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THE UNIVERSITY OF SOUTHERN CALIFORNIA

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VOLUME 12

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THE UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
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PACIFIC MARINE ALGAE OF THE ALLAN HANCOCK EXPEDITIONS TO THE GALAPAGOS ISLANDS

By WILLIAM RANDOLPH TAYLOR

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PREFACE

In the autumn of 1933, Dr. Waldo L. Schmitt of the U. S. National Museum broached the possibility of the writer's engaging in marine collecting in the warmer parts of the Pacific Ocean. Delighted at the prospect of such a chance to extend his phycological experience, he made the necessary arrangements to assure permission to leave his teaching duties. In due time a kind invitation to join the pending expedition came on behalf of Captain Allan Hancock, and was accepted with alacrity. There was little further time for preparation, but collector's gear for a phycologist not being very specialized, an outfit was soon assembled and shipped. Taking a circuitous route in order to establish closer relations with botanists at West coast institutions, the writer joined the staff on the *Velero III* before the end of December. This expedition spent about three months in the field, making stops on Baja California, Is. Revilla Gigedo, mainland México, Costa Rica, Panamá, Colombia, Ecuador, and especially the Galapagos Islands. In territory new to the writer's experience, the trip was altogether delightful, and produced a wealth of material. The attractive features of the *Velero III* and of the Hancock Expeditions have been ably described and illustrated by DeWitt Meredith (1939) and C. McLean Fraser (1943 a, b).

On returning to the University, full attention could not immediately be given to the study of this material because the writer already had in hand another considerable enterprise (Taylor 1937). However, the incidental collections of vascular plants, bryophytes and lichens, and the Myxophyceae were sent off for study by kind and skilled friends, and, so far as advantageous, reports on these have been published (Steere 1936, Drouet 1936, Dodge 1936). Of the labor of those associates who have generously given their time to the study and determination of the groups secondarily collected in 1934 and 1939, both those which resulted in immediate publication and those which did not, this is an appropriate place to express appreciation. Because of being singlehanded and short of time on land, these collections could be only fragmentary, but evidently they were not the less of considerable interest. Work was started on the marine algae of the expedition, but progressed slowly. It became possible to take many of the specimens abroad in 1937 to compare with specimens in European herbaria, a trip which also enabled the writer to prepare for publication an account of certain collections from the Strait of Magellan (Taylor 1939), thereby improving his knowledge of the flora south of the range of the Hancock Expeditions. Hardly was intensive work again begun, when another chance to get into the field under Captain Hancock's generous auspices developed. Since by this time the Captain had given the *Velero III* to The University of Southern California, the work came now more directly under that institution.

This 1939 trip did not entirely correspond in route to the 1934 voyage, but while supplementing the collections south to Panamá the party then went through the Canal and a month's work was done in the Caribbean. Since the writer had had more experience with algae from this than from any other exotic area, this was specially advantageous, but as a result he was again diverted from finishing with the West coast material until a susbtantial report on the eastern part of the 1939 Expedition (Taylor 1942) and certain other papers on similar material had been published. However, material in other groups worked up by collaborators (Sparrow 1940, Hedrick 1942) was immediately dealt with.

Finally, an account of the bulk of the 1934 and 1939 Pacific marine algae has been assembled. It shows that this area has a varied marine flora, of which a surprisingly large proportion of the plants have hitherto been undescribed. No doubt more thorough field work in the future will show still other new things we missed, and especially will connect the records we have made into a more continuous account of the flora of this coast. The present report is only the product of brief pioneering explorations, and much remains to be done to improve the completeness and the exactness of our knowledge of the algal flora of this area.

To Captain Allan Hancock, sponsor of these expeditions and master of the expeditions' vessel, the *Velero III,* for his many kindnesses, most grateful thanks are offered. Always thoughtful for the comfort of his guests, he made their work and leisure thoroughly delightful. The professional members of his crews also cheerfully gave every assistance to the scientific members in the arduous labor of dredging, and of landing parties and their equipment, often under conditions hazardous at least to the latter. That the scientists should occasionally lend each other a helping hand is to be expected, especially with the dredging, and Drs. C. McLean Fraser, H. W. Manter, and J. S. Garth, assisted by Fred Ziesenhenne and F. Elmore, did facilitate the writer's collecting on many occasions, but most particularly did Dr. Waldo L. Schmitt contribute to the tale of algae brought on board and mounted. Not only on the expeditions of 1934 and 1939 but also on several others under Hancock or other auspices, he secured interesting algae which the writer has been enabled to include in this account to its considerable enrichment. For some Schmitt material from earlier expeditions acknowledgement is due the U. S. National Museum, and for the *Hassler* specimens, the Farlow Herbarium.

Taking advantage of the special interests of various phycologists, the writer was fortunate in having certain genera determined by others: the contributions of Dr. Francis Drouet, Dr. George J. Hollenberg, Dr. Cheng Kwei Tseng, Dr. Francesca Thivy, and Dr. Ruth Chen-Ying Chou are designated in the systematic portion of the text.

To the scientists in whose care lie the algal collections chiefly consulted abroad and at home, most grateful acknowledgement is made for the hospitality of their institutions, in particular Dr. A. D. Cotton of the herbarium of the Royal Botanic Gardens at Kew, and Mr. J. Ramsbottom and Mr. Geoffrey Tandy of the herbarium of the British Museum (Natural History), Prof. Wm. Wright Smith and Dr. J. MacQueen Cowan of the herbarium at the Royal Botanic Gardens, Edinburgh, Prof. Harald Kylin for the use of the fundamental herbaria of C. A. Agardh and J. G. Agardh at Lund, Prof. Nils Svedelius of the Botanical Institute at Upsala for the use of that rich collection, Prof. Carl Skottsberg for the use of the herbarium at the Botaniska Trädgard, Göteborg, and to Dr. F. Børgesen, notable student of Caribbean and Indian algae, for his great kindness in arranging for the study of the algae at the Botanical Museum, Copenhagen. In this country particular assistance has been rendered by Dr. W. A. Setchell and, after his death, by Dr. H. L. Mason in loaning specimens from the University of California herbarium, by Dr. John T. Howell in loaning his algae from the *Zaca* Expedition in the herbarium of the California Academy of Sciences, by Dr. Ira L. Wiggins for the loan of specimens, particularly from the Hopkins-Stanford Expedition, in the herbarium of Stanford University, by Dr. M. A. Howe and, since his death, by Dr. Fred J. Seaver for specimens from the herbarium of the New York Botanical Garden, and by Dr. D. H. Linder for specimens from the Farlow Herbarium. Many of these botanists, and others, have in various ways given generous advice and aid, particularly Dr. W. R. Maxon, Dr. G. M. Smith, Dr. G. J. Hollenberg, and Dr. G. F. Papenfuss. The task of preparing the Latin diagnoses was assumed by Dr. Hannah T. Croasdale, for which signal service the writer is very grateful.

Two considerable works on West coast algae developed while this study was in progress and were brought to completion before it was printed. Dr. E. Yale Dawson under Hancock auspices visited the Gulf of California; he generously permitted the author to see galley proofs of his report, enabling a comparison to be made with that peculiar area. Prof. G. M. Smith has developed a marine flora of the region of Monterey, California, a much-needed study; he most kindly sent page proofs of his text for the writer's use. Since the systematic part of the present report was for the most part in typescript before these aids were received, they could not be referred to as comprehensively as might be desirable; nevertheless, they were of great assistance.

The University of Michigan Press has kindly allowed the author to draw freely upon his handbook of North American Atlantic coast algae in preparing the descriptions of the algae secured on the Hancock Expeditions.

Finally, cordial acknowledgement is made of the generous action of the Regents of the University of Michigan, which permitted joining these expeditions, and the Executive Board of the Rackham School of Graduate Studies for grants from the Faculty Research Fund for various expenses incident to the study.

Because of the short periods available at single stations, often only a few hours or the duration of a low tide, comprehensive studies of an area were impossible. Each represents but a reconnaissance visit; the sum total is probably considerably more complete because of overlapping floras, but the ranges of many of the algae probably falsely appear very limited. The classification of the material has proved very difficult. Our knowledge of the Northwest coast flora is fairly good down to southern California, but an account of the Rhodophyceae has never been assembled. Partial collections have been made in the Gulf of California, the Revilla Gigedo Is., and in a small way from the Galapagos Is. Thence to Peru there are only a few scattering applicable reports of algae. Our knowledge of Chilean algae is fragmentary and old. The area of this present report is, then, the least known of the whole West coast, it is climatically restricted, many elements of the flora seem rather isolated, and a conspicuous part of it is hitherto undescribed.

Since there has been less historical material on which to base this floristic study than usual, the writer has felt it wise to differentiate his plants as far as feasible from species of other areas. While this may result with further knowledge in reduction to synonymy of sundry names, it will be less damaging than confusing different plants under the same name, which is the alternative risk. From lack of complete reproductive material and from the intrinsic difficulty of studying the histology of marine algae from dried material, only tentative allocation of many new species to genus could be made. While regretting the manifest weaknesses of this report in these respects, the writer feels that they are largely inherent in a pioneering survey of this scope.

The first set of specimens, including the technical types of the newly described species, will be deposited with the Hancock Foundation; a second set, including portions of most of the type collections, in the herbarium of the University of Michigan; duplicates will be distributed from these institutions.

PACIFIC MARINE ALGAE OF THE ALLAN HANCOCK EXPEDITIONS TO THE GALAPAGOS ISLANDS

William Randolph Taylor

INTRODUCTION

The Pacific territory traversed by the 1934 and 1939 Hancock Expeditions was thoroughly familiar to Captain Hancock and some of his crew and scientists by virtue of frequent previous visits. As these had not involved a marine botanist, it was a new field in this respect, and this is the first general Hancock Pacific Expedition report of the marine plants of the region. For this reason it is appropriate to go into some detail regarding the history of algal study in the area, the actual operations, the aspect of the places visited, their main marine plant characteristics, and the general floristic relationships of this territory.

HISTORICAL REVIEW

Hooker (1851) and Howell (1941b) mention the brief visit to the Galapagos Is. of a notable collector, Hugh Cuming, in 1809; he was followed by Douglas, Scouler, MacRae, Darwin, Du Petit Thouars, and Edmonstone (Hooker 1851). Since this early period, visitors have been more frequent, and collections of vascular plants of a considerable degree of completeness are available in England and more particularly in America, though the lower cryptogams have fared poorly in these field activities. Of the more recent explorations only enough notice can be given to enable interested parties to obtain access, through their published results, to the quite considerable botanical literature now accumulated. We may mention a few, partly because they collected algae, partly for the importance of their other botanical observations. Algal records practically begin with the papers of Piccone (1886, 1889) on the collections of the *Vettor Pisani* Expedition, though Galapagos algal records are few. The United States Coast Survey vessel *Hassler* secured a few algae in 1872 (Pourtales 1875), and the United States Bureau of Fisheries vessel *Albatross* rather fewer in 1888, but these while identified in part were not directly published upon (Taylor 1930, p. 627).

The next considerable collections were those of Snodgrass and Heller, who secured the plants for the Hopkins-Stanford Expedition (Robinson

1902, p. 77); some algae were included, and these were reported upon by Farlow (1902, p. 89), this having been the first significant collection of algae made here. Following, we recognize the *St. George* Expedition where Dr. Cyril Crossland (1927) collected some algae, perhaps altogether coralline algae from Panamá and the Galapagos Is., which are reported by Mme. P. Lemoine (1929). Unfortunately, the Astor Expedition of 1930, on the yacht *Nourmahal,* though it did good work among the vascular plants, apparently did not produce any algae (Svenson 1935, 1938). The Templeton-Crocker Expedition of 1932 on the yacht *Zaca* did much better, Dr. J. T. Howell making considerable collections here and to the northward, which have been reported upon by Setchell (1937b) and by Setchell and Gardner (1937). Dr. W. L. Schmitt on several occasions collected algae in the islands, and at other places within the range of this report, but these materials are here referred to for the first time. These all taken together, however, were not enough to justify much analysis with respect to either the composition or the relationships of the Galapagos marine flora.

Conditions on the mainland have been even less satisfactory than on the Galapagos Is. Just south of our territory we have Howe's (1914) paper on R. E. Coker's Peruvian marine algae. There are hardly any references to Ecuadorean or Pacific Colombian marine algae. There are very few recorded species from Panamá, chiefly those of Lemoine (1911). For the coast north to México again there is apparently nothing, but here we have the important but brief paper of J. Agardh (1841), where several new species are described. The outlying Is. Revilla Gigedo yielded a number of algae to the California Academy of Sciences Expedition, and these, collected by H. L. Mason, have been studied and the flora analyzed by Setchell and Gardner (1930). The Gulf of California has fared somewhat better. Hariot (1895) listed a very few species, and later Howe (1911) a greater number on the basis of collections made at La Paz by G. L. Vives. The materials assembled on the California Academy of Sciences Expedition by I. M. Johnston, T. S. Brandegee, and W. E. Bryant, and by Dr. and Mrs. Marchant, were much more ample, and they were reported upon by Setchell and Gardner (1924); a further study by E. Y. Dawson appeared in 1944. Northward on the peninsula of Baja California small collections have been made and several species reported, especially in scattering notes by Setchell and Gardner, but there is no assembled account of them. Beyond the sources of our collections to the north, the coast comes within the range of resident botanists and, while much remains to be done, it is relatively well known.

EQUIPMENT

On the two expeditions here reported, the writer as botanist representing the University of Michigan brought with him thence all portable equipment. This consisted of the customary plant presses, ventilators, papers, glassware, mounting pans and zinc sheets, and all minor supplies. The ship's engineers constructed for botanical use two excellent drying racks which, electrically heated, circulated warm air through the presses and enabled material to be processed in 12-24 hours, seldom needing more. The ship was already amply fitted for dredging[1] even beyond the depth to which algae grew, and one of the launches equally adapted for use in shallower water. It is not the writer's purpose here to describe the handling of algal material in detail; with obvious adaptations to a tropical environment the necessary directions are those outlined by him earlier (Taylor 1937, pp. 9-18).

In general, tropical material is rather less quick to decay than northern material, but like it, should be kept in the shade with adequate water or aeration, and as cool as possible. It can, if immediate care is impossible, safely be stored in the ship's refrigerators, so long as it is not frozen. Material bruised by dredging, and especially material from deep and so very cold water, is liable to spoil rapidly and should be mounted without delay, or stored in the icebox. It is rarely possible to bottle each species separately, but it is advantageous, for each station, to put in one jar of preservative representative portions of all especially interesting types. These must have a particularly durable label written with soft pencil on good rag paper enclosed with the specimen. If the latter is rough or attached to shells or stones, the label must be protected from defacement. While not necessary on these trips, the writer has many times received excellent bulk material stored in 5-gallon kerosene tins soldered shut, and later crated for shipment. This is particularly suited for scientific expeditions operating from the shore, but is good for shipboard use also. The best preservative for algae is 4 per cent formaldehyde in sea water neutralized with a little borax, provided the specimens can be kept from strong light.

[1] For description and illustrations of dredging equipment and practice see Fraser 1943a, especially pls. 5, 6, 12-14.

GENERAL DESCRIPTIONS OF LOCALITIES

Baja California, México

I. Cerros[2]

Lying west of Ba. Sebastian Viscaino about halfway down the coast of Baja California is the rather large island sometimes designated I. Cerros and sometimes I. Cedros. It is characterized by high, steep hills with sharp ravines, and reddish rock, especially on the heights. The shore is abrupt and for the most part rocky. The Hancock Expeditions of 1934 and 1939 both stopped at the island. On the first occasion the vessel lay in South Bay and a considerable collection of algae was made. In 1939 it stopped at a small settlement about a cannery on the southeast end of the island. There was little opportunity to collect algae on this occasion, and only a few Myxophyceae were secured about the landing place.

On the earlier occasion an abundant flora probably similar to that of the southern California coast was noted. The tidal range was considerable and the surge moderate. The rocks showed a notable belt of pink coralline algae and numerous large types. Conspicuous Chlorophyceae were absent, but the Phaeophyceae were represented by large clumps of *Halidrys dioica* and many scattered plants of *Eisenia arborea,* and offshore by *Macrocystis pyrifera.* The larger Rhodophyceae present in quantity were mostly of *Prionitis* and *Gigartina,* especially *G. armata.* The important genus *Gelidium* was represented by the larger bushy types *G. densum* and *G. cartilagineum.* In the coralline zone on the rocks there were several species of *Corallina, Amphiroa* and *Bossea,* besides small crustaceous types, but no large crustaceous or bushy Lithothamnieae were secured, though no doubt had time permitted some would have been found by further search.

Bahía Thurloe[3]

The landing party from the Hancock Expedition of 1934 passed through very considerable kelp beds *(Macrocystis)* off the shore of Ba. Thurloe near Pto. San Bartolomé. The shore itself consisted of a broad shelf of rough bedded rock which extended in until it met a series of cliffs about 50 feet high, at the base of which there was a mass of tumbled rock. The shore did not have very good tide pools. In shallow water young

[2] For description and illustrations see Fraser 1943b, p. 65, pl. 31, fig. 69, pl. 32.
[3] *Ibid.,* p. 67, pl. 33, fig. 72.

Eisenias were noted, and in addition particularly *Colpomenia sinuosa* f. *deformans, Taonia Lennebackerae, Cystoseira osmundacea,* and some corallines. No dredging was done here which yielded any algae, and there was little washed ashore.

Point Hughes, Bahía Santa María

The party from the Hancock Expedition of 1934 landed at Point Hughes inside of Cabo San Lazaro, to the north of Bahía Santa María. The shore is of fissured and intrusion-lamellate rocks, forming rocky spurs alternating with sandy or bouldery beaches, backed by sheer cliffs of 20-50 feet in height. Two benches at elevations of approximately 15 and 30 feet above extreme high tide line showed rock fragments and fossil shells in vast abundance, apparently cemented by calcareous algae of an earlier period, and the ground near the top of the cliffs was strewn with the fossil operculae of mollusc shells.

In the intertidal zone there were good tide pools between the rocks, with an abundance of various stages in the development of young *Eisenia arborea, Codium,* Dictyotas, and *Padina Durvillaei.* Washed ashore there was a considerable mass of algae, which yielded numerous fully developed specimens of the *Eisenia,* a quantity of *Porphyra naiadum* on *Phyllospadix,* and *Hypnea Johnstonii.* Some dredging was done between 18 and 73 meters' depth, and this gave in particular *Nitophyllum uncinatum,* but no great variety of algae.

Nayarit, México

Isla Isabel[4]

No mainland landings were made in this province by the 1934 and 1939 Hancock Expeditions, but both of them stopped at the little I. Isabel. This island is of only very moderate height. The shore is partly sandy, partly of volcanic rock. It is a good nesting island, particularly for boobies and for frigate birds. It is also the station for a small group of Mexican shark-fishermen, who erect a flimsy shelter and spend a few months of the year there. Interesting though the island was on these accounts, it yielded little in the way of algae. There was a little *Ahnfeltia* on the surf-beaten rocks near high water, some small intermingled, matted forms, and little else. Dredging did not furnish any additional records.

[4] *Ibid.,* p. 139, pls. 66, 67, 68, fig. 146.

Las Tres Marías[5]

Considerably southwest of I. Isabel lies a small group of high, rocky islands called Las Tres Marías. The Hancock Expedition of 1939 effected a landing on the middle island, I. María Magdalena. This was done at considerable expenditure of effort and some risk, for there was neither safe anchorage nor suitable landing place about the islands. For the most part their margins are sheer cliffs, and even when there is no wind-whipped wave action the regular surges break heavily on their sides. As the surf crashed on the rock faces a few of us, as opportunity offered, leaped to footholds on the cliffs and scrambled up for such collecting as could be accomplished. It was obvious from the skiff that there was a good algal vegetation at depths and under surf conditions which made collecting impossible, and some even in the upper surf zone. However, when we got ashore the writer found that little could be secured. It was not possible to skirt the shore; all that could be done was to explore the little gully or open crevice in which he had landed. By clambering down the slippery cliffs as the waves receded, a small amount of dwarfed material could be prized or scraped from the rocks in the upper surf zone in the few moments before the return of the rollers forced a precipitous and uphill retreat.

At first considered altogether unpromising, the little samples were bottled; when studied later, they proved to have yielded about ten things, of which a couple were not otherwise secured. Dredging off these islands was even more successful, hauls at depths of 6-22 meters yielding some extremely interesting plants. The most important probably was a new species of *Haloplegma,* one of the few truly spongy Ceramiaceae of the American flora, a new *Bryothamnion, Dasya Stanfordiana* previously only known from the Galapagos, and *Amphiroa foliacea,* a western Pacific species, with other corallines.

Islas Revilla Gigedo, Colima, México

Isla Clarion[6]

The Is. Revilla Gigedo lie far offshore from mainland México, being much to the southwest even of the end of Baja California, but they are administratively attached to the province of Colima. The westernmost of the group, I. Clarion, was visited in 1934 and 1939. It lies at a consider-

[5] For description see Fraser 1943b, p. 139.

[6] For description and illustrations see Fraser 1943b, p. 70, pl. 74, fig. 157, pl. 75, fig. 159.

able distance from the other two members of the group, and a little to the south. The island rises to a considerable elevation, and the shore is for the most part exposed and rocky. The only good anchorage is at Sulphur Bay. What vegetation could be seen from the shore was poor and xerophytic. There were considerable cactus-covered slopes up from the beach, which was of fair extent, flanked by areas of highly lacunose lava. The shore line near the landing place was not favorable for a rich growth of algae. Neither here nor elsewhere on these trips where lava streams met the sea did this lava rock provide a good substratum for varied algal growth.

In the lava reef pools there was a considerable growth of a few species of green algae. In the highest tide pools only a few filamentous Myxophyceae *(Lyngbya, Symploca)* and a *Cladophora* were collected. Somewhat lower there appeared a good deal of *Dictyosphaeria australis* and *Lithophyllum bracchiatum.* Practically everywhere in the upper and middle intertidal area the lava rock was covered with *Hildenbrandia.* Most notable at a depth of a meter, and thence into deep water, was a great abundance of *Caulerpa racemosa,* which also was washed ashore in some quantity. With it, but somewhat less abundant and not common in quite so shallow water, were *Halimeda Tuna* and *H. discoidea.* On exposed rocky points there was a little different flora, but it was not possible to examine these well at the time of the visits. *Caulerpa racemosa* was again a major element, with an abundance of *Galaxaura filamentosa* and *Halimeda discoidea; Asparagopsis Sanfordiana* was also secured here.

There was a small amount of algal material washed ashore. The most curious element was a little *Macrocystis,* which had been tossed high up on the beach by a former storm, and which probably came from a considerable distance. Recently rejected material of *Caulerpa racemosa, Dictyosphaeria australis, Calothrix pilosa, Lithothamnium indicum* and *Jania capillacea* made up the bulk of this driftweed.

The Mason collections reported upon by Setchell and Gardner (1930, p. 111) show a considerable flora, reaching about 30 species, but there is no indication that these plants grew within reach from the shore; they were, rather, secured by dredging. The Hancock Expeditions also dredged successfully here, but the stays were brief and the hauls few, so that by no means a comprehensive view of the vegetation was secured. Nevertheless, with the shore collections a total of over 40 species was secured, with several others not certainly identified. The Mason collections include about 20 species which we did not find, there were about 10 in common between the lists, and we got upward of 30 which the earlier collections did not have. It may be clearly seen from the differences between the lists that one may expect many more species to be recorded from I. Clarion, and that our knowledge of the area is but fragmentary.

The dredging done off I. Clarion was very profitable, and some striking finds resulted. The depths reached ranged from 9 to 110 meters, mostly between 45 and 90 meters. There was a considerable variety of things in small amount. Most spectacular was a large quantity of *Halimeda Opuntia,* which in the Caribbean is chiefly a shoal water plant, *Codium longiramosum,* reaching several decimeters in height, and with lumps of such corallines as *Lithothamnion indicum* a great abundance of *Peyssonnelia rubra.*

Isla Soccoro[7]

Like I. Clarion, I. Soccoro is rather high with dry hills inland, sloping toward the sea, which generally is bordered by low cliffs. The shore vegetation is xerophytic with *Opuntia* cactus much in evidence, as on I. Clarion. Braithwaite Bay is the anchorage, visited in 1934 and 1939, and it is a small haven only, with very limited opportunity for shore collecting. There is a sandy beach at the head of the bay, with rocky points on each flank so hemmed in by basaltic lava cliffs that extended excursions are not practicable. The surf on the beach was not severe, but surges broke over the points in a dangerous fashion, so that collecting there was limited to the upper part of the tidal range.

The rocks between tide lines off the beach often showed round water-filled potholes. A very curious feature of these was the presence of *Neomeris* in them. While it never was abundant here, it was practically limited to these stations. In the tide pools generally the rocks were commonly covered with mats of *Wurdemannia, Gelidium,* and *Chlorodesmis.* In the upper ones *Lyngbya aestuarii* was common; below, there were large tufts of *Digenia,* Lithothamnieae, *Dictyosphaeria, Amphiroa annulata, Ralfsia,* and *Dictyota crenulata.* Limited to areas close to low tide line most exposed to the surf, and so difficult to collect, there was quite a lot of *Sargassum Howellii.*

Dredging off I. Soccoro produced less than off I. Clarion, a variety of things, but mostly in small amount. The depths surveyed ranged from 18 to 84 meters. Most notable constituents of the flora were *Lithothamnion indicum, Gracilaria confervoides, G. tenuifolia, Callithamnion pacificum,* and *Polysiphonia homoia,* but there was nothing of a spectacular nature.

[7] *Ibid.,* p. 69, pl. 74, fig. 158.

Jalisco, México

Bahía Tenacatita[8]

Both the 1934 and 1939 Hancock Expeditions anchored in Ba. Tenacatita. Both found this an entirely unprofitable place for algae, either along the shore or by dredging. Apparently the rocks were of a type unsuitable for the attachment of algae, for the place did not look unfavorable from a distance. Only one number was secured, an undetermined coralline on a rock. A most interesting and beautiful grove of oil-nut palms occupied the head of the bay, and with other features made the land vegetation attractive; the grove was apparently not being maintained in good condition at the time of the later visit.

Guerrero, México

Bahía Petatlán and White Friars Islands[9]

The mainland station on the shore at Ba. Petatlán was not a very productive one. Collecting in the littoral was only possible near high tide line. The shore was rocky, with smooth greenish-discolored boulders. In the water there was an abundance of smooth Lithothamnieae, which could not be secured in quantity sufficient for study, and also *Ralfsia,* which could not be gotten off in good pieces, but no evident *Hildenbrandia.* With this encrusting element there were *Sargassum* and *Chaetomorpha* in some quantity, and more especially cushions of *Jania mexicana* with *Centroceras* and the larger *Amphiroa peninsularis.* Little dredging was done about the bay, and only a few Lithothamnieae were secured.

Offshore from Ba. Petatlán there lies a spectacular series of about seven more or less separate bold, high rocky islets in a row, called the White Friars, of which four are of a considerable size. For the most part they rise in steep cliffs from the edge of the water; the rock appears to be of volcanic origin, and there are no beaches or practicable talus slopes above water. In rough weather quite impracticable, in very calm weather it is just possible to leap ashore in one or two spots when there is a momentary intermission in the breaking of the surges. In 1934 this was not attempted, at least by the botanist, but in 1939, with several members of the party, he landed on one of the larger islets.

These islets are brilliantly white with excrement, being a notable bird rookery, with boobies, terns, and bo'sun-birds predominating. The reek

[8] *Ibid.,* p. 151, pl. 68, fig. 147a.
[9] *Ibid.,* p. 152, pl. 69.

from them is quite impressive and drifts far down wind, so that it is quite offensive on shipboard, but once ashore the interesting bird groups soon make one forget the smell. Of vascular plants there were none visible, and probably no other land plants, but along the edge of the water there was a little growth of algae. What there was, was stunted, but *Chaetomorpha antennina, Laurencia,* and other genera could be recognized. Considerable dredging was done about these islands, particularly in 1934, but the hauls did not yield any profit in algae.

Oaxaca, México

Bahía Chacahua[10]

From the anchorage at Ba. Chacahua a long open beach extends to the west for miles. On the other side lies a rocky point with surf beating over the outlying rocks and the point itself. Behind the beach there is a considerable mangrove-bordered lagoon, fed by a stream draining the land behind, and in turn drained to the sea. At the time of the Hancock Expedition visit in 1939 no scientific work could be done on the point. This appears to be the usual condition here. However, a landing was effected on the beach near low tide, and the accessible shore line was investigated. There was a considerable growth of *Enteromorpha lingulata* on *Rhizophora* roots and *E. flexuosa* on dead sticks near by, but the expected vegetation of *Bostrychia, Caloglossa,* and *Catenella* was apparently absent. There was nothing washed ashore on the beach, and the rollers broke on the rocky point with such violence, even when the sea was quite calm offshore, that there was little promise of opportunity to work over that territory at any time. Dredging with the launch offshore yielded no algae. Embarkation with the ship's skiffs later in the day after the tide had risen proved impossible because of the increased violence of the surf. There was a small group of huts at the edge of the woodland behind the beach, and the men from this settlement took the scientific party off in a huge dugout canoe late in the afternoon, quartering the great rollers most skillfully.

Tangola-Tangola[11]

The shore line at Tangola-Tangola consists of headlands of a medium coarse granite, alternating with beaches of dull whitish quartz sand, and with rocky islets offshore. No streams emptied into the bay, but behind a barrier beach the land was marshy. The landing was easy, as the bay is a

[10] *Ibid.,* p. 153, pl. 73, figs. 156a, b.
[11] *Ibid.,* p. 153, pl. 73, fig. 155.

protected one and there was no sea running. There was more of the distinctive beach vegetation than farther south, including such characteristic things as *Ipomea pes-caprae*. Back of the beaches there was a woodland vegetation, then mostly in a leafless state, of such small trees as acacias, and five forms of cacti: columnar, mamillary, opuntioid, cereus, and ocotilla.

Collecting near high tide line showed that the rocks were colored with *Hildenbrandia*. In the sand over the rocks *Centroceras* was, as commonly, a binder plant. There were a fair amount of *Caulerpa sertularioides* and *Padina Durvillaei* on the rocks and a variety of things forming cushion and mat vegetations. In the pools Lithothamnieae were evident, but on the whole there were very few conspicuous algae either in sight or within reach.

Costa Rica

Port Parker, Guanacaste[12]

Port Parker is near Bahía Salinas, and near the northern boundary of Costa Rica. The coast in general is badly exposed to the pounding of heavy surf, but Port Parker itself is a protected harbor. A small river enters it, and there are a few patches of *Rhizophora* near the shore, which is for the most part bordered by a thicket of which Avicenna is a large element. Most of the woodland on high ground was not in leaf at the time we visited here. An *Acacia* with ant-inhabited thorns was conspicuous.

An islet lies at the entrance which, with neighboring rocky ledges, is much beaten by surf, but they are entirely accessible at low tide, particularly on the landward side. At the time of our visit an onshore gale made it particularly difficult. Without that obstacle, collecting here might have been even more profitable. The boulders on the beaches were green with a zone of Enteromorphas. The flora in the higher tidal pools was mostly myxophycean, with *Entophysalis, Dermocarpa,* and *Lyngbya semiplena* the conspicuous elements. In somewhat lower pools *Ulva* and *Enteromorpha* dominated. The rocks were exceedingly slippery. On rather more exposed rocks *Bangia* was conspicuous, and, below, the curious plantlike animal *Zoöbotrys* was to be found in large brown clumps, with the brown alga *Colpomenia ramosa* supposedly undescribed. Because of the rough weather no dredging was done.

[12] *Ibid.,* p. 157, pl. 76, figs. 162, 163.

Puerto Culebra[13]

The Hancock Expedition of 1934 stopped at Puerto Culebra. The country behind the shore was wooded. The low, dense woodland was mostly leafless when the visit was made, except for the occasional epiphytes and a few shrubs. It was notably interesting for the mixture of slender columnar cacti among the deciduous trees. The bay showed, near the north side of the entrance, a wide rocky shelf along the shore with good tide pools exposed at extreme low tide. The stone seemed of a traprock character; the surf broke on it, but moderately. As usual on this kind of rock there was not an abundant algal vegetation. In the higher tide pools there were widespread green felts of small forms, and some Myxophyceae, *Galaxaura,* and corallines. Somewhat inside the bay there was a shelf of coarse conglomerate rock, which had a good growth of *Enteromorpha lingulata* on it. Dredging done here yielded a few things of importance, especially a new *Chondria (C. platyclada),* but in very small amount.

Golfo Dulce, Puntarenas[14]

The Hancock Expedition in 1939 made a very profitable visit to Golfo Dulce, near the southern boundary of Costa Rica. A large bay with a broad entrance, it is very deep, but there is anchorage near the entrance on each side. The *Velero III* anchored on the western side, where rocky, clifflike points alternate with smooth beaches. A very considerable swell made working the cliffs for algae difficult, but a little north of them, nearer the sand, there were areas of broken rocks and boulders. Tide pools were to be found here and crevices between the boulders, where there were excellent collecting spots and it was possible to work out rather far at low tide.

The most notable element in the vegetation was the profusion of Galaxauras, eight so-called species by name, but probably the sexual and asexual forms of four species, nevertheless an unusual richness of this genus for the eastern Pacific. Furthermore, a large *Liagora* was common, and this genus too is seldom found on this coast. Quite abundant were *Padina Durvillaei* and *P. crispata,* with *Digenia* and other things. There was a well-developed mat vegetation on rocks of species of small stature, included in which there were a *Cladophora,* Gelidia, and Amphiroas. No effective dredging was done here.

[13] *Ibid.,* p. 158, pl. 80, fig. 171, pl. 81, fig. 172.
[14] *Ibid.,* p. 160, pl. 77, pl. 78, fig. 166.

Panamá

Islas Secas, Chiriqui[15]

In both 1934 and 1939 Hancock Expeditions parties landed in a cove in one of the larger of these small islands. The quiet surges broke very heavily and made the botanical collecting quite unsatisfactory, for it was not possible to get down to the lower rocks on the cliff faces or the broken rocks below. It is said to be a good station at low spring tides. What collecting was possible was done partly in a few tide pools and partly in gullies flushed by the surges. The rocks proved hard to break, and this made collecting of crustose forms difficult.

In the spray zone there was a quantity of *Bostrychia*. On the rocks *Isactis* was the main Myxophycean and the chief vegetation near high tide line. In the tide pools the rocks were discolored by *Hildenbrandia* and there were some Lithothamnieae. Other things were very scarce. No dredging was done in 1939, but a few Lithothamnieae were secured in about 27 meters in 1934.

Isla Jicarita, Veraguas[16]

The little I. Jicarita lies south of the somewhat larger I. Jicaron, which in turn is south of the large I. Coiba, on which there are reported to be some residents, but the smaller island seemed entirely undisturbed at the time of the Hancock Expedition visit in 1934. Behind the broad rocky foreshore there was a smoother beach of rock fragments and shells backed by woodland. This woodland was fringed by cocoanut palms, and on their old trunks and on other trees epiphytes such as bromeliads, orchids, and ferns were abundant, while a little farther in, some good examples of strangling figs were seen. This station at first sight seemed to have been favored with every advantage for a rich algal growth. The rocks formed a very broad sloping shore between tidemarks, with splendid tide pools. The surf was of a favorably heavy intensity, and there seemed to be a strong current between the islands. However, the rock was of a trap-rocklike character, and as on other occasions when such was met the algae were few. In the pools there were rare clumps of *Galaxaura* and patches of *Codium Setchellii*, while the rocks from the upper tide pools downward showed a very thin growth of slippery Myxophyceae, *Ralfsia*, and a few Lithothamnieae. In the lower tide pools there was also a thin felt of small filamentous forms which were not satisfactorily identified.

[15] *Ibid.*, p. 162, pl. 81, fig. 173.

[16] *Ibid.*, p. 163, pl. 83, figs. 176a, b.

Bahía Honda[17]

Bahía Honda is one of the most attractive of the customary stops made by Hancock Expeditions on the mainland, although not one of the most profitable from the phycological standpoint. As approached from the sea, it seems at first as if no entrance to the bay exists, for beautiful wooded points converge and overlap wooded islets within. Behind these, in the distance beyond the bay, rise high wooded hills. Even from the outside there are visible one or two simple huts. On close approach a channel opens out, and on following it through one enters a large, completely sheltered bay and excellent anchorage. There is a small settlement on the left of the entrance within. This, consisting of three or four board houses and several more of simple thatched construction, is most beautifully situated on the shore under cocoanut palms and other trees. It seems to exist by fishing and by boatmaking, but certainly was not prosperous. Particularly good dugout canoes were seen here, and others built up on the sides into sloops, and, finally, small sloops planked throughout.

The shore of the bay showed small sandy coves alternating with rocky points, but muddy shores are common below the rocks and especially near the settlement. Mangrove thickets appear in places on the mud banks. A small stream, very interesting for its flora of the striking aquatic phanerogam *Pistia,* enters the bay near the village. The wood also produced many interesting vascular plants of which few could be collected, but several orchids were seen in flower, and particularly numerous ferns.

Collecting of marine algae near the settlement was hopeless because of the muddy shore. However, one of the little islands near the entrance proved somewhat better. In high, sun-heated tide pools loose mats of *Cladophora, Lyngbya confervoides,* and *Centroceras* were abundant. Still higher on the rocks exposed to splash from the waves there was a good growth of *Bostrychia Calliptera.* The flora below was in general of crusts of *Hildenbrandia* and small turf-forming species of algae, and larger marine algae were lacking, although some drifting *Sargassum* was seen and some crustose Lithothamnieae and Janias were present. The rocks seem to be unfavorable for the attachment of large algae. Some dredging was done, chiefly outside the bay, but no significant amount of algae was secured.

Isla Taboga, Panamá[18]

There lie in the Golfo de Panamá two groups of islands. The outer of these are the larger and more important, and comprise the Is. Perlas

[17] *Ibid.,* p. 162, pl. 82, figs. 174, 175.
[18] *Ibid.,* p. 163, pl. 83, fig. 177.

group. Nearer to Balboa and Panamá are several small islands, of which I. Taboga is one. The Hancock party landed from the *Velero III* on the shore of an open bay, from which the land rises sharply. The shore is rocky but lacking in tide pools, and from but little below the water line the bottom appears muddy, there being no evidence of persistent surf action. The rocks were quite abundantly covered with the minute *Gelidium pusillum* and tufts of *Spyridia filamentosa,* but otherwise, except for a *Lithothamnium* on broken corals and for minor items, the shore line seemed remarkably barren.

Balboa[19]

As is generally found to be the case when entering a large port, the mooring places for the *Velero III* in 1934 and 1939 were too foul with oil and other refuse to permit the growth of larger marine algae on the wharves or stone piers. Nowhere near the piers was anything at all promising. However poor in quality, the quantity of slimy algal growth was considerable on the piling and fenders about Pier 15 in 1939 and no doubt on the others as well. It consisted of *Enteromorpha, Lyngbya,* and *Synedra tabulata* v. *parva* (Kütz.) Grun.,[20] sometimes in more or less independent colonies.

San Francisco

About the modern city of Panamá there did not seem to be any collecting station that promised well for algal studies. The shores were mostly very dirty. One excursion was made in 1939 to the outlying section called San Francisco. Here there were exposed at low tide very wide, flat, slightly shelving rocky stretches with abundant large pools. However, these were liable to heat badly in the sun from the complete absence of shade, and also the rocks and pools had a generally muddy sediment over them. These factors greatly limited their productiveness. Quite an assortment of samples was secured, but there were few which were identifiable. Most noticeable were *Wurdemannia,* an ill-developed *Dictyota, Bryopsis,* fragmentary *Ulva* and *Enteromorpha,* a crustaceous coralline, *Hildenbrandia* and, in the numerous dead sea shells, *Mastigocoleus.* There were no conspicuous species at all.

Barro Colorado Island[21]

Although the collections made on Barro Colorado Island do not enter into the present report, it seems worth while to record the botanical visit

[19] *Ibid.,* p. 164, pl. 84, fig. 179.
[20] Determined by Dr. Ruth Patrick.
[21] For description and illustrations see Fraser 1943b, p. 164, pl. 85.

made to the biological station and the excursion over the island and surrounding shores on the Hancock Expedition of 1934. Although not able to be present himself, the superintendent of the station, Mr. James Zetek, arranged with the Panamanian employees to act as guides, with the result that all the members of the party, and particularly the botanist, had a very profitable time there. A large number of species of ferns was the chief botanical harvest, and these have been deposited in the U.S. National Herbarium and the herbaria of the Hancock Foundation and the University of Michigan. The identifications were made by the kindness of Dr. W. R. Maxon of the National Herbarium.

Colombia

Bahía Utria, Choco[22]

The Hancock Expedition of 1934 went south from Is. Revilla Gigedo to I. Clipperton, a small atoll of disputed ownership far at sea. No algae were secured on this occasion, though Dr. Schmitt did get a very interesting sample from the lagoon on another visit (Taylor 1939). Thence it went direct to the Galapagos Is. for the major scientific work of the cruise. The visits in 1934 to mainland stations were made on the return voyage, but in order that the succession from north to south may be preserved they have been treated in geographical rather than chronological order, and the Galapagos observations will be placed last as a matter of convenience. In 1939 the Expedition went from Panamá into the Caribbean (Taylor 1942) and did not visit Pacific South American ports.

The most northerly South American station visited by the Expedition in 1934 was Bahía Utria. The country around the large harbor was intensely interesting botanically, but the shores of the harbor itself were very unproductive. Practically everywhere muddy or of mud-covered rocks where accessible, the collections by hand along the shore yielded a new *Halymenia (H. utriana),* crustaceous corallines, and a small *Gelidium.* On the higher rocks *Bostrychia* was seen, but apparently not collected. In a stream the rocks were red with a fresh-water *Hildenbrandia,* which was a very interesting find. Although considerable dredging was done here at depths of 27-73 meters, no algae were secured.

On the shores of the bay the muddy border was largely lined with brush and cocoanut palms. Some very poor thatched huts were built close to the water's edge, and there were a few people living there. In the woods the growth was heavy, with a fine development of epiphytes: aroids, bro-

[22] *Ibid.,* p. 166, pl. 87.

meliads, ferns, and orchids; and the writer had for the first time the pleasure of seeing here in the wild state the Butterfly-Orchid *(Oncidium Kraemerianum),* as well as a *Polystacha* and a *Brassavola.* The dampness of the woods rendered this a splendid place for collecting ferns, and numerous kinds were seen, including in particular several exceedingly delicate and beautiful Filmy-Ferns *(Trichomanes).*

Bahía Cabita[23]

The visit to Ba. Cabita will always be memorable to the writer as his first good opportunity to collect in a wet tropical forest. The bay seemed a promising one for algae in every respect, until close examination showed that the rocks had practically no large algal growth upon them. They seemed well placed, but except for a fair growth of small filamentous species and a very sparse development of encrusting types there was nothing to be had between tidemarks. In the splash zone at and above high tide mark there was, however, a little growth of *Bostrychia.*

The great attraction of this place lay in its wet, very dark forest. A small, rapid stream enabled some of us to penetrate the country for quite a little distance. On the rocks in the stream a small mosslike alga was quite common. While it is Rhodophycean, probably undescribed and not distantly related to *Batrachospermum,* it is interesting enough to deserve consideration apart from the marine algae, and will be held for a later report. That, however, at the time produced but minor enthusiasm. Here the writer first saw growing wild the famous Filmy-Ferns *(Trichomanes),* notable as having the leaf blade (except for the veins) translucent and but one cell thick. Able to survive only where growing in a nearly saturated atmosphere, these here covered dead sticks and the lower trunks of small trees with a deep green mantle. The light was so feeble that the attempts made to secure photographs in the woods were complete failures; although the writer was well familiar with plant photography in the woods, he greatly overestimated the light intensity. The list of fern genera noted here is too long to introduce into a report on algae. Only two kinds of orchids were noticed, but of one, a particularly interesting Lady-slipper *(Phragmopedium),* there was a very good clump.

Isla Gorgona, Valle[24]

This beautiful, rocky, wooded island was one of the most attractive spots visited. The high slopes, with trees of different foliage shades, were wooded down to the rocks of the shore line; and beautiful, delicate water-

[23] For description see Fraser 1943b, p. 166.

[24] For description and illustrations see Fraser 1943b, p. 167, pl. 88.

falls dropped within view from the boat. The landing place did not prove to be a good station for algae, but several species of ferns were collected in the woods behind the beach. The shore rocks yielded only a *Hypnea* in any quantity, except for the ubiquitous encrusting *Hildenbrandia* and a couple of Lithothamnieae. In the splash zone there was a good deal of *Bostrychia.* The minute species which formed a more or less sand-filled mat on some of the rocks gave a few small species to the record; the most important by far, being probably the first American record of the genus, was *Lejolisia (L. colombiana),* of which unfortunately only a small amount was segregated, and also a small amount of an apparently new *Dudresnaya (D. colombiana).* The island lies just north of the department of Narino, but by the best available source of information (Arenas Paz n. d.) appears to be administered by the Departemento del Valle.

Ecuador

Bahía San Francisco, Esmeraldas[25]

The approach to this station from the sea was exceedingly attractive. In entering, a village lay on the right hand, the houses built on high supports, mostly thatched, standing well apart with grassy areas between. Trees, mostly cocoanut palms, formed the immediate background, with a hill behind. On the other side were some wooded points, the nearest with a grove of tall cocoanut palms far overtopped by a few widely spaced, much taller trees on very high stilt roots. A small stream came down into the bay. The shores yielded very little in the way of algae, for they were broad, low, and muddy. On the roots of mangroves the appropriate vegetation of *Caloglossa, Catenella,* and *Bostrychia* was well established. Dredging yielded mostly mud and leaves brought down by the stream. One interesting *Amphiroa* found here *(A. franciscana)* appears to be undescribed, and also one small *Gelidium (G. sclerophyllum).*

Isla La Plata[26]

This island, like so many other stations, gave good promise, yet on close inspection proved to have a type of rock inhospitable to large marine algae. The wave conditions, the current, and freedom from mud or freshwater intrusion seemed ideal. Except for a few crustaceous corallines and some algae in shells, only a matlike growth of *Centroceras* was seen on the rocks. Dredging proved hardly more profitable, and the most interesting item was the same *Chondria platyclada* secured at Puerto Culebra.

[25] *Ibid.,* p. 168, pl. 89.
[26] *Ibid.,* p. 168, pl. 90, fig. 192.

La Libertad, Guayas[27]

This place was more of a modern settlement than most of those visited by the Hancock Expeditions, which generally avoided such places and stopped only at such cities as Panamá and Guayaquil because of the necessity for local arrangements. La Libertad is the port for Santa Elena. This is somewhat of a resort town, though very small and simple. The shore vegetation of algae was quite fair; some time was spent collecting on the near beach and some on the fine rocky shore of the far side of the point at Salinas, where the growth was much richer. The beach chiefly yielded plants washed ashore, most notably Gracilarias and *Padina.* From the rocky shore several things appeared to be undescribed, altogether at least six, of which a *Monostroma* and a *Sargassum* seem to be especially noteworthy.

Guayaquil[28]

In 1934 the Hancock Expedition first made the trip up the Rio Guayas to Guayaquil. For the botanist this was a memorable experience, his first trip up any part of a large tropical river. The vegetation along the shore as viewed from the boat was most attractive, and particularly strange were the often immense islands of vegetation floating down the stream and reversing with the turn of the tide. Little practical botanizing could be done, but *Salvinia,* a very interesting little water fern, was dipped from the river. The city itself received the full attention of all members of the party for the four days of the visit, and no botanical excursions were taken into the country.

Archipiélago de Colón

The annotated list of species collected on the Hancock Expeditions from the Galapagos Islands (Archipiélago de Colón) includes those species which Dr. W. L. Schmitt has collected, and those from the *Albatross* and *Hassler* Expeditions, so far as they have come into the hands of the writer, together with his own from the Hancock Expedition of 1934. Further, the plants reported upon by Farlow (1902) have been reexamined and references to most of them included. Howell's collections have been examined; but, since Setchell's (Setchell 1937b, Setchell and Gardner 1937) determinations of these are recent and authoritative, it has seldom been necessary to discuss them. The only important collection not available to the writer, and of which he is aware, is that reported by

[27] *Ibid.,* p. 169, pl. 91, fig. 193.
[28] *Ibid.,* p. 170, pl. 92, fig. 195.

Piccone (1886, 1889). However, while no attempt has been made to make this a complete algal flora of the Galapagos Is., the only considerable omissions are the new species recorded in Setchell's (loc. cit.) readily accessible papers.

The general character of these islands has been many times described, probably most notably by Darwin, and the flora also by numerous visitors, the accounts of Robinson (1902), Howell (1934, 1942), Svenson (1935), and Acosta Solis (1937) probably sufficing through their contents and bibliographies to give an adequate introduction to anyone desiring to search the literature dealing with the area. The paper of Stewart (1916) describes the botanical conditions on each island. It would be presumptuous for the writer to deal with the general floristics of the archipelago, or with the general history of exploration there, on the basis of his brief personal experience and specialized field of study. However, later he will attempt some generalization with respect to his own particular interest, the marine algae, which have otherwise been largely neglected by botanical visitors.

Some, but not all, of these islands have a legitimate Spanish name or names, and in listing the species these have been adopted, but in the cases of certain islands and minor sites no vernacular name could be located, and so in these the English names on the U.S. Hydrographic Charts, particularly no. 823 and no. 1798, have been followed.

Isla Wenman[29]

I. Culpepper is a little more northerly than I. Wenman, but was not visited by the Hancock Expedition of 1934. These are the smallest and most outlying independent islands of the archipelago, and are situated at about 1° 30′ N. L. I. Wenman itself is a bold and striking object, the reported height being 830 feet. Approaching the anchorage from the northwest and west one passes by a low, flat, outlying islet and a portion of the main island which have abrupt, often vertical cliff shore lines, probably without a landing place. On the south side of the anchorage are one or two quite high, very abrupt-sided islets, one with a great hole through it at the water's edge, which are likewise inaccessible. The main island from the sea appears as a towering mass with great cliffs for the most part dropping sharply toward the sea, and near the water's edge about vertical. This massive rock face is somewhat curved, and in the westward-facing concavity there is an anchorage which is good when the

[29] *Ibid.*, p. 218, pl. 105.

wind is not from the west. Rock falls have produced near the northern end of the cliffs a talus slope which is a quite practicable landing place, although by no means completely protected from the sea. The rough rocks and cliff ledges were evidently a favorite nesting place for birds, particularly the frigate birds, the males of which at the time of our visit were resplendent with the huge inflated red neck pouches of their nesting season. Except for lichens no land plants were noticed here; however, things on high ledges and along the ridges would have been inconspicuous from the shore.

