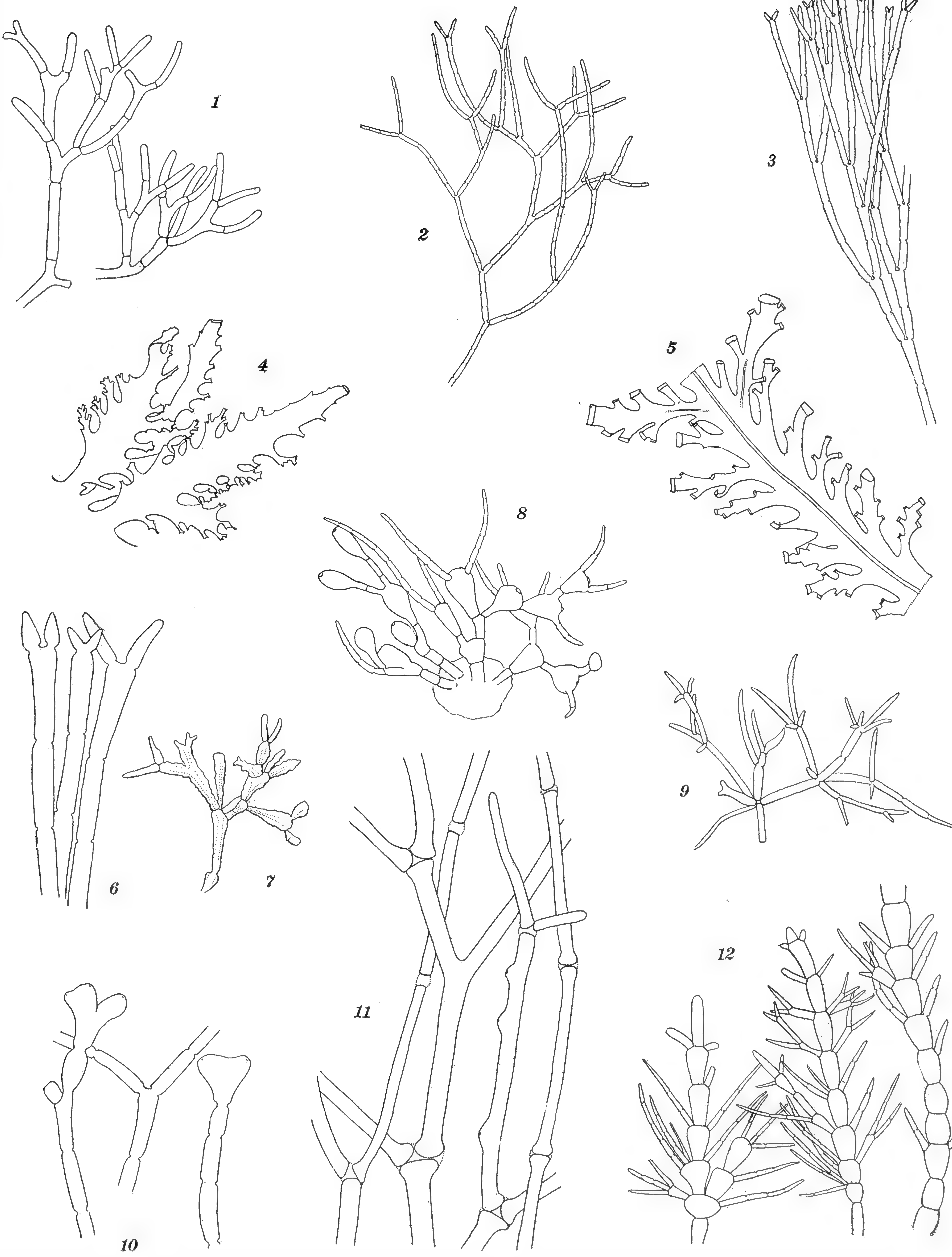
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PLATE 30

FIGS. 1. *Liagora pinnata*, habit of plant. × 0.8.
2. *Galaxaura rugosa*, habit of portion of plant. × 0.8.
3. *Liagora farinosa*, habit of portion of plant. × 0.8.
4. *Galaxaura flagelliformis*, habit of portions of plant. × 0.8.
5. *Crouania pleonospora*, habit of portions of plant. × 0.8.
6. *Eucheuma Gelidium*, habit of portion of plant. × 0.8.
7. *Liagora valida*, habit of portion of plant. × 0.8.
8. *Galaxaura lapidescens*, habit of portion of plant. × 0.8.
9. *Liagora pedicellata*, habit of small portion of large plant. × 0.8.
10. *Galaxaura rugosa*, habit of portion of plant. × 0.8.
11. *Liagora valida*, habit of portion of large plant. × 0.8.