The attached algal vegetation was not very considerable. The only common species were a small form of *Caulerpa peltata,* the undescribed *Bryopsis galapagensis, Hildenbrandia,* and a small Rhodophycean forming mosslike mats on the rocks. Dredgings produced a little *Plocamium* and *Carpomitra* from presumably 183-270 meters' depth.

Isla Isabela[30]

The next three relatively small islands of the archipelago, I. Pinta (or Abingdon I.), I. Marchena (or Bindloe I.), and I. Tower, lie a little to the northeast of the larger ones and were not visited in 1934. Isla Isabela (Albemarle I.), which was visited at various places, is by far the largest. The Equator passes across the northern portion of the somewhat distortedly boot-shaped island, where there is one of the four peaks which reach at least 4,000-feet elevation. The shank portion runs southeast, the foot portion southwest, with the junction constricted and relatively low. The chief mountains are volcanic, and the one in the southwest section is the highest in the islands, 5,000 feet, but four others are from 4,320 to 3,780 feet, and are conspicuous features, as in lesser degree are many smaller cones and hills.

The first landing was made on the northeast corner of the island near Albemarle Point. Inland the ground was high, but the shore was locally accessible, and on the sandy beach appeared occasional sea lions. Behind the shore there was a considerable mangrove-fringed, brackish lagoon. This first received attention; the growth on the roots included *Calothrix* as well as the expected Rhodophyceae. The rocks in the lagoon showed a growth of *Hildenbrandia,* with various Myxophyceae and especially the same *Calothrix* about the border. Another inland salt-water pool contained an undescribed *Galaxaura,* for which genus this is an unusual location.

[30] *Ibid.,* p. 219, pls. 110-113.

The outer shore supported a conspicuous population of *Padina Durvillaei,* but not much else, except that where mangroves reached the shore their roots again had a characteristic vegetation of *Rhizoclonium* and *Bostrychia,* and mats of *Centroceras* on the rocks. Drifting near the anchorage was a great amount of *Sargassum,* and one of the best collections of the expedition was made here, yielding four kinds. Dredging produced very little on this occasion.

The second stop on I. Isabela was south of Banks Bay, and here one of the members of the crew gathered small algal samples from the shore and from a lagoon. The only considerable amount was of a new variant of *Chaetomorpha brachygona* collected in the lagoon, but a *Gelidium (G. galapagensis)* from rocks on the shore also seemed to be undescribed.

The *Velero III* anchored at Tagus Cove, an excellent sheltered harbor, and this permitted good dredging. Shore collecting yielded little of algae, though the peculiar flightless cormorants and the marine iguanas were most interesting. The dredge from 27-55 meters' depth brought up quite a variety of plants, including *Leptocladia, Kallymenia, Nitophyllum,* and *Scinaia;* but, while some appear to be hitherto undescribed, the types have been selected from other stations. Drifting material of *Colpomenia* was considerable and it was also seen attached; *Sargassum* was extremely abundant adrift and some ten numbers apparently different in the field were segregated, representing perhaps seven variants, but not all could be identified.

A short launch run to a reef north of the Cove gave a much better opportunity to collect between tidemarks. Here the algal flora was quite luxuriant and good sets of specimens of several things were secured. Most spectacular was the beautiful *Plocamium pacificum,* of which excellent plants were collected. As less showy but scientifically much more important may be mentioned the notable endemic *Glossophora galapagensis,* the probably undescribed *Spatoglossum albemarlensis,* and a fine flat *Galaxaura,* with many minor items.

The next important stop, at Pt. Christopher near the southwestern end of the island, was peculiar for the excellence of a few things secured, although the botanist did not get ashore. The boat anchored so that Mr. Chas. Swett could go ashore to take photographs of a spectacular group of little volcanic cones and craters near the shore; the landing was very difficult, but in addition to bringing off his cameras intact he secured a few handfuls of algae from the rocks. Meanwhile, the writer was able to dip up from the boat other floating materials. From each of these sources he secured novelties, *Pterocladia robusta* adrift and *Laurencia opposito-*

clada and *Chondrus albemarlensis* from the shore. In addition, the very striking *Dendrymenia flabellifolia* and *Asparagopsis Sanfordiana* f. *amplissima* were secured in quantity.

Several days of activity on other islands intervened before the next visit to a station on I. Isabela. This time it was a relatively sterile visit to Cartago Bay on the east coast. A few good pieces of *Padina* and quite a nice collection of dead shells discolored by boring algae were secured. As the shores were more often rocky than sandy beaches, such shells were seldom secured in the Galapagos.

Isla Fernandina[31]

One visit was made to I. Fernandina (Narborough I.), primarily to see and photograph the large colony of marine iguanas there. These iguanas (*Amblyrhynchus cristatus* Bell) were dark grey-black with moderately long tails, of very pacific disposition and well able to swim in the sea, as the party demonstrated several times for the benefit of the cinematographer. However, certain features of the algal vegetation were striking. Little of interest appeared on the outer shore rocks, although there was a little *Bostrychia* about high-water line. The lava was exceedingly irregular and difficult to traverse, until one reached the level ground back from the water's edge. There, the country was open, with scattered clumps of cacti. Inland a salt-water lagoon was found, the bottom of which was covered with immense beds of *Caulerpa racemosa.* About the edges of the lagoon *Calothrix* was equally abundant. A member of the party saw and shot a "shell" turtle in another small inland pool, apparently free from vegetation; in its stomach was a quantity of broken algae which when mounted and studied in detail seemed clearly to be *Gelidium filicinum,* not otherwise collected on this expedition.

Isla San Salvador[32]

Visits were made to localities on both sides of I. San Salvador (James I.) in 1943. On the western side James Bay was visited. The algal collecting was very poor, yielding small samples of *Enteromorpha* and *Ulva* from the intertidal rocks on the beach. A spectacular feature of the place was a colony of pink flamingoes in a thicket-fringed lagoon behind the beach, and another, less beautiful but quite amusing, was the large number of wary goats in a ravine leading back from the shore. Dredging here yielded *Gracilaria panamensis* and two other lesser Rhodyphyceae in very small amounts.

[31] *Ibid.,* p. 219, pl. 109.
[32] *Ibid.,* p. 222, pls. 124–128.

On the eastern side of I. San Salvador the Expedition visited I. Bartolomé in Sulivan Bay. This little island was of great interest, because from the summit a large number of old but intact hollow volcanic craters were visible close by, some on shore and some just submerged; others could be seen a little distance away on I. San Salvador. The shore collections yielded a *Rhizoclonium* from a damp spot near the shore, and from the rocks a branching *Lithophyllum,* some encrusting corallines, and minor items. Dredging was not productive.

Isla Baltra[33]

Directly north of and close to I. Santa Cruz lie North and South Seymour islands (the latter I. Baltra), both quite small. The 1934 Hancock Expedition visited a small bay on the southwest side of Isla Baltra, the larger of the two, particularly to observe and photograph the iguanas there. These (*Conolophus subcristatus* Gray) were very different from the serrate-crested, blackish marine iguanas, living in the scrubby woodland behind the beach and being dusty reddish brown with heavy bodies and short tails; definitely wary, they were quite able to inflict a vicious bite when captured, and ambitious to do so. Later, on shipboard, they became reasonably tame.

The vegetation of the island was rather open; behind the beach and the bordering zone of scrubby trees the gradually rising ground became very rough, of broken lava with scattered rather than contiguous shrubs, cacti, and small trees. We did not penetrate far, having enough to do along the shore. However, the collecting along the coast was not very productive; mostly of broad and long beaches near where we landed, there were occasional small rocky points. In the pools on these we secured *Hildenbrandia, Lithophyllum, Lithothamnium,* and *Ochtodes.* The dredging done here was much more productive, from 9 meters yielding quite a variety including a new *Rhodymenia (R. decumbens),* two Sarcodiothecas, two Scinaias, *Padina,* and *Sargassum.*

Isla Santa Cruz[34]

The Expedition visited Academy Bay on the south shore of Isla Santa Cruz, (Indefatigable I.), second largest of the archipelago. In addition, collections made by Dr. W. L. Schmitt on the east coast at Gordon Rocks are listed in the systematic portion of the text.

[33] *Ibid.,* p. 225, pl. 117, pl. 118, fig. 246.

[34] *Ibid.,* p. 224, pl. 114, fig. 238, pl. 115, pl. 116, fig. 243.

This island station is located at the tiny settlement where a remnant of a Scandinavian fishing colony was represented by three families, with relatively adequate living facilities by Galapagos standards. The industry apparently was not thriving at the time of our visit. At the edge of the settlement a narrow rocky channel at the base of a high cliff led back into a lagoon behind the houses. This cliff was crowned by a spectacular growth of candelabralike cacti *(Cereus Thouarsii),* and of arborescent *Opuntia echios gigantea.* This is a famous and often-described locality (Howell 1934). The rocks accessible about Academy Bay did not yield many intertidal algae, although here small collections of *Blossevillea* and *Padina* were made. On the roots of the mangroves, which grew in white mud in the lagoon, there was the familiar vegetation of *Bostrychia, Catenella, Caloglossa,* and *Rhizoclonium.*

However, the dredging done at this locality by Dr. C. McL. Fraser while the shore party was busy was a spectacular success. Unfortunately no depth data seem to have been kept; from the types of plants included the range must have been great, from a few meters below low tide line to pretty deep water, and probably several hauls were made. About a dozen kinds of algae secured here seem not to have been previously described. By far the most notable was a fine *Eisenia (E. galapagensis)* in good quantity, the only kelp found at the Galapagos and quite outside the expected range for a plant of this group. It was secured at other Galapagos stations at approximately 50 meters' depth, so probably grew at that depth here also. The other Phaeophycean genus represented was *Spatoglossum,* and of Rhodophyceae *Sarcodiotheca, Acrosorium, Delesseria, Myriogramme, Nitophyllum, Pleonosporium, Platythamnion,* and *Chondria* all yielded novelties. There were also a number of interesting things not described as new from this station but from other Galapagos sites, and some which were known elsewhere than the Galapagos but appeared here as unexpected elements in the flora, such as *Desmarestia munda.* This, after the I. Santa María stations, was the best in the Galapagos for dredging.

Isla San Cristóbal[35]

Of the perhaps but four regularly settled places in the Galapagos at the time of our visit, only two had any considerable number of people, one a plantation on I. Isabela which we did not visit, and the other the little settlement on I. San Cristóbal (Chatham I.). Though the port, Wreck Bay, had few, there were more people inland at the village, which we did

[35] *Ibid.,* p. 226, pls. 119, 120.

not have time to see. The few houses at Wreck Bay, the corrugated iron administrative building, and the simple lighthouse had but a very few inhabitants, a military guard of three men and the Commandant, who represented the civil and military government of Ecuador in the islands. No algae were secured here, though rocky areas interrupted the sandy shore around the anchorage.

Isla Santa María[36]

By far the most often mentioned in the public press, I. Santa María (I. Floreana or Charles Island) is one of the two southernmost of the group, and not at all large. At one time the island was used as an Ecuadorean penal colony, but of this little more remained than some shelters which were partly in little caves, at the time of our visit. The population at that time consisted of three family groups, people who had been unable to adjust to their central European homeland and had come here to try under precarious circumstances to maintain themselves. Living a distance apart, these groups each depended for its existence on the water from a feeble spring, on a few plants grown with great effort in a small garden plot, and on the wild cattle which roamed the island, since there was no considerable water source in this porous volcanic rock and no considerable surface soil on the rough land for agriculture.

The island slopes up rather gradually to the chief volcanic summit and the other hills which rise over the otherwise moderately low surface. The terrain is quite rough, with broken lava, and a scrubby vegetation growing in the interstices of the rocks.

One or two walks along the trail to the highest of these little clearings were the extent of the botanical adventuring possible, apart from the marine work which was the proper purpose of our visit. Near the springs some very interesting xerophytic ferns were found, and on the trees along the trail a quantity of moss and lichen growth, especially *Ramalina*. We were unable to give time enough to go up to the summit of the island, where a more lush vegetation is reported in the old crater.

The shore collecting was done on the north coast, at Black Beach Anchorage and at Post Office Bay, chiefly the former, whence a trail led to the clearings. Post Office Bay is named from the barrel on a post which, since the days of whaling ships, has served as a repository for mail, each visiting vessel taking along what is found waiting and forwarding it from the first postal port next touched. Here there was a unit of the fishing settlement mentioned earlier, with a fairly good-sized building and the

[36] *Ibid.*, p. 227, pl. 121, 122, 123, fig. 257.

remnants of electrical and mechanical equipment, now all abandoned. Shore collecting here did not amount to much. Dredging, however, was excellent here and yielded many things, which with other I. Santa María dredging will be discussed below.

At Black Beach Anchorage the sand was, as the name would indicate, very dark blackish brown, a surprising contrast with the brilliant white coral sand found at many of our stops. The beach was backed by an abandoned clearing made attractive by numerous *Parkinsonia* trees. Rocky outcrops ran down into the sea, and the shore collecting done from this center was very productive indeed. As we made two stops at I. Santa María of some days' duration, far more serious work could be done there than at any other place visited, and the results reflect the better opportunity. Repeated visits to the rocky pools and ledges were made at low tide and many collections secured. Although the male sea lions did occasionally chase us away for a time, the females and young ones, which commonly were present, did not as a rule pay any attention, or swam away. On the high rocks spectacular *Cereus* and *Opuntia* trees were prominent features of the vegetation, with various large spiny shrubs below. In the intertidal zone, and within reach at low tide, the variety of algae was great. It was possible here to study relatively sheltered pools, and rocky points exposed to considerable surf. The dominant algal species appeared to be *Blossevillea galapagensis,* a notable fucoid endemic known from the time of the *Vettor Pisani* Expedition. This grew high on the littoral rocks in great abundance. Also common were *Ectocarpus tomentosus, Padina Durvillaei, Gelidium Hancockii* (new), *Lithophyllum Farlowii, Spatoglossum veleroae* (new), *Amphiroa peruana, A. dimorpha, Caulerpa racemosa, Codium isabelae* (new), *Pachymenia saxicola* (new), *Tylotus ecuadoreanus* (new, from a very exposed situation in the heavy surf), *Herpophyllon coalescens,* the first collection since the type was brought in by the Hopkins-Stanford Expedition, and a very curious endemic, and finally the morphologically interesting *Dendrymenia flabellifolia,* a more southern plant. The list of relatively scanty items, including several novelties, is far too long to cite.

Dredgings off Post Office Bay and Black Beach Anchorage may properly be considered together. The depths ranged from 6 to 183 meters, but the greatest depths were on a sandy bottom and not productive of algae. However, effective dredging to 55 meters was done and a large assortment of good deep-water marine algae secured, far too large to adequately discuss here and by far the best of the expedition. Of presumed novelties over a score of types came from this series of hauls. There are too many to designate even all the genera, but particularly striking are the representatives in *Zostcrocarpus, Sporochnus, Carpomitra, Desmarestia, Dictyota,* and *Dictyopteris* in the Phaeophyceae; in fact, it is very surprising that there are so many Phaeophyceae which are novelties in this series.

Isla Española[37]

The last and most southern of the islands visited by the Hancock Expedition in 1934 was I. Española (Hood Island), or rather, points in Gardner Bay on its northeast coast. One must note that there is a Gardner I. a short distance southeast of I. Santa María, and another one smaller and of less elevation in Gardner Bay. Furthermore, there is an islet in Gardner Bay called Osborn I. on detailed charts. This is where the intertidal collecting was actually done, and the dredging was chiefly carried on between the islet and I. Española. The shore collecting was not rich. There was an abundance of a new *Derbesia (D. prolifica)* on old corals, but very hard to secure in suitable form for mounting. With it were *Centroceras* and *Caulerpa peltata,* a good deal of *Amphiroa dimorpha,* and early stages of *Lithophyllum Farlowii.*

Dredging in Gardner Bay fell into two classes, one from muddy bottom at about 55 meters' depth and one from a rocky bottom at about 37 meters' depth. Both were productive. As one might have expected, the large plants on the soft bottom were few in number, in fact but three species. The rest were delicately filamentous types, and two Callithamnia from this station appear to be new. The hauls from off the rocky bottom brought in, however, many more large species, though few in large quantity, the most striking familiar species being *Dasya Stanfordiana* and the prominent novelty a new *Kallymenia (K. latiloba).* From Gardner Bay the Expedition left for Guayaquil, which in following the geographical rather than the chronological sequence has already been discussed in relation to the work of the expedition.

GENERAL CHARACTERISTICS OF THE ALGAL FLORA

The Chlorophyceae found in the Pacific territory surveyed by the Hancock Expeditions are not a conspicuous feature of the vegetation, and include few striking species. Of the 23 genera and 60-odd species, less than a dozen appear to be novelties, and of these a third are only of varietal rank. The flora is not a varied one and lacks much of the interest

[37] *Ibid.,* p. 228, pl. 123, fig. 258.

attaching to the corresponding vegetation of similar areas, particularly coral reef areas, in the Caribbean and the western Pacific. While the genus *Codium* is well represented, such notable genera as *Avrainvillea, Penicillus,* and *Udotea* are absent; in Dasycladaceae there are only two representatives; Valoniaceae are few and scarce, and even Cladophoras were seldom met with. The Chlorophyceae of this territory were predominantly plants of the littoral and tide pools, only 5 not being found here at all, though several occurred at some depth as well as in shallow water. The species found were seldom secured from more than one or two of the areas into which the surveyed territory was, somewhat arbitrarily, divided. This more detailed field work will no doubt alter. When attempting to analyze the flora on the basis of range within this area, it soon becomes clear that there is little of a decisive character. The most tropical genus, *Caulerpa,* has a scattered distribution throughout the territory. The genus *Codium,* tropical and warm temperate, was met in more areas in the southern than in the northern and presumably warmer portion. This is true for the Galapagos Islands as well as for the territory in general. The relations of the species in this population to those of other parts of the world are also very scattering. The most noticeable elements are those which have a general distribution in tropical and subtropical areas, those of western Pacific of northern Pacific range. There is nothing in the Chlorophyceae to suggest any significant Caribbean element. It is not surprising that there is little in common with the recorded flora to the south, for this is ill known. However, there are only about one fifth of the species in common with the list from the Gulf of California; the writer has the feeling that as the areas are more thoroughly studied the correspondence will be considerably closer, and more so in Chlorophyceae than in other algal groups. As nearly all the specimens available to the writer were collected in the first third of the year, nothing can be said about seasonal changes in the composition of the flora.

The Phaeophyceae present a very different picture from the Chlorophyceae, but still one which it is dangerous to interpret too closely. In contrast with the green algae, they are a truly conspicuous feature of the marine vegetation at times, although, except in a few situations, they do not dominate as they commonly do in cold northern seas. There are represented 24 genera and upward of 50 species. Since endophytes, minute epiphytes, and certain species of *Ectocarpus* which would raise the number considerably are not included, this represents a quite varied flora, as Phaeophycean floras go. There are many items of very great interest, for the subtropical and tropical element is marked and there are numerous endemics. Dredging produced nearly as many species of Phaeophyceae as were found in the littoral, counting *Sargassum* driftweed as dredged, for the drifted species generally came from the sublittoral, and less than a sixth of the whole list occurred in both littoral and deep situations. In contrast to the Caribbean area, we have here no truly pelagic Sargassa; considerable beds of *Sargassum* do occur, rather more often at moderate depths than in very shallow water, and weeds torn loose from these may often drift widely, but do not lose the characters of the attached plant.

The distribution within the area under survey was also in contrast with that of the Chlorophyceae, exhibiting marked restriction. Of the 13 species found on Baja California, only 5 appeared reliably to the southward. This is not a fair representation of the Phaeophyceae of Baja California, but it does call attention to the degree in which striking elements of the temperate flora of the Californias end there, for *Taonia, Zonaria, Macrocystis, Eisenia arborea, Cystoseira,* and *Halidrys* were not found to the south of the peninsula and none of the marked types of the southern flora were found so far north except *Padina Durvillaei.* One should remember that only the southernmost fraction of the peninsula's outer shore is considered to be in the tropical algal zone (Smith 1944). It is very striking how exceedingly few of the plants of the outer side of the peninsula, of the coast to the south of the Gulf, or of the outlying islands appeared in the Gulf itself, altogether only about a half dozen. The Is. Revilla Gigedo showed only a very few (10) Phaeophyceae, of which 2 may be but local, one ranged to the north, and the others have southern or Caribbean affinities. The records from mainland México are too few to signify much; the relations are a little stronger to the flora of the coast to the south than to the Gulf of California. There are too few data to be useful thence to Ecuador, but for this latitude some suggestions may be ventured on the basis of the Galapagos flora. Twenty-eight species of Phaeophyceae were found in that area, 31 on the other coasts visited, with only 4 in common, a very strange segregation indeed. Of the 28, the presumed endemics number 18, a remarkable proportion, of which but one occurs in the northern Galapagos,[38] 12 in the central Galapagos,

[38] In order to establish a basis for analysis of the Galapagos algal flora an effort was made to define zones within the archipelago. Obviously I. Wenman and I. Culpepper were a distinct northern Galapagos group. It seemed possible that I. Española, I. Santa María, I. San Cristóbal, and the southern part of I. Isabela, with associated small islands, because exposed most directly to currents from the south, might constitute a southern Galapagos group. The balance of the islands were grouped as central Galapagos, but perhaps I. Santa Cruz records should have been assigned to the south Galapagos area, since the collecting there was done on the south coast.

and 14 in the southern islands. There is clearly little difference between the central and the southern islands respecting endemics; about half the list are found in both groups; *Carpomitra luxurians* occurred in all three. The relationships of these 18 to the nearest similar species seem scattering and vague, though most often to other Pacific relatives. Of the 10 species of wider range, here again the distribution was scattering, being about equally pantropic, of the Gulf of California, or ranging more widely northward and southward on the coast. The strongest evidence of subtropical or more correctly south temperate elements in the Galapagos flora lies in the presence of *Eisenia, Desmarestia, Dendrymenia,* and some of the Delesseriaceae.

It seems now generally recognized that the Galapagos Is. may have originated in a common land mass, but that there is no strong evidence of connection with South America (Stewart 1911). The southern islands are bathed by water sometimes as much as 10° cooler than the northern; while the former receive the Humboldt Current, the northern are at least at times subject to a warmer current from the Gulf of Panama (Hooker 1851). While such might bring land plants of Caribbean origin, the isthmus which would facilitate this equally prevents the transfer of marine algae. The distinction emphasized by Hooker between the islands, different species of given genera being commonly peculiar to different islands, is certainly not true of the marine algae, conformably with the continuity of the sea in which they live. The problem of downstream dispersal of species peculiar to the archipelago is overshadowed by the importance of water temperature, the distances involved being short for the dispersal of marine algae.

It is evident, even from a casual inspection of the list of Rhodophyceae, that they constitute the greatest variety in the marine flora of this area, double the number of Chlorophyceae and Phaeophyceae combined, either of genera or of species. It is further readily determined that the Rhodophyceae are mostly from the littoral, to the extent of about half again as many as are secured solely from deeper water. It is a varied flora, with over 90 genera and 240 species. Most of these species and particularly most from shallow water are of relatively small stature.

The Rhodophyceae collected on Baja California are chiefly forms with a northward range, not going into the southern tropics; less than half as many are apparently local in distribution, a few range far to the south along the mainland coast of México, but very few beyond, and there were almost no pantropic or Gulf of California species there. There is little relation between the Rhodophyceae of Baja California and those of the Is. Revilla Gigedo; most of the red algae of this group of islands tend to range to the south, and rather farther than México itself.

The Rhodophycean flora of the mainland coast and adjacent small islands is subject to less isolation than that of the Is. Revilla Gigedo and Galapagos Is. It is furthermore evident that the aquatic climate is relatively uniform; the coast line under consideration, though long, runs far to the east in the middle portion and is, except for a few Ecuadorean stations, entirely within the north tropic zone. On the whole, the records from any one mainland area are too few to give much evidence, but in general the algal flora of the whole coast line is predominantly tropical. Of the 35 Mexican mainland species about two fifths do not extend farther south, but a half dozen go on to Costa Rica and another half dozen to Ecuador. There are almost as many species here recorded solely from Costa Rica as from México, and surprisingly many from Colombia and Ecuador, considering how little time was spent at work there. The Ecuadorean mainland flora is more related to the flora farther north than to the Peruvian flora southward, as far as the data go.

The chief collections of these expeditions, within a limited area, were those made about the Galapagos Islands in 1934. These were unequally studied; the stops at I. Wenman were brief, and I. Culpepper was not visited. Within the central area more thorough work was done, at several stations, and about as much at southern points.

The relatively small numbers of Rhodophyceae which range beyond the Galapagos archipelago when analyzed as to their most natural relationships seem to show that the southern tier of islands have more species (6) with a southward range than those of the central group (2) and fewer on the tropical mainland (2) against 7 for the central group; 5 which occur in both likewise range to the south, and 10 occur on the tropical mainland. Conversely, 6 of the algae of the central islands tend to range to the north against only 3 from the southern tier (barring 3 which occur in the Gulf of California), but of the joint floras 13 range to the north. These approximate figures seem to show a greater tendency for the southern islands to resemble the south Pacific flora than do the northern islands, which have more of the flora of the immediate mainland and the coast to the north.

Rhodophyceae were almost lacking from the I. Wenman collections. Doubtless more extensive collecting would have remedied this lack, but their relative absence does preclude any comparison with other regions. About half of the Galapagos Rhodophyceae came exclusively from the southern tier of islands and about a fourth exclusively from the central area. Inspecting the list for supposed new species, we find about the same ratio. The flora is twice as rich, and twice as rich in novelties, in the lower tier of islands.

There are several points of interest in the algal flora of this district. While essentially tropical, and so differing from the flora of Peru just to the south, certain characteristic groups commonly found in other tropical areas are missing. Of the Chlorophyceae one may mention the absence of *Udotea* and *Avrainvillea,* the poor representation of Dasycladaceae, Valoniaceae, and Caulerpaceae. However, the absence of extensive coral reef formations may help account for this. In the Phaeophyceae we note the absence of *Hydroclathrus* and *Turbinaria.* In the Rhodophyceae there is more difference between the genera found in different parts of the world, but the nearly ubiquitous *Hypnea musciformis, Gelidiopsis rigida, Laurencia papillosa,* and *L. obtusa* are missing, as are *Eucheuma, Wrangelia,* and *Acanthophora,* although the former genus does occur in the Gulf of California, close outside our range. It is doubtful that the Acrochaetia are as varied as on the Caribbean side: few were seen; Liagoras are scarce and fewer, and there are few species of *Gracilaria, Hypnea, Dasya, Laurencia,* and *Polysiphonia.*

There is no compensating richness in the Chlorophyceae. In the Phaeophyceae the Dictyotaceae are quite richly varied, and the Sargassa likewise, though not more so than in the Orient. The Rhodophyceae seem to have a particularly good variety of coralline algae (remembering that the crustose Lithothamnieae are here omitted) ; the Delesseriaceae are proportionately numerous.

If one may speculate as to what areas now most urgently need further study (recognizing that all the coast south of California is but fragmentarily surveyed), one may first suggest that the adjacent coasts of Ecuador and northern Peru need further attention, for until this is given the degree of specialization of the Galapagos Is. flora cannot be accurately stated. As Howe (1914) indicates, Peru although in the south tropical zone does not show a characteristically tropical marine flora, and, though the Galapagos Is. are barely 2° of latitude above the Peruvian border, they do not show any very great similarity in flora. At the other end, the Sinaloa-Jalisco coast near the Gulf of California, and Baja California near its southern end, must be carefully studied to define the limits of those algae supposed to be endemic to the Gulf, and to note how far north into it the outer-coast species penetrate. The general position and land vegetation suggest that Cocos Island might well be a good territory in which to search for some of the unexpectedly missing tropical genera. Finally, more detailed studies of the coast of Panama are called for, because the apparent poverty of the marine algal vegetation there is probably a misconception, and the study of coves and rocky points will probably show a rich flora, as has been noted on the Atlantic side, where in the accessible spots near the Canal it is poor, but rich only a few miles each side. The flora of this district might be expected to show Caribbean tendencies, but as yet there is little evidence of this.

It is worth while to look separately at the results of the deep-sea dredging. The Chlorophyceae is obviously not the group most likely to characterize dredged material. From the present series of collections no considerable number of species were solely secured by dredging. In general, the species of Chlorophyceae most often secured by dredging were Codiums, Halimedas, and *Ostreobium,* with a few scattering things. These did really at times come from quite deep water.

The Phaeophyceae were much more often present in the hauls. This was especially true of Dictyotaceae, Sporochnaceae, Desmarestiaceae, Laminariaceae, and would have been true of Fucaceae also if more of the dredging had been done in the shallow-water Sargassum beds. Especially notable finds were dredged in the genera *Zosterocarpus, Eisenia, Sporochnus, Spatoglossum, Dictyopteris,* and *Desmarestia.* Altogether, more novelties were dredged in this group than were expected; but, when one tries to attribute this to a south-temperate element, one finds that the genera are more often warm-water ones than not, and only *Desmarestia* and *Eisenia* are distinctly of cold-water affinities.

The Rhodophyceae, where one expects most of the dredged records to come, were mostly shallow-water species. As one looks for distinctively deep-water genera, one finds *Scinaia, Asparagopsis, Peyssonnelia, Lithothamnium, Aeodes, Halymenia, Kallymenia, Agardhiella, Sarcodiotheca, Gracilaria, Fauchea, Botryocladia, Griffithsia,* and most of the genera of the Delesseriaceae to be groups nearly limited to deeper water. Of these, *Agardhiella, Griffithsia,* and *Scinaia* are perhaps genera of cool-water tendencies, but for the most part the others include species more like those of the tropics and subtropics than otherwise.

SUMMARY OF ALGAL DISTRIBUTION

Considering the frequency of the species in the chief algal groups, we find the same general proportional relations here as in other comparable parts of the world, although perhaps a little accentuated. Granting that the data are quite imperfect, there is yet probable significance in the percentage of species in the groups as compared from certain major areas. For instance, on the northeast North American coast the flora, subarctic and cool temperate, shows a ratio of approximately 20 per cent of Chlorophycean species, 33 per cent of Phaeophycean, and 42 per cent of Rhodophycean. This in Florida is replaced by a flora of approximately 25 per cent of Chlorophycean species, 15 per cent of Phaeophycean, and 60 per cent of Rhodophycean. Unfortunately, on the West coast we have no easy way to analyze the cold-water flora as yet. The mild temperate flora of California as represented by Monterey shows approximately 14 per cent of Chlorophycean species, 21 per cent of Phaeophycean, and 65 per cent of Rhodophycean. The flora represented in the present catalogue is not strictly tropical, though dominated by that type of plant. Here we find approximately 17 per cent of Chlorophycean species, 16 per cent of Phaeophycean, and 67 per cent of Rhodophycean, reflecting the dominant tropical influence.

The algal distribution in the area of our study may then be summarized somewhat as follows. The flora of the outer coast of the peninsula of Baja California, at least for the greater part of its length, most resembles that of California to the north. That of the Is. Revilla Gigedo, lying off its southern end, however, resembles the Mexican mainland algae. There is no marked change in the rather impoverished yet tropical flora, though it is very imperfectly known, thence to Ecuador. The Ecuadorean mainland is less related to the Peruvian than to the mainland algae farther north. The flora of the Galapagos Islands contains a good many species not known elsewhere and in certain aspects, particularly along the southern border of the group, may have definite south subtropical or south temperate affinities. The dredged flora has few representatives which one might attribute to a distinctively cool-water element, though it may in the southern Galapagos have a southern element of a subtropical character. While more species of Rhodophyceae were dredged than of the other groups, the Phaeophyceae were unexpectedly numerous.

This is in accord with the currents and water temperatures prevailing (see Sverdrup 1940, p. 273, and especially Fleming 1939, p. 167). In general, the Peru or Humboldt Current from the South American coast sweeps up to the Galapagos Islands and turns west below the latitude of Guayaquil to join the westward South Equatorial Current. The water filters between the Galapagos in a northwestwardly direction, and frequently at the relatively high rate of 1.5-2.5 knots. The Equatorial Counter Current running east just north of the Galapagos divides off the Central American coast, a portion forming a current flowing northwestward off Nicaragua and another portion joining eddy currents in the Gulf of Panama to flow southward to Ecuador. The currents from Costa Rica to Ecuador vary a good deal locally and with the season, in some degree reversing direction seasonally. The northern Galapagos may receive a southwestward flow in the winter, a northwestward one in the summer. In the winter the Is. Revilla Gigedo receive a southward current which comes from California, but in the late summer this is deflected somewhat by the westward current from México. Throughout the year Baja California has a southward-tending current coming from California and the north. Local eddies in several places may alter these currents near shore.

As to surface water temperatures, it appears that the warmest water (27°-29°C.) lies off the coast of Costa Rica and Nicaragua in May, when the water in the Galapagos area is about 25°; from August to November, when the Galapagos water temperature is nearer 20°-22°, that off the Costa Rica and Nicaraguan coast is down a degree or two, but it reaches its lowest in February (25°-27°C.), when that off the Galapagos goes up to about 25° C. again.

On the 1934 trip water temperatures were recorded at the water intake by the engine-room crew; with a slight correction and converted to Centigrade, they are of some interest but of course represent only local subsurface water conditions. At the time the party left California (end of December) the water was about 17.0° C. daily min., 22.0° C. daily maximum. In the Is. Revilla Gigedo (first week of January) it was 22.5° C. and 24.5° C.; at I. Wenman in the northern Galapagos it was 25.5° C., 26.5° C. (early in the second week of January). During the time in the central and southern Galapagos a circuitous route was taken, and there does not seem to be any close correlation with the position of the vessel; it varied from 20.0° C. to 26.0° C., but, in general, the daily range was about from 22.0° C. to 24.0° C. during the first ten days and then was nearer 24.0° C. to 25.0° C. for ten days. The highest temperatures of the trip were recorded on the passage up to Guayaquil, but of course these do not affect the marine record. Along the coast north from the R. Guayas they varied from about 23.5° C. min. to 27.0° C. max., but were higher about the Is. Secas, reaching 26.0° C. min., 28.0° C. max. during the last week in February. The writer did not secure the data northward from this point.

DESCRIPTIVE CATALOGUE

Chlorophyceae

Grass-green plants, unicellular, colonial, filamentous, parenchymatous or coenocytic, of very varied forms; pigments chiefly chlorophyll and xanthophyll contained in definite chloroplasts; sexual and asexual plants generally morphologically similar; asexual reproduction by various types of spores, most commonly biflagellate zoöspores; sexual reproduction by biflagellate isogametes or with various degrees of sexual specialization and differentiation.

Ulvaceae[39]

Plants membranous or tubular, of one or two layers of cells, in size moderate to large, and generally found in or near the littoral; reproduction from little-modified cells producing biflagellate gametes or zoöspores.

KEY TO GENERA

1. Plants tubular in section, the wall one cell layer thick . . . . Enteromorpha
1. Plants membranous and expanded when mature 2
2. Membrane characteristically of one cell layer . . . Monostroma
2. Membrane of two cell layers throughout . . . . Ulva

ENTEROMORPHA Link, 1820

Plants simple or alternately branched, tubular or with the branches ending in uniseriate tips; capillary to broad; attached or becoming free floating; tube with a wall one cell in thickness, the cells usually close placed, with a single lateral chromatophore generally containing one pyrenoid.

KEY TO SPECIES

1. Plants simple or very sparingly branched 2
1. Plants clearly, generally abundantly, branched 3

[39] In order to conserve space, the descriptions of genera and larger categories have been shortened in this report in many cases. This has chiefly meant an abridgement of the description of reproductive organs, and chiefly affects the Rhodophyceae. More detailed descriptions may be found in the writer's 1937 and 1942 publications.

2. Plants moderately broad above, simple or sparingly and subequally divided very close to the base; cell arrangement in the upper portion mostly irregular, with some tendency to form longitudinal rows; cell shape rectangular to polyhedral, the lateral wall thick . . . . E. flexuosa
2. Branches relatively few, scattered, similar to the main axis; cells in clear longitudinal rows . . . . E. tubulosa
3. Once generally freely slenderly branched, the branches lateral, progressively larger upward for 1-5 mm above the base; cell arrangement in regular rows throughout; cell shape rectangular, lateral walls not conspicuously thickened . . . . . E. lingulata
3. Progressively 2-several times branched 4
4. Sparingly primarily branched, the scattered branches similar to the main axis, beset with numerous aculeate branchlets; cells in longitudinal rows . . . . E. salina v. polyclados
4. Branching freely in successive orders, throughout slender, the smaller branchlets and branch tips ending in a single series of cells; cells generally in longitudinal series . . . . . E. crinita

Enteromorpha flexuosa (Wulfen) J. Agardh

Collins 1909, p. 203; Taylor 1942, p. 13.

Probably widespread in the tropical Pacific. It is common in the Caribbean and the tropical Atlantic Ocean. A plant chiefly of the lower tidal range, growing on rocks, sticks, shells, coral fragments, etc.

MÉXICO: Is. Revilla Gigedo, dredged in 24-32 meters at sta. 129, Braithwaite Bay, I. Soccoro, *no. 34-20,* 3 Jan. 1934. *Ibid.,* attached to rocks on the sandy beach, *no. 39-60,* 18 Mar. 1939. Oaxaca, on dead sticks in shoal water of the lagoon, Ba. Chacahua, *no. 39-71,* 21 Mar. 1939. COSTA RICA: in a high protected tide pool, Port Parker near Bahía Salinas, *no. 39-74,* 25 Mar. 1939. ECUADOR: Guayas, at Salinas, Schmitt *no. 506,* 12-14 Sept. 1926.

Enteromorpha tubulosa Kützing, *prox.*

J. G. Agardh 1883, p. 128; Collins 1909, p. 203 (as *E. prolifera* v. *tubulosa*); Setchell & Gardner 1920, p. 256, pl. 14, figs. 4, 5; Smith 1944, p. 51.

The writer follows Setchell in placing here some material not otherwise satisfactorily disposable, and probably not identical with *E. prolifera.*

ECUADOR: Archipiélago de Colón, forming patches on the under side of rocks, exposed at low tide, Pta. Albemarle, I. Isabela, *no. 34-111,* 12 Jan. 1934.

Enteromorpha lingulata J. Agardh

J. G. Agardh 1890, p. 143; Taylor 1942, p. 13.

Probably widespread and common on the tropical Pacific coast of the Americas, as it is on the Atlantic coast. A plant often abundant on solid objects near low tide level.

MÉXICO: Guerrero, shore collections inside Morro de Petatlán, Bahía Petatlán, Schmitt *no. 120B-33,* 17 Mar. 1933. *Ibid.,* on rocks near the head of the harbor, *no. 34-585,* 2 Mar. 1934. Oaxaca, on dead mangrove roots in shoal water of the lagoon, Ba. Chacahua, *no. 39-70,* 21 Mar. 1939. COSTA RICA: Ba. Salinas, dredged from 3.6 meters, Schmitt *no. 477A-35,* 11 Feb. 1935. Port Parker, abundant in a high protected tide pool, *no. 39-74,* 25 Mar. 1939. Pto. Culebra, intertidal, *no. 34-532,* 24 Feb. 1934. CANAL ZONE: abundant on floating timbers and piling at Pier 15, Balboa, *no. 39-137,* 31 Mar. 1939. ECUADOR: Archipiélago de Colón, on intertidal rocks, I. San Salvador, *no. 34-349,* 24 Jan. 1934.

Enteromorpha salina Kützing, v. polyclados Kützing

Plants entangled, contorted, slender, vaguely branched, throughout or sometimes only in the lower portions beset with short tapering patent branchlets; main branches with squarish cells about 16 μ wide, generally shorter than broad, in definite rows; branchlets uniseriate toward the tips.

Kützing 1856, p. 13, pl. 36, fig. II (as *E. polyclados*); Farlow 1902, p. 89 (as *E. clathrata*); Collins 1909, p. 202; Setchell & Gardner 1920, p. 257.

This material, reported as *E. clathrata* by Farlow, consists of a smaller and more entangled plant which agrees tolerably well with *E. salina* v. *polyclados.* The variety has been accepted as an element in the Californian flora by Setchell and Gardner, and for the Gulf states by Collins, though first described from Europe. It is a plant of shallow, quiet water.

ECUADOR: Archipiélago de Colón, from a mangrove swamp near Turtle Point, I. Isabela, Snodgrass & Heller, Apr. 1899. *Ibid.,* from a salt-water lake south of Tagus Cove, Schmitt *no. 331A-35,* 10 Dec. 1934.

Enteromorpha crinita (Roth) J. Agardh

Collins 1909, p. 199; Setchell & Gardner 1920, p. 258; Taylor 1937, p. 62.

A plant of shallow, protected situations, growing on rocks and woodwork.

ECUADOR: Archipiélago de Colón, among shore rocks, I. Fernandina, *no. 34-158,* 14 Jan. 1934.

MONOSTROMA Thuret, 1854

Plants at first saccate, later usually splitting into broad, flattened blades or narrow segments; ordinarily of one cell in thickness; cells with one or two platelike chromatophores, each with a pyrenoid.

KEY TO SPECIES

1. Plants without differentiated stalklike portions, broadly foliaceous, only incidentally cleft . . . . . . M. ecuadoreanum
1. Plants with narrow stalklike bases, definitely lobed above . . . . M. dactyliferum

Monostroma ecuadoreanum n. sp.[40]

Plants gregarious, broadly foliaceous or sparingly cleft; green, becoming brown on drying, 1-3 cm tall, the thallus of one cell layer, the cells in surface view closely placed, angular, 10-24 μ (averaging 18 μ) diam., with the lateral walls 0.8 μ, the outer walls 1.5 μ thick; thallus thickness 18-26 μ, the cells quite rectangular in section; chromatophores probably single in each cell.

In the genus *Monostroma,* the northern and much larger *M. fuscum* and its varieties turn brown on drying and have two chromatophores in each cell. These plants likewise turn brown and are no thicker than some forms of *M. fuscum* (Wittrock 1866, p. 53; Collins 1909, p. 213; Setchell & Gardner 1920, p. 243). They may prove to be only a variety of that species, but the tropical habitat makes this seem unlikely.

ECUADOR: Guayas, on the rocky southeast side of Pta. Sta. Elena, Salinas, *no. 34-465 (TYPE),* 8 Feb. 1934.

[40] Monostroma ecuadoreanum n. sp.—Plantae brunneae cum exsiccatae sunt, gregariae, 1-3 cm. altitudine, cellulis 10-24 μ diam., confertis, membranis externis 1.5 μ crassitudine; thallo 18-26 μ crassitudine, cellulis in sectione rectangularibus. Planta typica in loco dicto Pta. Sta. Elena, Guayas, Ecuador, legit W. R. Taylor, *no. 34-465,* 8 Feb. 1934.

Monostroma dactyliferum n. sp.[41]

Plants small, 2-3 cm tall, dark green, irregularly lobed, the lower portions stalklike; stalks 1-3 mm broad, irregularly branched, narrow, thin near the markedly crisped margin but thick in the center (to 180-200 μ) and tristratose, consisting of a layer of cells 50-60 μ tall and 20-30 μ broad on one side, a central zone one third of the total thickness or more consisting of fibrillar extensions of the surface cells directed toward the base, and on the other side a layer of cells about 20-30 μ broad and 18-25 μ tall; the upper portion of each branch for 1-2 cm eventually somewhat expanded, simple to palmatifid, the lobes 3-5 mm broad, obtuse, the margins plane to minutely lobulate and crisped, in the center about 15-20 μ thick, the cells in section rectangular, 11-16 μ tall and about as broad; walls thick throughout, the cells in the expanded part somewhat areolate.

These plants are extremely interesting. Structurally, the stalk somewhat resembles the base of an *Ulva,* except that the strengthening fibrils pass abundantly between cell layers which are unequally thick; this feature extends up the stalklike portions to the thin blades. The margins of these stalks are intricately frilled, much thinner than the central part and of one cell layer. The specialized central zone develops along a sharp line near the base of the blade. Here the thickness suddenly increases from about 30 μ to about 45 μ, and the cells, which are columnar, all cut off a small cell toward the same face of the thallus. Gradually these cells, both the large primary ones and the small derivatives, develop projections which extend basipetally between the two layers. These, at first in contact, become separated by a thick hyaline zone one third to one half of the total thickness of the stalk, composed of tenuous protoplasmic filaments surrounded by relatively firm walls. This structure is not a familiar one in the genus, and a new one may have to be erected to contain this species. The fibrils run down as a thin zone between equal cell layers in *Letterstedtia japonica* Holmes, but in that plant the blades have two cell layers throughout, as does *Ulva.* In studying the peculiar structure of *M. dactyliferum* longitudinal sections were cut from carefully oriented fragments under continuous observation with the dissecting microscope, which enabled the zone of change to be established accurately.

ECUADOR: Guayas, in tide pools at Pta. Santa Elena, Schmitt *no. 523 (TYPE),* 17 Sept. 1926.

[41] Monostroma dactyliferum n. sp.—Plantae 2-3 cm altitudine, irregulariter, saepe digitate lobatae, stipites infra quo in loco ad 180-200 μ crassitudine et, cum strato medio rhizoideo, tristratosae; supra expansae, lobis 3-5 mm latitudine, crispatis, in centro 15-20 μ crassitudine et unistratosis, cellulis distributione paululum areolatis. Planta typica in loco dicto Pta. Santa Elena, Guayas, Ecuador, legit Schmitt *no. 523,* 17 Sept. 1926.

ULVA Linnaeus, 1753

Plants becoming expanded, foliaceous, attached or becoming free floating; simple and orbicular to elongate and laciniate, plane or crisped; of two cell layers, the cells showing single chromatophores with pyrenoids.

KEY TO SPECIES

1. Cells of the central portion little taller than broad, rectangular in section . . . . U. Lactuca
1. Cells of the central portion of the blade much taller than broad 2
2. Mature thallus deeply lobed with plane or ruffled margins; membrane 45-90 μ thick, the cells 2.5 times as high as broad . . . . U. lobata
2. Juvenile thallus deeply lobed with plane or ruffled margins, mature thallus deeply divided into long, narrow, crisped segments; thallus in the juvenile state to 100 μ thick in the center, the cells to twice as tall as broad, in the adult state to 190 μ thick, the cells to 5.0 times as tall as broad . . . . . U. dactylifera

Ulva Lactuca L.

Collins 1909, p. 214; Taylor 1937, p. 75, pl. 4, fig. 6; Smith 1944, p. 45, pl. 3, figs. 6, 7.

In one form or another a common plant of cosmopolitan distribution in the littoral and sublittoral belts, growing on solid objects, but in quiet water often continuing to develop if disengaged.

México: Is. Revilla Gigedo, frequent as dredged at sta. 135 from 45 meters' depth off Sulphur Bay, I. Clarion, *no. 34-48A,* 5 Jan. 1934. *Ibid.,* rare as dredged at sta. 136 from 57 meters, *no. 34-67,* 5 Jan. 1934. *Ibid.,* juvenile plants on shore rocks, *no. 39-16,* 16 Mar. 1939. *Ibid.,* dredged from 51-79 meters' depth at sta. 917, *no. 39-22,* 16 Mar. 1939. Costa Rica: abundant on rocks at mid- and low-tide levels, Port Parker near Ba. Salinas, *no. 39-75,* 25 Mar. 1939. Ecuador: Archipiélago de Colón, small plants on intertidal rocks, I. San Salvador, *no. 34-348,* 24 Jan. 1934. *Ibid.,* abundant but juvenile from *Rhizophora* roots over white mud in a lagoon near buildings, Academy Bay, I. Santa Cruz, *no. 34-301A,* 20 Jan. 1934. *Ibid.,* dredged from a sandy bottom at 36-55 meters near an islet in Gardner Bay, I. Española, *no. 34-409,* 31 Jan. 1934. Guayas, littoral rocks near Salinas, Schmitt *no. 503,* 12 Sept. 1926.

Ulva fasciata Delile[42]

Farlow 1902, p. 90.

Reported from I. Isabela, Archipiélago de Colón. However, see the discussion of *U. lobata.*

Ulva lobata (Kützing) Setchell & Gardner

Kützing 1856, p. 10, pl. 27 (as *Phycoseris lobata*) ; Setchell & Gardner 1920, p. 268; Smith 1944, p. 46, pl. 4, figs. 4, 5.

These plants could not be differentiated from those judged to be young *U. dactylifera* Setch. & Gard. except arbitrarily, on thickness. Neither group of specimens is very different from certain phases of *U. fasciata* Delile of the Caribbean which Setchell (in Phyc. Bor.-Amer.) at first considered to be an element of the California flora. Later (1920, pp. 284, 285) he segregated these plants under *U. lobata* and *U. dactylifera,* the latter in its full development, but not in its earlier phases, rather distinctive.

México: Guerrero, littoral at Ba. Petatlán, *no. 34-575,* 2 Mar. 1934. Ecuador: Archipiélago de Colón, I. Santa Cruz, Hassler *no. 1001,* June 1872. Guayas, in tide pools at Pta. Santa Elena, Schmitt *nos. 512, 516,* 17 Sept. 1926.

Ulva dactylifera Setchell & Gardner?

Setchell & Gardner 1920, p. 272, pl. 21, fig. 1.

These plants differ very little from those here assigned to *Ulva lobata* Kütz., except in thickness. Setchell and Gardner set limits on the thickness of *U. lobata* of 45-90 μ. In its early phase of growth *U. dactylifera* has about the same shape as *U. lobata,* but later develops the erect linear crisped lobes which characterize it. Setchell and Gardner state that it reaches 2-4 cm in height in the first growth stage, but authentic material is as much as 6 cm tall. Specimens in the Galapagos collections apparently in this growth phase reach 9 cm in height, 110-123 μ in thickness, but none have developed the characteristic long crisped lobes of the later phase.

Ecuador: Guayas, scraped from a mooring buoy at La Libertad, Schmitt *no. 12A-33,* 19 Jan. 1933. Archipiélago de Colón, dredged at sta. 146, I. Isabela, *no. 34-109,* 12 Jan. 1934. *Ibid.,* infrequent at Black Beach Anchorage, I. Santa María, *no. 34-227,* 17 Jan. 1934.

[42] This and subsequent similar references to Farlow's 1902 paper on Galapagos Islands algae are designed to include certain records which are neither confirmed by our own collections nor interpreted satisfactorily from his specimens.

Chaetophoraceae

Filamentous plants, sometimes spreading and sometimes forming disks, usually microscopic or nearly so, the cells in some genera bearing long hairs; reproduction from undifferentiated or moderately differentiated cells by biflagellate zoöspores or by gametes of various degrees of specialization.

KEY TO GENERA

1. Plants formed of relatively regular filaments, not developing parenchymatous nodules 2
1. Plants of creeping filaments composed of cells of irregular shape and articulation, often anastomosing, commonly developing parenchymatous masses; hairs lacking . . . . Zygomitus
2. Filaments differentiated into a basal layer which eventually bears erect filaments; hairs absent or present, in which case they are septate . . . . Pilinia
2. Filaments chiefly creeping, without differentiation of special erect branches; hairs setiform, continuous with the supporting cell 3
3. Plants generally with wavy setae; in the jelly of larger algae, rarely on stones or penetrating calcareous algae . . . Phaeophila
3. Plants generally with straight setae; in the jelly of larger algae or penetrating calcareous algae . . . . Ectochaete

PILINIA Kützing, 1843

Plants of branched creeping filaments, the horizontal layer of which bears simple or forking erect filaments, sometimes ending in multicellular hairs; the cell structure showing a chromatophore which encloses the protoplast; reproduction by numerous biflagellate zoöspores formed in terminal or lateral rounded to clavate sporangia in the erect filaments, or sessile on the horizontal filaments.

KEY TO SPECIES

1. Erect filaments reaching 400 μ in length, basally 5-8 μ diam., terminating in articulate hairs . . . . . . P. maritima f. pacifica
1. Erect filaments reaching 150 μ in length, 5-6 μ diam., widening upwardly to 6-8 μ, not terminating in hairs . . . . P. Lunatiae f. simplex

Pilinia maritima (Kjellman) **Rosenvinge, f. pacifica** F. Thivy n.f.[43]

Thallus extending as discs 0.5-1.0 mm diam., with the basal layer of more or less isodiametric cells 2.5-10.5 μ diam., at first distinct, later less conspicuous; erect filaments numerous, 0.2-0.4 mm long, usually unbranched with the lower cells cubical, the upper elongate cylindrical, with a basal diameter of 5.1-7.7 μ, ending in articulate hairs 1-3 μ diam.; sporangia on short erect few-celled branches, single and terminal, or lateral, or in pairs, clavate, 4-12 μ diam., 20.4-23.5 μ long; empty sporangia often proliferating into new ones, or into vegetative filaments; a pyrenoid visible in some of the cells.

This new form differs from typical *P. maritima* in that its thallus forms an extended layer and does not become rounded and gelatinous. The erect filaments are slightly narrower than in the typical form, 5.1-7.7 μ against 6-10 μ, and the sporangia may occur in pairs, which does not appear to be the case in the typical form.

MÉXICO: Is. Revilla Gigedo, in dead shells from tide pools, I. Clarion, *no. 39-4 p.p. (TYPE),* (det. F. Thivy), 1 Mar. 1939. ECUADOR: Archipiélago de Colón, in dead shells, Ba. Cartago, I. Isabela, *no. 34-352A p.p.* (det. F. Thivy), 25 Jan. 1934.

Pilinia Lunatiae Collins, n. f. **simplex** F. Thivy[44a]

Plants bright green, growing on the cuticle of a *Porella*-like bryozoan; disc centrally distromatic, of 2.5-11.8 μ semi-isodiametric cells, of one layer at the margin with cells 2.5-3.5 μ diam., 2-4 times as long; later with central cells empty; erect filaments reaching 150 μ in length, usually of 5-10 cells, unbranched, loosely arranged, with the cells at the base 4.70-5.88 μ diam., up to 12.9 μ long, 1-2 times as long as wide, but above 5.88-8.23 μ diam., and up to 33 μ long, being 2.5-5.0 times as long as wide, with the terminal cell transforming into a sporangium; cells (stained) showing a pyrenoid.

[43] Pilinia maritima (Kjellm.) Rosenv., n. f. pacifica F. Thivy—Thallis extensis tenuiter applanatis 0.5-1.0 mm diam.; filamentis erectis 0.2-0.4 mm longis, 5.1-7.7 μ diam., in pilis gradatim angustatos desinentibus; sporangiis singulis vel interdum binis. Planta typica in loco dicto I. Clarion, México, legit W. R. Taylor *no. 39-4 (p. p.),* 1 Mar. 1939.

[44a] Pilinia Lunatiae Collins n. f. simplex F. Thivy—Filamentis erectis simplicibus, plerumque 5.88-8.23 μ diam., 5-10 cellularibus, rarissime ad 13 cellularibus, laxe dispositis. Planta typica in loco dicto Panama City, Panamá, legit W. R. Taylor *no. 39-149 p.p.,* 31 Mar. 1939.

This form differs from typical *P. Lunatiae* in having the erect filaments of 5-10 cells and unbranched, with slightly lesser diameter and looser arrangement than in the type.

PANAMÁ: in a bryozoan on old shells from tide pools in the rocky tidal flats at San Francisco, Panama City, *no. 39-149 p.p. (TYPE),* 31 Mar. 1939.

PHAEOPHILA Hauck, 1876

Plants generally epi- or endophytic, of branching uniseriate filaments the cells of which bear one to three long, unseptate hairs neither separated by a wall from the supporting cell nor swollen at the base; cells with parietal lobed chromatophores and several pyrenoids; zoöspores quadriflagellate, produced in zoösporangia which are little enlarged, but often terminal on branchlets.

KEY TO SPECIES

1. A perforating alga in shells and corals; cells narrower, cylindrical, often sinuous, 5-12 μ diam., 3-9 times as long up to 45 μ maximum length, or subglobular up to 22 μ diam., or with irregular lobes and then reaching 52 μ; setae distinctly to slightly wavy, 1.2-3.6 μ diam.; pyrenoids 1-7 per cell; sporangia 10-28 μ diam., with short emission tubes, in length not over twice the diameter of the sporangium, 3.5-5.3 μ diam. . . . . . P. Engleri
1. An endophytic or epiphytic alga, also found on stones; cells wider, cylindrical or globular, 7-26 μ diam., 1-4 times as long as wide within a maximum of 54 μ; setae distinctly wavy, 2.5-5.1 μ diam., pyrenoids 1-13; sporangia 33-40 μ diam., with an emission tube about 4 times as long as the diameter of the sporangium, 4.8-7.7 μ diam. . . . . P. dendroides

Phaeophila Engleri Reinke

Kylin 1935a, p. 193, figs. 3, 4; Thivy 1943, p. 245, pls. 1, 2.

MÉXICO: Oaxaca, in dead shells from the littoral, Ba. Tangola-Tangola, *no. 34-563A* (det. F. Thivy), 1 Mar. 1934. *Ibid.,* with *Mastigocoleus* in dead shells in the lagoon at Ba. Chacahua, *no. 39-72* (det. F. Thivy), 21 Mar. 1939. Is. Revilla Gigedo, in dead shells from tide pools, I. Clarion, *no. 39-4* (det. F. Thivy), 1 Mar. 1939. PANAMÁ: Bahía de Panamá, with *Hyella* in dead corals in pools of 3 dm depth, I. Taboga, *no. 39-622* (det. F. Thivy), 2 May 1939. ECUADOR: Archipiélago de Colón, in dead shells from tide pools, Ba. Cartago, I. Isabela, *no. 34-352A* (det. F. Thivy), 25 Jan. 1934.

Phaeophila dendroides (Crouan) Batters

Batters 1902, p. 13; Taylor 1928, p. 58, pl. 3, figs. 4-6 (as *P. floridearum).*

MÉXICO: Nayarit, with Lithothamnieae on stones, an unusual habitat for this species, I. María Magdalena, Las Tres Marías, *no. 39-670 p.p.* (det. F. Thivy), 9 May 1939.

ECTOCHAETE (Huber) Wille 1909

Bright green endophytes in the wall or slime of larger algae, or tranophytes in shells, consisting of creeping, free or partly fused, bilateromonopodially branched or semidichotomous filaments; cells cylindrical to spherical, setigerous, uninucleate with a parietal platelike or netlike chloroplast and one to eight pyrenoids; seta single, straight, tubular, not separated by a septum from the supporting cell; sporangium and gametangium like the vegetative cells but with an emission tube of varying shape and size, containing many biflagellate zoöids; sexual reproduction isogamous; zoöspores and zygotes germinating directly.

Ectochaete perforans Thivy, n. sp.[44b]

Thallus perforating the hard external layers of shells, composed of densely branched filaments, not united; cells uninucleate, with usually one, rarely 2-3 pyrenoids, often bearing one seta, or very rarely two; setae 2.0-3.8 μ diam., straight, not septate at the base but at times provided with a ring-shaped parietal thickening at the base, or with a secondary basal septum; intercalary cells 7-20 μ diam., 1.3-4.0 times as long, but less than 43 μ, sometimes rhizoidal, narrow, about 3 μ diam.; terminal cells, 5-13 μ diam., 4-9 times longer than broad but between 20 and 95 μ; sporangia usually intercalary, 7-28 μ diam., 17-38 μ long, containing about 12 zoöspores, the ostiole shaped like a small tube, 3.5-5.0 μ diam., 3.5-29.0 μ long.

ECUADOR: Archipiélago de Colón, in dead shells, abundant about Ba. Cartago, I. Isabela, *no. 34-352E (TYPE),* 25 Jan. 1934.

[44b] Ectochaete perforans Thivy n. sp. (ex manuscripto inedit.)—Thallus in strata dura externa concharum perforans, e filamentis ramosis, confertis, non conjunctis compositus; cellulis uninucleatis, pyrenoideis plerumque uno, raro 2-3 praeditis, saepe unam setam (vel rarissime duas) gerentibus; setis 2.0-3.8 μ crassitudine, rectis, non basi septatis sed interdum aut ad basin incrassitione parietali anuliformi aut septo basali secundario instructis; cellulis intercalaribus 7-20 μ crassis, 1.3-4-plo longioribus, angustis, circa 3 μ crassitudine; cellulis terminalibus 5-13 μ crassitudine, 4-9-plo longioribus quam crassioribus sed inter 20 et 95 μ; sporangiis plerumque intercalaribus 7-28 μ crassis, 17-38 μ longis, circa 12 zoosporas includentibus, ostiolo tubuliformi 3.5-5.0 μ crasso, 3.5-29.0 μ longo. Planta typica in loco dicto Ba. Cartago, I. Isabela, Archipiélago de Colón, legit W. R. Taylor *no. 34-352e,* 25 Jan. 1934.

ZYGOMITUS Bornet & Flahault, 1889

Plant penetrating shells, of irregular filaments, branched, the branch tips commonly attaching to other filaments, uniseriate, the cells shorter or longer than broad, often with oblique end walls, the filaments commonly forming parenchymatous masses by irregular periclinal and transverse divisions.

Zygomitus reticulatus Bornet & Flahault

Bornet & Flahault 1889, p. CLX, pl. 9, figs. 1-4.

Ecuador: Archipiélago de Colón, in shells with *Mastigocoleus, Hyella,* and other perforating algae, Tagus Cove, I. Isabela, *no. 34-178* (det. F. Thivy), 13 Jan. 1934.

Valoniaceae

Plants sacklike, parenchymatous or filamentous, with large, coenocytic cells; septation often delayed after the development of the branching portion of the parent cell; when filamentous the branchlets free and divergent or joined to form nets, but when parenchymatous forming rather massive plants; reproduction by biflagellate zoöspores or gametes from little-differentiated cells.

KEY TO GENERA

1. Not bushy 2
1. Bushy, of branching filaments 3
2. Plants rounded, multicellular, the cells macroscopic Dictyosphaeria
2. Plants locally foliaceous, netlike, the primary axis deliquescent; consisting of branches of various orders which unite to form the meshes of the net; branches multicellular, uniseriate . Boodlea, f.
3. Entangled, spongy, the branching in part opposite, the branches adherent by special tenacular cells . . . . Boodlea
3. With the aspect of a *Cladophora;* growing continuously from the upper parts of the branches, which although with delayed septation become uniseriate, multicellular . . . . . Cladophoropsis

DICTYOSPHAERIA Decaisne, 1892

Plants rounded, sometimes flattened, laterally lobed or growing together, solid or hollow; multicellular, the cells macroscopic, along their adjacent margins attached to each other by special microscopic tenacula; the under side attached to rocks by short rhizoidal cells.

KEY TO SPECIES

1. Thallus larger; cells without intracellular spines . . D. australis
1. Thallus very small; cells with intracellular spines . D. Versluysi

Dictyosphaeria australis Setchell

Plants 1.0-4.5 cm or more in diameter, flattened or cushion shaped, irregular or lobed, light green, iridescent; solid at all stages seen, attached firmly by groups of rhizoidal cells, the surface cells very irregular in size, reaching 1-2 mm, the outer face moderately curved; intercellular hapteres mostly along the angles of junction, seldom on the cell surfaces; needle-shaped projections (intracellular spines) apparently absent from the cell walls.

Setchell 1926, p. 79, pl. 8, figs. 9, 10.

These specimens suggest *D. intermedia* Weber-van Bosse (1905, p. 143), but were not seen to become hollow and had rather larger cells. Setchell describes *D. australis* from Tahiti as having very scattered and very rare intracellular spines, but these were not seen in this material at all, leaving the identity slightly in doubt. Plants of the intertidal zone and in tide pools, generally in fairly exposed situations.

MÉXICO: Is. Revilla Gigedo, drifted ashore at Sulphur Bay, I. Clarion, *no. 34-55,* 5 Jan. 1934. *Ibid.,* common in the upper intertidal zone wedged between rocks and attached along rock crevices, *no. 39-13,* 16 Mar. 1939. *Ibid.,* on rocks in tide pools along the shore, Braithwaite Bay, I. Soccoro, *no. 34-26,* 3 Jan. 1934, and *no. 39-54,* 18 Mar. 1939.

Dictyosphaeria Versluysi Weber-van Bosse

Thallus small, solid, the cells 0.5-1.5 mm diam., with intracellular spines evident.

Weber-van Bosse 1905, p. 114; Setchell & Gardner 1930, p. 115.

This plant, which Mme. Weber-van Bosse described from the Malay reefs, appears here as a plant of intertidal and tide-pool rocks.

MÉXICO: Is. Revilla Gigedo, occasional in tide pools, Braithwaite Bay, I. Soccoro, *no. 34-8,* 2 Jan. 1934.

BOODLEA Murray & DeToni, 1889

Plants entangled, often to form a spongy mass; the main axes visible below, less distinct above, branched, the patent branches opposite or whorled, commonly adherent at the tips with tenacular attaching cells.

Boodlea composita (Harv. & Hooker f.) Brand

Plant green, spongy, matted, filamentous, the filaments rather stiff; axes scattered, mainly erect, below to 210-315 μ diam., the long cells somewhat clavate, branching irregular, above becoming indistinct; lesser axes with shorter cells, percurrent, oppositely branched, the branching in a plane or somewhat irregular; lesser divisions and branchlets entangled, the free end cells blunt, to 70-140 μ diam., 3-5 diameters long; the branch systems commonly concrescent, attachment commonly being made by tenacular cells 30-50 μ diam. and about as long, the appressed face slightly discoid-expanded and with the membrane margin lobulate.

Brand 1904, p. 187, pl. 6, figs. 28-35.

These plants probably come within the variation of the species *B. composita* as discussed in detail by Brand. Collins (1909, p. 367) at first admitted this genus to the West coast flora and then later dismissed the record as an error, in which he was followed by Setchell and Gardner (1920, p. 232). There is no doubt about this Mexican record of the genus, but it may be that with fuller knowledge a specific distinction may be possible, though for the present in the light of the considerable variability of these plants it seems best to retain the name of the most probable known Pacific species. Satisfactory criteria for distinguishing species in this genus seem yet to be established.

México: Nayarit, common on surf-beaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-636,* 9 May 1939.

Boodlea composita, *forma*

Plate 1, Figs. 1, 2

Plants small, 1-2 cm tall, densely entangled, several axes arising from a common base, with more or less distinct slightly tapering free basal cells 130-150 μ diam., 0.9-1.4 mm long, branched at the first septum or close above it, the main axes to 360 μ diam., forming veins, not remaining very distinct, the branching chiefly opposite, commonly in more than one plane, but locally bilateral, the divisions anastomosing into a plane or tridimensional network, directly or by tenacular cells about 35-80 μ diam. and nearly as long; areolae irregular, small, about 300-900 μ diam.; the lesser veins with cells to about 140-180 μ diam., 180-270 μ long; ultimate cells 90-180 μ diam., 180-220 μ long, the free ends rounded acute at the tips.

This plant was at first taken to be a *Microdictyon* of the section Boodleoides, but the relatively small amount of flat network and the approximation in size of the several parts to *Boodlea composita* eventually convinced the writer that it was merely a variant of that species. It is here described and recorded separately in order to call attention to its peculiarities.

ECUADOR: Guayas, closely tufted and entangled with other algae, especially *Centroceras,* on the rocky southeast side of Pta. St. Elena, Salinas, *no. 34-466,* 8 Feb. 1934.

CLADOPHOROPSIS Børgesen, 1905

Cladophoropsis robusta Setchell & Gardner

Plants to 2.5 cm tall, the base sparingly branched and rhizoidal, the erect axes simple or 1-2 times successively oppositely branched, the lateral branches usually without crosswalls until after one has been formed across the axis above the fork; filaments below to 685 μ diam., the cells of irregular length, in the lower portions quite long.

Setchell & Gardner 1924, p. 714, pl. 13, fig. 16.

This material, very scanty, was shorter and more slender than the maxima described by Setchell and Gardner. It generally formed branches of one degree, often opposite, but often only single. One specimen formed three pairs of branches on the main axis and the lower two pairs each bore a pair of opposite branchlets in turn. This looks rather unlike the figures given in the above publication, but the simpler plants resemble the illustration very closely.

MÉXICO: Nayarit, rare on the rocks of I. Isabel, *no. 34-588A,* 5 Mar. 1934.

Cladophoraceae

Plants filamentous, usually with distinct basal holdfasts, simple or branched above, the branches rarely whorled, the filaments uniseriate; cells with a commonly multinucleate protoplast; septation not notably delayed; reproduction by biflagellate zoöspores or gametes from little-differentiated cells.

KEY TO GENERA

1. Filaments unbranched, or with few short simple branchlets 2
1. Filaments progressively, often abundantly, branched . . . 3
2. Filaments unbranched, symmetrical, often attached by a differentiated basal cell . . . . Chaetomorpha
2. Filaments more slender and irregular of contour; unbranched or with a few rhizoidal or lateral spur branches . . Rhizoclonium

3. Filaments free, or somewhat twisted together, but not united into cords by special branchlets . . . . Cladophora
3. Filaments in the lower part of the plant united by rhizoidal, hooked or spinelike branchlets . . . . Spongomorpha

CHAETOMORPHA Kützing, 1845

Plants filamentous, the filaments uniseriate, unbranched; cells cylindrical or slightly inflated, with numerous peripherally placed nuclei and a much-dissected chromatophore with many pyrenoids; plants attached by a basal cell, which may be well marked in form, or unattached and with no evidence of holdfasts.

KEY TO SPECIES

1. Plants definitely attached, and forming erect tufts . . . . C. antennina
1. Plants entangled, without definite point of attachment . . 2
2. Plants with filaments commonly under 200 μ diam., the cells generally shorter than their width . C. brachygona v. crassipellita
2. Plants with filaments reaching 300 μ, the cells 1.7-3.0 diameters long, seldom shorter . . . . C. Linum

Chaetomorpha antennina (Bory) Kützing

Plants attached, gregarious, the filaments rather firm and more or less erect, to 16 cm tall; the hapteron consisting of branched rhizoidal extensions arising at various levels on the lower part of the basal cell; basal cell notably distinct, clavate, to 6-10 mm long (reported to 15 mm), the lower part tapering and about 100-150 μ diam. in the hapteral region, commonly rugose above it and near the top of the cell 450-580 μ diam.; cells slightly cask shaped, the lower cells of the axis about 530-560 μ diam., 1.5 mm long, the upper cells 450-650 μ diam., about as long as broad, more markedly cask shaped.

Howe 1914, p. 37; Børgesen 1940, p. 37.

This species takes the place of *C. media* (C. Agardh) Kützing (Taylor 1942, p. 22) found in the Caribbean in similar situations. The longer basal cell seemingly has its rhizoidal extensions scattered rather than, as in *C. media,* in a limited, almost discoid, group. This distinction, like others which have been suggested, may not suffice to maintain these as distinct species. Howe (1914, p. 37) states that the basal cell as figured by Kützing (1853, p. 19, pl. 60, by mistake labeled on the plate as *C.*

macropus) for the Javanese *C. pacifica,* which he considers a synonym of the Panamanian *C. antennina,* is 24 mm long. On close inspection of the plate it is evident that the two basal cells shown are 14 mm and 15 mm long, respectively, and each is cut off from a suprabasal cell which is also longer than the vegetative cells above it. In Kützing's figures these cells are 7 mm and 6 mm long, respectively. In the Petatlán material of the present collections, which was of smaller stature, the length of the suprabasal cell was 1.9-2.6 mm, and that of the cell next above it 1.2-1.9 mm. Here the difference was usually marked, averaging almost 50 per cent, about as much as in Kützing's figures, but in other Pacific specimens from several sources this character was found not to be altogether reliable. Børgesen, after taking a contrary stand, decided (1940, p. 37) that *C. media* was a synonym of *C. antennina,* for he found such variation that he was not able to delimit the species to his satisfaction. The present writer finds it more satisfactory for the present to retain the distinction.

MÉXICO: Nayarit, common on surf-beaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-635,* 9 May 1939. Guerrero, in tufts on rocks in the surf zone, White Friars Is., *no. 39-626,* 1939. *Ibid.,* in the surf of the lower littoral, Ba. Petatlán, *no. 34-567,* 2 Mar. 1934. PANAMÁ: scarce in the higher tide pools, Is. Secas near Puerto Nuevo, *no. 39-124,* 26 Mar. 1939. ECUADOR: Archipiélago de Colón, on the rocks at the south side of Banks Bay, I. Isabela, *no. 34-134,* 13 Jan. 1934. Guayas, on the south side of Pta. St. Elena, Salinas, Schmitt *no. 5A,* 16 Sept. 1926. *Ibid.,* on the rocky southeast side, *no. 34-459,* 8 Jan. 1934.

Chaetomorpha brachygona Harvey, v. **crassipellita** n. v.[45]

Filaments in tangled masses, flexuous, the diameter 128-170 μ, rarely to 205 μ, the cells 0.75-1.50 diameters long, generally equal or shorter, not or but very slightly contracted at the septa, the wall rather thick; not adhering to the mounting paper.

This material is quite different in texture from the Caribbean specimens of *C. brachygona,* although of about the same size. As it grew under somewhat special environmental conditions, it seems best to associate it with *C. brachygona* (Taylor 1942, p. 23) until more is known of its variation.

ECUADOR: Archipiélago de Colón, in a lagoon south of Banks Bay, I. Isabela, *no. 34-133 (TYPE),* 13 Jan. 1934.

[45] Chaetomorpha brachygona v. crassipellita n. v.—Filamenta 128-170 μ diam., cellulis 0.75-1.50 plo longioribus quam latis, cylindricis aut ad septa paululum constrictis, membrana crassa. Planta typica in loco dicto Banks Bay, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-133,* 13 Jan. 1934.

Chaetomorpha Linum (Müller) Kützing

Filaments entangled, rather soft, to 300 μ diam., the cells 1.7-3.0 diameters long, with rather thin walls, slightly contracted at the septa; not adhering well to the mounting paper.

Taylor 1928, p. 60, pl. 4, fig. 11; 1937, p. 80, pl. 1, figs. 1, 2; 1942, p. 23.

This material consists of a much softer plant than *C. Linum* as encountered in New England. However, it resembles very closely material from Tunisia (collected by Schussnig 1924, determined by Schiffner as f. *mollis*), and some of the West Indian material, in the writer's herbarium.

Ecuador: Archipiélago de Colón, scarce, entangled among Sargassa as driftweed, I. Wenman, *no. 34-82,* 11 Jan. 1934.

RHIZOCLONIUM Kützing, 1843

Plants filamentous, the filaments uniseriate, the cells with few to several nuclei and much-dissected chromatophores with small pyrenoids; branching absent, or if present the branches short and rhizoidal, or rudimentary few-celled spur branches.

KEY TO SPECIES

1. Rhizoids absent 4
1. Rhizoids present 2
2. Filaments not over 50 μ diameter 3
2. Filaments generally over 50 μ diameter . . . . R. rhizophilum
3. Mass slippery; filaments 35-40 μ diam.; rhizoidal branches short, rare . . . . R. lubricum
3. Mass soft; filaments 10-35 μ diam.; rhizoidal branches relatively frequent . . . . R. riparium
    3a. Branches few, short and continuous with the originating cell, or apparently wanting . . . . v. implexum
4. Filaments 55-75 μ diam., walls 5-11 μ thick . . . . R. crassipellitum v. robustum
4. Filaments 10-14 μ diam.; cells to 3-7 diameters long . R. Kerneri

Rhizoclonium crassipellitum W. & G. S. West, v. robustum G. S. West

Plants forming tangled masses; filaments of irregular contour, 55-75 μ diam., the cells 1-2, rarely to 3 diameters long; cell walls 5-11 μ thick; rhizoids absent.

West, G. S. 1904, p. 283.

ECUADOR: Archipiélago de Colón, in a damp hollow near the beach, I. Bartolomé, *no. 34-339,* 23 Jan. 1934.

Rhizoclonium Kerneri Stockmayer

Collins 1909, p. 329.

MÉXICO: Is. Revilla Gigedo, from brackish water near Sulphur Bay, I. Clarion, *no. 39-20,* 16 Mar. 1939.

Rhizoclonium rhizophilum n. sp.[46]

Filaments entangled, irregular, 95-140 μ diam., the cells 1.0-2.5 diameters long, the cells sometimes cylindrical, sometimes cask shaped, the wall firm; showing sharp-angled bends in the filaments with a short prolongation of the cell below the bend, and rarely the production of a distinct 1-3-celled branch.

Howe (1920, p. 599) recognizes two large Rhizoclonia, *R. Hookeri* Kützing and *R. crassipellitum v. robustum* G. S. West, as characteristic of *Rhizophora* habitats, but this material seems larger than either, although in his paper *R. Hookeri* is admitted as 110 μ diam., coarser than ordinarily described. The latter species has cells 2-4 diameters long. This is probably what Farlow (1902, p. 89) considered *R. Hookeri.*

ECUADOR: Archipiélago de Colón, with other algae on *Rhizophora* roots in a lagoon at Academy Bay, I. Santa Cruz, *no. 34-301D (TYPE),* 20 Jan. 1934.

Rhizoclonium riparium (Roth) Harvey

Setchell & Gardner 1920, p. 182; Taylor 1937, p. 83, pl. 1, fig. 3.

ECUADOR: Archipiélago de Colón, on an old stump on the open beach at Pta. Albemarle, I. Isabela, *no. 34-113A,* 12 Jan. 1934.

v. **implexum** (Dillwyn) Rosenvinge

ECUADOR: Archipiélago de Colón, on roots in a lagoon, Pta. Albemarle, I. Isabela, *no. 34-94B,* 12 Jan. 1934.

[46] **Rhizoclonium rhizophilum** n. sp.—Filamenta 95-140 μ diam., cellulis 1.0-2.5 plo longioribus quam latis, cylindricis aut cupiformibus, membrana firma; filamentis abrupte flexis, prolongationem brevem cellulae infra flexum habentibus, quae interdum in 1-3-cellularum ramum producitur. Planta typica in loco dicto Academy Bay, I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-301D,* 20 Jan. 1934.

Rhizoclonium lubricum Setchell & Gardner

Setchell & Gardner 1920, p. 185, pl. 9, figs. 5a, 5b.
Costa Rica: Pto. Culebra, in tide pools, *no. 34-534,* 24 Feb. 1934.

CLADOPHORA Kützing, 1843

Plants bushy, at least at first basally attached, freely alternately or oppositely branched, filamentous, uniseriate, the cells multinucleate, with little difference between axial and branch cells; growth apical.

KEY TO SPECIES

1. Plants matted, or loose in tide pools 3
1. Plants tufted 2
2. Plants small, densely tufted; dark green, drying brownish; axis cells to 300 μ diam. . . . . C. prolifera
2. Plants larger, softly bushy; remaining green upon drying; the axis cells not exceeding about 130 μ diam. . . . . C. sp.
3. Plants lax, early detached, irregularly branched, the main axes to about 150 μ diam. . . . . C. gracilis f. expansa
3. Plants forming spongy cushions or mats, the main axes to 77 μ diam. . . . . C. panamensis

Other specimens of *Cladophora* were collected on these expeditions, but it is felt that the specimens are not in sufficiently well-developed condition to make identification, or even description, possible. However, the genus was not particularly common at the stations visited.

Cladophora panamensis n. sp.[47]

Plants forming spongy dull-green cushions or mats 1-2 cm thick; filaments intricately entangled without special distinction of creeping axes; main axes indefinite, to 77 μ diam., the cells 2.5-4.0 diameters long, branching di-trichotomously, or somewhat irregularly, the branches often slightly connate at the base, often with small lateral branches which may divide or be subsimple and often rhizoidal; upper branching very irregu-

[47] Cladophora panamensis n. sp.—Planta spongiosa, obscure viridis, 1-2 cm crassis; filamentis non repentibus, ad 77 μ diam.; cellulis 2.5-4.0 plo diam. longitudine; infra ramificatione dichotoma ad trichotomam, supra dichotoma ad oppositam; ramusculis ad circa 30 μ diam., cellulis 3-5 plo diam. longitudine, cacuminibus obtusis. Planta typica in loco dicto Bahía Honda, Panamá, legit W. R. Taylor, *no. 39-131,* 26 Mar. 1939.

lar, subdichotomous to more commonly opposite or lateral, rarely secund, the lesser branchlets to about 30 μ diam., the cells 3-5 diameters long, the tips blunt, sometimes rhizoidally modified.

PANAMÁ: loose mats in high, hot tide pools on an islet in the bay, Bahía Honda, *no. 39-131 (TYPE),* 26 Mar. 1939.

Cladophora gracilis (Griffiths) Kützing, f. **expansa** Farlow

Farlow 1881, p. 55; Taylor 1937, p. 89.

MÉXICO: Is. Revilla Gigedo, with *Enteromorpha* in high, warm tide pools, Sulphur Bay, I. Clarion, *no. 34-66,* 5 Jan. 1934.

Cladophora sp.

Plants clustered, to 1 dm tall, with several main axes arising together; sparingly irregularly branched below, where the axes reach 130 μ diam., the cells 7-10 diameters long; above more closely branched, often opposite, the lesser branches excurrent, bearing somewhat fasciculate branchlets 25-35 μ diam., the cells 3-5 diameters long, alternate, opposite or often subpectinate, unilateral on the lower side.

ECUADOR: Archipiélago de Colón, dredged from a rocky bottom at 37-55 meters, I. Española, *no. 34-412,* 31 Jan. 1934.

Cladophora prolifera (Roth) Kützing, *f.*

Plants very small, to 2-3 cm tall, coarse, densely tufted, dark green drying brownish; basal cell much tapered, often transversely rugose when dry, the lower end rhizoidal, often supplemented by free rhizoidal extensions of the segments above, 250-350 μ diam., 3-5 mm long exclusive of the rhizoidal tip; lower vegetative branching trichotomous or opposite, middle branching close, opposite, the cells 240-300 μ diam., somewhat tapering downward, 4-7 diameters long; upper branching opposite to irregular, fastigiate, the branchlets 90-150 μ diam., with cells 1.5-2.5 diameters long, the tip cells a little tapered, obtuse.

Kützing 1853, p. 25, pl. 82, fig. 3; Vickers 1908, p. 18, pl. 12.

These little plants certainly come very close to small specimens of *C. prolifera* from the Mediterranean, but the writer's Caribbean specimens are all much larger. They probably represent a very poorly developed phase of the species, rather than a new parallel type. The description is based particularly on *no. 34-461.*

Costa Rica: In tufts of *Galaxaura,* Golfo Dulce, *no. 39-108* (in minor part) 26 Mar. 1939. Ecuador: Archipiélago de Colón, inconspicuous tufts in the littoral near Black Beach Anchorage, I. Santa María, *no. 34-229B,* 18 Jan. 1934. Guayas, on the rocky southeastern side of Pta. Santa Elena, *no. 34-461,* 8 Feb. 1934.

SPONGOMORPHA Kützing, 1843

Spongomorpha conjuncta n. sp.[48]

Plate 2, Figs. 7, 8

Plants 2-4 cm tall, tufted, dark green drying to a brownish green; many primary filaments conjoined to a common base bound together by slender descending filaments from the lower branches; lower primary filament cells to about 5-6 mm long, somewhat tapering downward, smooth, 330-440 μ diam. at the top; branching alternate below, the filaments about 220-350 μ diam., the cells 5-6 diameters long, somewhat tapering, intermediate branching alternate or opposite; upper branchlets fasciculate, closely unilateral on the upper side of the branchlets, 150-220 μ diam., the cells 3-5 diameters long, the tip cells a little tapered, obtuse, about 5-7 diameters long.

These little plants remind one of small *Cladophora fuliginosa* in the Caribbean. However, the bases are very definitely united by rhizoids into short, tough axes. From *C. graminea* they differ in the coarser filaments and fasciculate, unilateral upper branching. From *C. prolifera* the bases again distinguish them, as well as the absence of opposite branching in the upper portions.

Ecuador: Archipiélago de Colón, rare and inconspicuous in the littoral, I. Santa María, *no. 34-229A (TYPE),* 17 Jan. 1934.

Dasycladaceae

Plants with regular whorls of branches on the simple, generally unicellular and unbranched axis, the uniseriate branches multicellular, coenocytic, with limited growth or, in some genera, establishing secondary axes, frequently tipped by deciduous hairs; ultimate divisions becoming sporangial, or bearing specialized sporangia, in which aplanospores are produced.

[48] Spongomorpha conjuncta n. sp.— Planta caespitosae, 2-4 cm altitudine, filamentis prope basim per filamenta descendentia desuper junctis; filamentis primariis 330-440 μ diam., cellulis 5-6 mm long., ramificatione infra alterna, media in parte alterna aut opposita, supra fasciculata, ramulis unilateralibus 150-220 μ diam., cellulis 3-5 plo longioribus quam latis. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-229A,* 17 Jan. 1934.

KEY TO GENERA

1. Branches in many whorls covering the simple axis, at the tip with a tuft of green branching filaments, below the ends of expanded peripheral cells forming a regular surface which becomes calcified, near the base denuded in old specimens . . . . Neomeris
1. Branches in one, rarely to 3 whorls near the top of the axis, the branches undivided, laterally coherent in each whorl to form a generally calcified disk, but each bearing projections above and often below near the base . . . . Acetabularia

NEOMERIS D'Archiac, 1843

Neomeris Vanbosseae Howe

Plants subcylindrical, usually curved, the apex rounded; to 25 mm tall, 3.5 mm diam.; peripheral branches capitate, the ends about 150 μ diam.; the upper calcareous cortex showing regular facets each penetrated by a pore, this crust cracking off below, exposing the persistent calcified subspherical sporangia which are laterally free, 145-205 μ diam.; lower part of older plants denuded of sporangia, exposing calcified but laterally free primary branches 25-30 μ diam., 500-600 μ long.

Howe 1909, p. 80, pl. 1, figs. 4, 7, pl. 5, figs. 17-19.

México: Is. Revilla Gigedo, frequent in smooth pothole pools in the littoral zone, Braithwaite Bay, I. Soccoro, *no. 34-3,* 3 Jan. 1934, and *no. 39-55,* 18 Mar. 1939.

ACETABULARIA Lamouroux, 1812

Acetabularia parvula Solms Laubach, v. americana n. v.[49]

Plate 1, Figs. 17, 18

Plants small, 4-7 mm tall, the disks 2-4 mm diam., of 15-18 rays, the rays moderately laterally adherent, broad, moderately thin walled, the end rounded truncate, without evident apiculus; dorsal coronal projections radially slightly obovoid, 75-90 μ with generally 3, occasionally 4 or 5, hair bases.

Solms Laubach 1895, p. 29, pl. 2, figs. 3, 5.

[49] Acetabularia parvula v. americana n. v.—Plantae 4-7 mm altitudine, discis 2-4 mm diam. constantibus, ex 15-18 radiis modice adhaerentibus partesque extremas rotundato-truncatas atque leves habentibus; projectionibus dorsalibus coronariis obovatis, 75-90 μ diam. radiali, 3-5 basibus pilorum munitis. Planta typica in loco dicto Braithwaite Bay, I. Soccoro, Is. Revilla Gigedo, México, legit W. R. Taylor *no. 34-16,* 3 Jan. 1934.

These plants suggest *A. parvula* Solms Laubach, but the disks and especially the dorsal projections were larger than designated for that species. The calcification could not be carefully studied because after storage for 8 years in formaldehyde it had largely been destroyed.

MÉXICO: Is. Revilla Gigedo, very rare as dredged from 25-32 meters at sta. 139 off Braithwaite Bay, I. Soccoro, *no. 34-16 (TYPE),* 3 Jan. 1934.

Bryopsidaceae

Plants tufted, coenocytic, the axial coenocytes bearing radial or pinnate lateral branchlets which are not entirely cut off from the axis, but which in mature plants may act as gametangia.

BRYOPSIS Lamouroux, 1809

KEY TO SPECIES

1. Branching bilaterally pinnate at least in the distinctive plumose ultimate divisions 2
1. Branching radial, the last orders not distinctive . . B. hypnoides
2. Erect axes pinnate on the upper half, the pinnules 130 μ in diameter or less . . . . B. galapagensis
2. Erect axes pinnate near the tips only, though with irregularly placed pinnules below in some cases, the pinnules 150 μ diam. or more . . . . B. pennatula

Bryopsis hypnoides Lamouroux, *prox.*

Collins 1909, p. 403; Taylor 1937, p. 97; Smith 1944, p. 73.

This material formed rather involved soft tufts, relatively dark green in color. The stronger axes were barely distinct, and their branches imperceptibly intergraded and were nearly as long. The branchlets were never bilaterally arranged or plumose and reached 85 μ diam.

PANAMÁ: infrequent in rock crevices in the intertidal flats at San Francisco, Panama City, *no. 39-142,* 31 Mar. 1939.

Bryopsis galapagensis n. sp.[50]

Plate 6, Fig. 1

Plants small, light green, soft and delicate, 1-3 cm tall, the erect axes infrequently branched, bearing distichous pinnules in a flat linear to ob-

[50] Bryopsis galapagensis n. sp.—Plantae subvirides, 1-3 cm altitudine, axibus erectis sparse ramosis, pinnulas distichas in lamina a lineari ad lanceolatam variante, ad 15 mm long., 3 mm lat., ferentibus; axe 130-370 μ diam., pinnulis 55-130 μ diam. Planta typica in loco dicto I. Wenman, Ecuador, legit W. R. Taylor *no. 34-83,* 11 Jan. 1934.

long-lanceolate blade reaching 15 mm in length, 3 mm in width, or not infrequently irregular; axis 130-370 μ diam., pinnules 55-130 μ diam.

From *B. pennata* these plants may be differentiated by their much lighter green color, for *B. pennata* is dark green and the plants commonly iridescent in the water. They are also, so far as these collections go, smaller and with shorter pinnules, although the transverse dimensions of the axis and pinnules are not distinctive; it is a parallel species but apparently descends into deeper water than the Caribbean counterpart. The pinnules average one third the diameter of the axis when fully developed, and vary little from this ratio. The axis in *B. pennata* may be as much as three times the diameter of the pinnules in the ramelliferous portions, but is often hardly more than twice as wide. From *B. pennatula* J. Agardh these differ in size, in the much greater portion of the axis which is pinnate, the longer pinnules, and in the relative diameters of the axis and pinnules.

MÉXICO: Is. Revilla Gigedo, dredged at sta. 129 from 25-32 meters at Braithwaite Bay, I. Soccoro, *no. 34-17,* 3 Jan. 1934. *Ibid.,* dredged from 45 meters at sta. 135 off Sulphur Bay, I. Clarion, *no. 34-46B,* 5 Jan. 1934. COLOMBIA: Valle, at I. Gorgona (axis to 450 μ diam.), *no. 34-495A,* 12 Feb. 1934. ECUADOR: Archipiélago de Colón, intertidal in pools, I. Wenman, *no. 34-83 (TYPE),* 11 Jan. 1934. *Ibid.,* moderately frequent on sand near large rocks at about low tide line, Pta. Albemarle, I. Isabela, *no. 34-108,* 12 Jan. 1934. *Ibid.,* dredged from 14-18 meters at sta. 193 off Post Office Bay, I. Santa María, *no. 34-367,* 27 Jan. 1934.

Bryopsis pennatula J. Agardh

Kützing 1856, p. 27, pl. 76, fig. 2.

Plant to 5 cm tall, light green and soft, entangled below, the erect axes sparingly branched, 220-370 μ diam., bearing pinnules near the tip where sometimes distichous for a distance of 3 mm, and in sparse interrupted series below, where more often unilateral and irregular; pinnules very short, 0.5-0.75 mm long, markedly contracted at the base and above it thick, 150-185 μ diam.

These somewhat matted plants hardly appear to be ramelliferous until closely examined, and indeed are very sparingly so. They are certainly the *B. ramulosa* of Farlow (1902, p. 89), for authentic material from the Farlow Herbarium has been compared. However, *B. pennatula* J. Ag. and *B. ramulosa* are not synonyms, and *B. pennatula* as figured by Kützing *(loc. cit.)* is pinnate only near the tips, with the pinnules about half as wide as the axis. Our plants are much taller than those Kützing figures, but that may not be significant.

MÉXICO: tufts on rocks in the surf zone, White Friars Is., *no. 39-629,* 7 May 1939. ECUADOR: Archipiélago de Colón, intertidal on I. Wenman, *no. 34-86,* 11 Jan. 1934.

Caulerpaceae

Plants moderate to very large, branching in forms simulating the rhizoids or roots, stems and leafy branches of higher plants; coenocytic and nonseptate; reproduction involving local segmentation of the protoplast and discharge of swarmers through papillae on the plant surface.

CAULERPA Lamouroux, 1809

KEY TO SPECIES

1. Branchlets mucronate 2
1. Branchlets smooth on the rounded ends 3
2. Branchlets subcylindrical, short and divergent . . . . C. cupressoides v. Lycopodium
2. Branches cylindrical, slender, 10 diameters long or more, regularly distichous . . . . C. sertularioides
3. Branchlets typically with the ends spherical or a little compressed . . . . C. racemosa
   3a. Branchlets long-clavate to subcylindrical, erect spreading, on a long axis; plants of quiet tide pools . . . v. laetevirens
   3b. Branchlets short-clavate, at least near the top of the elongate and often branched erect axis, closely set, the pedicels slenderer and often upcurved, the end of the branchlet rather sharply expanded; plants of quiet tide pools . v. occidentalis
   3c. Branchlets short, broader, and somewhat flattened on the exposed face, crowded on a short axis; plants of exposed reef faces . . . . v. uvifera
3. Branchlets with the ends flat and peltate when fully developed . . . . C. peltata

Caulerpa cupressoides v. Lycopodium near f. elegans Weber-van Bosse

Weber-van Bosse 1898, p. 335, pl. 27, figs. 8, 9.

ECUADOR: Valle, one fragment at I. Gorgona, *no. 34-494A,* 12 Feb. 1934.

Caulerpa sertularioides (Gmelin) Howe

Taylor 1928, p. 103, pl. 12, figs. 2, 17; pl. 13, fig. 5.

MÉXICO: Oaxaca, slender plants near v. *brevipes* in mats on the coarse sand of broken shell, Ba. Tangola-Tangola, *no. 34-554,* 28 Feb. 1934.

Caulerpa racemosa (Forsskål) J. Agardh

Taylor 1928, p. 101, pl. 12, figs. 5, 6, 8; 1942, p. 33, pl. 7, fig. 1.

Farlow (1902, p. 89) records this species from Tagus Cove, I. Isabela. The specimens in Stanford University Herbarium were ill preserved and did not justify an attempt at varietal segregation.

MÉXICO: Is. Revilla Gigedo, very common, in mats between boulders at Sulphur Bay, I. Clarion, *no. 39-11,* 16 Mar. 1939.

v. laetevirens (Montagne) Weber-van Bosse

Weber-van Bosse 1898, p. 366, pl. 33, figs. 8, 16-22.

MÉXICO: Is. Revilla Gigedo, common in deeper tide pools, Sulphur Bay, I. Clarion, *no. 39-45B,* 17 Mar. 1939.

v. occidentalis (C. Agardh) Børgesen

Børgesen 1913, p. 147, fig. 124.

MÉXICO: Is. Revilla Gigedo, luxuriant plants abundant at a depth of about a meter below low tide, growing among corals, Sulphur Bay, I. Clarion, *no. 34-49,* 15 Jan. 1934 and *39-45A,* 17 Mar. 1939. ECUADOR: Archipiélago de Colón, an attenuate form growing in large beds at a depth of 1.5 meters in an inland salt-water lagoon, I. Fernandina, *no. 34-153,* 14 Jan. 1934.

v. uvifera (Turner) Weber-van Bosse

Weber-van Bosse 1898, p. 362, pl. 33, figs. 6, 7, 23.

ECUADOR: Archipiélago de Colón, dwarfed plants not infrequent in the deeper tide pools at Black Beach Anchorage, I. Santa María, *no. 34-244A1,* 17 Jan. 1934.

Caulerpa peltata (Turner) Lamouroux

Weber-van Bosse 1898, p. 373, pl. 31, fig. 9, pl. 32, fig. 9; Taylor 1928, p. 100, pl. 12, fig. 9, pl. 13, fig. 13.

MÉXICO: Oaxaca, near the low tide mark in Ba. Tangola-Tangola, *no. 34-552,* 28 Feb. 1934. ECUADOR: Archipiélago de Colón, abundant in the lower tide pools, I. Wenman, *no. 34-84,* 11 Jan. 1934. *Ibid.,* intertidal on islet in Gardner Bay, I. Española, *no. 34-427,* 31 Jan. 1934. Guayas, on the rocky southeastern side of Pta. Santa Elena, Salinas, *no. 34-460B,* 8 Feb. 1934. *Ibid.,* La Libertad, Schmitt *no. 12A-33,* 19 Jan. 1933.

Codiaceae

Plants spongy or sometimes calcified, flabelliform or cylindrical, simple or branched, sometimes with distal tufts of free filaments; structurally composed of branched filaments, which are commonly twisted and interwoven to produce a spongy axis, at other times roughly parallel and laterally conjoined, and occasionally in the distal parts of the plant free; peripheral branches of the filaments often anticlinally arranged and specialized in form to produce a cortex; sporangia (?) and gametangia lateral near the ends of the filaments.

KEY TO GENERA

1. Plants completely uncalcified 2
1. Plants branched, segmented, the segments disciform and calcified, connected by lime-free articulations . . . . . Halimeda
2. Plants with an ill-developed and lightly twisted, sometimes matted and sometimes stalklike base, but above the filaments free . . . . Chlorodesmis
2. Plants branched, spongy, with no free filaments . . . . Codium

CHLORODESMIS Harvey & Bailey[51]

Chlorodesmis mexicana n. sp.[52]

Plate 7, Fig. 2

Plants forming an expanded turf or cushion, or tufted, to 8 cm tall, developing from a closely matted base, the erect filaments dichotomous or occasionally trichotomous, the branches at their bases articulated by a

[51] In Harvey 1858, p. 29, the genus and the first species *C. comosa* are cited as "Bail. and Harv.," but in the original publication each species is cited "H. et B.," while the responsibility for the genus is not particularly designated.

[52] Chlorodesmis mexicana n. sp.—Plantae caespitideae aut pulviniformes, 8 cm alt., infra implectae, supra filamentis viridibus, dichotomis, super furcas constrictione et, postremo, pseudosepto; filamentis 148-185 μ diam. Planta typica in loco dicto Braithwaite Bay, I. Soccoro, Is. Revilla Gigedo, México, legit W. R. Taylor *no. 34-24B,* 2 Jan. 1934.

marked constriction and ultimately developing a marked pseudoseptal thickening, the supporting segment not bifurcate at the top; diameter of filaments 148-185 μ, branching intervals 0.2 mm to 1.0 cm or more, the apices obtuse.

México: Oaxaca, intertidal rocks in Ba. Tangola-Tangola, *no. 34-558B,* 28 Feb. 1934. Is. Revilla Gigedo, abundant in the littoral and in tide pools about Braithwaite Bay, I. Soccoro, *nos. 34-1, 34-24B (TYPE),* 2 Jan. 1934. Ecuador: Guayas, south side of Pta. Santa Elena, Salinas, Schmitt *no. 5C,* 16 Sept. 1926. *Ibid.,* on the rocky southeast side of Pta. Santa Elena, *no. 34-458A,* 8 Feb. 1934.

When best developed, this species was tufted, but it often grew in an expanded turf. The branches in these plants are at first simply contracted at the base to 0.5-0.66 their full diameter, but later at this point the wall gradually becomes greatly thickened, so that the cavity is nearly divided. It seems that in old filaments a true wall sometimes finally does complete this septum, but it is hard to be sure.