(Additional figures of *Liagora* appear on plates 21, 32, 33; of *Galaxaura* on plates 21, 31; of *Crouania* on plates 27, 32; of *Eucheuma* on plates 23, 31, 32, 36.)

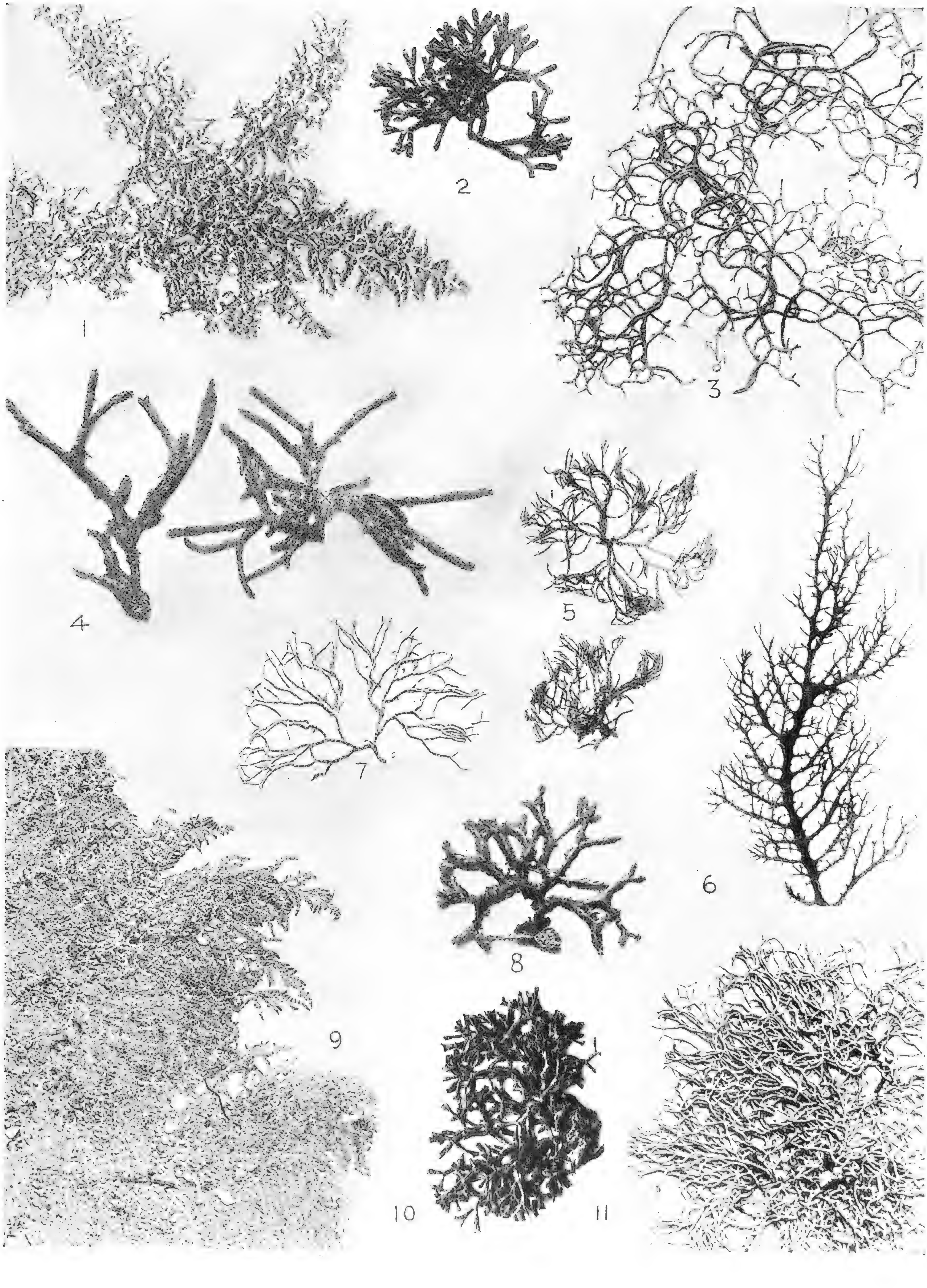
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PLATE 31