This is probably the Clarion I. plant referred to *C. comosa* Harv. & Bail. (1851, p. 373) by Setchell and Gardner (1930, p. 115). From *C. comosa* as interpreted by Okamura (Algae Japonicae Exsiccatae *no. 96;* 1936, p. 107, fig. 55) this species differs in a less well-developed base, it being not at all stalklike, and in that the filament segments at the forward end were not at all bifurcate below the articulations, as his were. It is also coarser, the filaments in his specimen hardly exceeding 130 μ. Material from the earliest collection of *C. comosa* in the U.S. National Herbarium consists of 9 individuals mounted on a piece of blue paper. The label is the blue printed one of the U.S. North Pacific Exploring Expedition under the command of Comm. Cadwallader Ringgold and Lt. John Rogers, 1853-56, with Chas. Wright as collector. The place is indicated faintly in pencil as "Feeji Ids." However, while it is from the same part of the world, Harvey indicates that the type material was brought back by Captain Wilkes from the U.S. Exploring Expedition, 1838-42, and by inference was collected by Dr. Chas. Pickering, after whom a *Caulerpa* was named. This material the writer has not seen. Information regarding these expeditions is given by Meisel (1924-29).

Of the Wright specimens, four show no stalklike part, though the bases are compact and felted, but the others show a free filamentous portion 3.0-4.5 cm long and a paler portion with the filaments held together somewhat at the top and clearly felted below, the whole being 7-15 mm long. The upper part of the base may well be stalklike simply because it had been squeezed between the fingers to drain it before mounting, but below the filaments are clearly intertwined. The free filaments are 65-115 μ diam., and in most cases there was a little, or even considerable, bifurcation of the filament below the articulation of the branches. The arms were generally unequal on the two sides. In one case the filaments were several times contracted above the articulation, giving a slightly beaded appearance. The amount of study of this material which was possible was, of course, very limited. In addition to a copy of the Alg. Jap. Exsic. *no. 96* in the writer's herbarium, he has one from Suburatsu, Hinga, Japan, coll. Higashi, July 1924; neither of these shows a stalk, and they do show segments forked below the branch articulations, with the opposite arms of unequal length.

The most complete account of the genus *Chlorodesmis* known to the author is that of A. & E. S. Gepp (1911, pp. 13-19). They recognize three species, *C. comosa* Harvey & Bailey with filaments 60-140 μ diam. and the tops of the branch supporting cells unequally bifurcate, *C. Hildebrandii* A. & E. S. Gepp with filaments 80-130 μ diam. and the tops of the supporting cells not bifurcate, but rather transverse with the branches articulated on the angles at an equal level, and the little-known *C. major* Zanardini, with filaments "more than twice as thick as *C. comosa*."

In the herbarium of the New York Botanical Garden there is material from Papete and Arue Reef, Tahiti (coll. A. G. Mayor), Aunuu I. and Aua, Samoa (coll. W. A. Setchell), Upolu, Samoa (Krypt. Exsic. Mus. Palat. Vindob. *no. 1349*), Taypay, Palawan, Philippine Is. (coll. E. D. Merrill *no. 9161*), Friendly Is. (coll. Harvey *no. 90*), New Hebrides (coll. E. E. Gore), Baie du Sud, New Caledonia (coll. Jouan), which all agree with *C. comosa* Harv. & Bail. as interpreted by the Gepps. The specimen in the same collection from Pomoni, Jonanna I., Comoro Is. (coll. Hildebrand), appears to be from the type collection of *C. Hildebrandii* A. & E. S. Gepp, and agrees with the description of that species except that the writer finds the filaments to measure as high as 150 μ diam., where they cite but 130 μ, while the lower limit is confirmed. Finally, in the herbarium of the New York Botanical Garden there is one specimen in the F. S. Collins collection simply marked in pencil "Torres Str.," and two from the Murray Islands, Torres Str. collected by H. L. Clark. They represent a species which is about 15 cm tall, and quite coarse. The ill-known *C. major* Zanard. came from Lord Howe I., east of Australia, and 20° more southerly in latitude. It is possible that it is the same plant as that in the Clark collection, but the inadequate data do not justify associating the Clark plant with that species name, nor is it like the other described species, and it may be designated *C. torresi-*

ensis n. sp.[53]—Plant tufted, to 15 cm tall, filaments divaricately branched and entangled below, slightly moniliform, above erect and dichotomously branched, the branches erect and articulated on the truncated end of the supporting segment below; filament diameter 138-416 μ. Murray Is., Torres Straits, collected by H. L. Clark, Oct. 1913, in the herbarium of the New York Botanical Garden, *TYPE*. This is a plant still coarser than the proposed *C. mexicana,* and hardly to be confused with it.

CODIUM Stackhouse, 1797

Plant thickly encrusting, lobed, or branched and decumbent, or most commonly erect and bushy from a small cushionlike holdfast, of moderate to large size, dark green, tough and somewhat spongy; coenocytic, composed of branching filaments which intertwine to form the massive plant, the filament tips oriented at right angles to the surface and inflated to form peripheral utricles, which are sometimes partly cut off by thickening of the cell membrane at the base, and which commonly bear hyaline branched hairs, and in season, gametangia.

KEY TO SPECIES

1. Plants cushionlike or encrusting . . . . C. Setchellii
1. Plants decumbent or erect, with relatively narrow branches 2
2. Peripheral utricles smooth on the ends 3
2. Peripheral utricles foveolate; surface of the plant when dried distinctly spongy . . . . C. foveolatum
2. Peripheral utricles mucronate; surface of the plant when dried appearing smooth . . . . C. fragile
3. Erect axes simple, or generally sparingly branched quite near the base . . . . C. longiramosum
3. Branching distributed, generally abundant 4
4. Utricles when fully developed over 300 μ diam. C. fernandezianum
4. Utricles smaller 5
5. End wall of the peripheral utricles generally thin, commonly less than 6 μ 6
5. End wall of the peripheral utricles generally thick, commonly more than 10 μ 7

[53] Chlorodesmis torresiensis n. sp.—Plantae caespitosae, ad 15 cm altitudine, filamentis infra divaricate ramosis implexisque, submoniliformibus, supra erectis atque dichotome ramosis, ramis erectis, parte in extrema truncata segmenti sustinentis articulatis; filamento 138-416 μ diam. Planta typica in loco dicto Murray Is., Torres Straits, legit H. L. Clark, Oct. 1913, in herb. New York Botanical Garden.

6. Peripheral utricles short, two diameters long or less, mostly 90-120 μ diam. . . . . C. santamariae
6. Peripheral utricles longer, three diameters long or more, mostly over 120 μ diam. . . . . C. dichotomum
7. Branch segments somewhat cuneate, a little compressed at the forks; gametangia 65 μ diam. or less . . . . . . C. cervicorne
7. Branch segments cylindrical, without any compression; gametangia 5 μ diam. or more when mature . . . . . . C. isabelae

Codium Setchellii Gardner, *prox.*

Plants forming quite thin, to moderately thick strata, the peripheral utricles with rounded ends, 60-90 μ diam., the membrane about 5 μ thick.

Gardner 1919, p. 489, pl. 42, figs. 10, 11; Smith 1944, p. 75, pl. 9, fig. 4.

These plants formed much thinner layers than those described by Gardner, except *no. 34-379,* which reached his lower limit, and the vesicles ranged more widely in size, the maximum being greater than he described, and the end walls thinner. The Jicarita material was little more than a thin weft of filaments supporting a layer of vertical utricles. No fertile material was available, but no other allocation of the material appears more suitable.

PANAMÁ: rare, spreading in thin crusts over rocks, I. Jicarita, *no. 34-508,* 21 Feb. 1934. ECUADOR: Archipiélago de Colón, on corals at 5.4 meters, I. Pinta, Schmitt *no. 46A-33,* 2 Feb. 1933. *Ibid.,* adhering to rocks about Black Beach Anchorage, I. Santa María, *no. 34-242,* 19 Jan. 1934. *Ibid.,* rare as dredged off Post Office Bay from 12-18 meters, *no. 39-361,* 27 Jan. 1934. *Ibid.,* dredged attached to shells from 60 meters' depth, *no. 39-379C,* 29 Jan. 1934.

Codium dichotomum (Hudson) S. F. Gray

Papenfuss 1944, p. 338; Setchell 1931, p. 361; Taylor 1942, p. 37.

This is the plant which has gone under the name *C. tomentosum* in the past.

MÉXICO: Baja California, intertidal at Point Hughes near Cabo San Lazaro, *no. 34-594,* 7 Mar. 1934. ECUADOR: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-273,* 19 Jan. 1934.

Codium santamariae n. sp.[54]

Plate 1, Figs. 14-16

Plants slender and relatively small, the axes to 3-5 cm long, irregularly dichotomously branched, the branches 1.0-3.0 mm diam., cylindrical throughout; peripheral utricles clavate, the outer end slightly flattened, diam. 90-190 μ, mostly 90-120 μ, about 1.5-2.0 diameters long; hair scars absent or occasional near the upper end, the end membrane smooth, firm, 3-6 μ, rarely to 17 μ thick; gametangia fusiform to oval, single and attached to the middle of the fertile utricle, 65-80 μ diam., 150-180 μ long.

These plants resemble *C. isabelae* except for the thin-walled vesicle tips and somewhat smaller gametangia. The dredged specimens *(no. 34-362)* may have been spreading rather than erect, since places on the branches seem to show groups of hapteral rhizoids. One is tempted to consider them small forms of *C. unilaterale* Setch. & Gard. (1924a, p. 710) but the plants are smaller, tend to be entangled, and seem to have smaller gametangia attached lower on the fertile utricles.

ECUADOR: Archipiélago de Colón, rare along the shore at Black Beach Anchorage, I. Santa María, *no. 34-226 (TYPE),* 17 Jan. 1934. *Ibid.,* dredged at 13-18 meters off Post Office Bay, *no. 34-362A* (fertile), 27 Jan. 1934. Guayas, on the rocky southeastern side of Pta. Santa Elena, Salinas, *no. 34-462,* 8 Feb. 1934.

Codium cervicorne Setchell & Gardner, *prox.*

Plants bushy, to 10 cm tall, irregularly dichotomously branched at close intervals of 0.5-1.5 cm, the segments slightly cuneate throughout, and a little compressed at the forkings, the angles rounded and wide, diverging 90°-120°, the upper segments considerably more slender (1-2 mm) than the lower (2-4 mm), and more closely branched, the apices blunt; peripheral utricles clavate, 140-260 μ diam., 2-3 diameters long, with occasional hair scars near the rounded distal end, which has a distinctly thickened smooth end wall reaching 12-20 μ thick; gametangia spindle shaped, 38-65 μ diam., 140-220 μ long, attached near the middle of the fertile utricles.

Setchell & Gardner 1924, p. 712, pl. 32, fig. B.

[54] Codium santamariae n. sp.—Plantae ad 5 cm altitudine, graciles, irregulariter dichotome ramosae, cylindricae; utriculis peripheralibus clavatis, 90-190 μ diam., 1.5-2.0 plo longioribus quam latis, membrana extrema levi, plerumque 3-6 μ crassitudine; gametangiis singulis, a fusiformibus ad ovata variantibus, 65-80 μ diam., 150-180 μ long. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-226,* 17 Jan. 1934.

These plants suggest *C. cervicorne* Setch. & Gard., but are more slender and more branched in habit, with rather more thin-tipped utricles.

ECUADOR: Archipiélago de Colón, dredged in 36-55 meters near an islet in Gardner Bay, I. Española, *no. 34-424* (fertile), 31 Jan. 1934.

Codium isabelae n. sp.[55]

Plate 1, Figs. 10-13; Plate 7, Fig. 1

Plant slender, bushy, 6-8 cm tall; dichotomously to irregularly branched, the branches 1.5-3.0 mm diam., slightly tapered above, not compressed, smooth when dry; peripheral utricles to 95-260 μ diam., generally 100-150 μ, about 2-3 diameters long, subcylindrical to broadly clavate, the end rounded, the wall notably thick and lamellate, 15-35 μ, smooth; hair scars not distinct; gametangia one or two on a fertile utricle, attached about two thirds below the top, rounded or truncate-spindle shaped, 75-107 μ diam., 150-220 μ long.

Of the specimens available, those from I. Española differ in having gametangia near the minimum size and perhaps in being of spreading rather than erect habit. While this last feature would relate the plants to *C. repens,* the thick end walls of the utricles relate them rather to the I. Isabela and I. Santa María plants.

MÉXICO: Is. Revilla Gigedo, dredged from 45 meters' depth at sta. 919 near I. Clarion, *no. 39-31,* 17 Mar. 1939. *Ibid.,* dredged from 56-102 meters' depth at sta. 921, *no. 39-42,* 17 Mar. 1939. ECUADOR: Archipiélago de Colón, very small plants on the littoral rocks at the head of Tagus Cove, I. Isabela, *no. 34-152* (fertile, *TYPE*), 14 Jan. 1934. *Ibid.,* littoral pools at Black Beach Anchorage, I. Santa María, *no. 34-253* (scantily fertile), 17 Jan. 1934. *Ibid.,* dredged from a rocky bottom at 36-55 meters' depth off an islet in Gardner Bay, I. Española, *no. 34-420A* (fertile), 31 Jan. 1934.

Codium longiramosum Setchell & Gardner

Plants to over 68 cm tall, occasionally simple, generally branched 1-4 times successively within 1 dm of the base, but not in the upper portion; at the axils slightly dilated, otherwise cylindrical and reaching 1 cm diam.,

[55] Codium isabelae n. sp.—Plantae ad 6-8 cm altitudine, graciles, dichotome aut irregulariter ramosae, ramis 1.5-3.0 mm diam., cylindricis; utriculis peripheralibus 95-260 μ diam., 2-3 plo longioribus quam latis, a subcylindricis ad late clavatos variantibus, membrana extrema 15-35 μ crassa; gametangiis 1-2 utriculo insedentibus, rotundatis aut truncato-fusiformibus, 75-107 μ diam., 150-220 μ long. Planta typica in loco dicto Tagus Cove, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-152,* 14 Jan. 1934.

the ultimate segments to 15-58 cm long; peripheral vesicles short clavate, the ends broad and low-arched, the greatest diameter of 380-510 μ near the end; the end wall smooth, 19-32 μ thick, with a zone of numerous hair scars just below the widest part; gametangia attached well below the hair zone, one or perhaps to three on a single vesicle, short fusiform, widest near the base, with a blunt tip and thickened end wall, the diameter 96-128 μ, length 220-288 μ.

Setchell & Gardner 1924a, p. 710, pl. 15, fig. 27, pl. 37.

This plant was available in some quantity, but mostly broken. A complete specimen with tips was 41 cm tall after drying; its longest branch above the upper fork was 35 cm, but in a specimen collected by Schmitt with 8 major tips one terminal segment was 58 cm long and quite possibly had been broken off at the end. The above description based on the present material differs a little from the original, but certainly represents plants of the same species, and adds the characters of the fertile utricles.

MÉXICO: Is. Revilla Gigedo, young fragmentary plant dredged at sta. 129 from 25-32 meters off Braithwaite Bay, I. Soccoro, *no. 34-18,* 3 Jan. 1934. *Ibid.,* dredged from 51-79 meters' depth at sta. 917 near I. Clarion, *no. 39-21,* 16 Mar. 1939. *Ibid.,* dredged in some quantity at sta. 919 from 36-38 meters off a bottom of sand and coralline algae off Sulphur Bay, I. Clarion, *no. 39-30,* 17 Mar. 1939. Guerrero, shore collecting inside Morro de Petatlán and toward the lagoon, Ba. Petatlán, Schmitt *no. 120A-33,* 17 Mar. 1933.

Codium fernandezianum Setchell

Plants very dark green, to 15 cm tall from a small holdfast, with a very short basal stalk or without evident stalk, branching 1-3 times, the branches 3-7 mm diam., at the forks cuneate flattened, to 2.5 cm across, but otherwise cylindrical; peripheral utricles large, subcylindrical, generally 360-500 μ diam., not uncommonly 740-1050 μ and sometimes more, 2-3 diameters long, the ends rounded to rounded conical, the end membrane smooth, 6-35 μ thick, generally about 20 μ on the smaller utricles and 10 μ on the larger ones, with hair scars not frequent or conspicuous; gametangia elongate ovoid to rounded conical, 222-320 μ long, 75-90 μ diam., 1-3 attached about the middle of each fertile utricle.

Setchell 1937, p. 592, pl. 36, fig. 10.

This record gives a notable range to this species, otherwise known only from the Is. Juan Fernandez. The plants were young and small; the writer has material from Juan Fernandez collected by the *Hassler* Expedition and determined by Setchell, where the plant size must have been far greater and the great triangular plates at the forks were 8 cm on a side, though in other instances hardly so distinct. The specimen *no. 509* is a small, densely branched thing, but probably only a young growth stage. From Setchell's paper it is evident that the species is exceedingly variable in general shape, although quite distinctive microscopically.

México: Baja California, shore collections in Ba. Santa María, Schmitt *no. 127A-33* (fertile, but poorly developed), 21 Mar. 1933. Ecuador: Guayas, tide pools at Pta. Santa Elena, Salinas, Schmitt *nos. 5B, 504, 509 (?), 510* (fertile), 12-17 Sept. 1926.

Codium fragile (Suringar) Hariot

Setchell & Gardner 1920, p. 171, pls. 28, 29; Smith 1944, p. 75, pl. 9, fig. 5.

México: Baja California, Pto. San Bartolomé, Ba. Thurloe, *no. 34-620,* 9 Mar. 1934.

Codium foveolatum Howe, *prox.*

Plant coarse but relatively small, the axes to 4-6 cm long, mostly decumbent with secondary attachments to the substratum and other branches, irregularly branched, the branches 3-8 mm diam., cylindrical throughout, when dried distinctly lacunose spongy; peripheral utricles rather truncate rounded, 300-600 μ diam., about 2-4 diameters long, the end wall 5-20 μ thick, the outer surface foveolate-roughened; hair scars not recognizable; gametangia apparently single on the fertile utricles, somewhat tapering ovoid, 150-190 μ diam., 250-420 μ long.

Howe 1914, p. 45, pl. 10, text-figs. 15-19.

These plants are to be compared with *C. repens* (Crouan) Vickers and *C. Geppii* Schmidt, but are in general coarser in habit than either of them and the vesicles have notably thicker end walls, with an irregular pattern of sinuous pits. Specimen *no. 362A-35* differed from the rest in being slender throughout, barely 3-4 mm, but had the same cell wall structure.

Ecuador: Archipiélago de Colón, dredged from 27-54 meters off Tagus Cove, I. Isabela, *no. 34-140,* 13 Jan. 1934. *Ibid.,* in the deeper tide pools at Black Beach Anchorage, I. Santa María, *no. 34-244C* (fertile), 17 Jan. 1934. *Ibid.,* dredged from 27 meters off Post Office Bay, *no. 34-276B,* 19 Jan. 1934.

HALIMEDA Lamouroux, 1812

Plants moderately large, solitary, gregarious or forming spreading colonies, with a massive rhizoidal base, a short stipe, and branched upper portion or in colonial masses losing any distinctive base and attaching at various places; branches segmented, the segments cylindrical or flattened, circular or somewhat lobed, slightly to considerably calcified, except the nodal joints between the segments.

KEY TO SPECIES

1. Branching characteristically in a plane; base remaining single and distinct 2
1. Branching in more than one plane, at least below; segments considerably calcified; base becoming obsolete . . . . H. Opuntia
2. Segments lightly calcified; viewed in transverse section the peripheral utricles attached for a fourth of their depth or even more, the subperipheral utricles several times larger; the large segments round to obovate . . . . H. discoidea
2. Segments moderately calcified; viewed in transverse section the peripheral utricles barely attached at the surface, the subperipheral utricles little larger . . . . H. Tuna

Halimeda Opuntia (Linnaeus) Lamouroux

Taylor 1942, p. 42.

These plants, probably because of the depth at which they grew, were somewhat more loosely branched than usual in the v. *typica,* but they had the shape of the segments of that variety and not that of v. *tripartita.* They show a little trace of ribbing and considerable tendency for the branching to lie in a plane. A plant 18 cm tall and 25 cm in diameter was secured.

MÉXICO: Is. Revilla Gigedo, abundant as dredged from 50 meters' depth off a bottom of gray sand at sta. 977 near I. Clarion, *no. 39-24A,* 16 Mar. 1939. *Ibid.,* dredged from 45 meters, *no. 39-32,* 17 Mar. 1939.

Halimeda discoidea Decaisne

Taylor 1928, p. 82, pl. 10, fig. 17.

MÉXICO: Is. Revilla Gigedo, occasional in tide pools at Sulphur Bay, I. Clarion, *no. 34-54,* 5 Jan. 1934. *Ibid.,* very abundant in tide pools on the rocky point, *no. 39-47,* 17 Mar. 1939. Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-657,* 9 May 1939.

Halimeda discoidea, *forma*

The segments deltoid with the forward margin rounded.

COSTA RICA: scarce, in rock crevices and lower tide pools, Golfo Dulce, *no. 39-96,* 26 Mar. 1939.

Halimeda Tuna (Ellis & Solander) Lamouroux

Barton 1901, p. 11, pl. 1, figs. 1, 4, 6; Collins 1909, p. 400; Taylor 1928, p. 85, pl. 10, fig. 8.

MÉXICO: Is. Revilla Gigedo, rather scarce, mixed with but extending lower than the *Caulerpa* beds, Sulphur Bay, I. Clarion, *no. 39-12,* 16 May 1939.

Derbesiaceae

Plants matted or tufted, with a creeping rhizomatous portion bearing attaching holdfasts and generally erect simple or branched assimilative filaments; sporangia lateral on the erect or upper free filaments, developing several zoöspores, each with an anterior circle of flagella.

DERBESIA Solier, 1847

KEY TO SPECIES

1. Forming mats without particularly distinct erect filaments; filaments 75 μ diam. or less; sporangia less than 100 μ diam . . . . D. longifructa
1. At least part of the plant erect and tufted; filaments generally 100 μ diam. or more; mature sporangia exceeding 100 μ diam. 2
2. Zoösporangia numerous, seriate, subspherical . . . D. prolifica
2. Zoösporangia few on an axis, turbinate . . . . D. Hollenbergii

Derbesia longifructa n. sp.[56]

Plate 1, Figs. 3-6

Plant matted, without particularly distinct erect filaments, near the free tips often curved, dichotomously and laterally branched, 38-75 μ diam., with crosswalls at the divisions infrequent; zoösporangia scattered

[56] Derbesia longifructa n. sp.—Planta implecta, filamentis erectis subdistinctis, prope cacumina saepe curvatis, dichotome lateraliterque ramosis, 38-75 μ diam.; zoösporangiis dispersis aut ad 4 simul, in stipitibus obliquiter positis, 14-17 μ diam.; sporangiis cylindrico-ovatis, 58-90 μ diam., 121-180 μ long. Planta typica in loco dicto Pta. Santa Elena, Salinas, Guayas, Ecuador, legit W. R. Taylor *no. 34-464,* 8 Feb. 1934.

or 2-4 fairly close together, obliquely placed on very short stalks 14-17 μ diam., the stalk cell perhaps at first formed by two walls but at maturity represented by a refractive disk 4-8 μ thick; sporangia cylindric-oval, 58-90 μ diam., 121-180 μ long.

This plant is of about the same size as *D. marina* (Lyngb.) Kjellm., (Setchell & Gardner 1920, p. 165), but the sporangia are clearly cylindrical in midsection, with slightly decreased and rounded ends, and so quite distinctive.

ECUADOR: Guayas, in mats in shallow water on the rocky southeastern side of Pta. Santa Elena, Salinas, *no. 34-464 (TYPE),* 8 Feb. 1934.

Derbesia prolifica n. sp.[57]

Plate 2, Figs. 1-6

Plants matted below, tufted above, to 1.5 cm tall, the erect filaments frequently and chiefly laterally branched, flexuous or a little arcuate, reaching 120-250 μ diam., the zoösporangia very numerous, seriate and often unilateral on the erect branches, borne at right angles or a little ascending, stalked, the stalks 32-42 μ diam., generally short but sometimes one or two diameters long, the sporangia subspherical, to 160-210 μ diam.

ECUADOR: Archipiélago de Colón, in intertidal pools on an islet in Gardner Bay, I. Española, *no. 34-425 (TYPE),* 31 Jan. 1934.

Derbesia Hollenbergii n. sp.[58]

Plate 1, Figs. 7-9

Plants tufted, epiphytic, 1.0-1.5 cm tall, the filaments from 60-142 μ diam., generally 100-120 μ, the erect axes occasionally branched, crosswalls infrequent, near the top flexuous or arcuate; zoösporangia solitary or 2-3 on an axis, or perhaps formed, discharged, and dropped in rapid

[57] Derbesia prolifica n. sp.—Planta infra implecta, supra caespitosa, ad 1.5 cm altitudine, filamentis erectis saepe lateraliter ramosis, 120-250 μ diam.; zoösporangiis plurimis, seriatis et saepe unilateralibus, patentibus aut ascentibus, in stipitibus brevibus positis, 32-42 μ diam.; sporangiis subsphaericis, 160-210 μ diam. Planta typica in loco dicto Gardner Bay, I. Española, Ecuador, legit W. R. Taylor *no. 34-425,* 31 Jan. 1934.

[58] Derbesia Hollenbergii n. sp.—Planta epiphytica, caespitosa, 1.0-1.5 cm altitudine, filamentis 60-142 μ diam., axibus erectis interdum ramosis, supra flexuosis; zoösporangiis singulis aut 2-3 simul, stipitibus circa 25 μ diam., 1-2 plo longioribus quam latis; sporangiis late turbinatis, 185-210 μ diam., 150-165 μ long. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-264,* 18 Jan. 1934.

succession, stalked, the stalks about 25 μ diam., 1-2 times as long as broad, the sporangia broadly turbinate, to 185-210 μ diam., 150-165 μ long.

These plants in some details, but not in growth habit, suggest *D. turbinata* Howe & Hoyt (1916, p. 106, pl. 11, figs. 10-16). The sporangia are relatively broader and the filaments coarser.

ECUADOR: Archipiélago de Colón, abundant at Black Beach Anchorage, I. Santa María, *no. 34-264 (TYPE),* 18 Jan. 1934.

Phyllosiphoniaceae

Plants endophytic or endozoöic, of large oval cells or branched filaments without crosswalls, coenocytic, with many nuclei and many disklike chromatophores lacking pyrenoids; reproduction by aplanospores produced in great numbers.

OSTREOBIUM Bornet & Flahault, 1889

Plants filamentous, of much-branched and apparently anastomosing coenocytic filaments of very irregular form and variable diameter; aplanospores formed in the swollen ends of branches, and capable of germination to new plants.

Ostreobium Reineckii Bornet

Filaments intricately spreading, the ends of the branchlets consistently free.

Bornet in Reinecke 1896, p. 269.

MÉXICO: Is. Revilla Gigedo, as a boring alga in old corals, drifted onto the beach, Sulphur Bay, I. Clarion, *no. 34-63,* 5 Jan. 1934. *Ibid.,* in old shell fragments dredged at sta. 917 from 50-75 meters' depth, Sulphur Bay, *no. 39-28B,* 16 Mar. 1939. *Ibid.,* boring in the test of a keyhole urchin, from 51-79 meters' depth, *no. 39-24 p.p.,* 16 Mar. 1939 (all det. by F. Thivy).

Vaucheriaceae

VAUCHERIA De Candolle, 1805

Plants forming considerable mats, particularly in shallow water, of branched coenocytic filaments, the filaments without normal vegetative crosswalls or constrictions; containing oil as the stored food reserve; sexual organs sessile or stalked, single or grouped, segregated by crosswalls, the antheridia cylindrical, the oögonia oval to subspherical; zoösporangia terminal on the branches, segregated by crosswalls, the zoöspores single, large, with flagella all over the surface.

If studies of brackish habitats had been more assiduously prosecuted, this genus would have been more abundantly represented and probably by fertile material, in the absence of which identification to species is impossible.

México: Baja California, intertidal on rocks at Point Hughes, Cabo San Lazaro, *no. 34-592,* 7 Mar. 1934. Ecuador: Archipiélago de Colón, on *Rhizophora* roots along the open beach, Pta. Albemarle, I. Isabela, *no. 34-115,* 12 Jan. 1934. Guayas, on the rocky southeast side of Pta. Santa Elena, Salinas, *no. 34-467,* 8 Feb. 1934.

Phaeophyceae

Brown or olive-colored plants, filamentous or parenchymatous, of very varied forms; accessory pigments partially masking the chlorophyll, in definite chloroplasts; sexual and asexual plants similar or different in habit, one stage sometimes nearly or quite suppressed; asexual reproduction chiefly by biflagellate zoöspores, in some groups by aplanospores; sexual reproduction by biflagellate isogametes or with various degrees of sexual specialization and differentiation.

Ectocarpaceae

Plants filamentous, branched, basally attached, generally free above; reproduction in intercalary or lateral organs partly or completely replacing branchlets, ordinarily asexually by zoöspores produced in unilocular sporangia, and sexually by motile iso- or anisogametes produced in plurilocular gametangia; the alternating generations of separate plants.

KEY TO GENERA

1. Gametangia and sporangia terminating branches or taking their places in the plant system . . . . Ectocarpus
1. Gametangial cells small, in clusters lateral to the axis; unilocular sporangia intercalary, solitary . . . . Zosterocarpus

Members of this family, and more specifically of the genus *Ectocarpus,* were not common at the places visited on the expeditions included in this study. A few more collections were secured than are here recorded, and in some the material was fruiting, but, for various reasons, it is not thought suitable for either identification or description at the present time. Minute creeping and endophytic types in the collections have not yet been investigated.

ECTOCARPUS Lyngbye, 1819

Plants sometimes microscopic, sometimes large and forming extensive soft tufts; filaments uniseriate, attaching by a disklike holdfast or by rhizoidal extensions of the basal cells, creeping or erect, sparingly to freely, generally alternately, branched, the branches similar to the axis, sometimes terminating in hairlike tips; sporangia lateral, gametangia lateral or terminal, sometimes hair tipped.

KEY TO SPECIES

1. Habit involved, the axes somewhat cordlike, being twisted together and united by curved branchlets; branch tips commonly recurved . . . . E. tomentosus
1. Habit erect, the branch tips not recurved . . E. Duchassaignianus

Ectocarpus tomentosus (Hudson) Lyngbye

Setchell and Gardner 1925, p. 426; Taylor 1938, p. 113, pl. 8, figs. 6-8; Smith 1944, p. 83.

ECUADOR: Archipiélago de Colón, epiphytic on various algae at Black Beach Anchorage, I. Santa María, *no. 34-398* (gametangial), 30 Jan. 1934.

Ectocarpus Duchassaignianus Grunow

Taylor 1928, p. 107, pl. 14, fig. 11; 1942, p. 48; Setchell & Gardner 1930c, p. 140.

MÉXICO: Is. Revilla Gigedo, in tide pools near high water mark, Braithwaite Bay, I. Soccoro, *no. 34-23,* 3 Jan. 1934. Nayarit, on *Chnoospora* on surfbeaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-638,* 9 May 1939.

ZOSTEROCARPUS Bornet, 1890

Zosterocarpus abyssicolus n. sp.[59]

Plate 2, Figs. 9-11

Plant diffuse, about 1-2 cm tall, light greenish brown, without persisting main axes, branching irregularly alternate, spreading, primary growth from the branch apices, secondary growth by evident intercalary zones in the younger branches; main axes to 32 μ diam., the cells nearly cylindrical, 58-65 μ long, the walls thin and chromatophores small, disciform; branches progressively more slender, the ultimate divisions to 16 μ diam., with cask-shaped cells 11-16 μ long; tips of actively growing branchlets moderately tapering and the end cell obtuse, but on matured branches gently tapering with the end cell acute; "sporangia" brown, solitary, intercalary, scattered through the upper part of the plant, oval, 29-32 μ diam., 58-70 μ long, containing oval bodies; gametangia lateral, in small groups of 4-6 cells, about 6-8 μ diam.

[59] Zosterocarpus abyssicolus n. sp.—Planta filamentosa, implexa, alterne ramosa, ad 32 μ diam. in axibus primariis atque ad 16 μ diam. in ramis; "sporangiis" brunneis, intercalaribus, 29-32 μ diam., 58-70 μ long.; gametangiis lateralibus atque botryoideis, 6-8 μ diam. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-380,* 29 Jan. 1934.

The brown oval cells characteristic of this genus have been interpreted as "sporangia" and as "propagulae." Their walls are said to be thick. However, when restored with KOH and studied, the outer wall in the present material was not found to be particularly heavy. The contents are figured by Bornet as alveolate, but older ones gave the appearance of containing oval bodies 6.0-8.5 μ in greatest diameter. When the old "sporangia" are crushed the contents appear to consist of a number of separate, refractive brownish bodies, slightly angular-compressed by contact. These Bornet (1890, p. 146) interprets as tannin masses. The Galapagos *Zosterocarpus* plants differ from *Z. Oedogonium* Menegh. in being more slender and having the brown "sporangia" considerably wider than the diameter of the filaments which bear them, instead of being about the same diameter. The contents of the vegetative cells in this material shrank very much in drying, giving to the lesser branches a falsely beaded appearance.

ECUADOR: Archpiélago de Colón, an epiphyte dredged from 55 meters' depth off Post Office Bay, I. Santa María, *no. 34-380 (TYPE)*, 29 Jan. 1934.

Ralfsiaceae[60]

RALFSIA Berkeley, 1831

Plants crustose, perennial, often one to several centimeters in diameter, composed of radial filament systems laterally united to form a horizontal layer, from which arise parallel series of cells to form a thick pseudoparenchymatous crust; unilocular sporangia and plurilocular gametangia in sori on separate plants, the former lateral on free paraphyses, the lateral terminal on the erect filaments.

KEY TO SPECIES

1. Thallus 2-4 cm diam., 280-350 μ thick; paraphyses cylindrical to slightly clavate, 9-11 μ diam. at the end, 180-220 μ long; zoösporangia clavate, 16-22 μ, occasionally to 32 μ diam., 80-95, occasionally to 140 μ long . . . . R. californica
1. Thallus to 4 cm diam., 450-750 μ thick; paraphyses 100-250 μ long, the tip slightly swollen to 8-10 μ diam.; zoösporangia 40-70 μ long, 18-30 μ diam., gametangia 40-60 μ long, 6.0-8.0 μ diam., each terminated by a single isodiametric cell R. occidentalis

[60] Identifications of Ralfsiaceae, and the accompanying notes, are supplied by the kindness of Prof. G. J. Hollenberg.

Ralfsia californica Setchell & Gardner, *prox.*

Setchell & Gardner 1925, p. 497, pl. 36, fig. 22.

MEXICO: Jalisco, on hard intertidal rocks at Ba. Tenacatita, *no. 34-565,* 2 Mar. 1934.

Ralfsia occidentalis G. J. Hollenberg, n. sp.[61]

Plants forming dark brown crusts on rocks, 450-750 μ thick and to 4 cm or more in diameter, seemingly without evident radial or circumferential growth ridges, firmly attached to the substrate; hypothallus composed of rows of horizontally elongate cells 15-19 μ diam., and mostly 1.5-2.0 diameters long, some of the cell rows curving toward the substrate, but mostly curving upward and merging abruptly with the erect photosynthetic filaments of the perithallus; perithallus 70-90 μ thick, composed of filaments whose cells are 4.0-6.0 μ diam., 1.0-1.5 diameters long and mostly not arranged in distinct periclinal layers; plurangia ('plurilocular gametangia') 40-60 μ long and 6.0-8.0 μ diam., each terminated by a single isodiametric sterile cell; unilocular sporangia 40-70 μ long, 18-30 μ diam., among paraphyses 100-250 μ long and 8-10 μ diam. at the slightly swollen tip, composed of about 15 cells mostly longer than wide; hair pits infrequent.

In many respects *Ralfsia occidentalis* is similar to *R. verrucosa* (Aresch.) J. Agardh common in the north Atlantic, but differs from the latter chiefly in the lack of horizontal stratification so common to the Atlantic plant. If one may judge by the somewhat fragmentary material available, *R. occidentalis* seems to be more firmly attached to the substrate. A species of *Ralfsia* common along the coast of southern California, which has passed for *R. verrucosa,* is likewise similar to *R. occidentalis,* but the Californian plant has a hypothallus composed almost exclusively

[61] Ralfsia occidentalis G. J. Hollenberg n. sp.—Plantae in saxis crustas atrobruneas formantes, 450-750 μ crass., ad 4 cm. aut plus diam., sine perspicuis incrementi rugis radialibus aut circumferentialibus, ad substratum firme affixas; hypothallo composito ex ordinibus cellularum horizontaliter elongatarum, 15-19 μ diam., maxima ex parte 1.5-2.0 plo diam. longitudine, quibusdam ex ordinibus cellularum ad substratum curvatis, plurimis, autem, sursum curvatis et cum filamentis perithalli erectis photosyntheticis abrupte commixtis; perithallo 70-90 μ crass., composito e filamentis quorum cellulae diametron 4.0-6.0 μ, longitudinem 1.0-1.5 plo diam. habent et maxima ex parte in stratis periclinalibus distinctis non ordinatae sunt; plurangiis (gametangiis plurilocularibus) 40-60 μ long., 6.0-8.0 μ diam., omnibus per singulam cellulam isodiametricam, sterilem terminatis; sporangiis unilocularibus 40-70 μ long., 18-30 μ diam., inter paraphyses 100-250 μ long. et, ad apicem subinflatum, 8-10 μ diam., compositas e circa 15 cellulis maxima ex parte longioribus quam latis; lacunis pilorum raris.

Planta typica in loco dicto Braithwaite Bay, I. Soccoro, México, legit W. R. Taylor *no. 34-31,* 2 Jan. 1934.

of assurgent cell rows which merge much more gradually into the erect filaments of the perithallus, and the cells of the perithallus are commonly in distinct periclinal layers. Furthermore, the cells of the photosynthetic filaments are somewhat smaller in *R. occidentalis*. Examination of material collected by Miss Josephine Tilden, *no. 434,* in Hawaii, seems to show that it has structural details identical with these Mexican specimens.

MÉXICO: Is. Revilla Gigedo, common on the rocks in Braithwaite Bay, I. Soccoro, *no. 34-31* (plurangial, *TYPE*), *no. 34-42* (sporangial), 2 Jan. 1934. *Ibid.,* dredged from 37 meters' depth at sta. 132 near Braithwaite Bay, *no. 34-42A* (sporangial), 2 Jan. 1934.

Asperococcaceae

Plants of moderate size, simple or fairly stoutly branched, flat, elongate cylindrical, or of simple rounded outlines; structurally appearing parenchymatous, the inner cells being very large and without many chromatophores, the outer being much smaller, and in the assimilatory layers crowded with chromatophores; sporangia and gametangia commonly developed directly from the surface cells.

KEY TO GENERA

1. Plant widely branched 2
1. Plant rounded or irregularly lobed, when branched, the branches close, short, generally blunt . . . . Colpomenia
2. Plants relatively tough, the branches compressed, little tapering except near the tips . . . . Chnoospora
2. Plants of relatively delicate texture, becoming hollow, easily torn, the branches tapering, terete . . . . Rosenvingea

CHNOOSPORA J. Agardh, 1847

Chnoospora pacifica J. Agardh

Taylor 1942, p. 51, pl. 9, figs. 1, 2.

These were small plants, none being secured as large as those collected in the Caribbean and recorded in 1942.

MÉXICO: Nayarit, common on rocks in heavy surf on I. María Magdalena, Las Tres Marías, *no. 39-631,* 9 May 1939. Guerrero, on rocks at Ba. Petatlán, *nos. 34-579, 34-582,* 2 Mar. 1934.

ROSENVINGEA Børgesen, 1914

Rosenvingea intricata (J. Agardh) Børgesen, *prox.*

Plants to 3-4 cm tall, crisp, irregularly branched, spreading, entangled, the branches tapering to acute tips; medullary cells to 75-115 μ diam., the surface cells 9-13 μ wide, somewhat longer than broad; gametangia unaccompanied by paraphyses or hairs, 3.8-7.5 μ diam., 28-47 μ long, the segments sometimes undivided, but generally biseriate.

The description is drawn from *no. 34-34*. These are, on the whole, firmer plants than those assigned to this species from the Caribbean, less regular in branching, with more adventitious short lateral branches. They do not greatly resemble their Caribbean counterpart. Comparison with a photograph of the type material from México in the herbarium of J. G. Agardh at Lund, *no. 47006/7,* showed good agreement, although the plants were rather more slender. Børgesen's (1930, p. 167) description of Indian material portrays rather shorter (16 μ) gametangia, but he recognizes that they may not have been fully matured.

MÉXICO: Is. Revilla Gigedo, rare on rocks in the littoral zone, I. Soccoro, *no. 34-34,* 3 Jan. 1934. *Ibid.,* on rocks near low tide line, I. Clarion, *no. 34-50,* 5 Jan. 1934. ECUADOR: Guayas, rocky southeast side of Pta. Santa Elena, Salinas, *no. 34-463 (?),* 8 Feb. 1934.

COLPOMENIA Derbès & Solier, 1856

Plants sessile, commonly ultimately with multiple attachments, spherical or irregularly lobed or branched, firmly crisp in texture, hollow; structurally showing one to several inner layers of large colorless cells and one to few outer assimilatory layers with small chromatophores; colorless hairs present, generally in clusters; plurilocular gametangia in sori, cylindrical.

KEY TO SPECIES

1. At least the basal part of the plant subspherical to bullose . . . C. sinuosa
1. Branching throughout 2
2. Texture crisply membranous; the surface cells 8.5 μ diam. or smaller . . . . C. ramosa
2. Extremely delicate; the surface cells 8.5 μ diam. or larger C. mollis

Colpomenia sinuosa (Roth) Derbès & Solier

Taylor 1942, p. 51; Smith 1944, p. 128, pl. 20, fig. 1.

MÉXICO: Baja California, at South Bay on I. Cerros, *no. 39-649,* 10 Mar. 1934. *Ibid.,* intertidal at Point Hughes on Cabo San Lazaro, *no.*

34-606, 7 Mar. 1934. COSTA RICA: drifted ashore at Port Parker, *no. 39-78,* 25 Mar. 1939. ECUADOR: Archipiélago de Colón, I. Santa Cruz, Hassler *no. 1005,* June 1872. *Ibid.,* infrequent on rocks at Black Beach Anchorage, I. Santa María, but individuals large, *no. 34-239,* 17 Jan. 1934.

Colpomenia sinuosa f. deformans Setchell & Gardner

Setchell & Gardner 1924, p. 726, pl. 19, figs. 61, 62.

MÉXICO: Baja California, in tide pools, with very small bullose bases and numerous large erect sacs reaching 10-15 cm in height, Ba. Thurloe, Pto. San Bartolomé, *no. 34-611,* 9 Mar. 1934. ECUADOR: Archipiélago de Colón, abundant in the drift and forming windrows on shore; also on intertidal rocks at the head of Tagus Cove, I. Isabela, *nos. 34-142, 34-151,* 13 Jan. 1934.

Colpomenia ramosa n. sp.[62]

Plate 6, Fig. 2

Plants to 3 cm tall, the clumps 6 cm broad, crisp, from multiple attachments, irregularly subdichotomously to polychotomously branched, spreading, sometimes the branches becoming adherent, the branches cylindrical or compressed, below 2-7 mm diam., but very irregular, the forking at irregular intervals, but the chief divisions about 4-8 mm apart; terminal divisions very small, cylindrical, 1-2 mm diam., 2-3 mm long, the ends rounded; becoming hollow, the wall of 6-8 cell layers and about 400-500 μ thick, the innermost (disorganizing) cells about 180 μ diam., these grading through successively smaller-celled layers to the cortex, which is of one layer of slightly swollen cells 8.5-10.0 μ in radial diam.; in surface view showing rounded-angular cells about 4.5-8.4 μ diam., containing 1-2 chromatophores and arranged in somewhat vague longitudinal rows; plurilocular gametangia in sori, cylindrical, uniseriate and of about 6-10 cells, 3-7 μ diam., 17-28 μ long.

This plant shows some similarity to *C. stellata* (Børg.) Børgesen (1928, p. 1; 1930, p. 168) described from Dwarka, Baroda, India. It appears to be more branched, more tapering from base to summit, and in more intricate clumps. The thallus wall is thinner and the plant in conse-

[62] Colpomenia ramosa n. sp.—Planta ad 3 cm altitudine, irregulariter subdichotome ramosa, ramis infra 2-7 μ diam., paulum compressis, furcatis intervallis 4-8 mm; ramulis terminalibus brevissimis, cylindricis aut teretibus, 1-2 mm diam., 2-3 mm long. Planta typica in loco dicto South Bay, I. Cerros, México, legit W. R. Taylor *no. 34-651,* 10 Mar. 1934.

quence less tough; the gametangia seem to be much shorter. The illustration is made from a very small specimen held in fluid, for the larger clumps after pressing gave a poor idea of their habit.

MÉXICO: Baja California, in littoral pools at South Bay, I. Cerros, *no. 34-651 (TYPE),* 10 Mar. 1934. COSTA RICA: Ba. Salinas, from shallow water along shore, Schmitt *no. 474A-35,* 10 Feb. 1935. *Ibid.,* occasional tufts on rocks in crevices near low tide line, Port Parker, *no. 39-76,* 25 Mar. 1939.

Colpomenia mollis n. sp.[63]

Plant to 1.0-1.5 cm tall, soft, and delicate, a little compressed, hollow, sparingly irregularly divided to short branches 2-3 mm diam., a little shorter or longer than broad, their ends rounded truncate and in some bearing short spinelike projections; structurally showing a wall of about two cells in thickness, the cortical cells in surface view 8.5-15.0 μ diam., subquadrangular, rather irregularly arranged; colorless medullary cells probably only in one layer, the cells angular, 40-85 μ diam., the walls very thin.

This small and delicate species was secured only in very small quantity, and it did not revive enough when sectioned to enable measurements of the wall thickness to be secured. It is probably much thinner than ordinary in this genus.

COLOMBIA: Valle, scarce on rocks in littoral pools on I. Gorgona, *no. 34-491A (TYPE),* 12 Feb. 1934.

Sphacelariaceae

Plants erect from a holdfast, or the basal branches rhizomatous; usually polysiphonous, growing by segmentation of a large apical cell; sometimes corticated by rhizoids; branches similar to the axis, or in other cases the axis and its main divisions clothed with short branchlets; unilocular sporangia and plurilocular gametangia on branchlets derived from the vegetative axis or from the cortex, the sexual and asexual plants similar in appearance.

[63] Colpomenia mollis n. sp.—Planta ad 1.5 cm altitudine, mollissima, paulum compressa, sparse irregulariterque divisa in ramos 2-3 mm diam., partibus terminalibus rotundato-truncatis; membrana tenuissima, fortasse e solis duobus cellularum stratis constante. Planta typica in loco dicto I. Gorgona, Colombia, legit W. R. Taylor *no. 34-491A,* 12 Feb. 1934.

SPHACELARIA Lyngbye, 1819

Sphacelaria mexicana n. sp.[64]

Plate 3, Figs. 1-8

Plants forming considerable mats, 2.5-4.0 mm high, the erect filaments arising from a disciform base, sparingly alternately branched, the branches erect, to 25-48 μ diam., rather less in the branches; hairs arising near the tips of the axes, short and soon lost, about 15 μ diam.; gametangia and sporangia unknown; propagula on short pedicels, bicornute, with convex sides and short obtuse slightly produced arms, to 86-120 μ broad, 72 μ long excluding the stalk.

This species seems related to *S. tribuloides* Menegh. (Taylor 1928, p. 106, pl. 14, figs. 7-10), but the base is different. It resembles *S. brevicorne* Setchell & Gardner (1924, p. 725, pl. 19, figs. 59, 60), except that it is bicornute and has a disciform base, is lithophilous instead of epiphytic, branches more freely and has propagulae with shorter body and more contracted arms. Sauvageau's (1900-1914, p. 132, fig. 31) *S. cornuta* has much longer arms.

México: Is. Revilla Gigedo, on rocks in the littoral zone, Braithwaite Bay, I. Soccoro, *no. 34-7 (TYPE),* 2 Jan. 1934.

Dictyotaceae

Plants of moderate size, one to several axes arising from a cushionlike holdfast, or rarely decumbent; usually stupose at the base but without a specialized stalk, though often eventually with the old, denuded portion appearing subterete and stalklike; above dividing into a flat bladelike part, which may be filiform or expanded, strap shaped or cuneate, fan shaped or reniform; growing from a single apical cell or from a marginal row of growth initials, forming a parenchymatous blade; reproductive structures scattered or in sori on the surface, developed outwardly from the surface cells; asexual reproduction by tetraspore; sexual reproduction by antherozoids and eggs.

KEY TO GENERA

1. Thallus without a midrib, or at most the midrib short and rudimentary 2

[64] Sphacelaria mexicana n. sp.—Planta implexa, ad 2.5-4.0 mm altitudine, filamentis erectis e basibus disciformibus natis, polysiphonis, ramificatione alterna, ad 25-48 μ diam.; propagulis in pediculis brevibus sitis, bicornuatis, lateribus convexis, brachiis brevibus obtusisque, paululum productis, 86-120 μ lat., 72 μ long. Planta typica in loco dicto Braithwaite Bay, I. Soccoro, México, legit W. R. Taylor *no. 34-7,* 2 Jan. 1934.

1. Thallus with a distinct, if delicate, percurrent midrib . . . Dictyopteris
2. Thallus not composed of fan-shaped segments 3
2. Thallus broad, divided into fan-shaped segments 5
3. Segments of the thallus strap shaped; growth from one distinct apical cell 4
3. Segments broad and somewhat foliose; growth from a group of initial cells . . . . Spatoglossum
4. Thallus generally smooth . . . . Dictyota
4. Thallus in the older and darker parts constantly beset with small appendages . . . . Glossophora
5. Growing margin plane; blade never calcified 6
5. Growing margin of the blade inrolled; blade sometimes lightly calcified . . . . Padina
6. Plant thin and with the reproductive structures slightly immersed . . . . Taonia
6. Plant thicker and with the reproductive structures eventually superficial 7
7. Tetrasporangial sori with paraphyses; median cell layer in transverse section not distinctive . . . . Zonaria
7. Tetrasporangial sori lacking paraphyses; cells of the median layer larger than those contiguous to it . . . . Pocockiella

DICTYOTA Lamouroux, 1809

Plant bushy, not markedly stalked, the base generally naked; dichotomously or alternately branching, the segments flat, narrow or moderately broad, with entire to dentate edges; growth of each branch from a large, broad apical cell; structurally showing a single-layered cortex on each face and a generally single medullary layer of much larger cuboidal cells with few chromatophores; tetrasporangia scattered; gametangia in scattered sori.