FIGS. 1. *Eucheuma acanthocladum*, habit of small portion of plant. × 0.8.
2. *Galaxaura obtusata*, habit of plant. × 0.8.
3. *Gracilaria crassissima*, habit of small plant. × 0.8.
4. *Galaxaura squalida*, habit of portion of plant. × 0.8.
5. *Galaxaura oblongata*, habit of small portion of plant. × 0.8.
6. *Galaxaura subverticillata*, habit of portion of plant. × 0.8.
7. *Galaxaura marginata*, habit of portion of plant. × 0.8.

(Additional figures of *Eucheuma* may be found on plates 23, 30, 32, 36; of *Galaxaura* on plates 21, 30; of *Gracilaria* on plates 23, 33, 36. Fig. 7 from Jamaica material collected by Wight.)

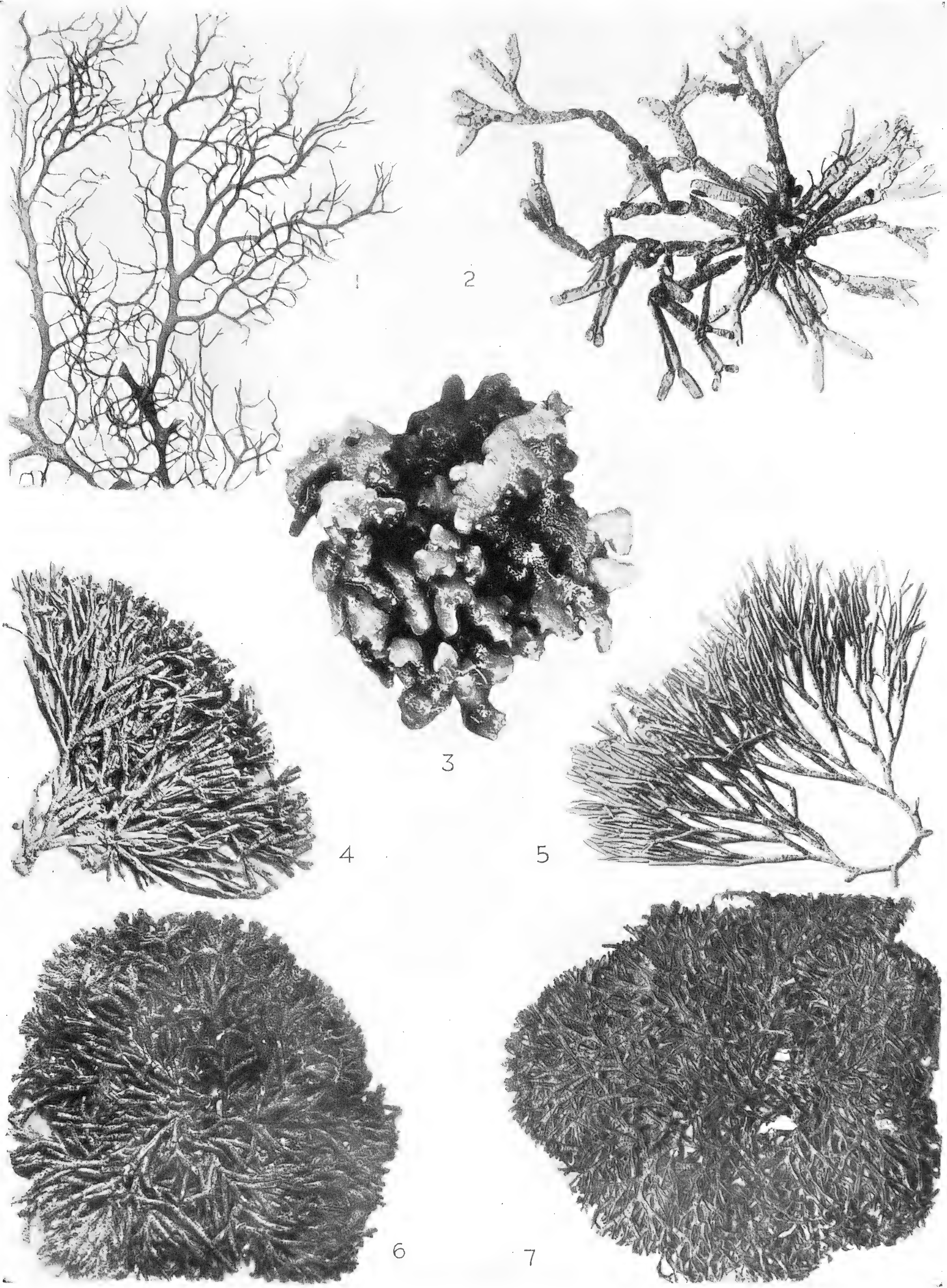
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PLATE 32