KEY TO SPECIES

1. Margin of the blade closely toothed . . . . D. crenulata
1. Margin of the blade entire 2
2. Plants large, when vegetatively mature exceeding 1.5 dm in height 3
2. Plants small, less than 1.5 dm tall when mature 5
3. Sparingly branched, light in color . . . . D. major
3. More closely branched 4

4. Plants dark brown, firm . . . . D. Binghamiae
4. Plants more delicate and lighter in color, appearing alternately branched above . . . . D. flabellata
5. Plants entangled, the lower segments moderately broad but the upper nearly filiform, the angles very wide, commonly over 90° . . . . D. divaricata
5. Plants without extraordinary reduction in branch width or particularly divergent branching 6
6. Branching closely dichotomous, at narrow angles, the segments oblong to cuneate . . . . D. Vivesii
6. Branching often subpalmate, especially above, the segments short and broad; the branches often becoming attached to each other . . . . D. concrescens

Dictyota Binghamiae J. Agardh

Setchell & Gardner 1925, p. 652, pl. 34, figs. 1, 2.

MÉXICO: Baja California, intertidal at Point Hughes on Cabo San Lazaro, *no. 34-599,* 7 Mar. 1934. *Ibid.,* Ba. Thurloe, Pto. San Bartolomé, *no. 34-613,* 9 Mar. 1934. PANAMÁ: dredged from 21 meters' depth off Is. Secas, Schmitt *no. 456C-35,* 6 Feb. 1935.

Dictyota flabellata (Collins) Setchell & Gardner

Collins in Phyc. Bor.-Amer. *no. 834;* Setchell & Gardner 1925, p. 652, pl. 34, fig. 3; Smith 1944, p. 101, pl. 15, fig. 6.

These specimens seem rather thin for this species, but are interpreted as deep-water forms, juvenile and still mostly in the dichotomous growth phase. The species was originally placed in the genus *Dilophus,* but it appears more difficult to distinguish *Dilophus* from *Dictyota* in the Pacific flora than in the Caribbean. The writer follows Setchell and Gardner in this instance.

COSTA RICA: Dredged off Pto. Culebra, *no. 34-258* (sexual plants) 24 Feb. 1934. PANAMÁ: Dredged from 21 meters' depth off Is. Secas, Schmitt *no. 456B-35,* 6 Feb. 1935.

Dictyota major n. sp.[65]

Plates 8, 9

Plants to 40 cm tall, light brown, and delicate except near the base, sparingly branched; stalklike base narrow, gradually expanding to about

[65] Dictyota major n. sp.—Plantae ad 40 cm altitudine, delicatae, sparse dichotomeque ramosae, ad 1 cm latitudine, furcatae intervallis 3-11 cm angulisque angustatis, sinu subcurvato; marginibus integris, paulum sinuoso-curvatis. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-357,* 27 Jan. 1934.

1 cm in width below the first forking; branching dichotomous, often unequal, at intervals of 3-11 cm, segments slightly tapered downward to each forking, to about 8-10 mm broad in the lower part of the plant but to 18 mm at a fork, 2-4 mm in the ultimate segments, in taller specimens noticeably sinuous curved; angles below narrow, acute or slightly rounded, in the upper portions 45°-60° and a little rounded, the branch tips rounded; antheridial sori very abundant, readily visible with the unaided eye; oögonial sori small, dark, also visible without a lens.

This very large *Dictyota* is not so broad as *D. dichotoma* v. *menstrualis* Hoyt, and is taller and more erectly branched. However, there is a good deal of similarity. It is somewhat similar to the New Zealand *D. ocellata* J. Agardh, but is a lighter, less bushy thing with longer, less tapering segments, as shown by comparison with material in the Agardhian Herbarium at Lund. The curious sinuous deflexions in the plane of the blade of older plants may be distinctive.

ECUADOR: Archipiélago de Colón, rare as dredged from 13-18 meters off Post Office Bay, I. Santa María, *no. 34-357 (TYPE),* 27 Jan. 1934. *Ibid.,* dredged off a rocky bottom at 36-55 meters near an islet in Gardner Bay, I. Española, *no. 34-423,* 31 Jan. 1934. *Ibid.,* dredged from 37 meters' depth off a rocky bottom, Schmitt *no. 362C-35,* 19 Dec. 1934.

Dictyota Vivesii Howe

Howe 1911, p. 497, pl. 27; Dawson 1944, p. 229.

MÉXICO: Baja California, intertidal on Point Hughes, Cabo San Lazaro, *nos. 34-596, 34-597,* 7 Mar. 1934. Is. Revilla Gigedo, dredged from 22 meters' depth at sta. 970 off I. María Magdalena, *no. 39-664,* 9 May 1939.

Dictyota concrescens n. sp.[66]

Plate 10, Fig. 2

Plants small, crowded, light brown, delicate, to 3-4 cm tall, the blades commonly becoming attached to each other, very irregularly dichotomously branched, the segments short and relatively broad, tapering

66 Dictyota concrescens n. sp.—Plantae frequentes, ad 3-4 cm altitudine, plerumque inter se adhaerescentes; irregularissime dichotome ramosae, segmentis brevibus latisque, attingentibus ad 15 mm in fastigio segmentorum, longioribus, autem, infra quam supra ubi rami confertissimi enascuntur atque subpalmati videntur, segmentis terminalibus 2-3 mm latitudine. Planta typica in loco dicto Point Hughes, Cabo San Lazaro, México, legit W. R. Taylor *no. 34-598,* 7 Mar. 1934.

downward, lower segments commonly to 2-3 cm long, narrow below and to 15 mm wide at the top, where they branch so closely as to appear subpalmate, the upper segments 2-3 mm broad, rounded truncate.

This densely growing little *Dictyota* has somewhat the aspect of *D. Bartayresiana* of the Caribbean, but branches more irregularly. As the individuals are sterile, it is probable that fuller growth would modify its appearance somewhat.

México: Baja California, intertidal on Point Hughes, Cabo San Lazaro, *no. 34-598 (TYPE),* 7 Mar. 1934.

Dictyota divaricata Lamouroux, *prox.*

Taylor 1928, p. 120, pl. 16, figs. 6-9.

These fragmentary specimens leave much to be desired for records of this species, but have in common wide-angled branching and considerable change from wide segments below to narrow ones above.

México: Is. Revilla Gigedo, dredged at sta. 129 in 25-32 meters at Braithwaite Bay, I. Soccoro, *no. 34-15,* 3 Jan. 1934. *Ibid.,* rare as dredged at sta. 135 from 45 meters, *no. 34-45,* 5 Jan. 1934. *Ibid.,* dredged at sta. 922 from 18-37 meters, *no. 39-69,* 18 Mar. 1939. Ba. Tenacatita, dredged from 18 meters' depth, Schmitt *no. 486A-35,* 15 Feb. 1935. Ecuador: dredged from 18 meters off I. LaPlata, *no. 34-478,* 10 Feb. 1934.

Dictyota crenulata J. Agardh

Plate 10, Fig. 1

Setchell & Gardner 1924, p. 730, pl. 18, figs. 50, 51; 1925, p. 655; Dawson 1944, p. 228.

The figures of Setchell & Gardner are of little assistance in recognizing this plant. The writer was able to confirm the identification by comparison with authentic material in the Agardhian Herbarium at Lund.

México: Is. Revivlla Gigedo, infrequent in lower tide pools and the surf, Braithwaite Bay, I. Soccoro, *nos. 34-5, 34-25,* 2, 3 Jan. 1934. Costa Rica: among the driftweed, Pto. Culebra, *no. 34-530,* 24 Feb. 1934.

GLOSSOPHORA J. Agardh, 1880

Plant erect, bushy, dichotomously branched, the branches strap shaped; growth from a single apical cell, developing a distinct medulla and more than one cortical layer; lower segments densely beset with small ligulate appendages.

Glossophora galapagensis Farlow

Plate 11, Figs. 1, 2

Plants tufted, to 35 cm tall, blackish brown below, yellowish brown near the tips; the base a little stupose and the stems of the older plants near the base with many slender entangled decurrent proliferations which supplement the holdfast; irregularly dichotomous at intervals of 2-5 cm, the segments linear, slightly widened at the forks, the sinuses narrowly rounded, the branches erect, with little narrowing between the base of the plant and the upper segments, the greatest width above a fork being 3-5 mm, the terminal segments (except for small proliferations) 2-3 mm diam., the margins regularly but sparsely beset with small spinose teeth 0.3-1.0 mm long at intervals of 2-7 mm, but these obsolete on the oldest segments; apices obtuse to emarginate, showing growth from a prominent apical cell; structurally showing in the midportion of the plant a single cortical, a single subcortical and one or two medullary layers in section; oögonial sori of a very few cells scattered over the surface; minute leaflets abundant over the surface of the older plants.

These handsome plants are much larger than the species as defined by Farlow. His statement at the end that the spines (spinose teeth) are 24-32 mm long is certainly a misprint. Whatever may be their taxonomic value, it surely looks as if the little leaflets on the face of the thallus developed, in this species, from sorus rudiments, replacing the eggs; they quickly assumed a growth based on the typical apical cell. Somewhat similar proliferations are not rare in *Dictyota* and *Padina*. Were it not for the structural differentiation, producing a distinct subcortical layer which is intermediate in cell size between the surface cortical layer and the medulla, it would be hard to separate this genus from *Dictyota*. The specimens underlying Farlow's record (1902, p. 90) from Turtle Pt., I. Isabela, which the writer has seen, are small and slender individuals not typical of what this plant may develop into.

Ecuador: Archipiélago de Colón, intertidal on the reef to the north of Tagus Cove, I. Isabela, *no. 34-165,* 13 Jan. 1934. *Ibid.,* dredged from 5.4-7.2 meters' depth at Academy Bay, I. Santa Cruz, Schmitt *no. 51B-33,* 4 Feb. 1933. *Ibid.,* occasional in the lower littoral near Black Beach Anchorage, I. Santa María, *no. 34-211,* 17 Jan. 1934.

SPATOGLOSSUM Kützing, 1843

Plant foliaceous, the segments pinnate to palmate, the margin entire or sparingly dentate; midrib lacking, or rudimentary near the base of the main segments; growth from a small group of initial cells at the apex; reproductive cells scattered.

KEY TO SPECIES

1. Plants small, reaching 1.5 dm, the segments without any costa and with strongly crisped margins . . . . . S. ecuadoreanum
1. Plants exceeding 2 dm in height 2
2. Blades without a costa, the segments 1.5-3.0 cm broad, the plane margin coarsely and sparingly sinuate dentate . . . S. veleroae
2. Blades showing a rudimentary costa near the base, the segments 4-6 cm wide, with entire to sinuate, sometimes slightly crisped margins . . . . S. Schmittii

Spatoglossum ecuadoreanum n. sp.[67]

Plate 14, Fig. 2

Plants exceeding 15 cm in height, light brown and bushy, the base slightly expanded, the lower axis smooth, irregularly forked, above flat, the branching irregular, in the upper divisions foliaceous, firm, irregularly dichotomously divided, broadly spatulate with rounded ends, the margins coarsely sinuate and very much crisped.

These plants resemble *S. veleroae,* but the blades reach their greatest width very near the end, are not definitely serrate, and are extremely crisped. They may be compared with *S. crispata* Howe (1914, p. 68, pl. 26), but the lower divisions are more stalklike, the terminal segments shorter, do not taper distally, and are much more crisped than his plants.

ECUADOR: Archipiélago de Colón, fragments dredged from 5.4-7.2 meters at Academy Bay, I. Santa Cruz, Schmitt *no. 51C-33,* 4 Feb. 1933. *Ibid.,* dredged at sta. 169 off Academy Bay, *no. 34-321 (TYPE),* 20 Jan. 1934.

Spatoglossum veleroae n. sp.[68]

Plate 12

Plants bushy, light brown, to 5 dm tall or more, at the base stupose from a slightly expanded holdfast forming an irregular primary stem 2-5

[67] Spatoglossum ecuadoreanum n. sp.—Planta altitudine maior 15 cm, fruticosa, infra stipitata, stipite diviso, divisionibus superioribus foliaceis, firmis, irregulariter dichotome furcatis, late spatulatis, partes extremas rotundatas habentibus, marginibus sinuatis maximeque crispatis. Planta typica in loco dicto Academy Bay, I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-321,* 20 Jan. 1934.

[68] Spatoglossum veleroae n. sp.—Planta altitudine ad 5 dm vel plus, infra stipitata, stipite diviso, ramis gradatim expansis in laminas firmas, anguste cuneatas, obtusas praeditasque marginibus sinuosis et, interdum, crasse obtuseque dentatis. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-212,* 17 Jan. 1934.

cm long, above branching freely, the lower divisions principally dichotomous, with many secondary branches and so appearing alternate, the upper subdichotomous; lower branches thickened, 2-5 mm broad, gradually expanding upwardly to near the summit, reaching 1.5-3.0 cm in width, foliaceous, firm, the divisions narrowly cuneate to oblanceolate, often somewhat sinuose, the margin very coarsely obtusely sinuate dentate at intervals of 2-5 cm, the ends broadly rounded; structurally showing in the expanded blades 4-6 layers of colorless medullary cells and one cortical layer, in the upper branching stipe portions 6-8 medullary layers, 1-2 subcortical layers and one cortical layer; apex showing a marginal zone of initial cells; reproduction not seen.

These plants somewhat resemble *S. Solieri,* but are broader; they also show similarities to plants in the Kew Herbarium considered by Murray to be near *S. asperum,* but are broader and less forked laterally. The proliferations near the base are not unlike those on *S. Howellii* Setchell & Gardner (1937, p. 74) kindly loaned by the California Academy of Sciences, but the type material is so badly preserved that it seems impossible to get a good idea of the habit and the margins of the blades without soaking it up and remounting, a procedure not lightly to be undertaken. It is not impossible that *S. veleroae* is a more developed and broader form of *S. Howellii.* One should also consider the note by Howe (1914, p. 69) regarding Piccone's (1889, p. 17) *S. Schroederi* record in relation to this form; they reported material from I. Santa María.

ECUADOR: Archipiélago de Colón, from the reef north of Tagus Cove, I. Isabela, *no. 34-162,* 13 Jan. 1934. *Ibid.,* frequent in the lower littoral near Black Beach Anchorage, I. Santa María, *no. 34-212 (TYPE),* 17 Jan. 1934.

Spatoglossum Schmittii n. sp.[69]

Plate 13

Plant exceeding 45 cm in height, broadly foliaceous, light brown and thin, the holdfast cushion shaped and like the lower stem stupose, the stem subcylindrical below, flattened above, irregularly branched, 2-6 cm long, the blades dividing irregularly below, the lower segments characteristically deltoid at the base, to 4-6 cm broad, above the branching di- to trichotomous, with the rounded sinuses, the ultimate segments ligulate,

69 Spatoglossum Schmittii n. sp.—Plantae altitudine ad 45 cm vel plus, stipite irregulariter ramoso, laminis tenuibus infra irregulariter divisis, costam vestigialem habentibus, deltoideis, ad 4-6 cm latitudine, supra 2-3-chotomis, sinibus rotundatis, segmentis ultimis ligulatis, obtusis. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-295,* 19 Jan. 1934.

smooth to somewhat crispate, obtuse, to about 3-4 cm broad, 6-10 cm long, the margin entire to slightly sinuate with occasional broad, somewhat pointed, lobes; reproductive cells usually solitary, sometimes 3-4 together, spherical or mutually compressed in surface view, 57-70 μ diam.

Especially in *no. 34-155* the blades show traces of a slight midrib for 1-3 cm, above which it disappears; *Spatoglossum* is customarily defined as lacking a midrib, but Howe (1914, p. 68) describes one in *S. crispata.* The reproductive cells observed look like immature tetrasporangia, which in this family commonly divide just before dispersal. Scattered oögonia are described for the genus. Some individuals are much more minutely divided than others, with segments 1-2 cm broad, while in one instance an ultimate segment (except for two small proliferations) was 6 cm broad, 23 cm long, and *no. 34-386* showed one undivided fragment over 9 cm broad, 50 cm long, lacking both base and tip of the segment, indicating that this species reaches noble proportions in deep water. This was presumably a tetrasporangial specimen, many sporangia having germinated *in situ,* so that small folioles were scattered abundantly over the surface. The sporangia became 60-90 μ diam. before dividing; they seldom if ever became normal tetrads, but produced small leaflets directly. These quickly developed a row of growth initials at the forward margin. The plants were commonly perforate, and near the base almost netlike, but this may not be a natural state. Structurally, the blade developed four layers of cells in the medulla, but the sections did not swell well enough to afford a measurement of thickness. The cortex, of one layer, did, however, expand perfectly; its cells were square to brick-shaped, and about 30-45 μ in surface view, 30 μ in thickness.

ECUADOR: Archipiélago de Colón, dredged at sta. 155 off Tagus Cove, I. Isabela, *no. 34-181 (?),* 15 Jan. 1934. *Ibid.,* infrequent as dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-294 (TYPE),* 19 Jan. 1934. *Ibid.,* occasional at 55 meters' depth, *no. 34-386B,* 29 Jan. 1934. *Ibid.,* fragments dredged from 37 meters' depth off a rocky bottom, I. Española, Schmitt *no. 362D-35,* 19 Dec. 1934.

DICTYOPTERIS Lamouroux, 1809

Plants small to large and coarse, sometimes entangled, generally erect and bushy, the segments flat, strap shaped to membranous, costate, dichotomously to alternately branched; growing from a small group of apical initial cells; forming the reproductive cells in linear or rounded sori.

KEY TO SPECIES

1. Plants small, thin and transparent, the dichotomous to irregularly branched thallus with strap-shaped segments less than 5 mm wide . . . . D. delicatula
1. Plants larger, the segments foliaceous 2
2. Main segments of the blade broadly strap shaped, reaching 4.5-5.5 cm in width above the forkings, the thickness to 125 μ, the veins forming just below the branching of the blade . . D. Cokeri
2. Main segments of the blade deltoid below, but the end segments tapering at the tips; the veins generally forking a second time before the blade divides for the first forking of the midrib; the thickness to 85 μ . . . . D. diaphana

Dictyopteris delicatula Lamouroux

Vickers 1908, p. 35, II pl. 3; Setchell & Gardner 1930, p. 149; Taylor 1942, p. 62.

México: Is. Revilla Gigedo, very rare among other algae at Braithwaite Bay, I. Soccoro, *no. 34-6,* 2 Jan. 1934.

Dictyopteris Cokeri (Howe) n. comb.

Plate 14, Fig. 1

Howe 1914, p. 70, pl. 13, figs. 5-9, pl. 27 (as *Neurocarpus Cokeri*).

The fragments of this plant showing stalk and blades relatively complete were within Howe's size limits, but one piece of blade with several forks was itself 45 cm long and 5.5 cm broad at the lower end; as base and tips were lacking, it must have belonged to a plant exceeding 60 cm in height. The broadest blade was 9 cm across just below a fork. Faint but distinct midribs could be traced in even the largest blades, but lateral veins were definitely absent.

Ecuador: Archipiélago de Colón, dredged from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-279,* 19 Jan. 1934. *Ibid.,* occasional as dredged from 12-18 meters, *no. 34-353,* 27 Jan. 1934.

Dictyopteris diaphana n. sp.[70]

Plate 15

Plants to 4.5-5.0 dm tall, foliaceous, of extreme delicacy, pale brown in color; holdfast about 1 cm broad, cushion shaped, the lower stalk

[70] Dictyopteris diaphana n. sp.—Planta ad 5 dm altitudine, foliacea, tenuissima, stipitata, stipite ramosa, supra, autem, habente laminam latam et lobatam quae segmentis extremis teretibus praedita; segmentis costas praecociter divisas habentibus; membrana supra crassitudine duarum cellularum, infra, autem, stratum corticeum atque unum vel duo strata medullaria habente. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-386A,* 29 Jan. 1934.

slender, about 1 cm long, like the base stupose; the stalk dividing dichotomously 1-3 times, subcylindrical with remnants of the marginal membranes attached; blades ample, several times irregularly dichotomously divided, the segments deltoid toward the base of the plant, the upper divisions tapering to the tips, the sinuses a little rounded, in width to 4-6 cm above a forking; stalks continued into the blade and its divisions as definite though inconspicuous midribs which divide notably far down in advance of the division of the blade, so that two forkings of the midrib occur before the first corresponding division of the margin; above the membrane generally two cells thick, together measuring 17-28 μ, but below consisting of a cortical layer and 1-2 medullary layers, the cells similar in size, the total thickness reaching 85 μ; reproduction unknown.

This large, broad *Dictyopteris* is very distinct. The segments are not strap shaped as in most of the genus, but rather tapering; the midribs divide precociously; the membrane is, for its size, extremely thin.

ECUADOR: Archipiélago de Colón, infrequent as dredged from 55 meters off Post Office Bay, I. Santa María, *no. 34-386A (TYPE),* 29 Jan. 1934.

TAONIA J. Agardh, 1848

Plant erect, bushy, flabellate, the blade divided into cuneate segments which may be narrow or wider, rather thin and delicate; apical margin of the blade plane, growing from a marginal row of initial cells, producing medullary and cortical layers; not calcified; sori slightly immersed in the blade at maturity.

Taonia Lennebackerae Farlow

Setchell & Gardner 1925, p. 657, pl. 96.

MÉXICO: Baja California, in the lower tide pools, Ba. Thurloe, Pto. San Bartolomé, *no. 34-614,* 9 Mar. 1934.

ZONARIA C. Agardh, 1817

Plants of small to large size, decumbent or erect and tufted, flabellate, originally rounded, becoming split and forming spatulate to cuneate lobes with more or less evident concentric hair bands; texture generally firm; attached by rhizoids developed from the lower face of the blade when decumbent, or when erect attached by an irregular holdfast; apical margin of the blades plane, growing from a marginal row of initial cells, producing medullary and cortical layers; not calcified; sori at maturity superficial, with paraphyses in the tetrasporangial sori.

Zonaria Farlowii Setchell & Gardner

Setchell & Gardner 1924b, p. 11; 1925, p. 660, pl. 97.

MÉXICO: Baja California, on rocks at South Bay, I. Cerros, *no. 34-650,* 10 Mar. 1934. *Ibid.,* drifted ashore at Point Hughes, Cabo San Lazaro, *no. 34-595,* 7 Mar. 1934.

Zonaria lobata C. Agardh

Piccone 1886, p. 89, 1889, p. 40; Farlow 1902, p. 93.

Recorded from I. San Cristóbal and I. Santa María, Archipiélago de Colón. Whatever this is, it is probably not *Z. zonalis* (Lamouroux) Howe of the Caribbean.

POCOCKIELLA Papenfuss, 1943

Thallus flat, decumbent or erect, simple or becoming lobed or lacinate; growth by a marginal series of initial cells; structurally showing a small-celled cortex and a thick medulla of several layers, of which the median layer is of larger cells; reproductive organs in indefinite superficial sori, the tetrasporangial sori lacking paraphyses.

Pocockiella variegata (Lamouroux) Papenfuss, *forma*

Plant crustaceous, attached by moniliform rhizoids on the under surface; total thickness 120 μ or somewhat more; upper cortex of one layer of small cells 9-13 μ long, 12 μ broad in surface view; subcortical layer of somewhat larger cells; upper submedullary layer of thin cells of the same lateral dimensions as the cuboidal cells of the central medulla; lower submedullary cells like the upper; lower subcortical layer absent; lower cortex of cells about 4 times as large as those of the upper cortex; marginal growing cells very large, to 40-45μ wide, the lower segments dividing less than the upper.

Papenfuss 1943, p. 467, figs. 1-14; Børgesen 1926, p. 77 (as *Aglaozonia canariensis*); Taylor 1928, p. 124, pl. 15, figs. 20-22, pl. 17, fig. 4 (as *Zonaria variegata*), probably also p. 116, pl. 15, figs. 23-25, pl. 37, fig. 4 (as *A. canariensis*); 1942, p. 55 (as *Z. variegata*); Setchell & Gardner 1930, p. 147 (as *A. canariensis*).

MÉXICO: Is. Revilla Gigedo, from shore rocks, Sulphur Bay, I. Clarion, *no. 39-17,* 16 Mar. 1939. *Ibid.,* on rocks in tide pools at Braithwaite Bay, I. Soccoro, *no. 34-33A,* 3 Jan. 1934. ECUADOR: Archipiélago de Colón, rare as dredged at sta. 145 off I. Isabela, *no. 34-98,* 12 Jan. 1934. Guayas, obtained by diving near the cable station, Salinas, Schmitt *no. 18A-33,* 21 Jan. 1933.

PADINA Adanson, 1763[71]

Plants in erect clumps, rarely prostrate, several blades ultimately arising from the same stupose base; blades flat or somewhat plicate, fan shaped to reniform, frequently becoming split into narrow segments which are sessile or the lower part somewhat attenuate; blades generally thin and pale brown or straw colored, sometimes darker brown, concentrically zonate, in some cases lightly calcified on one or both surfaces; growing margin inrolled, the growth from a marginal row of initial cells, producing two or more cell layers, when of two layers the lower, and when of three or more layers the inner ones with longer cells than the upper or cortical layers; blades showing concentric rows of hairs, at least on the morphologically upper surface, sometimes on both, and the reproductive organs usually formed in bands with a prescribed arrangement with respect to the hair zones.

KEY TO SPECIES

1. Thin-bladed species; cortical cells predominantly 20 μ and more in width, intermittently equal to or half as long as the subcortical cells; apical rolled margin two layered in the outer part . . 2
1. Thick-bladed species; cortical cells predominantly 12-20 μ wide, half to a seventh as long as the subcortical cells; apical margin 3-6 layered in the outer part 3
2. Plants about 16 cm tall, 14 cm broad, membranous above, coriaceous below, the frond split into cuneate, flabellate segments, the lower surface lightly or not at all calcified; stipe branched, about 6 cm tall, 1.5 mm thick at the base, 0.5 mm at the top; cortical cells 20-25 μ wide, lower cortical cells at first 30-100 μ long; region adjoining rolled margin two layered, about 50 μ thick; basal region of the blade 9-12 layered, 200-250 μ thick P. caulescens
2. Plants 2-4 cm tall, 2-6 cm broad, membranous, with the frond split into rounded, flabellate, crispate lobes, the lower surface conspicuously calcified; stipe simple or branched, to 1 cm long, 0.5-1.0 mm thick; cortical cells 25-40 μ wide; lower cortical cells at first 45-75 μ long, later 25-50 μ; region adjoining the margin two cell layers and 30-40 μ thick; basal region of the blade 6-8 layered and 130-200 μ thick . . . . P. crispata

[71] The identifications in the genus *Padina,* and the key used to distinguish the species, have been revised by Dr. F. Thivy.

3. Plants with decumbent to assurgent fronds, 5-10 cm long, usually coherent, usually uncalcified; apical margin rolled upwardly, 6 layered in the outer part, with primary hair lines on the lower face; upper cortical cells 20-30 μ deep, lower cortical cells 30-40 μ deep; basal region of the blades 12-20-stratose and 400-500 μ thick; sori in each interpilary zone forming 2-3 bands, or scattered or fusing over 2-3 zones . . . . P. concrescens
3. Plants with erect free fronds 5-40 cm tall, usually lightly calcified, chiefly on the lower surface; apical margin rolled downwardly, 3-6-layered in the outer part, with primary hair rows on the upper face; upper and lower cortical cells usually 20-30 μ deep; basal region of the blade 10-18-stratose, 250-500 μ thick; sori in each interpilary zone forming a number of bands or scattered, but not fusing over several zones . . . . P. Durvillaei

Padina caulescens Thivy n. sp.[72a]

Plant to 16 cm tall, 14 cm broad, repeatedly split, with flabellate segments 0.5-1.5 cm wide; stipe conspicuous, to 1.5 mm thick for 1-2 cm above the base, above subdivided, 6-8 cm long, flat and stupose; blades lightly or not calcified, with piliferous zones 1 mm apart, the hair lines of the lower surface when present opposed to those of the upper surface; thickness at the involute apex of two cell layers and about 45 μ, in the lower central portion of the blades to 220-250 μ and 9-12 cell layers; upper

[72a] Padina caulescens Thivy n. sp. (ex manuscripto inedit.)—Plantae dioeciae altitudine usque ad 16 cm, flabellatim divisae, latitudine 14 cm, segmentis flabelliformibus, inferioribus deorsum in ramos stipitis flabelliformibus, inferioribus deorsum in ramos stipitis tenues attenuatis; stipite primario valido, 1.5 mm crasso, 1-2 cm alto, subcylindrico, ramos 0.5 mm crassos stuposos emittiente; parte frondis a rhizoideis inclusa laminiformi, i. e., typice frondosa; lineis piliferis inter se ca. 1 mm distantibus in frondis parte juvenili sed ca. 3 mm in parte vetustiore, pro parte amphigenis, oppositis, pro parte solum visis in aspectu superiore; fronde in media parte et stipite 9-12-stratosis, 200-250 μ crassis, utrinque absque calce, vel in pagina inferiore continue sed tenuiter et in pagina superiore discontinue et disperse calciferis; cellulis superioribus corticis 20-25 μ diam., isodiametientibus vel duplo vel triplo longioribus quam crassioribus, duplo brevioribus quam cellulis subcorticalibus vel eas aequantibus; cellulis corticalibus inferioribus diametro superiores aequantibus, 2- vel 4-plo longioribus, longitudine subcorticales in regione 1 cm infra partem involutam aequantibus, in regione inferiore, transverse divisis, duplo vel triplo longioribus et duplo brevioribus quam subcorticalibus, vel eas aequantibus; in sectione transversali cellulis stratorum adjacentium oppositis; soris zonatis, zonis antheridialibus in planta mascula et oogonialibus in planta feminea consecutivis in pagina inferiore; soris antheridialibus plus minusve dispersis cum cellulis basalibus 12-25 μ longis, 12-18 μ altis, duplo vel quadruplo brevioribus quam cellulis corticalibus; soris oogonialibus 0.25 mm latis, medianis, zonam unam vel duas imperfectas formantibus. Planta typica in loco dicto. I. María Magdalena, Las Tres Marías, México, legit W. R. Taylor *no. 39-669,* 9 May 1939.

cortical cells 20-25 μ wide, 1-3 times as long as broad, half as long or equal to the subcortical cells; lower cortical cells of the same width as the upper; sexual phase dioecious, the antheridial sori more or less scattered; oögonial (?) sori 0.25 mm wide, in a single or paired continuous or broken band between the hair lines.

MÉXICO: Nayarit, dredged from 5.5-9.0 meters' depth at sta. 971 off I. María Magdalena, Las Tres Marías, *no. 39-669 (TYPE),* 9 May 1939.

Padina crispata Thivy n. sp.[72b]

Plants 2-4 cm tall, 2-6 cm broad, flabelliform, with a distinct stipe and holdfast, the basal third bifacially stupose, the blades above split to lobes 1-4 cm wide, calcified on the lower surface, with piliferous lines 0.75-3.00 mm apart opposed or only on the upper surface; thickness of 2 cell layers above, increasing to 6-8 layers in the lower part and 130-200 μ; cells of all layers 20-40 μ wide; in upper part the upper cortical cells 25-65 μ long and the lower 45-75 μ long, but in the lower part of the blade the length on both surfaces 25-50 μ; tetrasporangial sori on either surface or both, in consecutive interpilary zones and forming one or two rows or scattered, with a delicate indusium, the sporangia 75-100 μ diam.; oögonial sori linear or round, 0.25 mm diam., indusiate, the oögonia 35-50 μ diam.

[72b] Padina crispata Thivy n. sp. (ex manuscripto inedit.)—Plantae 2-4 cm altae, 2-6 cm latae, flabelliformes, distincte stipitatae et bysso praeditae; lobis valde crispatis, 1-4 cm latis, inferne calce incrustatis, utrinque in tertia parte inferiore stuposis; zonis concentricis 0.75-3.00 mm latis, interdum indistinctis vel delineatis a lineis piliferis oppositis vel a lineis solis superioribus; fronde in apicali parte (usque ad regionem 5 mm infra marginem revolutam) 2-stratosa, 30-40 μ crassa, in regione media 4-6-stratosa, 65-130 μ crassa, et supra stipitem 6-8-stratosa, 130-200 μ crassa; cellulis stratorum omnium 20-40 μ diam., in sectione transversali oppositis, solis exceptis eis superioribus corticalibus in regione basali radialiter divisis; cellulis corticalibus in regione basali radialiter divisis; cellulis corticalibus inferioribus eo modo non septantibus sed latitudine paululo compressis; cellulis corticis superioris exacte infra partem revolutam 25-65 μ longis, iis corticis inferioris 45-75 μ longis, ambabus in regione frondis basali 25-50 μ longis; in sectione radiali cellulis corticis superioris cellulas subcorticales aequantibus vel duplo brevioribus; cellulis inferioris corticis eis superioris consimilibus in regione basali sed sursum subcorticales aequantibus; soris tetrasporangialibus zonas consecutivas superne vel subtus vel utrinque occupantibus, 1- vel 2-seriatis vel plus minusve dispersis, 0.5 mm latis, indusio tenuissimo praeditis; tetrasporangiis maturis 75-100 μ diam., altitudine diametrum aequantibus vel sesquipliciter altioribus quam diametro; cellulis basalibus ca. 12 μ diam., ca. 40-60 μ longis; soris oogonialibus linearibus vel circularibus vel forma intermediis, 0.25 mm diam., indusiatis; oogoniis 35-50 μ diam. Planta typica in loco dicto Golfo Dulce, Costa Rica, legit W. R. Taylor *no. 39-100,* 26 Mar. 1939.

México: Nayarit, on Isla María Madre, legit A. L. Herrera *no. 246,* Mar.-May 1927 (Herb. N.Y. Bot. Gard.). Costa Rica: infrequent on rocks near the entrance to the bay, Golfo Dulce, *no. 39-100 (TYPE),* 26 Mar. 1939. Panamá: Bahía Honda, scarce and stunted in the lower tide pools, *no. 39-134A,* 26 Mar. 1939.

Padina Durvillaei Bory

Bory de St. Vincent 1829, p. 147, Atlas 1826, pl. 21, fig. 1; Farlow 1902, p. 91; Howe 1911, p. 497; Dawson 1944, p. 230.

Padinas are nearly as common in the littoral flora on the tropical Pacific American coast as they are in the Caribbean. On the higher rocks they form close dense growths a couple of centimeters high, especially along cracks. In tide pools they reach a better size, and in deep water may become relatively huge. Here we may get dredged specimens 4 dm tall, and they may be divided by wave action into many narrow segments or, if the water is quiet as at deeper stations, we may get individuals with blades to 2 dm broad. Again, in considering texture, we find great variation. Some specimens of *P. Durvillaei* are firm, indeed almost leathery, while at the other extreme some are quite as delicate as West Indian *P. Vickersiae* of the same size. There seems no division of these thin and thick forms into separate species, or even sharply marked varieties. The histological features of thickness, size and shape of cells in the different layers and in the spore band characters appear to fall into unbroken ranges.

México: Baja California, south shore of I. Cerros, Schmitt *no number,* 29 Aug. 1932. *Ibid.,* at Pt. Hughes on Cabo San Lazaro, *no. 34-662,* 7 Mar. 1934. Is. Revilla Gigedo, in tide pools at Braithwaite Bay. I. Soccoro, *no. 34-32,* 3 Jan. 1934. Nayarit, on surf-beaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-633,* 9 May 1939. *Ibid.*, dredged from sta. 970 at 22 meters' depth, *no. 39-658,* 9 May 1939. *Ibid.,* dredged from sta. 971 at 5.5-9.0 meters' depth, *no. 39-668,* 9 May 1939. Guerrero, at Ba. Petatlán, *no. 34-571,* 2 Mar. 1934. Oaxaca, at Ba. Tangola-Tangola, *nos. 34-550, 34-551,* 28 Feb. 1934. *Ibid.,* district of Juquila, Conzatti *no. 4481,* 17 Dec. 1921 (Herb. N. Y. Bot. Gard.). Costa Rica: Puerto Culebra, intertidal, *no. 34-531,* 24 Feb. 1934. Golfo Dulce, infrequent in rock crevices near the entrance to the bay, *no. 39-101,* 26 Mar. 1939. Panamá: Bahía Honda, on rocks near low tide line, rare, *no. 39-134B,* 26 Mar. 1939. Colombia: Valle, on I. Gorgona, *no. 34-491B,* 12 Feb. 1934. Ecuador: Archipiélago de Colón, I. Isabela, *Hassler* Exped. *no. 1016,* June 1872. *Ibid.,* on rocks at low tide, Pta. Albemarle, *nos. 34-101, 34-102,* 12 Jan. 1934. *Ibid.,* south shore of Banks Bay, *nos. 34-127, 34-128,* 13 Jan. 1934. *Ibid.,* dredged from 4-6 meters' depth off Black Bight, Schmitt *no. 63A-33,* 8 Feb. 1933. *Ibid.,* intertidal on reef north of Tagus Cove, *no. 34-170,* 13 Jan. 1934. *Ibid.,* brought up on anchor from 5.4 meters' depth in Tagus Cove, *no. 34-150,* 13 Jan. 1934. *Ibid.,* intertidal in Cartago Bay, *no. 34-352B,* 25 Jan. 1934. *Ibid.,* I. San Salvador, *Hassler* Exped. *no. 1015,* June 1872. *Ibid., Albatross* Exped. *no. 11,* no date. *Ibid.,* growing near low tide line on I. Bartolomé, *no. 34-341,* 23 Jan. 1934. *Ibid.,* dredged at 4-7 meters' depth at Velero Bay, I. Baltra, Schmitt *no. 87A-33,* 19 Feb. 1933. *Ibid.,* dredged from 9 meters' depth, *no. 34-336,* and dredged on anchor, *no. 34-338,* 22 Jan. 1934. *Ibid.,* I. Santa Cruz, *Hassler* Exped. *no. 1006,* June 1872. *Ibid.,* dredged from 9-18 meters' depth near Eden I., Conway Bay, Schmitt *no. 81A-33,* 16 Feb. 1933. *Ibid.,* dredged from 5-7 meters' depth at Academy Bay, Schmitt *no. 51A-33,* 4 Feb. 1933. *Ibid.,* on rocks in the littoral in front of the settlement, *no. 34-303,* 20 Jan. 1934. *Ibid.,* dredged at sta. 169 off Academy Bay, *no. 34-304,* 20 Jan. 1934. *Ibid.,* on the shore east of Wreck Bay, I. San Cristóbal, Schmitt *no. 41C-33,* 30 Jan. 1933. *Ibid.,* dredged in 4-6 meters' depth in the bay, I. Santa Fé, Schmitt *no. 46B-33,* 2 Feb. 1933. *Ibid.,* frequent in the lower littoral at Black Beach Anchorage, I. Santa María, *no. 34-210,* 17 Jan. 1934. Guayas, dredged from 2-4 meters' depth along the village beach, La Libertad, Schmitt *no. 12B-33,* 19 Jan. 1933. *Ibid.,* dredged off La Playa from 4 meters' depth, Schmitt *no. 14B-33,* 20 Jan. 1933. *Ibid.,* scraped from a mooring buoy, Schmitt *no. 12aA-33,* 19 Jan. 1933. *Ibid.,* from the northwestern beach near Salinas, *nos. 34-455B, 34-456,* 8 Feb. 1934. *Ibid.,* in tide pools at Pta. Santa Elena, Salinas, Schmitt *nos. 502, 513,* 12, 17 Sept. 1926.

Padina concrescens Thivy n. sp.[73]

Plants gregarious, 5-10 cm in length, commonly procumbent, when imbricate, orbicular flabellate, estipitate, with no defined holdfast, attaching by ventral rhizoidal cushions; when assurgent with more definite holdfast and the basal portion stipelike and stupose, the upper portions

[73] Padina concrescens Thivy n. sp. (ex manuscripto inedit.)—Plantae gregariae, 5-11 cm longae, partim procumbentes, crustiformes, imbricatae, orbiculari-flabelliformes, basi truncatae, estipitatae, absque bysso sed subtus pulvinis rhizoidalibus dispersis adfixae, partim assurgentes vel erectae et prope basin per 2 cm stipitiformes et byssiformes; partibus erectis inter se a pulvinis adhaerentibus etiamque paucas plantas erectas autoephiphyticas sustinentibus; margine apicali sursum involuta: zonis piliferis primariis solum in pagina inferiore sitis: zonis piliferis

adherent to each other by ventral rhizoidal attachments; apical margin upwardly inrolled, with piliferous bands on the ventral surface, and secondary bands sometimes present on the upper side as well as the lower and opposed to the latter; thickness to 6 cell layers above and to 10-20 layers below and 400-500 μ thick; cells of the cortex 12-25 μ wide, occasionally to 30 μ, 1-2 times as long, those of the upper layer one third to one seventh as long as the subcortical cells, and those of the lower layer one half to one fifth as long; sori in consecutive interpilary zones, scattered or fusing in large patches, on both surfaces or chiefly on the upper; indusium present, delicate, deciduous; tetrasporangia to 100-120 μ diam.

This plant appears to be closely related to *P. Durvillaei,* except for the direction of inrolling of the margin, and in so far as it is modified in adaptation to its procumbent habit.

ECUADOR: Archipiélago de Colón, growing closely appressed to rocks, the blades overlapping, often adherent to each other, on a reef to the north of Tagus Cove, I. Isabela, *no. 34-166,* 13 Jan. 1934. *Ibid.,* partly decumbent and concrescent, on rocks at Black Beach Anchorage, I. Santa María, *no. 34-245 (TYPE),* 17 Jan. 1934. *Ibid.,* from about 3.6 meters' depth in Gardner Bay, I. Española, Schmitt *no. 28A-33,* 25 Jan. 1933.

Sporochnaceae

Thallus bushy, the branches filiform, or compressed and narrow, the divisions terminating in tufts of brown filaments from which trichothallic growth occurs; unilocular sporangia in dense swollen sori covering specialized portions of determinate lateral branchlets or the ends of branches in the main system, associated with cylindrical to clavate paraphyses.

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secondariis plerumque nullis, raro ut primariis positis (solis inferioribus) vel partim oppositis; fronde in parte involuta 6-stratosa, 200 μ crassa, deorsum saepe 10-stratosa, 300 μ crassa, basi et in stipite 12-20-stratosa, 400-500 μ crassa; cellulis corticalibus inferioribus superioribusque 12-30 plerumque 20 μ diam., 15-45 μ longis; in sectione transversali plerumque dimidio angustioribus quam cellulis medulariis vel paucis indivisis cellulas medulares aequantibus; cellulis corticis superioris 20-30 μ altis 3-7-plo brevioribus, quam cellulis subcorticalibus, eis corticis inferioris 30-40 μ altis, 2-5-plo brevioribus quam cellulis subcorticalibus; soris vel in 2 vel 3 seriebus 0.5 mm latis in quaque zona, zonas consecutivas glabras occupantibus inter lineas piliferas, vel dispersis, vel dense aggregatis per zonas 2-3 adjacentes, amphigenis sed plerisque in superficie superiore; indusio plerumque evanescenti, tenui, interdum circum soros apertos visibili; sporangiis 100-120 μ diam. plerumque sesquiplo altioribus quam diamentientibus sed minus quam 130 μ altis; cellulis basalibus corticales latitudine et longitudine aequantibus sed paulum brevioribus. Planta typica in loco dicto I. Santa María, Archipiélago de Colón, Ecuador, legit W. R. Taylor *no. 34-245,* Jan. 1934.

KEY TO GENERA

1. Branching alternate or irregular, progressive, without the formation of determinate branchlets . . . . Carpomitra
1. Branching alternate in one degree along the single main axis, the primary branches bearing numerous small determinate fertile branchlets . . . . Sporochnus

CARPOMITRA Kützing, 1842

Carpomitra luxurians n. sp.[74]

Plate 3, Figs. 9-16; Plate 16; Plate 17, Fig. 2

Plants to over 47 cm tall, bushy; the holdfast to 1.3 cm diam., subconical, stupose, giving rise to a very slender main stem which is also stupose near the base; stem subcylindrical below, flattened above, about 0.5 mm diam. throughout except at the forks, where it is a little larger, and in the ultimate branches where it is generally about 0.3 mm diam., and rarely in any part reaches 1.3 mm diam.; to 380 μ thick; the branching alternate or, near the tips, pseudodichotomous, and where subtending a fertile receptacle becoming opposite or verticillate, rebranching freely at intervals of 0.5-5.0 cm, with little decrease in size between the successive divisions, the main axes deliquescent above and hardly distinguishable; costa not externally distinguishable, represented in section by an ill-defined axial cell row; growing tips of the branches terminated by luxuriant hair tufts, the hairs 5-7 mm long, to about 42 μ diam.; fertile receptacles terminating axes, conical, resting on disklike expansions of the end of the axes, commonly becoming subtended by 1-3, most commonly two branches, or these not developed and the receptacle then appearing long pedicellate; paraphyses slender, 5.5 μ diam., with subspherical or truncate terminal cells 18-28 μ broad, 15-18 μ long; sporangia 35-45 μ long, 13-15 μ diam.

These plants seem larger and much more slender than European *C. Cabrerae* (Clem.) Kütz., and most extra-European material attributed to that species, although a specimen from "Port Philip Heads, J. Bracebridge Wilson 10. 1. 90," in Kew Herbarium was very similar. Material from the Galapagos has been attributed to *C. Cabrerae* by Piccone (1886, p. 40).

[74] Carpomitra luxurians n. sp.—Planta altitudine maior 47 cm, fruticosa, axibus subcylindricis et infra ad 0.5 mm diam., supra, autem, ramis planis, 0.3, raro ad 1.3 mm latitudine; costa inconspicua; sporangiis 35-45 μ long., 13-15 μ diam.; paraphysibus tenuibus, 5.5 μ diam., cellulis terminalibus sphaeroideis aut truncatis, 18-28 μ diam., 15-19 μ long. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-285,* 19 Jan. 1934.

ECUADOR: Archipiélago de Colón, a fragment dredged from 183-270 meters at sta. 143, I. Wenman, *no. 34-88B,* 11 Jan. 1934. *Ibid.,* dredged from 9-37 meters near North Bay and anchorage, I. Marchena, Schmitt *nos. 310A-35, 311A-35,* 3 Dec. 1934. *Ibid.,* dredged off Academy Bay at sta. 169, I. Santa Cruz, *no. 34-322,* 20 Jan. 1934. *Ibid.,* dredged from 25 meters' depth off the anchorage, I. San Cristóbal, Schmitt *no. 43A-33,* 31 Jan. 1933. *Ibid.,* dredged off Black Beach Anchorage, I. Santa María, *no. 34-249,* 19 Jan. 1934. *Ibid.,* dredged in abundance from 27 meters' depth at sta. 167, *no. 34-285 (TYPE),* 19 Jan. 1934. *Ibid.,* dredged from a rocky bottom at 36-55 meters' depth at sta. 203 off I. Española, *no. 34-416,* 31 Jan. 1934

SPOROCHNUS C. Agardh, 1817

Plants with a single erect main axis bearing alternate spreading branches, which in turn bear many short determinate branchlets terminating in tufts of brown filaments, which branchlets eventually near their ends are each swollen by the sorus of sporangia and paraphyses which surrounds them.

KEY TO SPECIES

1. Fertile branchlets relatively long stalked, the fertile portion subcylindrical, terminated by a hair tuft directly . . . S. Bolleanus
1. Fertile branchlets short stalked, the fertile portion subcylindrical, terminating in a slender style equally long, which in turn bears the hair tuft . . . . S. rostratus

Sporochnus Bolleanus Montagne

Plants to 57 cm tall, profusely alternately branched, the branches bearing many stalked branchlets which are small when young and tipped with clusters of brown filaments 5-8 mm long, but later become swollen with cylindrical tips 2-5 mm long, on stalks about as long, the sori containing slender paraphyses with pyriform to subglobose end cells, and sporangia 25-30 μ long.

Taylor 1928, p. 114, pl. 14, fig. 14.

The swollen fertile branchlet tips are not so long as is common on Atlantic specimens. Kützing (1859, pl. 81, fig. 2) figures the paraphyses as somewhat clavate. However, examination of material from Florida, which certainly seems typical of what passes under this name from the western Atlantic and Caribbean, shows them much as in the Ecuadorean specimens, though perhaps a trifle narrower.

ECUADOR: Archipiélago de Colón, dredged from 27 meters' depth at sta. 167 off I. Santa María, *nos. 34-284, 34-287B,* 19 Jan. 1934.

Sporochnus rostratus n. sp.[75]

Plate 2, Figs. 12-17; Plate 17, Fig. 1

Plants to over 2 dm tall, delicate, the axis once alternately branched, like the branches filiform, below about 0.5 mm diam.; fertile branchlets short stalked, the slender stalk about 0.3-0.8 mm long, bearing a thicker subcylindrical fertile portion 1.0-2.5 mm long, which in turn is tipped by a very delicate styliform tip 1-3 mm in length, generally a little longer than the fertile portion, and which in turn bears a cluster of brown filaments 3-5 mm long; paraphyses with stalks expanding somewhat to the end, where the end cell is turbinate, 13-20 μ diam., 13-14 μ long; gametangia subcylindrical to oval or slightly obovoid, 28-31 μ long, 8.5-10.5 μ diam.

This interesting species is most satisfactorily compared with *S. stylosa* Harvey from New Zealand, a plant with similar style-tipped fertile branchlets. In the absence of New Zealand material and lack of measurements in the original description there may be doubt of its distinctness, but there is so little in common between the Ecuadorean and the New Zealand floras that it is most safely assumed to be distinct.

ECUADOR: Archipiélago de Colón, dredged from 37 meters' depth at North Bay, I. Marchena, Schmitt *no. 311B-35,* 3 Dec. 1934. *Ibid.,* dredged at sta. 167 from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-287A (TYPE),* 19 Jan. 1934. *Ibid.,* rare as dredged from 12.5-18.0 meters' depth at sta. 193, *no. 34-365,* 27 Jan. 1934. *Ibid.,* dredged from 37 meters' depth off a rocky bottom, I. Española, Schmitt *no. 362B-35,* 19 Dec. 1934.

Desmarestiaceae

DESMARESTIA Lamouroux, 1813

Plants arising from a basal disk, filiform, compressed or foliaceous, and when flat often with a midrib, oppositely or alternately branched; growth trichothallic at least at first, in structure showing an axial cell row and a parenchymatous cortex; sporangia formed by the conversion of superficial cells of the thallus; gametophyte microscopic, filamentous, oögamous.

[75] Sporochnus rostratus n. sp.—Plantae altitudine maiores 2 dm, tenues, alterne filiformiterque semel divisae; ramusculis fertilibus stipitem brevem atque partem fertilem subcylindricam 1.0-2.5 mm long. habentibus, parte fertili cacumen styliforme 1-3 mm long. habente, quod penicillum terminalem sustinet; paraphysibus clavatis, cellula terminali expansa turbinataque; 13-20 μ diam., 13-14 μ long.; sporangiis ovatis, 28-31 μ long., 8.5-10.5 μ diam. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-287A,* 19 Jan. 1934.

KEY TO SPECIES

1. Thallus ligulate to foliaceous 2
1. Thallus not foliaceous, but bushy with flat branches . D. tropica
2. Plant freely branched, ligulate, narrow throughout, the margins entire . . . . D. herbacea
2. Plant larger, sparingly branched, the branches 2 cm broad or wider, the margins with slender teeth . . . . D. munda

Desmarestia tropica n. sp.[76]

Plates 18, 19

Plants of moderate size, in excess of 4 dm tall, bushy, light brown, soft; holdfast very small, little differentiated; stipe compressed, short, about 3 mm broad, firm and fleshy, continuing as the rachis of the plant, the first branches within 1-2 cm of the base; rachis to 5-8 mm broad, flat, above hardly recognizable; main branches wide-angled, opposite, at intervals of 1-3 cm, similar to the primary axis, and sometimes as large, rebranching to more and more slender divisions in several degrees; midrib represented by a faint line in the branches of intermediate age, but otherwise generally not visible in surface view; branches of all degrees tapering somewhat to base and apex, regularly beset with broad short teeth at intervals of from 7-15 mm on the lower main axis, but of only 1-2 mm on the lesser branches, these tipped with brown filaments in the youngest parts, naked behind, and continued out to opposite spinose prolongations or branches in the older parts; brown filaments distichously closely oppositely branched, the primary filament a continuation of the tooth bearing it, sharply tapered to the base, gradually to the apex, the cells 36-65 μ diam., almost moniliform, being strongly contracted at the septa.

These plants represent a species of the greatest interest. They are relatively coarse and fleshy below; above they become progressively more slender and softer, but can scarcely be called membranous. They are more bushily branched and with more gradation from base to apex than in *D. latifrons,* and the branches are more expanded than in that section of the genus. They are best included in the section Herbaceae, but are clearly less membranous than the other North American representatives. Among less well-known Desmarestias, *D. anceps* Mont. (Kützing 1859, p. 41, pl. 98, figs. c, d) and *D. distans* (C. Ag.) J. Ag. (Kützing 1859, p.

[76] Desmarestia tropica n. sp.—Planta altitudine maior 4 dm, fruticosa, succulenta, stipite firma brevi compressaque, ramificatione opposita, stipite ad 5-8 mm latitudine, supra vix agnoscibili; ramis patentibus versus basim apicemque paululum attenuatis, dentibus brevibus latisque, regulariter crebreque ornatis, qui, novi, penicillis brunneis praefiguntur; costa obsoleta. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-388,* 29 Jan. 1934.

41, pl. 99, figs. Ia, Ib); in the figures given by Kützing rather suggest fragments of the present species, particularly his figure of *D. anceps.* However, the present writer sees little similarity between the figures given by Gain (1912, p. 39, pl. 5, figs. 2-6) for *D. anceps* and those given by Kützing *(loc. cit.),* though they are supposed to represent the same species and Gain reports having seen the typical material, which was in the Kützing herbarium. J. G. Agardh (1848, p. 168) gives the width of *D. anceps* as a *line,* which De Toni converts as 2 mm, but *D. tropica* in the lower and older portions is much wider.

Ecuador: Archipiélago de Colón, dredged at sta. 167 from 27 meters off Post Office Bay, I. Santa María, *no. 34-277,* 19 Jan. 1934. *Ibid.,* dredged at sta. 192 from 14-18 meters, *no. 34-354,* 27 Jan. 1934. *Ibid.,* dredged at 60 meters' depth, *no. 34-388 (TYPE),* 29 Jan. 1934.

Desmarestia herbacea (Turner) Lamouroux

Setchell & Gardner 1925, p. 566, pl. 87; Smith 1944, p. 121, pl. 17, fig. 2.

México: Baja California, rare near low tide line in South Bay, I. Cerros, *no. 34-627,* 10 Mar. 1934.

Desmarestia munda Setchell & Gardner

Setchell & Gardner 1925, p. 567, pl. 89; Smith 1944, p. 121, pl. 17, fig. 1.

Ecuador: Archipiélago de Colón, dredged in some quantity at sta. 169 off Academy Bay, I. Santa Cruz, *no. 34-311,* 20 Jan. 1934.

Laminariaceae

Plants usually large at maturity, generally with a branching fibrous holdfast, distinct slender stalk and broad blades of various forms bearing sporangia and paraphyses in more or less widely expanded sori; gametophyte microscopic, filamentous, oögamous.

KEY TO GENERA

1. Very large, slenderly and repeatedly branched, the branches bearing lanceolate leaves with aculeate-serrate margins and a petiolar vesicle at the base of each leaf; growth from the terminal blade, the lateral leaves being developed from the meristem at its base, and splitting off laterally from it . . . . Macrocystis

1. Large, with a short trunk bifurcate at the top, and eventually several strap-shaped leaves with serrate or pinnate margins; growth from the transition zone at the end of the stem portion of the plant . . . . Eisenia

MACROCYSTIS C. Agardh, 1820

Macrocystis pyrifera (Linnaeus) C. Agardh

Setchell & Gardner 1925, p. 627, pl. 64, 65; Smith 1944, p. 144, pl. 31, figs. 3, 4.

MÉXICO: Baja California, abundant at South Bay, I. Cerros, *no. 34-652,* 10 Mar. 1934. *Ibid.,* abundant in deep water off Ba. Thurloe, Pto. San Bartolomé, *no. 34-618,* 9 Mar. 1934. Is. Revilla Gigedo, a few specimens cast ashore and lying at extreme high storm tide line, Sulphur Bay, I. Clarion, *no. 34-56,* 5 Jan. 1934.

EISENIA Areschoug, 1876

KEY TO SPECIES

1. Stalk becoming as much as a meter in length, stout, flattened above; leaves becoming numerous, several decimeters long, simply serrate, longitudinally rugose, functioning as sporophylls . . . . E. arborea
1. Stalk short, much less than 1 dm in length, slender; leaves rather few, approaching a meter in length, serrate to once pinnate . . . . E. galapagensis

Eisenia arborea Areschoug

Setchell & Gardner 1925, p. 646.

MÉXICO: Baja California, in early stages of development at South Bay, I. Cerros, *no. 34-642,* 10 Mar. 1934. *Ibid.,* mature plants numerous at Point Hughes, Cabo San Lazaro, *no. 34-663,* 7 Mar. 1934.

Eisenia galapagensis n. sp.[77]

Plates 20-22

Plant with a fibrous holdfast and at first a thin, simple blade; eventually the simple blade replaced by two diverticula supporting a succession

[77] Eisenia galapagensis n. sp.—Planta magnitudine mediocris, stipite brevi, bifurcato, utroque latere 5-7 (aut pluribus?) sporophyllis membranaceis, e simplicibus ad pinnatifida variantibus, marginibus crasse dentatis, ad 15 cm lat. atque aliquot dm long., lobis lateribus vestigialibus aut ad 7 cm aut plus longitudine. Planta typica in loco dicto Academy Bay, I. Santa Cruz, Ecuador, legit W. R. Taylor, *no. 34-305,* 20 Jan. 1934.

of serrate sporophylls which in young plants tend to be deeply lobed or even pinnate, but in older plants are smooth, strap shaped, and show very small lobes only; sori on the sporophylls, appearing as large irregular fertile areas on the face of the blades.

These are very curious plants to be found in deep water. The small number of species hitherto known from the genus makes them of particular interest on that score also. They have a spreading fibrous holdfast, from which arises in the young plant a very short, rather slender stalk 1-2 cm tall, terminated by a thin primary blade. This blade is broadly lanceolate with a subcordate base, the margin being irregularly coarsely dentate. Later, when about 2 dm tall, the blade begins to be eroded from the tip and the lateral margins develop a few large divergent triangular or ligulate lobes 2-5 cm long, the margins compound dentate, the first coarse teeth irregular and erose, 3-10 mm long, the secondary aculeate with a flattened base, about 1-2 mm long. Eventually the primary blade tip disintegrates and the lateral margins of the base develop as a pair of divergent incrassate flat bands 1-3 cm long from the apex of the stalk, giving rise to a succession of secondary blades from the margin. First formed secondary blades are commonly 1-3 dm long, linear lanceolate, 3-5 cm wide, erose dentate on the margins or distantly pinnately lobed, the dentate lobes 5-15 mm long. Large plants at this developmental stage may have blades much longer, with a midportion to 5 cm broad and lobes in great excess of 7 cm long, but the specimens of this type secured were all fragmentary. Mature plants appear to have 5-7 secondary blades on each side and simplified blades succeed the pinnately divided blade type of the younger stages. These ultimate type blades appear to be 85 cm long or more, and 4-6 cm broad, the margin above irregularly aculeate serrate, but below compound serrate, the lobular teeth rarely over 1 cm long. The sori form large patches 3-4 cm broad and to 1 dm long or more on the face of the sporophylls. The blades are thin, and adhere to paper as well as most Laminariaceae of the same size. At first the subsimple sporophyll-bearing specimens were thought to belong to a different species from the ones with pinnately divided sporophylls, but transitions are so complete as to make this conclusion unwarranted.

The genus *Eisenia* was formerly composed of *E. arborea* of the western American coast, a long-stalked coarser littoral form, and *E. bicyclis* (Kjellman) Setchell, of Japan. Later, *E. Masonii* Setchell & Gardner (1930, p. 145, pl. 14) and *E. desmarestioides* Setchell & Gardner (1930, p. 146, pl. 15) were added from I. Guadeloupe, Baja California, México. In *E. arborea* the juvenile blades are at first hardly serrate, and the mature plant is larger with a heavy stalk and more numerous sporophylls. In *E.*

bicyclis the sporophylls are often pinnately divided, but they are numerous and relatively short. In both *E. arborea* and *E. bicyclis* the lobes on the lower sides of the primary blade have narrowed, upcurved, rather than divergent bases. In both the mature sporophylls are conspicuously wrinkled. From *E. Masonii* this species may be differentiated by its serrate to somewhat pinnate, rather than bipinnately compound, sporophylls, for in that species the blades are compound and the divisions in turn pinnately divided or bipinnate, with the margins coarsely irregularly serrate. In *E. desmarestioides* the blades are twice pinnately compound and the leaflets coarsely, rather regularly serrate. In both the leaflets are contracted to a very slender base, while in *E. galapagensis* they are less contracted, the base usually being about half as wide as the blade, but not less than one third. The rachis in each of the Guadeloupe species is thick, but there is no particular thickening in that from the Galapagos. Finally, one must consider the resemblances which the specimens of the present collections show, in the younger examples, to forms of *Ecklonia radiata* (Turn.) J. Ag., especially f. *exasperata* (Turn.) De Toni (1895, p. 354) as exemplified, in particular, by *"Laminaria biruncinata"* Bory (1926, pl. 10) from Chile. There is quite a bit of resemblance between his figure and the youngest stages of the Galapagos plant, but in the latter the surface does not bear spinose projections. In *Ecklonia* the primary blade persists and the secondary blades are borne pinnately along its margins until eventually the lower-formed ones may dominate it, while in *Eisenia* the primary blade, while lobed, soon decays and the secondary blades are produced from its lower lateral margins now become stalklike in the meristematic area. Our specimens certainly belong in *Eisenia,* and one cannot be sure that the single plant which Bory had might not likewise have been an *Eisenia* rather than related to *Ecklonia radiata.* The writer finds no resemblance between his plants and African, Australian, New Zealand, or Japanese specimens, or to other Ecklonias.

ECUADOR: Archipiélago de Colón, dredged from 27 meters at North Bay, I. Marchena, Schmitt *no. 310B-35,* 3 Dec. 1934. *Ibid.,* frequent as dredged off Academy Bay, I. Santa Cruz, *no. 34-305 (TYPE),* 20 Jan. 1934. *Ibid.,* dredged from 46-55 meters opposite Gordon Rocks, Schmitt *no. 317C-35,* 8 Dec. 1934. *Ibid.,* rare as dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-293,* 19 Jan. 1934. *Ibid.,* infrequent as dredged from 55 meters, *no. 34-387,* 29 Jan. 1934. *Ibid.,* dredged from 55 meters off Black Beach Anchorage, *no. 34-391A,* 30 Jan. 1934.

Fucaceae

Plants moderate to very large, often massive, forming cushion-shaped or fibrous holdfasts from which arise cylindrical to flattened axes, subsimple or branched, often with a broad membranous margin, dichotomous or in some genera pinnate, or divided into axis and lateral foliar organs; inflated vesicles often present in the branchlets, or lateral; reproduction by the formation of fertile crypts distributed generally over the plant body, or in special receptacular branchlets; heterosporous, eventually producing gametes by continuing the division in the sporogenous organs.

KEY TO GENERA

1. Special foliar organs absent, the minor divisions of the vegetative portions filiform; vesicles absent . . . . Blossevillea
1. Lateral organs foliaceous or, if filiform, clearly flat . . . 2
2. Vesicles seriate, somewhat moniliform, in regular branchlets . . . . Cystoseira
2. Vesicles solitary, in regular branchlets, several chambered . . . . Halidrys
2. Vesicles generally present, always solitary, lateral, unilocular . . . . Sargassum

BLOSSEVILLEA Setchell & Gardner, 1913

Blossevillea galapagensis (Piccone & Grunow) n. comb.

Plate 23

Plants gregarious, olivaceous, firm in texture, black and brittle when dried, exceeding 4 dm in height, the basal holdfasts small, irregularly lobed; branching close to the base into several main axes which are about 1.0-1.5 mm diam., and which branch irregularly into smaller divisions, especially above bearing scattered lateral determinate aculeate to filiform branchlets 1-3 cm long; above irregularly dichotomously branched, the sterile divisions slender, near the top somewhat fastigiate; fertile branches dichotomously or sometimes laterally branched, the divisions nodulose, to 2.5 mm diam., tapering, the conceptacles hermaphrodite, the oval sporangia 133-200 μ long, 46-80 μ diam., each producing one egg.

Piccone & Grunow in Piccone 1886, p. 40, pl. 1, fig. 1, pl. 2, fig. 3 (as *Fucodium galapagense*); De Toni 1895, p. 215 (as *Pelvetia ? galapagensis*); Farlow 1902, p. 90 (as *F. galapagense*).

Preserved material was available for study and enabled a close examination of the conceptacles to be made. They are clearly hermaphrodite, but even in the largest "sporangia" only one egg appeared. In the sporangia of intermediate age there were a lighter spot in the middle and darker ones toward the ends, but at no stage was any cleavage present. In young stages of growth of the plant there was a slight bilaterality of the branching from the axis not evident in older plants. One notes that *Blossevillea Brandegeei* Setch. & Gard. (1913, p. 325, pl. 46), though with a very different mature main axis, looks a little like these plants in its fructiferous parts and has but one egg in each sporangium. The writer is inclined to consider this plant more nearly related to *B. Brandegeei* than to *Bifurcaria* Stackhouse (*Fucodium* J. Agardh) with single eggs, or to *Pelvetia* Decaisne & Thuret with two, where it was put by De Toni.

ECUADOR: Archipiélago de Colón, I. Isabela, *Hassler* Exped. *no. 1019,* June 1872. *Ibid.,* I. Rabida, *Hassler* Exped. *no. 1013,* June 1876. *Ibid.,* dredged from 37 meters opposite Gordon Rocks, I. Santa Cruz, Schmitt *no. 316A-35,* 8 Dec. 1934. *Ibid.,* on rocks in the littoral in front of the settlement at Academy Bay, *no. 34-302,* 20 Jan. 1934. *Ibid.,* dredged east of Wreck Bay in 3.6-5.4 meters, I. San Cristóbal, Schmitt *no. 41A-33,* 30 Jan. 1933. *Ibid.,* from the shore rocks southeast of Cormorant Rock, I. Santa María, Schmitt *no. 38A-33,* 29 Jan. 1933. *Ibid.,* abundant on the higher littoral rocks at Black Beach Anchorage, *no. 34-208,* 17 Jan. 1934.

CYSTOSEIRA C. Agardh, 1820

Plants erect and bushy from a fibrous holdfast, the main stalks angular with a few main branches which become flattened and pinnately divided, filicoid, and in their upper segments bearing in the ends of the branches receptacles and in branchlets of lower orders, seriate vesicles.

Cystoseira osmundacea (Menzies) C. Agardh

Setchell & Gardner 1925, p. 709; Smith 1944, p. 156, pl. 34.

MÉXICO: Baja California, on littoral rocks at Ba. Thurloe, Pta. San Bartolomé, *no. 34-619,* 9 Mar. 1934. *Ibid.,* dredged from 14-18 meters off Ba. Thurloe, Schmitt *no. 283C-34,* 9 Mar. 1934.

HALIDRYS Lyngbye, 1819

Plant bushy, arising from a holdfast, the erect stipe cylindrical or a little flattened, branching alternately, the branches subsimple to pinnate, below bearing alternate, linear to spatulate, simple to sparingly pinnate foliar divisions, near the tips filiform divisions developing flattened, chambered vesicles, and at the ends developing filiform receptacles.

Halidrys dioica Gardner

Setchell & Gardner 1925, p. 707.

MÉXICO: Baja California, on littoral rocks at South Bay, I. Cerros, *no. 34-632,* 10 Mar. 1934.

SARGASSUM C. Agardh, 1821

Plants of moderate to large size, with distinct often massive lobed holdfasts and well-differentiated branches with broad to filiform, occasionally forked, entire or serrate leaf organs; lateral stalked vesicles usually present; receptacles axillary or paniculate, more or less forked, cylindrical, nodulose, sometimes flattened or serrate; eventually bearing eggs singly in the megasporangia.

KEY TO SPECIES

1. Leaves or their divisions narrowly linear, in general 10 times as long as broad, or more 2
1. Leaves in general less than 10 times as long as broad . . . 5
2. Leaves without evident costa, linear to generally filiform, forked, without cryptostomata 3
2. Leaves with generally evident costa, more or less linear . . 4
3. Plant generally loose in habit; the inflorescences moderately to markedly loose . . . . S. setifolium
3. Plant pyramidal, of close habit; inflorescences congested . . . . S. galapagense
4. Leaves generally forked, more slender, less dentate; inflorescences moderately loose . . . . S. Templetonii
4. Leaves simple or in the upper parts of the plant somewhat forked, dentate; inflorescence compact . . . . S. zacae
5. Leaves entire or slightly erose, cryptostomata absent; vesicle stalks often alate . . . . S. albemarlense
5. Leaves subentire to strongly serrate 6
6. Vesicles absent; leaves oblong lanceolate, subentire or moderately serrate with small teeth, particularly the basal leaves . S. Howellii
6. Vesicles generally present; leaves conspicuously, often coarsely serrate 7
7. Leaves of small to moderate size 8
7. Leaves conspicuously large and thin, coarsely serrate . . . 12
8. Receptacles dentate . . . . S. Liebmannii
8. Receptacles smooth to rough, but not dentate 9

9. Leaves subsessile, more narrow, teeth of moderate size . . . . S. Skottsbergii
9. Leaves petiolate, broadly lanceolate or ovate 10
10. Leaves small, deeply aculeate dentate, the teeth often bifid . . . . S. Brandegeei
10. Leaves larger, or less deeply dentate 11
11. Leaves of moderate size, the lower teeth sometimes ciliate . . . . S. pacificum *p.p.*
11. Leaves very large 12
12. Leaves with rounded asymmetric base, aculeate dentate; stalks as long as the vesicles . . . . . . S. pacificum f. megaphyllum
12. Leaves with tapering base, shallowly and coarsely dentate; stalks one half as long as the vesicles . . . . S. ecuadoreanum

The genus *Sargassum* is a difficult one, in this area as in many others. To date so few collections have been made that the limits of variation for the several species on these coasts are as yet quite undefined. From the collections made by the writer there remain a number as yet unidentified which neither fit the descriptions already published nor are sufficiently complete or clear in their differences to describe as new. As will be noted, some of the specimens are only cautiously associated with names accepted by Setchell for plants from this area, and differ a little from his descriptions. It is believed that they simply represent variations of these species. Further collections, particularly in quiet shallow water, will substantially add to this list.

Sargassum setifolium (Grunow) Setchell

Plate 24

Plants to over 8 dm tall, somewhat pyramidal to quite loosely branched, the stem smooth, sparingly to moderately closely leafy above, defoliate below and with branches 8-17 cm long; leaves 2.5-7.5 cm long, simple or more commonly once, less often 2-3 times subdichotomously branched, the narrowly linear segments 0.3-1.2 mm broad, tapering to base and apex, entire, the midrib inconspicuous in the broader leaves and not distinguishable in the more slender ones; cryptostomata absent; vesicles absent or to moderately numerous, broadly to narrowly oval, to 3-4 mm diam., the slender stalk 3-10 mm long, the muticous tip generally conspicuous, filiform and often compressed, commonly 5 mm, rarely to more than 15 mm long; receptacles moderately closely clustered but not congested, to commonly loose, simple to 2-3 times unevenly forked, the divisions often spindle shaped, sometimes with vesicles or small leaves intermixed.

Setchell 1937b, p. 143, pl. 28, figs. 11, 12, pl. 32, figs. 58, 59.

The denser specimens of this plant are with difficulty separated from *S. galapagense*, and the writer is not altogether convinced that Setchell was correct in giving this name full species rank. However, in most cases a fairly clear disposal could be made, with the relative congestion of the receptacles the most reliable, though variable, character. Both dense and loose-branched plants were collected attached near low tide level, but both *S. galapagense* and loose forms of *S. setifolium* were drifted ashore and may have come from deeper water. These specimens covered even a wider range of variation than those in the Howell collections kindly loaned by the California Academy of Sciences.

ECUADOR: Archipiélago de Colón, I. Isabela, *Hassler* Exped. *nos. 1007, 1017,* June 1872. *Ibid.,* dredged from 5.4-7.2 meters off Black Bight, Schmitt *no. 63B-33,* 8 Feb. 1933. *Ibid.,* drifted ashore at Tagus Cove, *no. 34-149D,* 13 Jan. 1934. *Ibid.,* on rocks near low tide level, *no. 34-144,* 13 Jan. 1934. *Ibid.,* reef north of the cove, *nos. 34-172, 34-173A,* 13 Jan. 1934. *Ibid.,* drifting ashore on I. Bartolomé, I. San Salvador, *no. 34-350A,* 23 Jan. 1934. *Ibid.,* I. San Cristóbal, *Albatross* Exped. *no. 10,* Apr. 1888.

Sargassum galapagense Grunow

Plate 25

Plants to over 7 dm tall, narrowly pyramidal, the stem smooth, leafy above, defoliate below and with branches 10-15 cm long; leaves 2.5-5.0 cm long, simple or once or twice forked, narrowly linear to rarely 4 mm wide, entire to vaguely erose or infrequently on the widest leaves near the tip sparingly serrate, the apices and bases acutely tapered, the midrib in narrower leaves not distinguishable, and even in the broader leaves inconspicuous, disappearing in the upper part of the leaf; cryptostomata apparently absent; vesicles numerous, oval, smooth to muticous or the tip occasionally somewhat foliose, stipitate, the stalk 1-2 times as long as the vesicle; receptacles congested in clusters less than 1 cm long, alternately to subdichotomously branched, the ultimate segments relatively long and tapered.

Grunow *in* Piccone 1886, p. 48, pl. 1, figs. 2, 3; Grunow 1916, p. 167; Setchell 1937b, p. 141, pl. 29, figs. 20-27, pl. 30, figs. 28-30, pl. 32, figs. 54-57.

The bulk of the material in the Howell collections was small, and of basal shoots with relatively broad, simple leaves, and it hardly exemplifies the full development of this species. Farlow's (1902, p. 92) records of

S. galapagense v. *setifolium* from I. Isabela probably belong in part to that variety, but the specimen from Turtle Point is *S. galapagense* Grun.

Ecuador: Archipiélago de Colón, I. Isabela, *Hassler* Exped. *no. 1018,* June 1872. *Ibid.,* drifted ashore south of Banks Bay, *no. 34-126,* 13 Jan. 1934. *Ibid.,* drifted ashore at Tagus Cove, *nos. 34-149A, -149E, -149G,* 13 Jan. 1934.

Sargassum Templetonii Setchell

Plate 26

Setchell 1937b, p. 140, pl. 29, figs. 15-19, pl. 31, figs. 51-53.

These plants seem undoubtedly to be Setchell's *S. Tempeltonii,* but certain modifications in his description seem appropriate. They are probably quite large plants, for the portions mounted, obviously incomplete, exceed 4 dm in height. The vesicles were always unarmed, on stalks not exceeding their diameter. In *no. 34-104* the leaves, 0.7-1.5 mm wide and to 4-5 cm long and branched, are entire. In *no. 34-107,* though quite irregular, they are often clearly broader, to 3 mm, and serrate, the teeth relatively large and very widely separated, at intervals commonly of 3-10 mm, the teeth 0.3-1.0 mm long. In *no. 34-195* the lower leaves are again quite broad, to 3 mm or a little more, subsimple and entire below with a few strong teeth near the base but otherwise entire. While no teeth were seen on the fragmentary type kindly loaned by the California Academy of Sciences, a few were seen on leaves of *no. 149* mounted on the same sheet, though the tangled and overgrown condition of the specimen did not permit obtaining a very good idea of their distribution.

Ecuador: Archipiélago de Colón, in the shore drift at Pta. Albemarle, I. Isabela, *nos. 34-104, 34-107,* 12 Jan. 1934. *Ibid.,* driftweed floating off Pt. Christopher, *no. 34-195,* 16 Jan. 1934.

Sargassum zacae Setchell

Plants with a simple subconical holdfast, with several axes arising to a height of 60 cm or more from near the base, their lower portions rough with the scars of old leaf and branchlet bases, but quite smooth above; conceptacles moderately compact; otherwise in general corresponding to the type description.

Setchell 1937b, p. 138, pl. 29, figs. 13, 14, pl. 31, fig. 50.

These plants show, as might be expected, a good deal of variation in the leaves, but except on *no. 34-350B* very little forking. In general on the more developed shoots the lower leaves were a little dentate and the upper more markedly dentate and more forked. The teeth were on the whole rather coarser on most specimens than those on the type. The vesicle stalks were cylindrical at the base but above were more or less flat, or even subfoliaceous and dentate, as occasionally happened in *no. 34-254.* The few vesicles on the type material kindly loaned by the California Academy of Sciences showed a range of form, some with a flattened stalk but more, apparently, without any flattening, and only two showed small apiculi. Since the type consisted of fragments much worn and supporting many attached organisms, the present collections probably more justly express the natural variation of the species. The duplicate material loaned with the type showed generally simple leaves rather finely serrate near their bases, and generally loose receptacles.

ECUADOR: Archipiélago de Colón, attached to rocks at Black Beach Anchorage, I. Santa María, *no. 34-254,* 17 Jan. 1934. *Ibid.,* drifted onto I. Bartolomé, I. San Salvador, *no. 34-350B,* 23 Jan. 1934.

Sargassum albemarlense n. sp.[78]

Plate 27

Plants 4 dm tall or more, bushy, the main axes smooth, early defoliate, bearing numerous lateral branches 10-15 cm long; leaves not crowded, moderately thin, glaucus, 25-45 mm long, 4-7 mm wide, oblong to linear-oblong, acute and a little asymmetrical at the base, the margins entire to slightly erose sinuate, slightly tapered to the broadly obtuse apex; midrib evident in the lower half of the leaf, becoming indefinite and ending well below the apex; cryptostomata none or rare, inconspicuous; vesicles moderately numerous, spherical, smooth, 3-4 mm diam., pedicellate, the stalks 4-6 mm long, compressed and alate above, the wings sometimes extending as ridges onto the lower sides of the vesicles; receptacles at first subtended by ordinary foliage leaves, later these drop, but 1-4 quite small leaves may develop among the branches of the receptacles, which are moderately compact, 5-8 mm long and nearly as wide, dichotomous to alternately branched, the divisions erect or moderately divergent, smooth, the final divisions short and close, with acute apices.

These plants are distinguished from *S. zacae* Setchell & Gardner (1937, p. 138, pl. 29, figs. 13, 14, pl. 31, fig. 50) by the lack of any

[78] Sargassum albemarlense n. sp.—Plantae ad 4 dm altitudine, fruticosae, stipitibus levibus, foliis paululum sparsis, tenuibus, glaucis, lineari-oblongis, basi acuta atque asymmetrica, marginibus paululum eroso-sinuatis, cacumine late obtuso; costa non ad apicem folii attingente; cryptostomatibus nullis aut raris, inconspicuis; vesiculis sphaeroideis, 3-4 mm diam., in stipitibus compressis saepeque alatis, longioribus dimidio; receptaculis compactis, divisionibus brevibus levibusque. Planta typica in loco dicto Pta. Albemarle, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-105,* 12 Jan. 1934.

tendency for acute serration of the leaves, even above, and by the blunt leaf tips. The leaves resemble considerably those of the Caribbean *S. cymosum,* but are in general larger and the receptacles are more congested. In common with many other Sargassa a compact form seems also to exist *(no. 34-350C).*

ECUADOR: Archipiélago de Colón, drifted ashore on Pta. Albemarle, I. Isabela, *no. 34-105 (TYPE),* 12 Jan. 1934. *Ibid.,* drifted ashore in Tagus Cove, *no. 34-149F,* 13 Jan. 1934. *Ibid.,* on reef north of the cove, *no. 34-173B,* 13 Jan. 1934. *Ibid.,* on rocks near low tide line, *no. 34-145,* 13 Jan. 1934. *Ibid.,* rare as drifted onto the shore of I. Bartolomé, I. San Salvador, *no. 34-350C,* 23 Jan. 1934.

Sargassum Howellii Setchell

Plate 28

Setchell 1937b, p. 132, pl. 28, figs. 7-10, pl. 31, fig. 49.

These plants in most respects fit the type description. However, the leaves are rather more definitely and closely serrate in most instances and particularly in the leaves of the basal tuft, and the cryptostomata are more distinct, and, though scattered more, tending to be concentrated in a row along each side of the midrib. Examination of the type material kindly loaned by the California Academy of Sciences revealed that upper and younger leaves were distinctly and moderately serrate. The large leaves became oblong lanceolate and reached 65 mm in length, 8 mm in width, though the smaller ones were more truly lanceolate. Setchell's fig. 10 on pl. 28 is characteristic of the old and worn leaves, but entirely unlike the upper undamaged ones. The serrations occur at intervals of about 0.75-2.0 mm, are acute and about 0.3-1.0 mm long. The type specimens appear to be old and considerably condensed, perhaps by growing in an exposed place, and rather waterworn. This last feature tends to obscure the cryptostomata. It is curious that no Sargassa were found on either trip at Clarion I., the type locality for this species, though the 1939 visit was in March, the same month in which the type had been collected 7 years before.

MÉXICO: Is. Revilla Gigedo, frequent in the littoral, as in the surf, on rocks in gullies near low tide line, Braithwaite Bay, I. Soccoro, *nos. 34-11, 34-24A,* 2, 3 Jan. 1934, and *no. 39-50,* 18 Mar. 1939.

Sargassum Liebmannii J. Agardh

Plate 29

Agardh, J. G. 1847, p. 8; 1889, p. 91, pl. 5, figs. 1-3; Kützing 1861, pl. 41 (as *Carpacanthus Liebmannii*) ; Setchell 1937b, p. 130, pl. 28, figs. 1-3.

The leaves of these plants are less consistently coarsely dentate than figured by Agardh, the lower especially, but on the whole they agree with his description and figures. They agree more closely with type material which the writer was allowed to compare at the Agardhian Herbarium in Lund, and cotype material in the Field Museum of Natural History.

México: Nayarit, on surf-beaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-632,* 9 Mar. 1939. Guerrero, littoral rocks at Ba. Petatlán, *no. 34-566,* 2 Mar. 1934. Oaxaca, rare in the drift at Ba. Tangola-Tangola, *no. 34-559,* 28 Feb. 1934. Panama: From rocks near low water mark, Bahía Honda, *no. 39-129A,* 26 Mar. 1929.

Sargassum Skottsbergii Sjostedt, *prox.*

Sjostedt 1924, p. 311, text-figs. 1-5.

Farlow's record of *S. graminifolium* J. Ag.? (1902, p. 92) from Wenman I. is based on a specimen in the Stanford University herbarium which is annotated by Setchell as *S. Skottsbergii* Sjost. (?) *forma.* This has longer and narrower leaves than the plants I have tentatively assigned to the same species.

Ecuador: Salinas, Schmitt *no. 500A,* 12 Sept. 1926.

Sargassum Brandegeei Setchell & Gardner?

Setchell & Gardner 1924, p. 736, pl. 21, fig. 79.

These specimens were few and the determination somewhat uncertain. At Wenman I. basal parts were not available, and only the fruiting tops were secured. The leaves, which occasionally forked once, are very deeply serrate, the teeth often bifid. Cryptostomata are few and obscure. The vesicles occasionally show a ridge near the stalk and, while they are generally smooth on the end, do in rare cases show a minute subfoliose tip.

Costa Rica: rare as floated ashore at Golfo Dulce, *no. 39-102,* 26 Mar. 1939. Ecuador: Archipiélago de Colón, drifted ashore on I. Wenman, *no. 34-81,* 11 Jan. 1934.

Sargassum pacificum Bory

Setchell 1937b, p. 145; probably Grunow *in* Piccone 1886, pp. 49, 50 under *S. lendigerum* v. *foliosa* f. *subdelicatula,* f. *rigidiuscula* and v. *furcifolia.*

Setchell indicates that the "type" of *S. pacificum* Bory belongs to his f. *subdelicatulum* (Grunow) Setchell (1937, p. 147), which appears to the writer to create a nomenclatorial anomaly covered by Art. 29, rec. 18 of the 1935 International Rules of Botanical Nomenclature, so the form name is not adopted here. The leaves in some of these, such as *no. 34-194B,* are larger than described by him for *S. pacificum.* Farlow's record (1902, p. 92) of *S. cymosum* Ag. from I. Wenman is based on a specimen in the Stanford University herbarium annotated by Setchell as *S. pacificum* f. *subdelicatulum* (Grun.) Setch.; that from Tagus Cove, Isabela I. he annotated in part as f. *subdelicatulum* and in part f. *rigidiusculum* (Grun.) Setch.

ECUADOR: Archipiélago de Colón, dredged at sta. 157 from 18-32 meters off Tagus Cove, I. Isabela, *no. 34-194B,* 13 Jan. 1934. *Ibid.,* dredged in 5.4-7.2 meters of water east of Wreck Bay, I. Cristóbal, Schmitt *no. 41B-33,* 30 Jan. 1933.

f. **congestum** Setchell, *prox.*

Setchell 1937b, p. 149, pl. 30, figs. 35-40, pl. 33, figs. 63, 64.

These plants approached the type specimen, Howell *no. 149,* kindly loaned by the California Academy of Sciences, but were looser in habit. Examination of the several other sheets of material in the Howell collection determined by Setchell showed a wide variation in habit, as in density, leaf size, and vesicle stalk characters.

ECUADOR: Archipiélago de Colón, on rocks near low tide line, Pta. Albemarle, I. Isabela, *no. 34-103,* 12 Jan. 1934. *Ibid.,* south shore of Banks Bay, *no. 34-124,* 13 Jan. 1934.

f. **rigidiusculum** (Grunow) Setchell, *prox.*

Setchell 1937b, p. 148, pl. 30, fig. 34, pl. 33, fig. 62.

The collections reported by Setchell are all of dense forms growing in exposed situations. The writer finds the same characters of detail, that is, firmer and smaller leaves more crowded, rarely with cilia, more dentate, and vesicles with smooth pedicels, on plants to over 40 cm tall, with paniculate habit.

ECUADOR: Archipiélago de Colón, on rocks near tide level and floating, Tagus Cove, I. Isabela, *nos. 34-143, 34-149C,* 13 Jan. 1934. *Ibid.,* I. San Salvador, *Albatross* Exped. *no. 13?,* Apr. 1888.

f. megaphyllum n. f.[79]

Plate 30

Plants to over 45 cm tall, virgate to paniculate, stems smooth, leaves thin, light brown, not crowded, 2-5 cm long, 6-15 mm wide, obtuse lanceolate to oblong lanceolate with broadly rounded ends, undulate, the margins slightly to strongly irregularly and acutely serrate, occasionally slightly ciliate at the base, the midrib evident to near the tip, the cryptostomata very small, few and scattered or apparently absent; vesicles moderately numerous, spherical, to 8 mm diam., on stalks about as long, the stalks cylindrical or a little flattened, occasionally foliaceous, even serrate, and rarely 1-2 teeth on the margin of the vesicle; receptacles as in the type.

The dredged specimen *(no. 34-337)* is an extreme phase, but being sterile is not designated the type of the form. These plants appear to be an extension of the variation of the species opposite to that which produces the f. *rigidiusculum,* and in the more small-leaved specimens approaches the so-called f. *subdelicatulum.*

ECUADOR: Archipiélago de Colón, in the shore drift at Pta. Albemarle, I. Isabela, *no. 34-106 (TYPE),* 13 Jan. 1934. *Ibid.,* in the drift at Tagus Cove, *no. 34-149B,* 13 Jan. 1934. *Ibid.,* dredged at 9 meters' depth, I. Baltra, *no. 34-337,* 22 Jan. 1934. *Ibid.,* drifting off Black Beach Anchorage, I. Santa María, *no. 34-255,* 17 Jan. 1934.

Sargassum ecuadoreanum n. sp.[80]

Plate 31, Figs. 1, 2

Plants to 75 cm tall or more, several smooth subsimple branches arising from a short rough main stem, bearing scattered leaves at intervals of 1-2 cm; leaves thin, light brown, 4.5-7.5 cm long, 6-10 mm wide, the base long and slightly asymmetrically tapered to a short petiole, above lanceolate to a little oblanceolate, the tip generally obtuse to moderately

[79] Sargassum pacificum f. megaphyllum n. f.—Forma maior quam planta typica, foliis tenuibus 2-5 cm longitudine, 6-15 mm latitudine, obtuso-lanceolatis ad oblongo-lanceolata, undulatis, valde irregulariter acuteque serratis, infra interdum ciliatis. Planta typica in loco dicto Pta. Albemarle, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-106,* 12 Jan. 1934.

[80] Sargassum ecuadoreanum n. sp.—Planta altitudine maior 7.5 dm, stipite inferiore aspera brevique, ramos primarios multos levesque ferente; foliis paululum sparsis, tenuibus, 4.5-7.5 cm long., 6-10 mm lat., lanceolatis ad oblanceolata; folio basim attenuatam, apicem acutum ad obtusum, marginem crassissime serratum, costamque paene percurrentem habente; cryptostomatibus minimis dispersisque; vesiculis sphaeroideis, ad circa 7 mm diam., stipitum longitudine circa dimidia. Planta typica in loco dicto Pta. Santa Elena, Ecuador, legit W. R. Taylor *no. 34-473,* 8 Feb. 1934.

acute, the margin very coarsely serrate with teeth 1-3 mm long at intervals of 1-7 mm; the midrib evident nearly to the tip of the leaf; the cryptostomata extremely small, scattered; vesicles spherical, smooth, to about 7 mm diam., on stalks about half as long; receptacles (perhaps incompletely developed) small, axial, sparingly forked, the divisions stalked, each tapering from the base, with acute tips.

These plants come closest to *S. sinicola* Setchell & Gardner (1924, p. 736, pl. 20, fig. 73; Dawson 1944, p. 247) but apparently are larger and coarser, with blunt to obtuse rather than tapering leaves.

ECUADOR: Guayas, dredged along the village beach, La Libertad, Schmitt *no. 12C-33,* 19 Jan. 1933. *Ibid.,* at Salinas, Schmitt *no. 500B,* 12 Sept. 1926. *Ibid.,* from driftweed and observed in dredged material, Pta. Santa Elena, *no. 34-473 (TYPE),* 8 Feb. 1934.

Myxophyceae[81]

A full account of the Myxophyceae of the 1934 Hancock Expedition has already been published (Drouet 1936). There were not enough records deriving from the 1939 Expedition to justify a special paper on the Pacific collections. However, both the Caribbean and the Pacific sections of this Expedition did secure Myxophyceae, and Dr. Drouet kindly supplied the data for separate reports on the two phases of this trip. The first part was incorporated in the paper already published on the Caribbean Marine Algae of the Allan Hancock Expedition, 1939 (Taylor 1942). The second part follows here, where it is appropriate to list the blue-green algae of the Pacific portion of the 1939 Expedition, but by including references to the 1936 report the account is made far more representative of the collections.—W.R.T.

Chroococcaceae

CHROOCOCCUS Nägeli, 1849

Chroococcus turgidus (Kützing) Nägeli

Drouet 1936, p. 15, fig. 16.

ECUADOR: I. Isabela (reported also as v. *submarinus*) Hansg., Drouet 1936, p. 15.

GOMPHOSPHAERIA Kützing 1836

Gomphosphaeria aponina Kützing

Drouet 1936, p. 15, fig. 10.

ECUADOR: I. Isabela, I. Fernandina.

MERISMOPOEDIA Meyen *apud* Kütz., 1843

Merismopoedia glauca (Ehrenberg) Kützing

Drouet 1936, p. 15, fig. 1, as f. *mediterranea* (Nägeli) Collins.

COSTA RICA: Puerto Culebra.

JOHANNESBAPTISTIA J. DeToni, 1934

Johannesbaptistia pellucida (Dickie) Taylor & Drouet

Drouet 1938, p. 285; 1936, p. 16, figs. 3, 4, as *J. primaria*.

ECUADOR: I. Isabela, I. Fernandina.

[81] The section on Myxophyceae has kindly been contributed by Dr. Francis Drouet, Chicago Natural History Museum.

ENTOPHYSALIS Kützing, 1843

Entophysalis granulosa Kützing

Tilden 1910, p. 24, pl. 1, fig. 33.

Growing in greenish or brownish pannose and cushion-shaped strata on rocks wet by sea spray, and on rocks and shells in shallow water. The plant consists of cells arranged in vertical rows, the cells near the surface sooner or later becoming much divided internally, the daughter cells remaining within the wall of the mother cell for some time. Pulvinate masses of this species have been described under the name *Placoma vesiculosa* Schousb.

COSTA RICA: abundant on the rocks along shore, and on turret shells, Port Parker, near Ba. Salinas, *nos. 39-81,* and *39-88,* 24 Mar. 1939. ECUADOR: on lava in an isolated brackish lagoon cut off from the sea by a wide stretch of volcanic rock, Pta. Albemarle, I. Isabela, *no. 34-95,* 12 Jan. 1934.

Chamaesiphonaceae

HYELLA Bornet & Flahault, 1888

Hyella caespitosa Bornet & Flahault

Tilden 1910, p. 51, pl. 3, figs. 9-11; Taylor 1928, p. 42, pl. 1, fig. 10; Frémy 1939, p. 9.

Plant a brownish- or yellowish-green stratum on shells in shallow sea water, the branching filaments penetrating the outer layer of the shell, the cells separated from each other by gelatinous material. The larger cells near and on the surface of the shell each divide into numerous smaller cells, which remain for some time enclosed in the gelatinous wall of the mother cell.

PANAMÁ: in old corals, depth 3 dm at low water, I. Taboga, Bahía de Panamá, *no. 39-622,* 2 May 1939.

DERMOCARPA Crouan, 1858

Dermocarpa Schousboei (Thuret) Bornet

Tilden 1910, p. 50, pl. 3, fig. 7, as *Xenococcus Schousboei;* Taylor 1928, p. 42, pl. 1, fig. 6, as *Xenococcus Schousboei.*

Plants spherical ovoid pyriform, epiphytic on other marine algae, up to 12 μ long, one or two celled, the cell contents dividing into two or more rounded or angular cells which remain for some time within the wall of the mother cell.

MÉXICO: Baja California, on *Lyngbya semiplena* etc., from wharf pilings, fishing settlement on the southeastern side of I. Cerros, *no. 39-2,* 14 Mar. 1939.

Dermocarpa violacea Crouan

Tilden 1910, p. 53, pl. 3, figs. 19-21.

Plants ovoid to pyriform, up to 20 μ long and 30 μ broad, one celled, forming a continuous layer on rocks, shells, etc., the cell contents dividing into several or many rounded or angular cells which remain for some time within the wall of the mother cell.

Costa Rica: with *Entophysalis granulosa* Kütz. on turret shells along shore, Port Parker near Ba. Salinas, *no. 39-88,* 25 Mar. 1939.

Stigonemataceae

MASTIGOCOLEUS Lagerheim ex Bornet & Flahault, 1887

Mastigocoleus testarum Bornet & Flahault

Tilden 1910, p. 237, pl. 14, fig. 12; Taylor 1928, p. 49, pl. 2, fig. 2.

Plants discoloring shells dirty or yellowish green in shallow marine situations, the much-branched filaments growing at the surface of the shell and penetrating the outer layers, the spherical heterocysts borne terminally on short branches.

México: Oaxaca, in old shells, in the lagoon at Ba. Chacahua, *no. 39-72,* 21 Mar. 1939. Panamá: in old shells from tide pools in rocky tidal flats, San Francisco, Panamá, *no. 39-149,* 31 Mar. 1939.

Rivulariaceae

CALOTHRIX C. Agardh ex Bornet & Flahault, 1886

Calothrix pilosa Harvey ex Bornet & Flahault

Drouet 1936, p. 21, fig. 17.

México: Nayarit, on rock faces in heavy surf, I. María Magdalena, Las Tres Marías, *no. 39-673,* 9 May 1939. Ecuador: I. Isabela, I. Fernandina; also on twigs and roots in a lagoon, Pta. Albemarle, I. Isabela, *no. 34-94A,* 12 Jan. 1934.

ISACTIS Thuret ex Bornet & Flahault, 1886

Isactis plana Thuret ex Bornet & Flahault

Tilden 1910, p. 281, pl. 19, fig. 5.

Plant a bright or dark blue-green cushion (up to several cm in diameter and 1 mm thick), often coalesced with other plants and forming a continuous stratum, on rocks, wood, shells, and larger plants between or just below tidemarks, the filaments upright and parallel, the sheaths hyaline becoming brownish, the inner portions distinct, the outer portions diffluent and coalesced.

MÉXICO: Is. Revilla Gigedo, intertidal on rocks, Sulphur Bay, I. Clarion, *nos. 39-9, 39-10,* 16 Mar. 1939. COSTA RICA: intertidal on rocks, Puerto Culebra, *no. 34-538A,* 24 Apr. 1934. PANAMÁ: from rocks in surf near high tide line in a cove, Islas Secas, *no. 39-122,* 26 Mar. 1939.

Oscillatoriaceae

HYDROCOLEUM Kützing ex Gomont, 1892

Hydrocoleum comoides Gomont

Drouet 1936, p. 23, fig. 7.

MÉXICO: I. Soccoro, I. Clarion.

Hydrocoleum cantharidosmum (Montagne) Gomont

Drouet 1936, p. 24, fig. 9.

MÉXICO: Ba. Tangola-Tangola.

Hydrocoleum lyngbyaceum Gomont

Tilden 1910, p. 135, pl. 5, fig. 58; Taylor 1928, p. 43, pl. 1, fig. 17; Frémy 1939, p. 19.

Plant a black or dark-greenish gelatinous stratum on rocks and larger plants in clean marine locations, between or just below tidemarks, the upper portions extending in tongues and waving free in the water, the filaments parallel or somewhat entangled, the sheaths hyaline, gelatinous, soon diffluent, the trichomes several within a sheath in older filaments, 8-16 μ broad, the cells short.

MÉXICO: Nayarit, on mud in a shallow pool beyond the surf, I. María Magdalena, Las Tres Marías, *no. 39-640,* 9 May 1939.

MICROCOLEUS Desmazières ex Gomont, 1892

Microcoleus tenerrimus Gomont

Drouet 1936, p. 24, figs. 11, 12.

ECUADOR: I. Fernandina.

SYMPLOCA Kützing ex Gomont, 1892

Symploca hydnoides Gomont

Tilden 1910, p. 129; Frémy 1939, p. 22.

Plant a black, blue-green, or violet slimy or gelatinous-pannose stratum on rocks or other algae between or just below tidemarks, the lower filaments straight or flexuose, parallel or much intertwined, the upper filaments parallel and agglutinated into fascicles up to 5 cm long, the sheaths hyaline, thin, firm or diffluent, coloring blue when treated with chlor-zinc-iodine, the trichomes 6-12 μ broad, slightly constricted at the crosswalls, rounded at the tips, the cells quadrate and longer and shorter than broad.

MÉXICO: Is. Revilla Gigedo, in a high sandy tide pool, Sulphur Bay, I. Clarion, *no. 39-15,* 17 Mar. 1939.

LYNGBYA C. Agardh ex Gomont, 1892

Lyngbya epiphytica Hieronymus

Drouet 1936, p. 24, fig. 8.

ECUADOR: I. Wenman.

Lyngbya aestuarii Gomont

Tilden 1910, p. 120, pl. 5, figs. 40, 41; Frémy 1939, p. 27.