FIGS. 1. *Wrangelia penicillata*, female plant with cystocarps. × 1.
2. *Wrangelia bicuspidata*, habit of plants. × 1.
3. *Dasya Collinsiana*, habit of plant. × 1.
4. *Wrangelia Argus*, habit of plants. × 1.
5. *Eucheuma Gelidium*, habit of part of plant. × 1.
6. *Liagora ceranoides*, habit of plant. × 1.
7. *Wrangelia penicillata*, habit of tetrasporic plant. × 1.
8. *Crouania pleonospora*, habit of large plant. × 1.
9. *Crouania attenuata*, habit of large and loose-grown type. By reason of retouching for reproduction appearing of much too great diameter. × 1.

(Additional figures of *Wrangelia* appear on plates 20, 22; of *Dasya* on plates 26, 35; of *Eucheuma* on plates 23, 30, 31, 36; of *Liagora* on plates 21, 30, 33; of *Crouania* on plates 27, 30.)


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PLATE 33

FIGS. 1. *Gracilaria compressa*, habit of part of plant. $\times$ 0.6.
2. *Gracilaria ferox*, habit of part of plant. $\times$ 0.6.
3. *Laurencia obtusa*, habit of part of plant. $\times$ 0.6.
4, 5. *Liagora ceranoides*, habit of small plants. $\times$ 0.6.
6. *Gracilaria Blodgetii*, habit of part of plant. $\times$ 0.6.
7. *Digenea simplex*, habit of two robust specimens. $\times$ 0.6.
8. *Spyridia aculeata hypneoides*, habit of part of plant. $\times$ 0.6.
9. *Gracilaria cylindrica*, habit of portion of plant. $\times$ 0.6.

(Additional figures of *Gracilaria* appear on plates 23, 31, 36; of *Laurencia* on plates 34, 35; of *Liagora* on plates 21, 30, 32; of *Digenea* on plate 24; of *Spyridia* on plate 28. Fig. 6 from Florida material collected by Brooks.)


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PLATE 34

FIGS. 1. *Chondria dasyphylla*, habit of portion of plant. × 0.8.
2. *Chondria littoralis*, habit of portion of plant. × 0.8.
3. *Chondria floridana*, habit of portion of small plant. × 0.8.
4. *Laurencia Poitei*, habit of flattened type, two portions. × 0.8.
5, 6. *Laurencia Corallopsis*, habit of portions of two plants. × 0.8.
7. *Acanthophora spicifera*, habit of portion of plant. × 0.8.
8. *Laurencia intricata*, habit of portion of plant. × 0.8.
9. *Acanthophora muscoides*, habit of small plant with holdfast. × 0.8.
10. *Laurencia Poitei*, habit of cylindrical type. × 0.8.
11. *Chondria sedifolia*, habit of plant. × 0.8.

(Additional figures of *Chondria* appear on plate 35; of *Laurencia* on plates 33, 35; of *Acanthophora* on plate 26.)

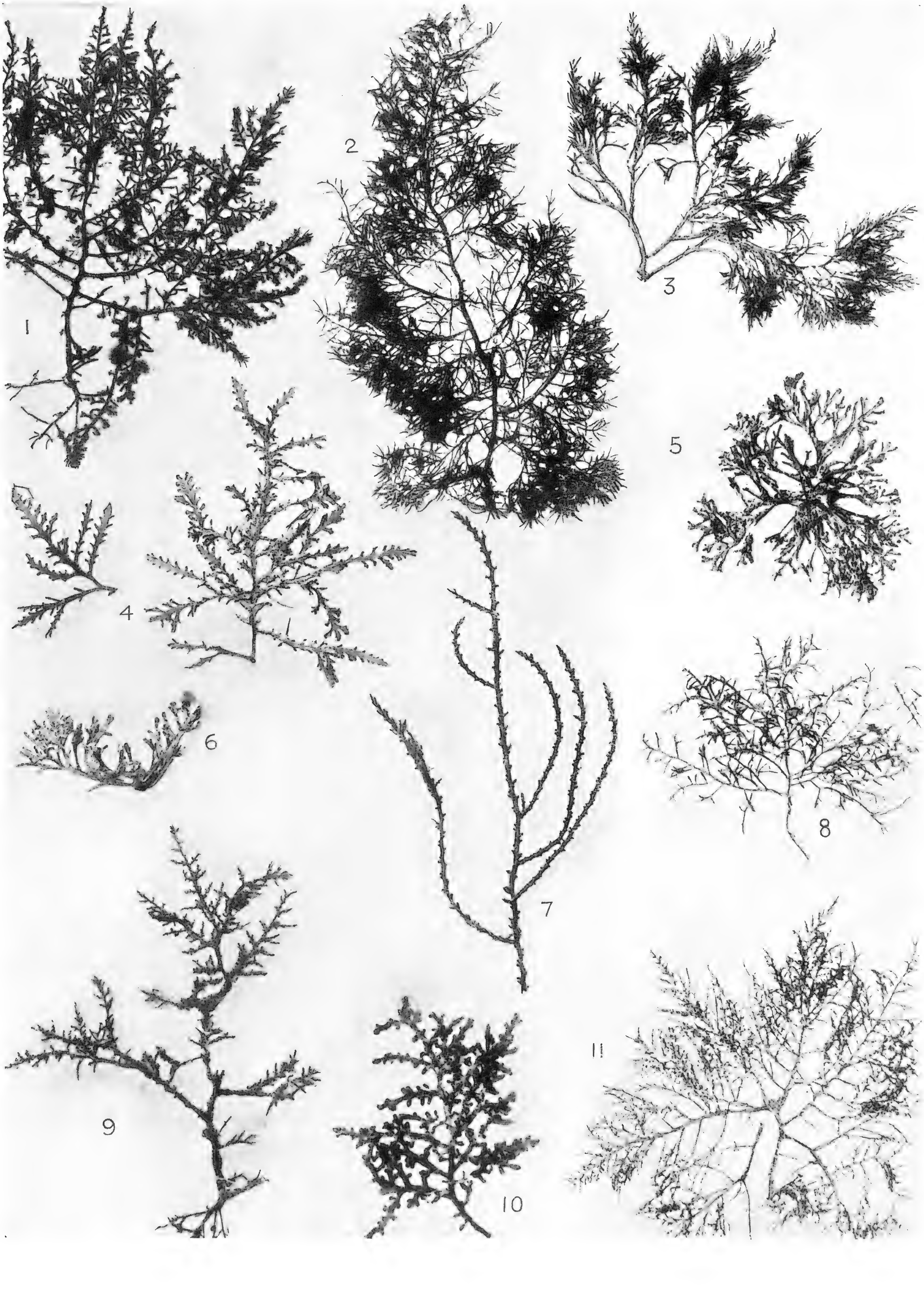
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Plate 35

Figs. 1, 2. *Heterosiphonia Gibbesii,* habit of two portions of plant. $\times$ 0.6.
3. *Chondria tenuissima,* habit of plant. $\times$ 0.6.
4. *Laurencia papillosa,* habit of plant. $\times$ 0.6.
5. *Dasya Crouaniana,* habit of part of plant. $\times$ 0.6.
6. *Halymenia Floresia,* habit of portion of plant. $\times$ 0.6.
7. *Dasya pedicellata,* habit of portion of plant. $\times$ 0.6.

(Additional figures of *Heterosiphonia* appear on plate 25; of *Chondria* on plate 34; of *Laurencia* on plates 33, 34; of *Dasya* on plates 26, 32; of *Halymenia* on plates 26, 28. Fig. 5 from Florida material collected by Thaxter.)