Plant a pannose green, blue-green, black, or brownish stratum on soil wet by sea or rain water, or a coarsely and radiately fibrous mat submersed in fresh or sea water, the filaments coarse, straight or entangled, the sheaths hyaline and thin at first, becoming thick, lamellose, and internally yellow, brown or almost black, never coloring blue when treated with chlor-zinc-iodine, the trichomes 10-24 μ broad, cylindrical, not constricted at the crosswalls, slightly attenuated at the tips, the cells very short, the crosswalls marked on each side with a row of conspicuous granules, the apical cells rounded truncate, the outer membrane conspicuously thickened.

MÉXICO: Is. Revilla Gigedo, from an upper tide pool, Braithwaite Bay, I. Soccoro, *no. 39-53,* 18 Mar. 1939.

Lyngbya majuscula Gomont

Tilden 1910, p. 123, pl. 5, fig. 42; Taylor 1928, p. 44, pl. 1, fig. 19; Frémy 1939, p. 28.

Plant a greenish, brown, or black mat of coarse tangled threads free in marine situations, or entangled with attached algae, less often forming a fibrous-pannose stratum on rocks, the filaments contorted and much intertwined, not seldom straight and parallel, the sheaths hyaline, at first thin, becoming thickened, roughened, and lamellated in age, never coloring blue when treated with chlor-zinc-iodine, the trichomes 15-60 μ broad, not constricted at the crosswalls, the cells very short, the crosswalls not granulated, the apical cells rounded.

MÉXICO: Is. Revilla Gigedo, in high sandy tide pools, Sulphur Bay, I. Clarion, *no. 39-14,* 16 Mar. 1939.

Lyngbya confervoides Gomont

Tilden 1910, p. 119, pl. 5, fig. 39; Taylor 1928, p. 44, pl. 1, fig. 20; Frémy 1939, p. 29.

Plant a blue-green or blackish stratum or cushion on rocks and wood between tidemarks, the filaments prostrate in the lower strata, free above, the sheaths hyaline, thin at first, becoming thick and lamellose in age, not coloring blue when treated with chlor-zinc-iodine, the trichomes blue green to violet, 10-30 μ broad, not constricted at the crosswalls, the cells very short, the crosswalls granulated, the end cells rounded, their outer membranes not at all or only slightly thickened.

PANAMÁ: in hot high tide pools in a cove, Is. Secas, *no. 39-137,* 26 Mar. 1939; in the higher tide pools on an islet on the south side of Bahía Honda, *no. 39-135,* 26 Mar. 1939.

Lyngbya gracilis Rabenhorst, v. **monilis** (Setchell & Gardner) Drouet

Drouet 1936, p. 25, fig. 2.

MÉXICO: I. Soccoro, I. Clarion. COSTA RICA: Puerto Culebra.

Lyngbya semiplena Gomont

Tilden 1910, p. 118, pl. 5, fig. 38; Drouet 1936, p. 26, fig. 13; Frémy 1939, p. 29.

Plant a blue-green or brownish pannose or thick-gelatinous stratum on rocks and wood between tidemarks, or a yellowish floccose mass in quiet brackish water, the filaments prostrate at the bases, free toward the tips, the sheaths hyaline, thin at first, becoming thick and lamellose in age, not coloring blue when treated with chlor-zinc-iodine, the trichomes 5-12 μ broad, not constricted at the crosswalls, the cells short, the crosswalls granulate, the outer membrane of the end cell thickened and rounded or obtuse conical.

MÉXICO: Baja California, with *Dermocarpa* on wharf pilings, fishing settlement, southeast side of I. Cerros, *no. 39-2,* 14 Mar. 1939; also I. Clarion. COSTA RICA: intertidal on rocks, Pt. Parker, *no. 39-82,* 24 Mar., 1939.

Lyngbya versicolor (Wartmann) Gomont

Drouet 1936, p. 26, fig. 6.

ECUADOR: I. Isabela.

PHORMIDIUM Kützing ex Gomont, 1892

Phormidium Hancockii (Drouet) Drouet

Drouet 1942, p. 139; 1936, p. 22, 23, fig. 15, as *Schizothrix Hancockii* and f. *submersa.*

MÉXICO: I. Soccoro and I. Clarion. ECUADOR: I. Wenman.

Phormidium uncinatum Gomont

Tilden 1910, p. 106, pl. 5, figs. 16, 17.

Plant a thin green, black, or brownish gelatinous stratum, firm to very soft and fragile, in shallow fresh water, the gelatinous material hyaline, not coloring blue when treated with chlor-zinc-iodine, the trichomes straight and parallel, stiff and fragile, not constricted at the crosswalls, attenuate capitate and curved or spiraled at the tips, the cells quadrate or shorter than broad, the crosswalls conspicuously granulated, the outer membrane of the apical cell obtuse conical and thickened.

MÉXICO: Baja California, from a ditch at the fishing settlement, southeast side of I. Cerros, *no. 39-1,* 14 Mar. 1939.

OSCILLATORIA Vaucher ex Gomont, 1893

Oscillatoria laetevirens Crouan ex Gomont

Drouet 1936, p. 26, fig. 5.

MÉXICO: I. Clarion.

SPIRULINA Turpin ex Gomont, 1893

Spirulina tenerrima Kützing ex Gomont

Drouet 1936, p. 26, fig. 14.

ECUADOR: I. Isabela.

Rhodophyceae

Plants generally rose or purplish red, filamentous or parenchymatous, of very varied forms; accessory pigments, particularly phycoerythrin, generally masking the chlorophyll, in definite chromatophores; reproduction generally involving one sexual phase and one or two different asexual phases, the cycle when of two stages showing a relatively well-developed sexual phase or gametophyte and a compact attached dependent carposporophyte produced after fertilization from the zygote, but when of three phases an additional tetrasporophyte phase is intercalated between the carposporophyte and the next gametophyte, and is morphologically similar to the latter; sexual organs composed of nonflagellate spermatia produced singly in spermatangia, and carpogonia which in the simple genera are produced from the surface thallus cells, but which in the higher genera are the terminal cells of specialized filaments or carpogenic branches, and consist of an enlarged base and a receptive projection or trichogyne; carposporophyte produced directly or indirectly from the carpogonium, more or less completely converted into carpospores at maturity; tetrasporophyte producing sporangia laterally on the filaments, in the cortex or in specialized branches, these generally each forming four nonmotile spores.

Bangiaceae

Plants filamentous or membranous, when filamentous the filaments simple or branched, or creeping and even associated to form disks; cells usually with axial, sometimes with parietal chromatophores; asexual reproduction by monospores; sexual reproduction when present by spermatia and carpogonia, the zygote developing several carpospores.

KEY TO GENERA

1. Plants filiform throughout 2
1. Plants membranous 3
2. Unbranched, becoming pluriseriate . . . . Bangia
2. Branched, uniseriate . . . . Goniotrichum
3. Plants forming minute, strap-shaped blades only a few cells wide . . . . Erythrotrichia
3. Plants very much larger, foliaceous . . . . Porphyra

GONIOTRICHUM Kützing, 1843

Thallus erect, filamentous, dull rose red, pseudodichotomous or rarely laterally branched, below attached by thickened cells, above terete or somewhat irregular; cells short, nearly disklike, with central radiating chromatophores, central pyrenoid and excentric nucleus; reproducing without special cell division by the formation of monospores which are liberated by the dissolution of the thallus membranes.

Goniotrichum Alsidii (Zanardini) Howe

Taylor 1937, p. 215, pl. 28, figs. 1-4; Smith 1944, p. 161, pl. 35, figs. 1, 2 as *G. elegans.*

México: Nayarit, rare as dredged on *Bryothamnion* from 5-9 meters' depth at sta. 971 near I. María Magdalena, Las Tres Marías, *no. 39-665 (p.p.),* 9 May 1939. Colombia: Valle, scarce among filaments of *Lejolisia* at I. Gorgona, *no. 34-495 (p.p.),* 12 Feb. 1934.

BANGIA Lyngbye, 1819

Thallus erect, filiform, simple, attached by a small dilated holdfast, terete, subcylindrical or locally constricted; uniseriate or pluriseriate; cells uninucleate with a radiating chromatophore; reproducing by monosporangia resulting from subdivision of the vegetative cells, and also sexually by spermatangia formed by segmentation of the vegetative cells and carpongonia formed by a slight extension from the surface of a vegetative cell into a receptive trichogyne, the cystocarps resulting being simple, of about eight cells.

Bangia fuscopurpurea (Dillwyn) Lyngbye

Taylor 1937, p. 218, pl. 28, figs. 10-12.

One notes that Smith (1944, p. 167, pl. 37, figs. 4-6) recognizes only *B. vermicularis* Harv. from the West Coast, and that only from central California. The writer was unable to distingush his material from the East Coast and European species, which does reach moderately warm water (Adriatic Sea). However, perhaps his material is only of the undistinctive early phase of *B. vermicularis.*

Costa Rica: locally abundant on very exposed rocks in the surf near low tide line, Port Parker near Ba. Salinas, *no. 39-80,* 25 Mar. 1939.

ERYTHROTRICHIA Areschoug, 1850

Erythrotrichia polymorpha Howe

Plants filamentous, erect, clustered, to 2.0-2.5 mm tall, 15 μ diam., of one cell series below with thick outer walls, above very gradually expanding to a flat ribbon 6-8 cells wide, the cells subquadrate, giving a total width of 60 μ, of but one cell in thickness, the cells in fairly regular rectilinear rows.

Howe 1914, p. 77, pl. 29.

The bases of these plants seem to consist of a few cells loosely arranged, but not in conspicuous disks as figured by Howe. This may be merely a matter of the nature of the substratum. The Erythrotrichias described by Gardner (1927a, pp. 238, 239), especially *E. pulvinata,* show considerable resemblances, but *E. pulvinata* seems to be small and *E. Parksii* v. *minor* much larger.

Ecuador: Archipiélago de Colón, a minor element among epiphytes on *Prionitis,* which grew on surf-beaten rocks south of Black Beach Anchorage, I. Santa María, *no. 34-394 p.p.,* 30 Jan. 1934.

PORPHYRA C. Agardh, 1824

Plant membranous, brownish, dull purplish or rose, often large, attached by a small holdfast, expanding above into a soft slippery blade of one or two cells in thickness; cells with a radiating chromatophore and central pyrenoid, alike except near the base where they are extended into intramatrical rhizoids to form the holdfast; asexual reproduction by monospores; sexual reproduction by spermatia formed by regular repeated divisions of the thallus cells and by simple carpogonia formed from vegetative cells by production of a short trichogyne; fertilization resulting in the formation of small scattered clusters of carpospores.

Porphyra naiadum C. L. Anderson

Plants very small, from a cushion-shaped base, clustered, the blades purplish red, somewhat oval, about 5 mm wide and 1 cm long.

Hus 1920, p. 212, pl. 21, figs. 19-22; Smith 1944, p. 169, pl. 40, fig. 1.

México: Baja California, common in shallow water on eelgrass at Point Hughes, Cabo San Lazaro, *no. 34-665,* 7 Mar. 1934. Costa Rica: with *Bangia* on huge barnacles on rocks in the surf near low tide line, Port Parker, *no. 39-87,* 25 Mar. 1939.

Chantransiaceae

Plants small, filamentous, with apical growth, the axes prostrate or erect; cell arrangement uniseriate, the cells uninucleate, with one to several chromatophores; asexual reproduction by mono-, bi- or tetrasporangia; sexual reproduction when present by spermatangia on small, branched spermatangial filaments and by carpogonia which constitute the generally one-celled carpogenic branches, the cystocarps small.

ACROCHAETIUM Nägeli, 1861

Filamentous, rose red; from a basal holdfast cell, a disk, or from decumbent filaments giving rise to simple or branching uniseriate erect filaments, which may terminate in hairs; chromatophores one to few in each cell, stellate, ribbonlike or disciform; sporangia terminal or lateral, usually monosporous; sexual reproduction infrequent, by scattered spermatangia and lateral or intercalary carpogonia; cystocarps forming short filaments direct from the carpogonium, the outer cells forming the carpospores.

KEY TO SPECIES

1. Plant without an extensive creeping system, the erect portion dominant . . . . A. Daviesii
1. Plant chiefly creeping, with but very short erect branches protruding little beyond the surface of the host . . . A. penetrale

Acrochaetium Daviesii (Dillwyn) Nägeli

Drew 1928, p. 172 (as *Rhodochorton Daviesii*).

These plants agree tolerably with the description of western representatives of the species, but show a seemingly more extensive disklike base of laterally approximated filaments.

México: Is. Revilla Gigedo, epiphytic on *Caulerpa* from the lower tide pools and sublittoral of Sulphur Bay, I. Clarion, *no. 34-52,* 5 Jan. 1934.

Acrochaetium penetrale (Drew) n. comb., *prox.*

Drew 1928, p. 187, pl. 44, figs. 57, 58 (as *Rhodochorton penetrale*).

These plants are abundant in the somewhat chitinous branches of *Zoöbotrys.* The intramatrical ramification is very extensive and the cells mostly 4.5-8.5 μ diam., and 2-3 diameters long, but very variable. The emergent branches are small and often simple, but may show 1-4 short erect tapering branchlets. As the spores seen were doubtfully mature, the specific assignment is provisional. Since the species has single chromatophores and reproduces by monospores, the writer prefers to remove it to the genus *Acrochaetium,* which he maintains, but which Drew *(loc. cit.)* considered a synonym of *Rhodochorton.*

Costa Rica: dredged as growing in *Zoöbotrys* in Port Parker, *no. 39-89,* 25 Mar. 1939.

Helminthocladiaceae

Plants erect, of moderate size, generally coarsely branched, mucous or sometimes partly calcified; structurally uni- or pluriaxial, the central filaments developing lateral assimilatory branches; monosporangia present or absent; sexual reproduction by spermatangia borne in clusters on the ends of assimilatory filaments; carpogenic branches three celled, borne on the assimilators, the terminal cell being the carpogonium and auxiliary cells being absent; cystocarps immersed among the assimilators, without a special pericarp, the outer cells of the gonimoblasts producing carpospores.

LIAGORA Lamouroux, 1812

KEY TO SPECIES

1. Calcification soft; adventitious branches common . L. ceranoides
1. Calcification brittle below; adventitious branches not prominent . . . . L. valida

Liagora ceranoides Lamouroux

Taylor 1928, p. 135, pl. 21, fig. 7.

COSTA RICA: common and large in rock crevices and in the lower tide pools, Golfo Dulce, *no. 39-97,* 26 Mar. 1939.

Liagora valida Harvey

Plants to 5 cm tall, abundantly, chiefly dichotomously, branched, stiff, especially below firmly calcified, the calcification commonly fracturing at the forks; branches 0.6-1.0 mm diam., the segments 3-7 mm long; peripheral filaments closely forked, their outer cells approximated, about 4-6 μ diam.; cystocarps immersed, about 120-180 μ diam., without well-defined involucral filaments; spermatangia not seen.

Taylor 1928, p. 137, pl. 21, fig. 3, pl. 30, figs. 7, 11.

COSTA RICA: scarce in the tide pools near the entrance to Golfo Dulce, *no. 39-94* (cystocarpic), 26 Mar. 1939.

These plants seemed rather less calcified, less friable, and more discolored than the same species in the Caribbean, but probably this is due to local conditions and endophytic organisms in the surface calcification.

Chaetangiaceae

Plants of moderate size, erect and bushy, soft but not slippery, sometimes partly calcified; structurally multiaxial, the ultimate filaments turned outward to form the assimilatory cortex, with the outer cells sometimes closely associated to form a continuous epidermis; asexual reproduction by monosporangia or tetrasporangia; carpogenic branches three celled, borne on inner forks of the cortical, or on the subcortical, filaments; cystocarp becoming surrounded by a pericarp of slender crowded filaments arising from the lowest cell of the carpogenic branch, discharging through a pore at the surface.

KEY TO GENERA

1. Smooth and completely uncalcified 2
1. Smooth or pilose, but if smooth always more or less calcified . . . . Galaxaura
2. Outer cortex of a more or less coherent layer of chiefly colorless cells forming a distinct epidermis . . . . Scinaia
2. Original utricular surface cells soon interspersed with, and ultimately displaced by, anticlinal moniliform filaments . Gloiophloea

GALAXAURA Lamouroux, 1812

Plants bushy, of moderate size, fairly soft to firm and wiry, dichotomously or somewhat pseudoalternately branched; pilose, the cortex inside of the zone of assimilatory filaments somewhat calcified, or, smooth and without free assimilators, lightly to moderately calcified at the surface, sometimes segmented by the absence of calcification at the forks; structurally composed of a medulla of slender colorless filaments which gives rise by lateral branches to an inner more or less filamentous cortex of large colorless cells, the outer cortical cells large in some species, cohering and forming an epidermal membrane, in some smooth, in others bearing one-celled spinulose projections on these outer cortical cells, or, the cortical cells not coherent and bearing long assimilatory filaments; spermatangia formed in conceptacles; carpogenic branches three celled, formed on the inner cortical filaments, the cystocarp surrounded by a pericarp of slender filaments, discharging by a pore at the surface.

The genus *Galaxaura* is a perennially troublesome one. There is little difficulty where the sexual and asexual plants are alike, though even here the supposed alternate phases have histological differences. It appears probable that the sexual and the asexual plants are in some other species grossly dimorphic, as probably in *G. subverticillata* and *G. rugosa,* or *G. cylindrica* and *G. lapidescens,* in others not so evidently dimorphic, as in the plants here referred to *G. veprecula* and *G. stupocaulon*. This is conjectural, since not experimentally proved. In a few species the repeated incidence of two "species," and only two, at the same place and time makes it reasonable that they may be the alternate phases of the same specific entity, but in other cases it is probable that the sexual and the asexual phases are prevalent at different seasons. Consequently, it is only in a few instances that this relationship is fairly clear in the dimorphic types. Furthermore, there are instances where a group of fairly distinct "species" (if one considers only one phase, such as the asexual) seem to correspond to an assemblage of very closely similar forms in the other phase, which can only indefinitely be segregated into "species." It is not yet clear if we should use simple priority in establishing the correct name when we do demonstrate the true relationships, or if we should designate the earliest-used name for the asexual or the sexual phase, disregarding the other form.

As a result of this confusion it has become customary not to try to associate the sexual and the asexual plants taxonomically, but to describe them independently. It is not possible to associate them from the casual collections of exploratory parties, but it will in time probably be possible to do so on the basis of seasonal studies in the field. While an earnest attempt was made to pair up the Hancock Expedition "species," little was accomplished. Rarely did more than one occur in a given collection. The taxonomic situation established by this practice is unfortunate, but not susceptible of immediate improvement; certainly in many cases there are no morphological clues to the relationship.

Certain Pacific material of *Galaxaura* is being monographed by Miss Ruth Chen-Ying Chou; the key and the descriptions here included are based on her manuscript, and in turn on Hancock Expedition or other Pacific material, and she has made the determinations, for which help the writer is very grateful. The determinations have been made with every effort to preserve the Kjellman attitude toward the genus; certain distinctions are by no means clear, as in the group Brachycladia, but this seemed the best method of approach for the time being, and the most likely to keep all forms separate which should conceivably be distinguished.

KEY TO SPECIES

1. Plants asexual; outer assimilatory tissue filamentous, composed of stalk and terminal cells *2*
1. Plants sexual; peripheral tissue parenchymatous, composed of a continuous epidermis and a hypodermis 7
2. Plants with branches terete throughout, at least in part villous 3

2. Plants with branches above clearly flattened, although terete below 6
3. Cortex homogeneously filamentous, composed only of extended assimilatory filaments; supporting cells undifferentiated, tumid basal cells absent . . . . G. filamentosa
3. Cortex heterogeneous, composed of extended and of short assimilatory filaments; extended assimilatory filaments barbate, or occurring in rings 4
4. Short assimilatory filaments not mixed with long filaments, although these may occur at branch bases or on proliferous branches; short filaments composed of an enlarged basal cell and a narrow cylindrical or obconical stalk cell bearing one oval external cell, or two cells side by side . . . . G. barbata
4. Short assimilatory filaments sometimes mixed with long filaments, sometimes zonate or in groups; short filaments composed of a swollen basal cell, sometimes on a swollen supporting cell, outwardly bearing one rounded cell, or two cells in a filament 5
5. Short assimilatory filaments two celled . . . . . . G. ramulosa
5. Short assimilatory filaments two or three celled . G. subfruticulosa
6. Cortical tissue 20-60 μ thick, 1-2-stromatic; plants small, frutescent; branches sometimes constricted, or proliferous, the constrictions and proliferations at the base surrounded by tufts of extended assimilatory filaments . . . . G. stupocaulon
6. Cortical tissue 60-80 μ thick, 2-3-stromatic; plant tall, arborescent, branches continuous, rarely proliferous . . G. spathulata
7. Branches terete throughout, cortical tissue parenchymatous or subfilamentous 8
7. Branches terete only at the base, above flattened; cortical tissue parenchymatous; lobed cells when present in the median layer 9
8. Branches villous, cortical tissue parenchymatous, tristromatic, lobed cells present among the cells of the innermost layer . . . . G. squalida
8. Branches glabrous, cortical tissue subfilamentous, the cells remaining attached to the medullary filaments after decalcification . . . . G. oblongata
9. Epidermal cells spinulose, bearing small unicellular subcylindrical spinelike cells; cortical tissue containing lobed cells present 10
9. Epidermal cells smooth, without spinelike cells upon them; cortical tissue with or without lobed cells 11
10. Thallus 1-2 mm wide, chalky; epidermis abundantly spinulose . . . . G. veprecula

10. Thallus 2-3 mm wide, smooth, shiny; spinulose cells few, found only on the thickened margins . . . . G. ventricosa
11. Cortical tissue containing lobed cells, tristromatic; plant low, frutescent; internodes less than 1 cm long . . . G. angustifrons
11. Cortical tissue without lobed cells, 3-4-stromatic; plant tall, arborescent; internodes 1.0-2.5 cm long . . . . G. intermedia

Galaxaura filamentosa Chou n. sp.[82a]

Plants about 5 cm tall, dichotomous or subdichotomous, often irregular by reason of adventitious branches, lightly calcified, villous, the extended assimilatory filaments 1.0-4.5 mm long; axis of the internodes 0.5-1.5 mm diam., 2-10 mm long; structurally homogeneous, the medulla of filaments 16-24 μ diam., the cortex not distinctly developed because the assimilatory filaments do not have differentiated basal or supporting cells; assimilators 18 μ diam. near the base, 20-22 μ diam. above, the cells 1.5-3.0 diameters long.

MÉXICO: Is. Revilla Gigedo, very abundant in tide pools on a rocky point at Sulphur Bay, I. Clarion, *no. 39-46 (TYPE),* 17 Mar. 1939. COSTA RICA: in tide pools at Pto. Culebra, *no. 34-533,* 24 Feb. 1934. Golfo Dulce, frequent on intertidal rocks near the western side of the bay near the entrance, *no. 39-93,* 26 Mar. 1939. ECUADOR: Archipiélago de Colón, in an inland salt lagoon near Albemarle Pt., I. Isabela, *no. 34-110,* 12 Jan. 1934.

Galaxaura barbata Chou n. sp.[82b]

Plants bushy, to 5 cm tall, the holdfast broad, disciform; branches terete, moderately calcified, fairly regularly dichotomous, with assimila-

[82a] Galaxaura filamentosa n. sp.—Planta 3.5-5.0 cm alta ad substratum disco adfixa, frondibus teretibus cum filamentis assimilatoriis dense vestitis; dichotome ramosis vel interpositione rami adventivi ut videatur trichotome ramosis; internodiis 2-10 mm longis, 0.5-1.5 mm crassis (filamentis liberis haud includensis); thallo ex filamentis in parte media intertextis in parte exteriore parallelis constato sed structura homogeneo sine cortice; filamentis axialibus 16-24 μ diam., apice in filamenta assimilatoria chromatophoria transeuntibus per cellulas sustinentes non aut raro maleque differentiatas; absque cellulis basalibus tumidis; parte filamentorum assimilatoriorum libera 1.0-4.5 mm longa, simplici vel irregulariter ramosa, ex cellulis cylindricis constante inferioribus 16-18 μ diam., et superioribus 20-22 μ diam., sesquiplo vel triplo longioribus quam crassioribus. Planta typica in loco dicto Sulphur Bay, I. Clarion, México, legit W. R. Taylor *no. 39-46,* 17 Mar. 1939.

[82b] Galaxaura barbata Chou, n. sp.—Plantae 5 cm altitudine; ramis teretibus, 0.5-1.0 mm diam., apice, siccato, collapso aut subancipiti; filamentis extensis assimilativis barbatis, anulos spatio intermisso efficientibus, filamentis medullatibus 6-20 μ diam.; tela corticea monostromatica, cellulis 32-50 μ diam.; cellulis stirpis 12-24 μ long., 10-18 μ diam., cellulis terminalibus 28-44 μ alt., 20-28 μ diam., crebris, aspectu superficiali angularibus; filamentis assimulativis extensis 1-2 mm long., 16-18 μ diam.; cellulis 1-5 plo diam. longitudine; cellulis basalibus tumidis permagnis 90-120 μ long., 28-40 μ diam. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-364,* 27 Jan. 1934.

tory filaments 1-2 mm long, sometimes in crowded, sometimes in more remote rings; segments 3-9 mm between the forkings, 0.5-1.0 mm diam., those below with several rings of filaments, those above commonly with only one at the base; structurally of a medulla of longitudinal filaments generally 12-16 μ diam., cortex unistratose, of large, rounded cells 32-50 μ diam., bearing one or two stalk cells which may be simple or slightly expanded, or forked and bearing one or two terminal cells, which are rounded, 28-44 μ tall, 20-28 μ diam., in surface view clearly crowded and angular; extended assimilatory filaments cylindrical above, of cells 16-18 μ diam., 1-5 times as long as broad, resting on a swollen basal cell about 90-120 μ long, 28-40 μ diam.

ECUADOR: Archipiélago de Colón, dredged from 37 meters' depth off I. Santa Cruz, Schmitt *no. 316-35,* 8 Dec. 1934. *Ibid.,* dredged from 13-18 meters' depth off Post Office Bay, I. Santa María, *no. 34-364 (TYPE),* 27 Jan. 1934.

Galaxaura ramulosa Kjellman

Plants 5-9 cm tall; branches strongly calcified and rather rigid, dichotomous or subdichotomous; axis of the internodes 2-15 mm long, 0.5-1.2 mm diam., villous, becoming denuded below, the extended assimilatory filaments 0.8-1.2 mm long; structurally the axis with a medulla of filaments 6-20 μ diam., with a cortex of angular supporting cells 20-40 μ in lateral and 30-32 μ in radial diameter, each bearing one or two assimilatory filaments with one or two tumid basal cells 40-65 μ long, 20-40 μ diam.; the shaft of the extended filaments 12-15 μ diam. near the base, 18-20 μ diam. above; short assimilatory filaments intermixed with the long ones, of two cells, the basal similar to those of the long filaments, 40-64 μ long, 20-36 μ diam., the terminal cells globose or subglobose, 20-32 μ diam.

Kjellman 1900, p. 50, pl. 3, figs. 24-26, pl. 4, figs. 1-3, pl. 20, fig. 18.

PANAMÁ: forming rare tufts on rocks in tide pools, I. Jicarita, *no. 34-505A,* 20 Feb. 1934.

Galaxaura subfruticulosa Chou n. sp.[83]

Plants with large discoid holdfasts 1 cm diam., terete, 5-6 cm tall, villous, becoming denuded below, irregularly dichotomously branched at

[83] Galaxaura subfruticulosa Chou, n. sp.—Plantae altitudine circa 5 cm; ramis teretibus, 0.5-1.0 mm diam.; nodis constrictis; longioribus filamentis assimilatoriis anulos interruptos formantibus cum cellulis basalibus tumidis, 90-120 μ longis, 28-40 μ diametro et cellulis superioribus numerosis 16-18 μ diam., usque ad quinquies

wide angles, or subalternate, the segments 3-12 mm long; extended assimilatory filaments less than 1 mm long, evenly distributed, or near the tips slightly verticillate; structurally the axis with a medulla of slender filaments 6-18 μ, rarely 24 μ diam., and a cortex of ill-developed supporting cells bearing 1-2 assimilatory filaments with well-developed tumid elliptical or elongate-ovate basal cells 45-65 μ long, 28-40 μ diam., the shafts of the extended filaments 14-16 μ diam. near the base, 16-18 μ diam. above, the cells 2-3 diameters long; intermixed are short assimilatory filaments of 2-3 cells, the basal cells like those of the extended filaments, the terminal cells globose or subglobose, 20-34 μ diam.

Kjellman 1900, p. 51, pl. 4, figs. 4-16, pl. 20, fig. 19, as *G. fruticulosa* Kjellm., *non* (Ellis & Solander) Lamouroux.

The type of *G. fruticulosa* is Bahaman, but the name was adopted by Kjellman for a Japanese plant. It is similar to *G. subverticillata,* but shows little of a verticillate habit, and there are minor differences, in which the Mexican plant is like its western Pacific relatives.

MÉXICO: Is. Revilla Gigedo, on intertidal rocks at Sulphur Bay, I. Clarion, *no. 34-53 (TYPE),* 5 Jan. 1934.

Galaxaura stupocaulon Kjellman

Plants bushy, to 6-7 cm tall, the holdfast discoid; the branches below subterete, villous, above flattened, commonly proliferous, each proliferation encircled by a tuft of extended assimilatory filaments; segments short, 2-7 mm long, 1-2 mm wide, the margins slightly thickened; structurally showing a loose medulla of filaments 7-15 μ diam., bearing a 1-2-stromatic cortex 20-40, rarely 60 μ thick; cells of the inner layer largest and rounded to much compressed, 20-44 μ tall, 25-50 μ broad; outer cortex cells bearing the short assimilators, which are composed of simple cylindrical to obconical or even forked stalk cells 30-36 μ tall, bearing generally two terminal cells, rounded but of variable form, 20-44 μ tall, 20-32 μ diam.; extended assimilatory filaments about 1 mm long, with one or two tumid basal cells, the shaft cells 15-16 μ diam., 2-5 times as long as broad.

Kjellman 1900, p. 75, pl. 14, figs. 1-9, pl. 20, fig. 28.

COSTA RICA: from tide pools near the entrance to the bay, Golfo Dulce, *nos. 39-90A, 39-91A, 39-92A,* 26 Mar. 1939.

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longioribus quam crassioribus; cortice monostromatico, cellulis ovoideis vel subglobosis, 32-50 μ diam., filamentos breviores assimilatorios bicellulos ferentibus, eos ex cellula stipitiforme 12-20 μ diam., 12-24 μ long. et secunda terminali ovoidea vel clavata, 28-44 μ longa, 20-28 μ diam. constantes; filamentis medullae 6-20 μ diam. Planta typica in loco dicto Sulphur Bay, I. Clarion, México, legit W. R. Taylor, *no. 34-53,* 5 Jan. 1934.

Galaxaura spathulata Kjellman

Plants to 18 cm tall or more, at the base caulescent, the stem rough, villous, 3-4 cm long, bearing many branches, these repeatedly narrowly dichotomous; above the branches flat, firm, rarely contracted or proliferous, segments elongate cuneate, 0.5-1.5 cm long, 1.0-1.5 mm broad at the proximal end and 1.5-2.0 or occasionally to 3.0 mm at the distal end, the margins thickened and often inrolled; branches above 400-500 μ thick (decalcified); cortex parenchymatous, 1-3-stromatic, 60-80 μ thick, the inner layer largest, the cells rounded, 24-60 μ tall, 60-80 μ broad, the outer cells bearing the short assimilatory filaments composed of one or two stalk cells and these in turn bearing rounded terminal cells of obovate shape, about 30-44 μ tall, 25-30 μ diam., crowded and subangular from surface view; extended assimilatory filaments found only at the bases of the proliferations; margins or abraded areas sometimes showing a tomentum similar to young assimilatory filaments.

Kjellman 1900, p. 74, pl. 12, figs. 5-12, pl. 20, fig. 35.

ECUADOR: Archipiélago de Colón, from the intertidal rocks of a reef to the north of Tagus Cove, I. Isabela, *no. 34-164,* 13 Jan. 1934. *Ibid.,* from the rocks at Black Beach Anchorage, I. Santa María, *no. 34-246,* 17 Jan. 1934.

Galaxaura squalida Kjellman

Kjellman 1900, p. 55, pl. 6, figs. 1-12, pl. 20, fig. 9; Børgesen 1915-20, p. 102, figs. 108-111; Collins & Hervey 1918, p. 102; Howe 1920, p. 558; Taylor 1928, p. 140, pl. 21, fig. 18, pl. 31, fig. 4; 1942, p. 84.

PANAMÁ: Bahía Honda, *no. 39-130,* 26 Mar. 1939.

Galaxaura oblongata (Ellis & Solander) Lamouroux

Plants forming rounded tufts 4-12 cm tall; branching dichotomous, fastigiate or spreading; branches smooth, distinctly calcified, fragile; segments cylindrical, slightly turgid, somewhat more slender above, 0.4-2.5 cm long, 0.8-2.5 mm diam., often slightly transversely rugose, at the forkings commonly articulated; medulla of loosely branched filaments which near the surface branch closely and terminate in 2-3 subglobose cortical cells of which the innermost cells are largest, 20-40 μ diam., the outermost small, subglobose, 8-18 μ diam., the epidermis easily detached, of cells angular in surface view and 8-20 μ diam., lenticular in section and slightly wider than tall; cystocarpic and spermatangial conceptacles on the same plant.

Børgesen 1927, p. 71, figs. 39-41; Taylor 1928, p. 139, pl. 21, fig. 15, pl. 31, fig. 5.

MÉXICO: Nayarit, dredged from 21.5 meters' depth at sta. 970 off I. María Magdalena, Las Tres Marías, *no. 39-653,* 9 May. 1939. *Ibid.,* dredged at 5.5-9.0 meters' depth at sta. 971, *no. 39-667A,* 9 May 1939. ECUADOR: Esmeraldas, dredged from 5.5 meters' depth off Bahía San Francisco, *no. 34-485,* 11 Feb. 1934.

Galaxaura veprecula Kjellman

Plants bushy, short stalked, the holdfast broad and discoid, height 5-8 cm or more, the terete stalk 1-2 cm long; densely branching, somewhat flabellate, the basal substipitate and subterete, those above flattened, more or less regularly narrowly dichotomous; internodes continuous or constricted and proliferous, 0.5-1.2 cm long, 1-2 mm broad, clearly broader at the distal ends, the margins thickened, smooth and nitent, or chalky where covered with spinulose cells; medulla of filaments 7-12 μ diam.; cortex tristromatic, the inner layer of colorless cells 20-30 μ tall, 35-45 μ diam., intermediate layer subglobose or somewhat lobed, cells about as large, or when lobed very much broader, the cells of the outer layer forming a continuous epidermis, angular in surface view, lenticular to hemispherical in section and 10-15 μ tall, 18-20 μ broad; spinulose cells in scattered patches over the frond surface, and especially the margins, easily rubbed off, the cells columnar to clavate or pyriform, 25-35 μ tall, to 12-15 μ diam., at the apex rounded to mucronate; plants monoecious, the cystocarps discharging from ostioles near the margins, the spermatangia generally scattered.

Kjellman 1900, p. 80, pl. 16, figs. 17-33, pl. 20, fig. 20.

COSTA RICA: from tide pools near the entrance to the bay, Golfo Dulce, *nos. 39-90B, 39-91B, 39-92B,* 26 Mar. 1939. ECUADOR: Archipiélago de Colón, dredged from 3.6-5.4 meters' depth east of Wreck Bay, I. San Cristóbal, Schmitt *no. 41C-33,* 30 Jan. 1933.

Galaxaura ventricosa Kjellman

Plants bushy, 7.0-8.5 cm tall, repeatedly furcate, the internodes strongly flattened, fleshy membranous, smooth and even nitent, the margins slightly thickened; internodes 0.5-1.2 cm long, 2-3 mm wide, of constant width or slightly broader upwardly; proliferations infrequent, encircled by a tuft of assimilatory filaments about 1 mm long; structurally of a medulla and an assimilatory cortex, the medulla of filaments 8-15 μ diam., the cortex tristromatic, 60-75 μ thick, the innermost cells 20-36 μ

tall, 56-80 μ broad, colorless, the intermediate cells subglobose or irregular to columnar, the surface cells forming a continuous chromatophorous epidermis, in surface view polygonal, in section lenticular to hemispherical, 12-24 μ high, 20-35 μ diam.; the epidermis bearing small columnar to subfusiform cells on the thallus margins, 12-20 μ diam., 32-40 μ tall, rounded to submucronate.

Kjellman 1900, p. 81, pl. 16, figs. 11-16, pl. 20, fig. 24.

México: Nayarit, rare as dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-652,* 9 May 1939.

Galaxaura angustifrons Kjellman

Plants to 9-10 cm tall, dichotomously branched, the angles wide, branches at the base subterete, slightly villous, above complanate, the segments 5-7 mm long, 1.5-2.0 mm diam., when dry with the margins appearing slightly thickened; proliferations scanty, each at the base with a tuft of assimilatory filaments 0.5-1.0 mm long; medullary filaments 8-16 μ diam., cortex tristromatic, the cells of the inner layer subglobose or angular, 40-100 μ diam., 30-50 μ radial length, those in the intermediate zone subglobose to ovate, 24-28 μ diam., cells of the surface or epidermal layer loose, 5-6-gonal, 20-30 μ diam. in surface view, in section appearing hemispherical or lenticular, 16-24 μ in radial length; extended assimilators 15 μ diam., the cells 2-3 diameters long, the basal cells obpyriform or elongate elliptical, 28-30 μ wide, about 48 μ radial length.

Kjellman 1900, p. 82, pl. 15, figs. 11-25, pl. 20, fig. 27.

Ecuador: Archipiélago de Colón, dredged from 9-20 meters near Eden I., Conway Bay, I. Santa Cruz, Schmitt *no. 81B-33,* 16 Feb.1933.

Galaxaura intermedia Chou n. sp.[84]

Plants bushy, to 23 cm tall, the holdfast broad, below the axis caulescent and villous, 2 cm long, 3-5 mm thick at the base; above dichotomous,

[84] Galaxaura intermedia Chou, sp. nov.—Plantae deliquescentes, arborescentes, minus quam 23 cm altae a disco ad substratum adfixae; caudice partibusque ramorum basalibus subteretibus, villosis; ramis sursum compressis, glabris; segmentis linearibus vel cuneate linearibus, continuis, 1.0-2.5 cm longis, 1-2 mm latis, gelatinosis, coriaceis, vix calce incrustatis, siccatate fragilibus, inconspicue transverse striatis, marginibus neve incrassatis neve involutis; filamentis medullariis 10-12 μ diametientibus, cortice parenchymatoso, 3- vel 4-stromatico, minus quam 100 μ crasso, cellulis intimis quam aliis grandioribus, ovoideis vel subrectangularibus, 28-40 μ altis, 50-70 μ diametro, intermediis hypodermaticisque parvioribus, subglobosis, diam. 20-40 μ, in sectione frondis transversali lunatis, 10-18 μ altis, 16-24 μ diam.; liberis filamentis assimilatoriis basi 16 μ, diam., ad apicem versus 18-20 μ, cellulis isodiametricis vel interdum duplo longioribus quam latioribus, absque vel cum cellulis tumidis basalibus; conceptaculis globosis, in thallo immersis, ostiolis ad superficiem aperientibus. Rami carpogoniales desunt. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-213,* 17 Jan. 1934.

the angles acute, the lower segments subterete and villous, the upper ones complanate, glabrous, 1.0-2.5 cm long, 1-2 mm wide, little calcified and carnose membranous, the margins neither involute nor much thickened, near the tips about 1 mm wide; thickness 300-400 μ (decalcified); medullary filaments 10-12 μ diam., cortex 3-4-stromatic, the innermost layer of subglobose or angular cells 50-70 μ diam., 28-40 μ radial length; cells of the intermediate layers more or less globose, 20-40 μ diam., surface or epidermal layers thick walled, 5-7-gonal and 12-20 μ diam. in surface view, in section hemispherical to lenticular, 10-18 μ tall radially; extended assimilatory filaments 16-20 μ diam., the cells 1-2 diameters long, the basal cells somewhat tumid or not differentiated.

ECUADOR: Archipiélago de Colón, frequent in the lower littoral near Black Beach Anchorage, I. Santa María, *no. 34-213 (TYPE),* 17 Jan. 1934.

GLOIOPHLAEA J. Agardh, 1870

Plants bushy, dichotomously branched, the terete branches unconstricted; structurally showing an axis of longitudinal filaments bearing a cortex which at first shows a surface layer of utriculiform cells, which is gradually displaced by anticlinal assimilatory filaments with larger cells within, smaller without; spermatangia scattered over considerable areas of the plant; cystocarps scattered in the inner cortex, enclosed within a few layers of pericarpic filaments, discharging by a narrow pore.

Gloiophlaea confusa Setchell

Setchell 1914b, p. 118, pl. 14, figs. 44-47.

ECUADOR: Archipiélago de Colón, dredged at sta. 157 from 16-32 meters' depth, Tagus Cove, I. Isabela, *no. 34-185,* 15 Jan. 1934.

SCINAIA Bivona, 1882

Plants bushy, repeatedly dichotomously branched, firmly gelatinous, with an obscure axial strand; structurally showing this strand of slender filaments surrounded by a loose filamentous medulla, and a cortex of two layers, the inner or hypodermal layer of large chromatophore-bearing cells and the outer or epidermal layer of coherent colorless cells with a few columnar colored cells intermixed; asexual reproduction by monosporangia formed between the epidermal cells; sexual reproduction by spermatangia in small superficial sori, and by carpogenic branches, three celled, borne on the outer medullary filaments, the cystocarps small, immersed, with a filamentous pericarp, the carpospores discharging through a small pore.

KEY TO SPECIES

1. Branches flat . . . . S. latifrons
1. Branches nearly or quite cylindrical 2
2. Plants small, height less than 10 cm . . . . . S. complanata
2. Plants becoming much larger 3
3. Branching erect, the intervals averaging about 2 cm or more; colorless cells of the epidermis 14-24 μ diam., 18-25 μ deep . . . . S. Johnstoniae
3. Branching more bushy and close, at intervals of 1.5 cm or rather less; small colored cells occasional in the epidermis, the colorless cells 24-28 μ diam., 35-45 μ deep . . . . S. Setchellii

Scinaia complanata (Collins) Cotton, *f.*

Plants dull red purple throughout, soft in substance, to 5 cm (or more ?) in height, closely branched 7-8 times successively, the segments to 3 mm diam. in the upper part and to 2 mm in the lower portion measured above the forks; apices of branches rounded to obtuse conical; axis fairly evident in the lower part of the dried plant, less so above; epidermis of colorless cells polygonal and thin walled in surface view, ranging from 11-28 μ diam., averaging 17.5 μ; in radial aspect rectangular, about 21-28 μ tall, the outer face flat; small colored cells between the colorless ones rare; hypodermal layer single, of rounded compressed cells 11-17 μ diam., 7-10 μ tall in section, about one to each epidermal cell; medulla extremely sparse, of very delicate filaments 2-3 μ diam., the axis (soaked up) to about 150 μ diam., of some scores of larger filaments and a few delicate ones.

Setchell 1914b, p. 100.

This plant differs from *S. Johnstoniae* in its short, densely branched habit, relatively slightly taller epidermal cells, and the more extensive axial strand. From the West Indian *S. complanata* it is perhaps separated by structure again, for the epidermal cells appear to be more distinctly taller than broad, the hypodermal layer of larger cells seems more regular, and the axial strand is fairly extensive.

MÉXICO: Nayarit, dredged from 21.5 meters' depth off a bottom with many coralline and other algae, sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-647,* 9 May 1939. COSTA RICA: dredged at 4-7 meters' depth in Cocos Bay, Puerto Culebra, Schmitt *no. 116A-33,* 13 Mar. 1933. ECUADOR: Archipiélago de Colón, dredged from 22 meters' depth, south side of Tagus Cove, I. Isabela, Schmitt *no. 327B-34,* 10 Dec. 1934.

Scinaia Setchellii n. sp.[85]

Plate 32

Plants bushy, to 15 cm tall or more, dichotomously forked to 10-12 times successively, rose purple throughout; cylindrical branches to 3-4 mm diam. above, 2-3 mm in the lower part of the plant, downwardly little tapered, the apices acute to rounded conical, the axis slightly visible in the lower parts, not visible above; colorless epidermal cells to 21-28 μ diam. in surface view, with small colored cells 6-8 μ diam. occasionally present between them, in transverse section 35-42 μ deep, subquadrangular, the outer wall slightly convex; hypodermal cells rounded and large, 15-22 μ diam., mostly in a single layer; axis not large, of larger and smaller filaments intermixed; cystocarps basally attached, the lower gonimoblast cells elongate, the pericarp without filaments penetrating the gonimoblast mass, the ostiole with many short filaments hardly emerging from the opening.

ECUADOR: Archipiélago de Colón, dredged several large clumps from 27 meters off Post Office Bay, I. Santa María, *no. 34-288* (cystocarpic, *TYPE*), 19 Jan. 1934.

Scinaia Johnstoniae Setchell

Plants to 23 cm tall, to 10 times dichotomously forked, cylindrical, to 3 mm diam. above, 2 mm diam. below, dull reddish purple and darker below, the axis obscure; epidermis of thin-walled polygonal cells which in surface view are 14-24 μ diam., in section rectangular with the outer face flat, the cells 18-25 μ tall; small colored cells absent from the epidermis; hypodermal cells round, in a single layer; medullary filaments slender, sparse; axis of larger and smaller filaments intermixed.

Setchell 1914b, p. 97, pl. 11, figs. 14, 15.

The Ecuadorean plants seem taller and more slender than those reported by Setchell, but otherwise agree quite well with his description, except that the colorless epidermal cells seem relatively taller in section than he describes, and colored cells were not seen between them.

COSTA RICA: dredged near Pto. Culebra, *no. 34-523 (?)*, 24 Mar. 1934. ECUADOR: Archipiélago de Colón, dredged at sta. 173 from 9 meters' depth off I. Baltra, *no. 34-335* (cystocarpic), 22 Jan. 1934.

[85] Scinaia Setchellii n. sp.—Plantae fruticosae, ad 15 cm altitudine, ad 10-12-dichotomae; ramis cylindricis, supra ad 3-4 mm diam., infra 2-3 mm, paululum teretibus deorsum, apicibus acutis ad rotundato-conicos, axe infra paulum visibili; cellulis epidermalibus turgidis, ad 21-28 μ diam., 35-42 μ crass., inter quas cellulae parvae coloratae interdum videntur; cellulis subepidermalibus plerumque in strato uno, magnis, rotundatisque, 15-22 μ diam. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-288,* 19 Jan. 1934.

Scinaia latifrons Howe

Plants to 14 cm tall, reddish purple, the color slightly transversely banded and darker at the margins, 7-8 times dichotomously branched, the branches flat with abruptly thickened margins, to 5-7 mm wide below and 7-10 mm above (measured above the forks), the tips rounded to slightly tapered with a rounded apex; thickness to 250 μ in the central portion, 1.3-1.7 mm at the margins, the axial strand not distinguishable; colorless epidermal cells in surface view polygonal with moderately firm walls, 18-28 μ diam., averaging about 17 μ, in transverse section appearing rectangular with flat outer faces, 18-21 μ tall;[86] small colored cells scattered between the colorless ones; hypodermis of large spherical cells nearly in one layer, 14-18 μ diam.; cystocarps chiefly marginal, rounded, 280-350 μ diam., the pericarp pseudoparenchymatous.

Howe 1911, p. 500, fig. 1, pl. 28; Setchell 1914b, p. 102, pl. 11, fig. 23.

These Mexican specimens are more slender than those described by Setchell (1914b, p. 102), but seem substantially similar. They resemble with this exception the illustrations in Howe's original paper (1911), including the somewhat transversely banded appearance of the upper thallus. The Ecuadorean plants seem somewhat more slender than those from Mexico, and they do not appear banded. Microscopically they show slightly larger somewhat turgid epidermal cells: 14-31 μ in surface diam., and to 28-38 μ in radial height when sectioned. The plants also are taller, reaching at least 22 cm, and with to 10-13 successive forkings. It does not seem advisable at present to give them separate varietal designation, though at first glance they certainly look like different things.

MÉXICO: Nayarit, dredged from a depth of 21.5 meters at sta. 970 from a bottom of coralline and other algae near I. María Magdalena, Las Tres Marías, *no. 39-645,* 9 May 1939. ECUADOR: Archipiélago de Colón, dredged from 22 meters' depth, Tagus Cove, I. Isabela, Schmitt *no. 327A-34,* 10 Dec. 1934. *Ibid.,* dredged from 27-55 meters, *no. 34-141* (cystocarpic fragments), 13 Jan. 1934. *Ibid.,* dredged from 9 meters' depth at sta. 173, I. Baltra, *no. 34-334,* 22 Jan. 1934. *Ibid.,* dredged from 36 meters' depth opposite Gordon Rocks, I. Sta. Cruz, Schmitt *no. 316E-34,* 8 Dec. 1934. *Ibid.,* dredged several large clumps from 29 meters' depth off Post Office Bay, I. Santa María, *no. 34-289* (cystocarpic), 19 Jan. 1934. *Ibid.,* dredged from 20 meters' depth in Gardner Bay, I. Española, Schmitt *no. 356C-34,* 17 Dec. 1934.

[86] Mexican material.

Bonnemaisoniaceae

Plants of moderate size, slenderly branched, with an evident axis and extensive branch systems; the minor branches commonly beset with numerous slender branchlets of limited growth forming brushlike tufts; sporangia absent; spermatangia covering enlarged branchlets; carpogenic branches three celled, formed in the cortex of the fertile branch, a pericarp formed partly from the lowest cell of the carpogenic branch.

ASPARAGOPSIS Montagne, 1840

Asparagopsis Sanfordiana Harvey

Harvey 1858, pl. 6.

MÉXICO: Is. Revilla Gigedo, from the shore pools at Sulphur Bay, I. Clarion, *no. 39-44,* 17 Mar. 1939. ECUADOR: Manabi, dredged in 4-15 meters' depth off I. Salango, Schmitt *no. 398B-35,* 18 Jan. 1935.