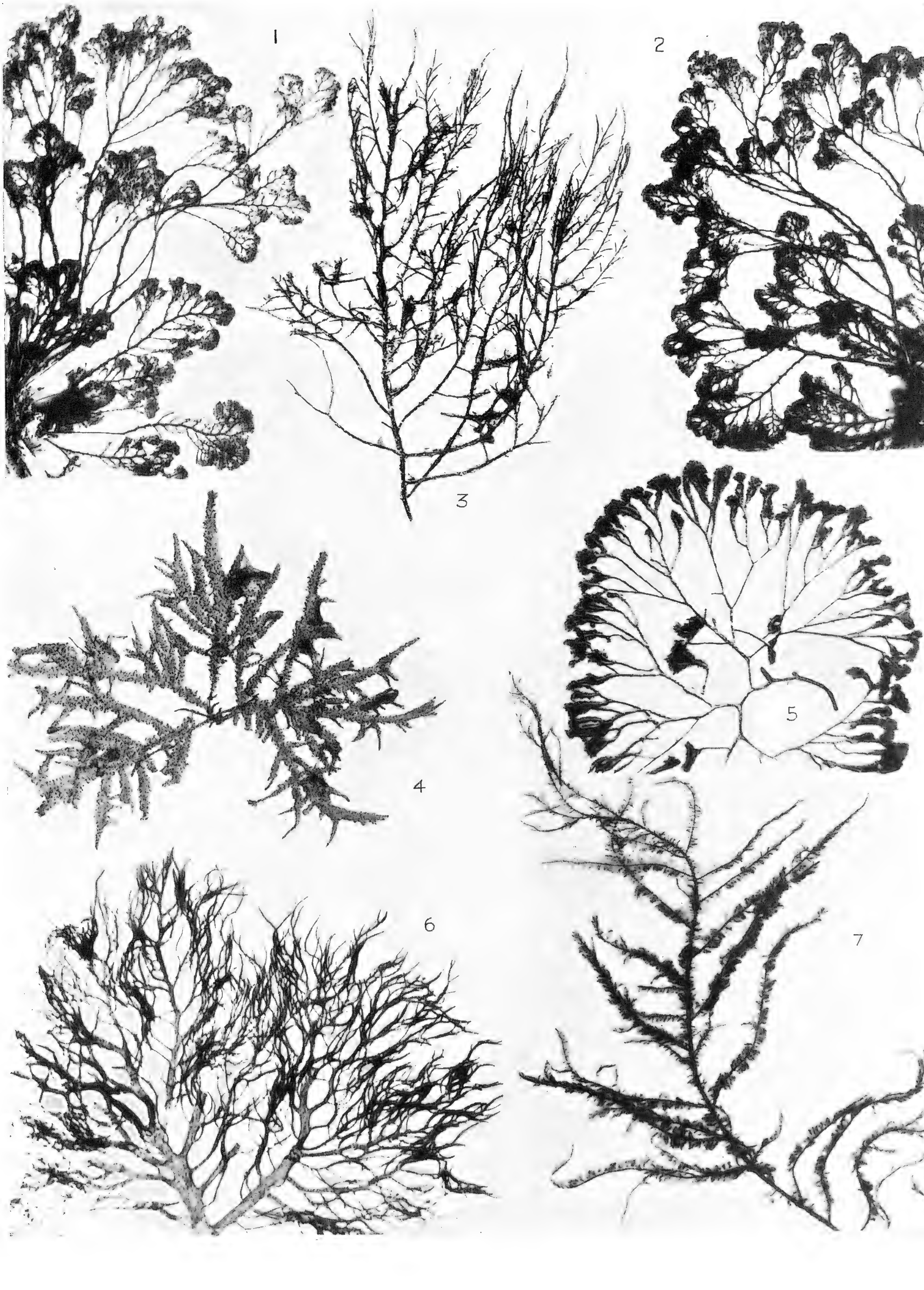
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Plate 36

Figs. 1. *Amphiroa Tribulus,* habit of sub-cylindrical and flattened types. × 0.8.
2. *Eucheuma isiforme,* habit of branches. × 0.8.
3. *Goniolithon decutescens,* habit of plant on coral. × 0.8.
4. *Gracilaria cornea,* habit of portion of plant. × 0.8.
5. *Goniolithon strictum,* habit of portions of plant. × 0.8.
6. *Amphiroa fragilissima,* habit of pieces of turf. × 0.8.
7. *Lithothamnium incertum,* habit of mass from above, with *Porites.* × 0.8.

(Additional figures of *Amphiroa* appear on plate 29; of *Eucheuma* on plates 23, 30, 31, 32; of *Goniolithon* on plate 37; of *Gracilaria* on plates 23, 31, 33; of *Lithothamnium* on plate 37.)

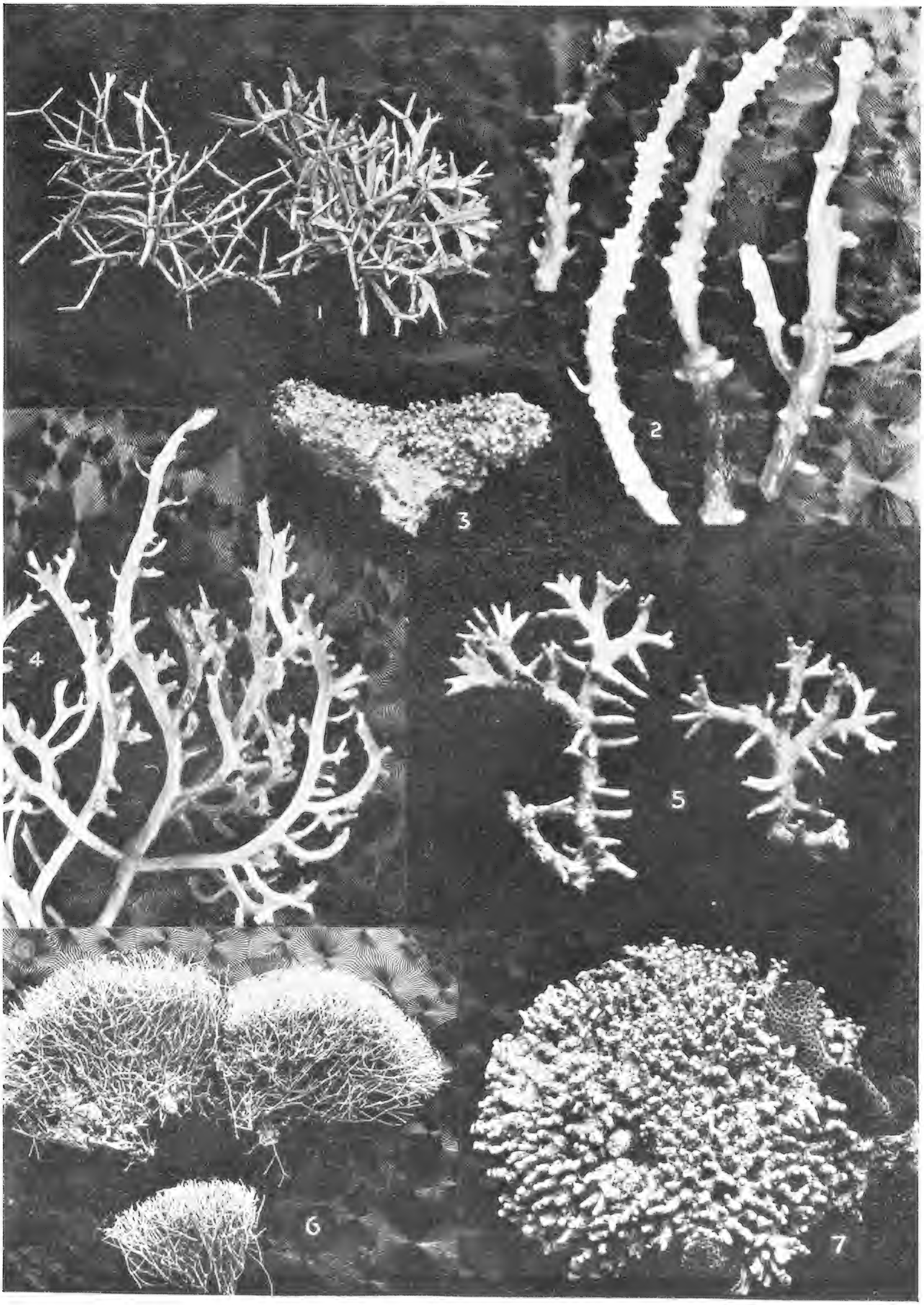
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PLATE 37

FIGS. 1 to 3. *Ralfsia expansa,* habit on fragments of shell. × 1.

4, 5. *Goniolithon Boergesenii,* habit of crusts with conceptacles. On No. 4, lower left, a portion of a lobe of *Aglaozonia canariensis.* × 1.

6. *Lithophyllum prototypum,* habit of crust with conceptacles on shell. × 1.

7. *Lithothamnium syntrophicum,* habit of crust. × 1.

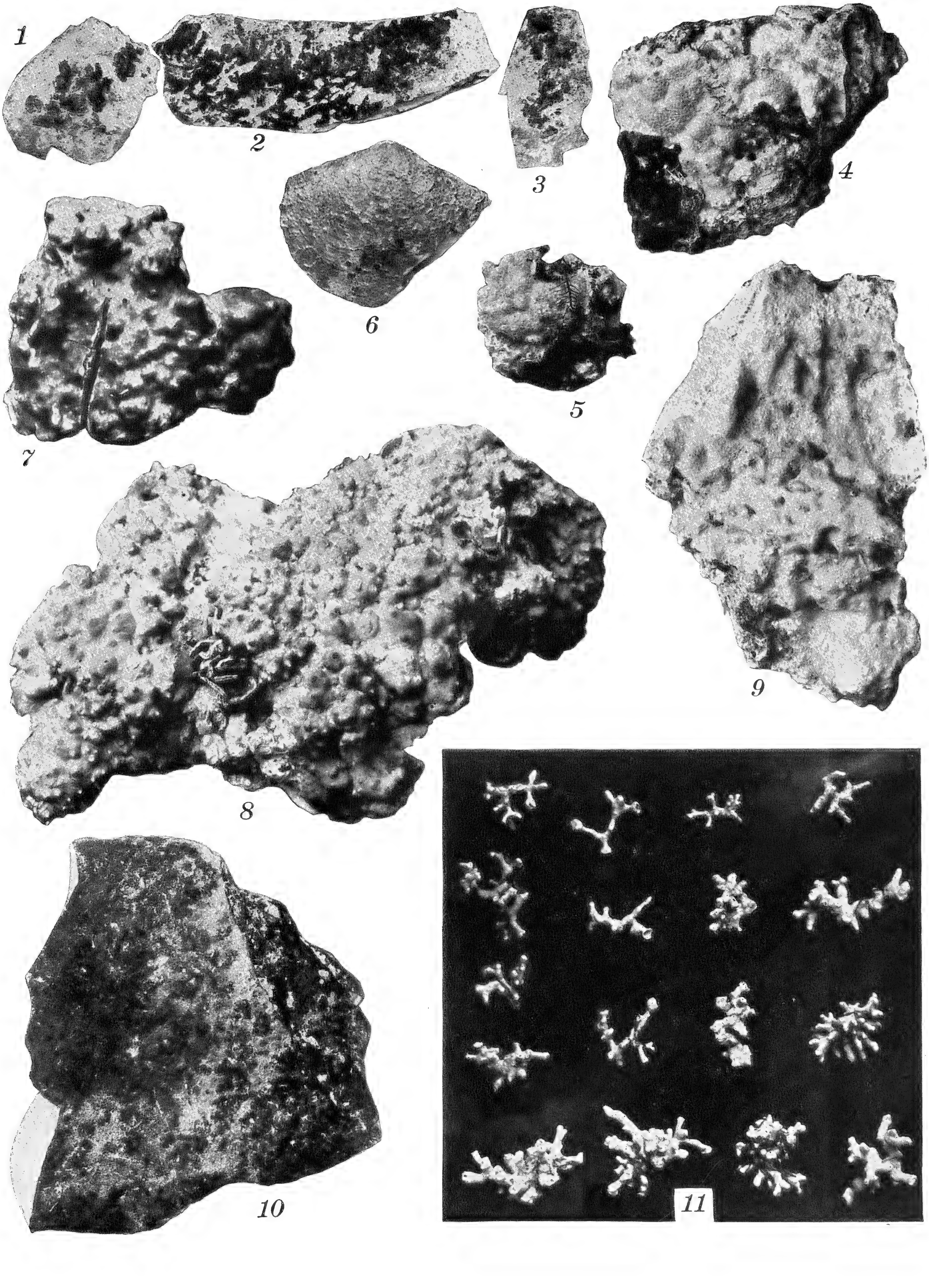
8. *Goniolithon solubile,* habit of crust with conceptacles. × 1.

9. *Goniolithon accretum,* habit of crust. × 1.

10. *Hildenbrandia prototypus,* habit of crust on piece of slate. × 1.

11. *Lithothamnium occidentale,* habit of several branched thalli from dredgings, some showing infundibuliform apices. × 1.

(Additional figures of *Ralfsia* appear on plate 15; of *Goniolithon* on plate 36; of *Lithothamnium* on plate 36; of *Aglaozonia* on plate 15.)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