Asparagopsis Sanfordiana f. amplissima Setchell & Gardner

Setchell & Gardner 1824a, p. 760, pl. 22, fig. 3, pl. 41.

The specimens from Punta Cristofer reached a maximum length of 33 cm, although broken, and so exceeded the length specified for this form in the above description very considerably. However, one should note that the typical form of the species has been recorded in excess of 25 cm tall. The primary lateral branches are longer than those described by Setchell and Gardner, reaching 8 cm, though theirs in turn were longer than the typical form of the species, which reach about 2.5 cm. The specimens from the Is. Revilla Gigedo and from I. Santa María are rather fragmentary, but probably also belong to this form.

MÉXICO: Is. Revilla Gigedo, dredged from 57 meters at sta. 2829, *Albatross* Exped. *no. 29* (cystocarpic), 1 May 1888. ECUADOR: Archipiélago de Colón, floating in some abundance off Pt. Christopher, I. Isabela, *no. 34-201,* 16 Jan. 1934. *Ibid.,* dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-275* (cystocarpic), 19 Jan. 1934. *Ibid.,* dredged from 12.6-18.3 meters, *no. 34-366,* 27 Jan. 1934.

Asparagopsis Svedelii n. sp.[87]

Plate 97, Fig. 1

Plants erect, the terete axes percurrent, alternately branched to 2-3 degrees, bearing radially disposed straight or slightly curved pluriseriate

[87] Asparagopsis Svedelii n. sp.—Plantae erectae, axe tenui rigidoque, 2-3 alterne furcatae, ramulis radialibus, fastigiatis, pluriseriatis, simplicibus aut sparse divisis, 0.75-1.30 mm long., 75-100 μ diam. ad basim. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, *no. 34-378,* 29 Jan. 1934.

branchlets which are simple or very sparingly alternately branched, 0.75-1.30 mm long, 75-100 μ diam. near the base and markedly tapered toward the tips; axes wiry, about 0.75 mm diam., corticated irregularly, in section showing one large thick-walled axial cell about 180 μ diam., lying in a considerable cavity which had 5-7 small filaments appressed to the outer wall; cavity surrounded by 3-4 layers of moderately large firm-walled cells and externally a one-layered cortex of chromatophore-bearing cells; gland cells not noticeable on the branchlets; reproduction unknown.

Named for Professor Nils Svedelius in recognition of his cytological studies made in this family of algae.

ECUADOR: Archipiélago de Colón, rare as dredged from 55 meters' depth off Post Office Bay, I. Santa María, *no. 34-378 (TYPE),* 29 Jan. 1934.

This plant differs much from *A. Sanfordiana.* It lacks the close approximation of short side branches along the main axes, so that the habit is more openly bushy; the branchlets are less crowded and less plumose; although slender it does not adhere to paper so closely as does *A. Sanfordiana.* It also differs from *A. hamifera* in its firmer texture and more slender axis, as well as the absence of crozier branch tips, though these structures are often absent from Atlantic specimens of *A. hamifera.* The branchlets were more slender, and so far as could be seen in the material available did not have gland cells. The depth from which it was secured, 55 meters, is beyond where one would expect to find the shallow-water *A. hamifera.*

Gelidiaceae

Plants small to moderate in size, wiry in texture; axis ultimately of numerous filaments though characteristically with a single cell at the apex, lower down becoming corticated; asexual reproduction by tetrasporangia usually formed just below the surface of the branchlets; sexual reproduction by spermatangia formed from the surface cells, and by carpogenic branches loosely associated with chains of nutritive cells; gonimoblasts intermingled with these nutritive cells and there producing the carpospores.

KEY TO GENERA

1. Section of the plant not showing slender filaments mixed with the large cells; apical growth by a few small initial cells; reproduction unknown . . . . Wurdemannia
1. Section of the plant generally showing very slender refractive filaments ("rhizines") mixed with the large cells which make up the bulk of the central tissue 2

2. Rhizines chiefly in the central part of the medulla; tetrasporangia when young generally regularly placed in rows near the tips of the branchlets; cystocarps unilocular . . . . Pterocladia
2. Rhizines chiefly in the outer or subcortical tissue; tetrasporangia when developing showing young and old stages intermixed; cystocarps bilocular, with two pores and groups of carpospores, separated by a sterile septum . . . . Gelidium

WURDEMANNIA Harvey, 1853

Plants bushy, often matted or entangled, slender and wiry, the branching irregular, subalternate; growth from a small pluriaxial apex, mature structure showing a cylindrical medulla of stout filaments with thick, coalescent walls and a cortex of anticlinal rows of cells.

Wurdemannia miniata (Draparnaud) Feldmann & Hamel

Harvey 1853, p. 246; Børgesen 1915-20, p. 368, figs. 360-361; Taylor 1928, p. 145, pl. 20, figs. 9, 10 (all as *W. setacea*); Feldmann & Hamel 1934, p. 17, figs. 9-11.

The figures and descriptions of Feldmann and of Børgesen show axial filaments with thin walls; the specimens from Florida seen by the writer, and also the present ones from the west coast of Panama, show thick walls. Harvey's type came from Florida, and Draparnaud's from the Mediterranean. Though the differences are slight, it is just possible that two species are involved after all.

México: Is. Revilla Gigedo, forming tufts under ledges in tide pools, Braithwaite Bay, I. Soccoro, *no. 39-52,* 18 Mar. 1939. Costa Rica: from below overhanging rocks, Golfo Dulce, *no. 39-107,* 26 Mar. 1939. Panamá: San Francisco, forming scattered sand-covered tufts in tide pools, Panama City, *no. 39-140,* 31 Mar. 1939.

GELIDIUM Lamouroux, 1813

Plants of moderate to small size, cylindrical or flattened, with the axis erect from a somewhat fibrous base, usually laterally branched, wiry to cartilaginous; developing from an apical cell, with ultimately several medullary cell rows and a compact cortex of short radial cell rows, rhizines generally being present in the outer subcortical part of the medulla; tetrapartite sporangia produced in enlargements of the main axes, or in special lateral branchlets, generally without being arranged in any definite order; spermatangia forming a coating on local areas of the branches; carpogenic branches three celled; cystocarps bilocular, a sterile septum separating two groups of carpospores which discharge from pores on opposite sides of the branchlet.

KEY TO SPECIES

1. Plants minute, creeping, or at most turflike and 1-3 cm tall . . . 2
1. Plants large, bushy, generally 5 cm tall or more when full grown 5
2. Tetrasporangial branchlets with a thickened margin; in sections a median series of notable large thick-walled cells evident . . . . G. sclerophyllum
2. Tetrasporangia not in thick-edged branchlets; no especially large cells in the medulla 3
3. Tetrasporangial branchlets irregularly palmately or digitately expanded from a contracted base . . . . G. galapagense
3. Tetrasporangial sori in ordinary branches 4
4. Very small, about 1 cm tall, rather fleshy . . . . . . G. isabelae
4. Larger, the thin somewhat nitent blades membranous . . . . G. pusillum
   4a. Still larger, to 2 cm or by proliferation to 3 cm tall . . . . v. pacificum
   4b. Blades narrower, when fertile commonly cylindrical, at least for the major lower part . . . . v. cylindricum
5. Branchlets with entire margins 6
5. Branchlets with toothed margins 7
6. Plants delicate, branches slender, often congested . . G. densum
6. Plants coarse, cartilaginous . . . G. cartilagineum v. robustum
7. Axis and primary branches virgate, sparingly divided, dominating the growth habit; determinate branches short pinnate . . . . G. Hancockii
7. Axis and main branches redividing, bushy, progressively pinnate . . . . G. filicinum

Gelidium pusillum (Stackhouse) LeJolis

Taylor 1928, p. 142, pl. 20, fig. 8, pl. 22, fig. 7, pl. 23, fig. 3.

These plants are in general rather more vigorous than those which the writer has collected in the Caribbean area, the Revilla Gigedo material being in particular quite large. It is perhaps intermediate between the species and what is here distinguished as v. *pacificum*.

MÉXICO: Is. Revilla Gigedo, common in rock crevices in the littoral, Braithwaite Bay, I. Soccoro, *nos. 34-2, 34-36,* 2 Jan. 1934. *Ibid., no. 39-49A,* 18 Mar. 1939. Oaxaca, abundant on old shells, Ba. Tangola-Tangola, *no. 34-563D,* 1 Mar. 1934. COSTA RICA: a somewhat narrow form abundant on rocks, much mixed with sand, Golfo Dulce, *no. 39-111,* 26 Mar. 1939. PANAMÁ: Bahía de Panamá, from rocks along the steep shore, in quiet water near the anchorage, I. Taboga, *no. 39-620,* 2 May 1939.

v. pacificum n. v.[88]

Plate 5, Fig. 7; Plate 33, Fig. 1

Plant with a slender creeping rhizome, which produces holdfasts at intervals and, on the upper side, thin flat linear lanceolate reddish-purple blades with a short terete stalk, which reach 1-2 cm in length to 1.5-2.0 mm in width, the apex blunt, especially in the fertile specimens; branching chiefly proliferous from the end or margin, when the collective length may reach 3 cm, but sometimes distinctly once pinnate; structure in transverse section showing rhizines in the subcortical blade tissue; tetrasporangia irregularly disposed in rounded sori near the ends of the blades; cystocarps single in small fertile blades chiefly formed along the distal margins of rather short vegetative blades.

These Ecuadorean plants are certainly much larger than the Caribbean ones ordinarily ascribed to *G. pusillum* (Taylor 1928, p. 142), sexual plants of which apparently have not been reported. It is, perhaps, a parallel species, or at least a variety, Pacific in range.

ECUADOR: Archipiélago de Colón, on rocks exposed at low tide, Pta. Albemarle, I. Isabela, *no. 34-114* (cystocarpic), 12 Jan. 1934. *Ibid.,* on intertidal rocks at Black Beach Anchorage, I. Santa María, *no. 34-266* (tetrasporic, *TYPE*), 18 Jan. 1934.

[88] Gelidium pusillum v. pacificum n. v.—Plantae rhizomatosae, constantes e hapteris et laminis tenuibus lanceolatisque, 1-2 cm long. ad 1.5-2.0 mm lat., a margine aut apice proliferentibus; tetrasporangiis in soris rotundatis prope partem extremam laminae; cystocarpis singulis in laminis parvis fertilibus, secundum marginem distalem laminarum brevium vegetativarum magna ex parte orientibus. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-266,* 18 Jan. 1934.

v. cylindricum n. v.[89]

Plate 5, Fig. 1

Plants small, creeping, the prostrate axes terete, 75 μ diam., bearing on the upper side single or more or less clustered erect branches which if sterile are generally thin, flat, ligulate to spatulate, 1-3 mm long, 0.2-0.5 mm broad, but if potentially fertile may elongate as terete filaments 75 μ diam., to 1.3 cm long; growth from a single apical cell; axis in section simple with a medulla of thicker-walled colorless cells, and 1-2 layers of cells bearing chromatophores constituting a cortex which in surface view shows cells in no regular order; tetrasporangial branchlets flat, occasionally sessile, oval and 0.6 mm long, 0.24 mm broad, or more commonly on terete stalks about 75 μ diam., to 1.2 cm tall; tetrasporangia scattered irregularly throughout the sporangial area, young and old intermixed.

This small form agrees in general with the smaller phase of this plant as described by Feldmann and Hamel (1936, p. 236), but the tetrasporangial blades, very small, are most commonly on long stalks.

ECUADOR: Esmeraldas, dredged in 5.4 meters near the northeastern side of Bahía San Francisco, *no. 34-490C (TYPE),* 11 Feb. 1934.

Gelidium isabelae n. sp.[90]

Plate 5, Figs. 8-12

Plants small, creeping, dull purplish, the branching rhizome 160-250 μ diam., terete or a little compressed, irregularly and closely bearing discoid haptera or erect, flat, stipitate foliar branches which are ligulate to spatulate or lanceolate, obtuse, simple or occasionally sparingly pinnately branched, 0.2-1.0 cm tall, in texture rather more fleshy than usual in small gelidia, growing from a distinct apical cell, the surface cortical cells rounded, in no regular order; rhizines present in the subcortical region; tetrasporangia rounded, in sori in the upper ends of ordinary branches, in no definite arrangement.

[89] Gelidium pusillum v. cylindricum n. v.—Plantae rhizomatosae, laminis sterilibus singulis aut fasciculatis, erectis, ligulatis ad spatulatas, tenuibus, 1-3 mm long., 0.2-0.5 mm lat.; ramis tetrasporangialibus sessilibus aut plerumque in stirpibus teretibus, circa 75 μ diam., ad 1.2 cm long., partibus extremis planis ovatisque, ad 0.6 mm long., 0.24 mm lat. Planta typica in loco dicto Bahía San Francisco, Esmeraldas, Ecuador, legit W. R. Taylor *no. 34-490C,* 11 Feb. 1934.

[90] Gelidium isabelae n. sp.—Plantae parvae, rhizomatosae, rhizomate tereti aut paululum compresso, ferente haptera atque laminas erectas, stipitatas, ligulatas ad spatulatas aut lanceolatas obtusaque, 0.2-1.0 cm alt., in textura quasi firme carnosas; tetrasporangiis in soris in partibus superioribus ramorum ordinariorum. Planta typica in loco dicto Pta. Albemarle, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-121,* 12 Jan. 1934.

These plants when dry distinctly show decussate lines on the blade surface, but on examination proved to be sterile and the surface cells show little suggestion of a structural basis for this. The tetrasporangia are definitely irregularly placed. The firm rather than membranous structure and simple form of these plants distinguish them from similar species.

COLOMBIA: Chocó, in a mixed growth of dwarf filamentous algae, Bahía Utria, *no. 34-504,* 14 Feb. 1934. ECUADOR: Archipiélago de Colón, on rocks at Pta. Albemarle, I. Isabela, *no. 34-121* (tetrasporic, *TYPE*), 12 Jan. 1934.

Gelidium crinale J. Agardh

Farlow 1902, p. 95.

Reported from I. Santa María on the basis of Piccone 1889, p. 39.

Gelidium galapagense n. sp.[91]

Plate 5, Figs. 2-6

Plants dark purplish, nitent, with short creeping terete rhizomes forming short haptera on the under side and foliar branches above; erect foliar branches reaching a height of about 1 cm, terete at the base, flattened above, simple to irregularly marginally branched, the branches short, sometimes redivided; axis growth from a distinct apical cell, in section with a few rhizines visible in the outer part of the colorless medullary region of the stem; the fertile branchlets contracted at the base, irregularly palmately expanded or digitately divided above; tetrasporangial sori in branch tips or occupying the whole extent of small branches, the sporangia in no definite order.

This interesting little species is chiefly distinguished by the highly irregular tetrasporangial branchlets, which are fanlike to irregularly digitate.

ECUADOR: Archipiélago de Colón, forming a close growth on rocks south of Banks Bay, I. Isabela, *no. 34-130* (tetrasporic, *TYPE*), 13 Jan. 1934.

91 Gelidium galapagense n. sp.—Plantae parvae, rhizomatosae, ferentes haptera et ramos erectos foliares, circa 1 cm long., infra teretes, supra planos, simplices aut in margine irregulariter ramosos; soris tetrasporangialibus in cacuminibus ramorum, aut ramulos totos occupantibus, ramis fertilibus, palmate expansis aut digitate divisis. Planta typica in loco dicto Banks Bay, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-130,* 13 Jan. 1934.

Gelidium sclerophyllum n. sp.[92]

Plate 5, Fig. 13; Plate 33, Fig. 2

Plants small, from a creeping base erect 1-2-pinnate branches arising to 1-3 cm in height, the linear branches compressed above to 0.5 mm in width, terete below, texture corneus; in transverse section showing a row of large very thick-walled cells spaced at intervals across the width of the blade, these separated and surrounded by close-packed rhizines which become more scattered in the inner cortex where the colored cells appear, but no large thin-walled cells present in the medulla; tetrasporangia, young and old intermixed, occupying the central area of small stipitate lateral or terminal branchlets, the margin sterile and thicker when dry, the tips deeply indented; cystocarps generally near the ends of acute-tipped lateral branches, bilocular with a median septum and swollen on both faces.

This little plant shows most extraordinary sectional structure for the genus. It is one of several which make the histological distinction between *Pterocladia* and *Gelidium* a character which is, when considered alone, often undecisive. Howe's *G. caloglossoides* (1914, p. 96, pl. 34, fig. 7, pl. 35) shows structural similarity, but quite different branching habit.

Costa Rica: Golfo Dulce, on the under side of rocks, stunted, *no. 39-99,* 26 Mar. 1939. Ecuador: Esmeraldas, dredged in 5.4 meters of water with corallinae near the northeastern side of Ba. San Francisco, *no. 34-489* (cystocarpic and tetrasporic, *TYPE*), 11 Feb. 1934. Guayas, Pta. Santa Elena, Schmitt *no. 517,* 17 Sept. 1926.

Gelidium densum Gardner

Gardner 1927, p. 278, pl. 47, fig. 1, pl. 48.

These plants are somewhat smaller, more delicate, and more dense in the terminal branching than Gardner illustrates, but are interpreted as an extreme form of the species. Rhizines were clearly present in the sub-cortex.

México: Baja California, on the shore of South Bay, I. Cerros, *no. 34-640,* 10 Mar. 1934.

[92] Gelidium sclerophyllum n. sp.—Plantae parvae, rhizomatosae, ramis erectis 1-2-pinnatis, 1-3-cm altitudine, linearibus, supra compressis, ad 0.5 mm lat., infra teretibus, textura corneis; tetrasporangiis centrum ramulorum parvorum, lateralium aut terminalium, stipitatorum occupantibus, cacuminibus profunde indentatis, marginibus sterilibus; cystocarpis bilocularibus plerumque prope partes extremas ramorum lateralium acuminatorum. Planta typica in loco dicto Ba. San Francisco, Esmeraldas, Ecuador, legit W. R. Taylor *no. 34-489,* 11 Feb. 1934.

Gelidium cartilagineum (Linnaeus) Gaillon, v. **robustum** Gardner

Gardner 1927, p. 280, pl. 54; Smith 1944, p. 197, pl. 43, fig. 4.

MÉXICO: Baja California, on rocks near South Bay, I. Cerros, *no. 34-639,* 10 Mar. 1939. *Ibid.,* rare on rocks at Ba. Thurloe, Pto. San Bartolomé, *no. 34-617,* 9 Mar. 1939.

Gelidium Hancockii n. sp.[93]

Plate 34, Figs. 1, 2

Plants to 25 cm tall from a small fibrous, somewhat flagelliferous base, the erect axes sparingly to freely 1-2 times alternately divided, especially below, virgate, compressed, to 2-3 mm broad, below becoming naked but roughened by scars of fallen lateral branches; determinate branchlets closely alternately to suboppositely placed along the margins of the chief axes, once, seldom twice pinnate, generally only about 1.5 cm long, the ultimate branchlets ligulate, minutely but sharply aculeate-serrate, 1-3 mm long; in section clearly showing rhizines in the subcortex; tetrasporangial sori occupying the central area of the fertile ultimate branchlets, leaving a narrow sterile serrate margin.

These plants are rather more coarse than some from Copacabana determined with some reservations by Setchell and Gardner as *G. seminudum* J. Agardh, which otherwise seemed superficially identical. However, on examination of the branchlets with a lens the serrate character was very striking, and a certain distinguishing feature. Howe's *G. crispum* (1914, p. 94, pl. 33, pl. 34, figs. 1-6) is a smaller, bushy plant more repeatedly pinnate and with relatively flatter axes. From the other West coast species, *G. filicinum* Bory, also found in the Galapagos, these specimens are distinguished by the absence of a bushy pyramidal habit of branching, and much greater coarseness, as well as details of branch form. Material from Payta, Peru (*Hassler* Exped. *nos. 79, 112*), both tetrasporic and cystocarpic, was available for comparison. Specimen *no. 34-215* is much more slender and more amply branched in the first and second degrees than the other, but on the branches of the last degree the branchlets are similar to those on the coarser specimen. Farlow (1902, p. 95) reported plants from I. Wenman under the name of *G. serrulatum* which

93 Gelidium Hancockii n. sp.—Plantae ad 25 cm altitudine, basi fibrata, axibus erectis 1-2-alterne ramosis, virgatis, compressis, ad 2-3 mm lat., infra nudescentibus; ramis determinatis conferte alternis ad suboppositos secundum margines axium primariorum, 1-2-pinnatis, circa 1.5 cm long., ligulatis, minute acuteque aculeato-serratis; soris tetrasporangialibus superficiem centralem ramulorum fertilium, intra marginem serratum sterilemque occupantibus. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-218B,* 17 Jan. 1934.

may belong to the present species. They have the very marked excurrent main axis, without large lateral branches, which is very different from the spreading *G. serrulatum* of Caribbean waters.

Ecuador: Archipiélago de Colón, occasional on rocks in the littoral near Black Beach Anchorage, I. Santa María, *no. 34-218B* (tetrasporic, *TYPE*), *no. 34-215* (tetrasporic), 17 Jan. 1934.

Gelidium filicinum Bory

Bory 1828, p. 162; Farlow 1902, pp. 95, 96.

The specimens being fragmentary, this determination should be regarded with some caution, but comparison with Peruvian specimens of *G. filicinum* and Trinidadian specimens of *G. serrulatum* J. Ag., both of which Farlow reported from the Galapagos, indicates that these fragments probably belong to *G. filicinum,* as do likewise the specimens from I. Isabela in the Stanford University herbarium, on which Farlow based his record. The specimens he called *G. serrulatum* from I. Wenman have few main lateral branches and broader midribs. Howe (1914, p. 97) also reported *G. filicinum* in turtle stomachs, though with some doubt.

Ecuador: Archipiélago de Colón, fragments in abundance taken from the stomach of a marine turtle secured in an inland salt-water pool which was apparently devoid of vegetation, but probably had an underwater communication with the sea, I. Fernandina, *no. 34-157* (tetrasporic), 14 Jan. 1934.

PTEROCLADIA J. Agardh, 1852

Small plants, to plants of moderate size, generally considerably branched, slender and firm; structurally generally showing rhizines in the central part of the medulla but none, or fewer, in the subcortex; tetrasporangia in sori, formed progressively from near the apex, generally in rows; cystocarps with a single loculus, discharging from a pore on one side of the fertile branchlet.

KEY TO SPECIES

1. Plants turflike, small, about 1 cm tall . . . . P. musciformis
1. Plants tufted, much taller 2
2. Branches flat, almost membranous 3
2. Branches compressed, but rather thick and firm . . P. mexicana
3. Branchlets relatively slender, main axes to 1.5 mm wide; bushy, closely branched plants . . . . P. Okamurai
3. Branchlets broadly obtuse, main axes to 2.5 mm wide; rather more sparingly branched plants . . . . P. robusta

Pterocladia musciformis n. sp.[94]

Plants forming mosslike turfs about 1 cm tall, with decumbent filiform rhizomes 80-100 μ diam., which at intervals bear short, stout, little-expanded lateral branches on the lower side and on the upper erect foliar branches which are at first subcylindrical, later, above, linear oblanceolate and to 5-8 mm long, 220-450 μ broad; foliar branches irregularly to marginally sparingly pinnately branched, the branches similar to the primary blade; growth by an apical cell, the axes and blades structurally showing rhizines in the central medullary tissue; surface cells angular, 4-6 μ diam., not longer than broad; tetrasporangial sori sometimes in simple blades, more often in apically palmate to subpinnately branched blades with separate sori in each division; sori showing spores produced in decussate rows, those rows near the apex younger than those more basal, in old sori all spores discharged and the sorus area becoming perforate; sexual reproduction not observed.

These plants considerably resemble Bornet's *Gelidium melanoideum* (Feldmann & Hamel 1936, p. 232, figs. 15, 16), but the blades tend to be more oblanceolate, the rhizines are more conspicuous and show the characters of *Pterocladia,* and the surface cells are not longitudinally elongate. It is notable that in only this species of *Gelidium* where the cystocarps are unknown and the rhizines doubtfully distinctive are the spores reported to be in decussate rows; one anticipates that it may be shown to be a *Pterocladia* also, when the cystocarps are found.

COSTA RICA: abundant on the rocks, much admixed with sand, associated with *Centroceras clavulatum* and *Gelidium pusillum,* Golfo Dulce, *no. 39-106* (tetrasporic, *TYPE*), 26 Mar. 1939.

Pterocladia mexicana n. sp.[95]

Plate 35

Plants to 1 dm tall, very bushy, dark red, firmly fleshy, several branches arising from near the base, these in turn progressively 3-4 times

94 Pterocladia musciformis n. sp.—Planta bryoidea, 1 cm altitudine, rhizomatibus 80-100 μ diam., ramos hapterales foliaresque ferentibus, his infra subcylindricis, supra lineari-oblanceolatis, 5-8 mm long., 220-450 μ irregulariter aut marginaliter pinnate ramosis, rhizinas intra medullam centralem habentibus; soris ferentibus tetrasporangia in ordinibus decussatis prope apicem laminarum fertilium orientibus. Planta typica in loco dicto Golfo Dulce, Costa Rica, legit W. R. Taylor *no. 39-106,* 26 Mar. 1939.

95 Pterocladia mexicana n. sp.—Plantae ad 1 dm altitudine, fruticosae, firme carnosae, singulis ramis primariis 3-4-pinnatis, divisionibus externis complanatis, paululum triangularibus; axibus primariis 1.0-1.2 mm lat., compressis; ramis lateralibus brevibus, in basi nudis, supra pinnatis, ramulis 0.2-0.5 mm lat., paululum compressis; ramulis tetrasporangiatis similibus sed compressioribus quam ramis vegetativis, soris linearibus circa ⅔ latitudinem laminae occupantibus, sporis in ordinibus vix decussatis positis. Planta typica in loco dicto Point Hughes, Cabo San Lazaro, Baja California, México, legit W. R. Taylor *no. 34-601,* 7 Mar. 1934.

pinnately branched, the outer divisions somewhat triangular, complanate, the axis evident to the tip; main axes to 1.0-1.2 mm wide, somewhat compressed; lateral short branches naked at their bases, above pinnately branched, the branchlets 0.2-0.5 mm diam., slightly compressed, tapering slightly from near the rather obtuse apex to the base; in transverse section showing in the younger parts a few rhizines near the angles in the medullary area, and in the older stems many, chiefly central; tetrasporangia in branchlets very little different from the vegetative except that they are a little more compressed, the fertile parts linear, the sorus occupying about two thirds of the width of the branchlet, the spores in many vaguely decussate rows, formed progressively with the growth of the slightly indented apex and discharging in the older regions individually, without producing a macroscopic perforation of the sorus area.

These plants are fleshy rather than wiry, but yet very firm, contrasting with *P. Okamurai* and *P. robusta,* where the branches are much flatter and thinner.

México: Baja California, dredged off Point Hughes on Cabo San Lazaro, *no. 34-601* (tetrasporic, *TYPE*), 7 Mar. 1934.

Pterocladia robusta n. sp.[96]

Plate 36

Plant to 15 cm tall, rather fragile, dull red, except near the base flat throughout, the lower main axes becoming naked, above regularly pinnately 2-4 times branched, the branches strongly contracted at the base, the stronger axes thin, to 1.5-2.5 mm broad, the apices obtusely rounded, particularly in the ligulate to spatulate branchlets.

These plants somewhat resemble *P. tenuis* Okamura (1934, p. 62), but are perhaps coarser and more divided, with less tendency for the ultimate branchlets to be elongate. They are coarser and less abundantly branched than *P. Okamurai,* but no doubt closely related to it.

Ecuador: Archipiélago de Colón, floating offshore at Pt. Christopher, I. Isabela, *no. 34-198 (TYPE),* 16 Jan. 1934. *Ibid.,* a few pieces dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-272,* 19 Jan. 1934.

[96] Pterocladia robusta n. sp.—Plantae ad 15 cm altitudine, paululum fragiles, planae, nisi ad basim, axibus infra nudis, supra regulariter 2-4-pinnate ramosis, ramis in basi contractis, tenuibus, 1.5-2.5 mm latitudine, ramulis ligulatis ad spatulatos, cacumina obtuse rotundata habentibus. Planta typica in loco dicto Pt. Christopher, I. Isabela, Ecuador, legit W. R. Taylor *no. 34-198,* 16 Jan. 1934.

Pterocladia Okamurai (Setchell & Gardner) n. comb.

Setchell & Gardner 1937, p. 75, pl. 6, fig. 16, pl. 17, fig. 38.

These plants show a structure and form very close to *P. tenuis* Okamura (1934, p. 62, pl. 29, pl. 30, fig. 3, pl. 33, figs. 1-3), to which genus the original authors hesitated to assign their plants in the absence of cystocarps. They are generally somewhat coarser in the branches. The type locality is I. Clarion, México.

ECUADOR: Archipiélago de Colón, occasional in the littoral near Black Beach Anchorage, I. Santa María, *no. 34-216,* 17 Jan. 1934. *Ibid.,* more regularly pinnately branched with longer primary and secondary axes, *no. 34-218A,* 17 Jan. 1934. *Ibid.,* with branchlets commonly long attenuate and in part intricately congested, *no. 34-268,* 17 Jan. 1934. Salinas, south side of Pta. Santa Elena, Schmitt *no. 5F,* 16 Sept. 1926.

Pterocladia Okamurai (Setchell & Gardner), f. **densa** n. f.[97]

Plate 37, Fig. 1

Younger branches commonly as in the species, but the upper older branches developing much more slender, irregularly placed, densely congested branchlets.

These plants represent a variation which is parallel to *P. densa* Okamura (1934, p. 63, pl. 30, figs. 1, 2, pl. 33, figs. 4-8), considered a separate species by him rather than a form of *P. tenuis* Okam. In the present instance the material attributed to the species *P. Okamurai* shows such variability that specific segregation of these plants would be questionable practice.

ECUADOR: Guayas, on the rocky southeast side of Pta. Santa Elena, Salinas, *no. 34-457 (TYPE),* 8 Feb. 1934.

Dumontiaceae

Plants more or less branched, or plane and entire, commonly soft; the growth from an apical cell but the original axial filament soon obscured, the plants then appearing to have a pseudoparenchymatous cortex and a filamentous, often lacunose, medulla; sporangia zonate or tetrapartite; carpogenic branches of five cells, or sometimes more.

[97] Pterocladia Okamurai, f. densa n. f.—Rami iuniores velut in specie: ramis superioribus, senioribus ramulos multo tenuiores, irregulariter positos, dense congestos formantibus. Planta typica in loco dicto Pta. Santa Elena, Salinas, Guayas, Ecuador, legit W. R. Taylor *no. 34-457 (Type),* 8 Feb. 1934.

KEY TO GENERA

1. Exceedingly gelatinous, irregularly alternately branched, small; sporangia zonate . . . . Dudresnaya
1. Larger and firmer plants, bushy in habit; sporangia tetrapartite . . . . Leptocladia

DUDRESNAYA Bonnemaison 1822

Dudresnaya colombiana n. sp.[98]

Fragments to 5 cm long, at the thickest part to 6 mm diam., branching 1-3 times freely and irregularly, the branches tapering, to 1 mm diam. in the upper divisions, which end in acute tips; very softly gelatinous, easily dissociated by pressure, pale rose pink in color; structurally showing in the finer branchlets an axial filament 12-16 μ diam., at intervals of about 200 μ bearing contiguous whorls of determinate assimilatory branchlets; in somewhat older portions the axial filaments 20 μ diam., surrounded by numerous delicate longitudinal rhizoidal filaments, but near the basal ends this axial filament obscure; assimilatory filaments slightly tapering to their tips and the cells there shorter, oval, 4-7 μ diam.; carpogenic branches present.

COLOMBIA: Valle, a few pieces from I. Gorgona, *no. 34-495C* (cystocarpic, *TYPE*), 12 Feb. 1934.

LEPTOCLADIA J. Agardh, 1892

Plants bushy, repeatedly alternately branched, the branches linear, flat, with irregularly serrate margins and an obscure costa; in section showing an axial cell row surrounded in turn by crowded slender filaments, a pseudoparenchymatous zone and a cortex of anticlinal cell rows; tetrasporangia in sori, tetrapartite; cystocarps subseriate, immersed.

KEY TO SPECIES

1. Branching patent, the main axes vague above, 1-3 mm broad, the branchlets irregular, flat . . . . L. Binghamiae
1. Branching more erect, the main axes soon disappearing, 0.5-1.5 mm broad, the branchlets slender, subfiliform, compressed . L. laxa

[98] Dudresnaya colombiana n. sp.—Fragmenta molissima, ad 5 cm long., 6 mm diam., irregulariter 1-3-ramosa, divisionibus superioribus 1 mm diam., cacuminibus acutis; filamento axiali ad cacumina 12-16 μ diam., posterius 28 μ diam., corticationem rhizoideam, ad basim invisibilem, habente; assimilatoribus ramosis in axe verticillatis, subteretibus, cellulis externis ovatis, 4-7 μ diam. Planta typica in loco dicto I. Gorgona, Valle, Colombia, legit W. R. Taylor *no. 34-495C,* 12 Feb. 1934.

Leptocladia Binghamiae J. Agardh

Setchell 1912, p. 250.

Plants to 17 cm tall from a small cushion-shaped holdfast, in the lower part cartilaginous, subcylindrical, branching nearly to the base, irregularly alternate, with ill-defined main axes, the branches similar and equaling it; above softer in texture, red, flattened, linear, one to occasionally 3 mm broad, the margin irregular and subserrate, the teeth grading into branchlets of indeterminate growth; structurally showing a large central axial cell row with considerable filamentous medulla about it, the inner cortex of large colorless cells, the outer medulla of small cells in rather irregular radial rows.

ECUADOR: Archipiélago de Colón, dredged in 26-55 meters' depth at Tagus Cove, I. Isabela, *no. 34-136,* 13 Jan. 1934. *Ibid.,* dredged at Academy Bay, I. Santa Cruz, *no. 34-308,* 20 Jan. 1934.

Leptocladia laxa n. sp.[99]

Plate 38, Fig. 1

Plants to 12-15 cm tall, gregarious from a small disciform holdfast, almost wiry and blackish red, branching irregularly and alternate, or 2-5 branches arising together, more or less erect, the upper divisions sometimes beset with a few erect spinelike branchlets; terete or slightly compressed, 0.5-1.5 mm in diameter below, 0.3-0.5 mm in the upper divisions; structurally showing a notable axial row of cells with thick walls which becomes 100-150 μ diam., and the cell cavity at first loosely but later densely filled with irregularly longitudinal filaments attached here and there to the cavity wall; the medulla around the axial row showing a zone about 70 μ thick of relatively thin-walled longitudinal filaments of irregular diameters, and outside this a regular pseudoparenchymatous zone 2-3 times as wide of large thick-walled cells about 60 μ diam. in the inner layers, less without; cortex ultimately about 70-125 μ thick, at first of one cell layer, becoming finally a compact tissue of strict anticlinal rows of cells 10-12 μ in lateral diameter, 12-15 μ deep (radially), appearing rectangular in section, about 7-10 cells in each row.

99 Leptocladia laxa n. sp.—Plantae ad 12-15 cm altitudine, gregariae, tenuibus rigidisque, ramificatione irregulariter alterna, erecta, ramis superioribus ramulos spiniformes interdum habentibus; ramis teretibus ad compressos, infra 0.5-1.5 mm lat., supra 0.3-0.5 mm lat.; cellulis ordinis axialis 100-150 μ diam. rhizoideis demum impletis; medulla intus filamentosa, extra parenchymatica, cortice ex ordinibus anticlinalibus 7-10 cellularum, 10-12 μ diam. constante. Planta typica in loco dicto Point Hughes, Cabo San Lazaro, Baja California, México, legit W. R. Taylor, *no. 34-603,* 7 Mar. 1934.

In structure these plants agree in general with *L. conferta* Setchell (1912, p. 252), except that in the writer's authentic specimens of that species no invasion of the axial siphon by filaments appears, nor did it appear in his specimens of *L. Binghamiae* J. Ag. or *L. peruviana* Howe, both larger and flatter species. It is a more delicate plant than *L. conferta,* nearly free from proliferations. A somewhat similar structure is shown by *Cryptosiphonia Woodii* J. Ag. (Phyc. Bor.-Amer. 449; Kylin 1925, p. 14), but the filamentous investment of the axial cell row is more extensive than in our plant, and the outer medulla less clearly parenchymatous, and of relatively smaller cells.

MÉXICO: Baja California, dredged off Point Hughes, Cabo San Lazaro, *no. 34-603 (TYPE),* 7 Mar. 1934.

Rhizophyllidaceae

Plants crustose or erect and bushy; if crustose, structurally with a basal layer supporting a cortex of erect assimilatory filaments, if erect, with an axial strand of longitudinal filaments forming a medulla and radial assimilatory cortical filaments, rather closely united into a firm thallus; tetrasporangia terminal on the corticating filaments; carpogenic branches and auxiliary branches in nemathecia, giving rise to crowded cystocarps.

OCHTODES J. Agardh, 1872

Ochtodes Crockeri Setchell & Gardner

Plants to 15 cm tall, bushy, red, firm in texture, moderately to densely alternately branched, especially densely in the slender tapering upper divisions, where the branching may be subdichotomous; spreading below, but above either spreading or erect; cylindrical throughout or compressed slightly below the forks, about 2 mm diam. near the base, 0.5-1.0 mm in the branchlets, the tips acute; structurally showing growth from an apical cell, developing an axial cell row, generally distinct, which in the lower parts may in places show as one, occasionally two or even three very thick-walled cells in the middle of the pseudoparenchymatous medulla, but this row sometimes little different from the neighboring cells; outer medulla and cortex clearly filamentous, the filaments closely placed, the last divisions radially placed and the outer cells columnar; large refractive (mucus?) cells common in the inner cortex; cystocarps seriate, common on the secondary or lesser branches, strongly laterally projecting, about 0.2-0.6 mm diam.

Setchell & Gardner 1937, p. 92, pl. 25, fig. 48.

The old material from I. Santa María is particularly confusing. No filiform terminal branchlets are present. The branches reach nearly 3 mm diam. throughout the plant and end in crowded subspinescent branch clusters. The histological features show its true nature quite clearly, but its form does not; it probably consists of quite old, abraded, proliferous specimens. Farlow (1902, p. 99) reports *O. filiformis* J. Ag., but the plants probably belong to the present Pacific species. His specimens are ill developed, particularly the fragment from I. Isabela, though those from I. Wenman are better. His material from Iguana Cove, I. Isabela, designated (1902, p. 96) *? Gracilaria rugulosa* is also *O. Crockeri.*

Examination of material from the West Indies in the writer's herbarium, especially Arndt *no. 177* from Haiti, showed 2-6 discolored axial cell rows, and examination of branchlet apices showed tolerably consistently two apparently equal apical cells, which De Toni (1905, p. 2) specifies as a characteristic of the genus. In only a very few cases did it appear possible that there were two apical cells at branchlet tips of the Galapagos material, and no clear case was seen. The highly refractive (mucus?) cells observed in the cortex region of the Galapagos material were not so marked in the Haitian material, but especially in a spermatial piece were abundant in the younger portions, though small and not refractive. They were not recognizable in sections near the base of the plant.

Ecuador: Archipiélago de Colón, on rocks south of Banks Bay, I. Isabela, *no. 34-129,* 13 Jan. 1934. *Ibid.,* intertidal on a rocky reef north of Tagus Cove, *no. 34-160,* 13 Jan. 1934. *Ibid.,* frequent on littoral rocks near Black Beach Anchorage, I. Santa María, *nos. 34-219, 34-260* (cystocarpic), *no. 34-232* (proliferous), 17 Jan. 1934. *Ibid.,* in tide pools, I. Baltra, *no. 34-329,* 22 Jan. 1934.

Squamariaceae

Plants spreading, crustose; partly or nearly completely calcified; structurally generally showing a basal layer of radiating filaments supporting a compact upper layer of erect filaments; sporangia tetrapartite, in nemathecial groups or crateriform conceptacles; spermatangia tufted on paraphysal filaments; carpogenic branches short, lateral on similar filaments; cystocarps small, immersed or superficial.

KEY TO GENERA

1. Tetrasporangia formed in crypts; thallus firm, not calcified . . . . Hildenbrandia

1. Tetrasporangia associated with paraphyses in superficial nemathecia or sori; thallus little or moderately calcified, mostly below 2
2. Cells on the lower side of the thallus in simple or dichotomously branched parallel rows . . . . Peyssonnelia
2. Cells on the lower side of the thallus forming small fan-shaped groups . . . . Cruoriella

HILDENBRANDIA Nardo, 1834

Plants horizontally expanded, widely spreading, the lower side strongly adherent, composed of a horizontal filamentous layer from which arise erect cell rows to form the upper layer of the plant, the whole strongly united to a firm though thin uncalcified crust; tetrasporangia irregular in division or zonate, borne in sunken conceptacles which discharge by a pore.

KEY TO SPECIES

1. Fresh-water streams; thallus very thin, drying rose red H. rivularis
1. Marine species 2
2. Thallus thin, brownish red drying bright to dark rose red; conceptacles relatively shallow with a relatively open pore, the tetrasporangia irregularly divided . . . . H. Prototypus
2. Thallus up to 1-2 mm thick, drying dark purplish red or blackish; conceptacles rather narrow and 200-800 μ deep with a pore 100-150 μ wide; tetrasporangia zonately divided . H. occidentalis

Hildenbrandia rivularis (Liebmann) J. Agardh

Colombia: Chocó, forming a thin red film on rocks in a fresh-water stream above high tide influence, Bahía Utria, *no. 34-505,* 14 Feb. 1934.

Hildenbrandia Prototypus Nardo

Taylor 1937, p. 257, pl. 36, figs. 9, 10.

México: Is. Revilla Gigedo, very abundant on rocks in higher tide pools, Sulphur Bay, I. Clarion, *no. 39-7,* 16 Mar. 1939. Nayarit, on rocks and pebbles in very heavy surf, I. María Magdalena, Las Tres Marías, *no. 39-675,* 9 May 1939. Guerrero, abundant on rocks, White Friars Is., off Ba. Petatlán, *no. 34-563B,* 2 Mar. 1934. Oaxaca, abundant on large granite boulders, intertidal, Ba. Tangola-Tangola, *no. 34-*

561, 28 Feb. 1934. COSTA RICA: abundant on shalelike rock, Port Parker, *no. 39-84,* 25 Mar. 1939. PANAMÁ: on rocks exposed to severe surges, Is. Secas, *no. 39-120,* 26 Mar. 1939. *Ibid.,* on rocks, San Francisco, Panama City, *no. 39-147,* 31 Mar. 1939. COLOMBIA: Valle, on littoral rocks, I. Gorgona, *no. 34-495E,* 12 Feb. 1934. ECUADOR: Archipiélago de Colón, on intertidal rocks, I. Wenman, *no. 34-93 (p.p.),* 11 Jan. 1934. *Ibid.,* on lava in a brackish lagoon, Pta. Albemarle, I. Isabela, *no. 34-95A,* 12 Jan. 1934. *Ibid.,* intertidal on rocks, Ba. Cartago, I. Isabela, *no. 34-352C,* 25 Jan. 1934. *Ibid.,* abundant on water-worn lava rock fragments in tide pools, I. Baltra, *no. 34-328,* 22 Jan. 1934. *Ibid.,* on intertidal rocks on an islet in Gardner Bay, I. Española, *no. 34-430,* 31 Jan. 1934.

Hildenbrandia occidentalis Setchell

Setchell in Gardner 1917, p. 393, pl. 33, fig. 4; Smith 1944, p. 215, pl. 49, fig. 4.

ECUADOR: Archipiélago de Colón, on intertidal rocks, I. Wenman, *no. 34-93 (p.p.),* 11 Jan. 1934.

PEYSSONNELIA Decaisne, 1841

Plants crustose or subcrustose, little to considerably calcified, forming expansions over the substratum or marginally free, attached by the entire surface of the lower layer or by rhizoids; basal layer of radiating filaments, simple or dichotomously branched, forming parallel rows, the upper or perithallus layer of ascending to erect filaments borne upon these; erect filaments simple or sparingly dichotomously branched, closely laterally united; reproductive organs in nemathecia of unconsolidated filaments or of specialized paraphyses on the upper surface; sporangia tetrapartite, associated with paraphyses; spermatangia lateral on the free filaments; carpogenic branches four or five celled, lateral on the bases of the free filaments, after fertilization uniting by oöblast filaments with auxiliary cells formed by other filaments, and there producing scattered gonimoblasts of eight to twelve large carposporangia.

KEY TO SPECIES

1. Thallus lightly calcified, chiefly below; thin and relatively lightly attached to the substratum . . . . P. rubra
1. Thallus considerably calcified; much thicker and more firmly attached to the substratum 2

2. Light chalky pink when dry; about 150 μ thick; hypothallus cells in tangential section low; sporangia over 85 μ long . P. clarionensis
2. Brownish or yellowish when dry; to 450 μ thick; hypothallus cells in tangential section tall; sporangia under 85 μ long P. calcea

Peyssonnelia rubra (Greville) J. Agardh, *prox.*

MÉXICO: Is. Revilla Gigedo, frequent as dredged from 37 meters' depth at sta. 132, Braithwaite Bay, I. Soccoro, *no. 34-40B,* 2 Jan. 1934. *Ibid.,* dredged from 58 meters' depth off Sulphur Bay, I. Clarion, at sta. 136, *no. 34-62,* 5 Jan. 1934. *Ibid.,* dredged from 92 meters' depth at sta. 137, *no. 34-75,* 5 Jan. 1934. *Ibid.,* dredged from 50-75 meters' depth at sta. 917, *no. 39-27,* 16 Mar. 1939. *Ibid.,* dredged from 46 meters' depth at sta. 919, *no. 39-35,* 17 Mar. 1939.

Peyssonnelia clarionensis n. sp.[100]

Plants closely crustose, except at the margin, to 2 cm diam. or more, chalky pink when dry, firmly calcified below and brittle; rhizoids numerous; basal layer single, consisting of cells in occasionally branched radial rows, 30 μ long radially, 20 μ wide, and about 22 μ tall, supporting vertical filaments which are once or twice forked below, 9-16 μ diam., the cells of the middle portion about one half longer than broad and rectangular in sectional view, the end cells rounded-hemispherical, 6 μ diam., 4.5 μ tall, the total thickness being about 150 μ; sporangial sori scattered, small, 0.5-0.8 mm diam., the tetrapartite sporangia oval, to 85-133 μ long, 45-60 μ broad, associated with laterally free clavate paraphyses about 125-150 μ long, 10 μ diam. at the top, with elongated cells below, short ones near the end.

MÉXICO: Is. Revilla Gigedo, on fragments of coralline algae dredged at 56 meters' depth at sta. 134 off I. Clarion, *no. 34-74C,* 5 Jan. 1934. *Ibid.,* sta. 137 at 103 meters' depth, *no. 34-68,* 5 Jan. 1934. Probably also: ECUADOR: Archipiélago de Colón, intertidal growing on barnacles, Tagus Cove, I. Isabela, *no. 34-146,* 13 Jan. 1934.

[100] Peyssonnelia clarionensis n. sp.—Plantae crustosae, ad 2 cm diam., bene calcifactae atque fragiles, multa rhizoidea habentes; hypothallo constante ex unico strato cellularum, in ordinibus radialibus dispositarum, 30 μ long., 20 μ lat., 22 μ alt.; perithallo 150 μ crass., constante e filamentis verticalibus, infra 9-16 μ diam., his cellulis 1.5 diam. long., supra circa 6 μ diam., 0.6 plo diam. long.; soris sporangialibus dispersis, 0.5-0.8 mm diam., sporangiis 85-133 μ long., 45-60 μ diam.; paraphyses clavatas 125-150 μ long., 10 μ diam. habentibus. Planta typica in loco dicto I. Clarion, México, legit W. R. Taylor *no. 34-74C,* 5 Jan. 1934.

Peyssonnelia calcea Heydrich, *prox.*

Plant crustose, forming irregular disks more than 5 cm diam., the margin lobed, the surface dull, brownish or yellowish when dry with darker glutinous spots; moderately closely adherent without any free lobes, but readily cracking off the rocky substratum when dry; the lower portion firmly calcified, only the upper perithallus free from lime; thickness to 450 μ, composed of a hypothallus about 60 μ thick including a pronounced lower cuticle, of one cell layer, the cells subequal to much taller than broad, about 30 μ long and the narrowest columnar, 15 μ wide, this layer on the under side covered with very many short, rather straight rhizoids 15 μ diam.; perithallus of cell rows about 15 μ diam., sparingly divided and the cells considerably taller than broad below, but near the surface much more closely divided, the last 2-3 tiers of small cells about 6-7 μ wide and 4-5 μ tall, but the surface layers on some tiers replaced by darker and rounded cells about 12-18 μ diam., rather abundant and giving a characteristic appearance in surface view; sporangia in small sori, red, oval, tetrapartite, 55-72 μ long, 22-35 μ diam.

MÉXICO: Is. Revilla Gigedo, dredged from 37 meters' depth at sta. 132, Braithwaite Bay, I. Soccoro, *no. 34-41,* 2 Jan. 1934.

CRUORIELLA Crouan, 1859

Plant crustose, attached to the substratum by rhizoids on the under surface, the thallus composed of a lower layer or hypothallus and an upper layer or perithallus, the hypothallus of radiating filaments in small fan-shaped groups, the perithallus of erect filaments united by a matrix; sporangia tetrapartite, in sori.

Cruoriella Dubyi Crouan, *prox.*

This material appears to be close to, if not identical with, that issued in Phyc. Bor.-Amer. *no. LVII* from Pacific Beach, Calif., as *Peyssonnelia Dubyi.*

MÉXICO: Is. Revilla Gigedo, rare as dredged from 37 meters' depth at sta. 132 off Braithwaite Bay, I. Soccoro, *no. 34-40A,* 2 Jan. 1934. *Ibid.,* rare on coral fragments from tide pools, Sulphur Bay, I. Clarion, *no. 39-8,* 16 Mar. 1939. *Ibid.,* rare on shells dredged from 50-75 meters' depth at sta. 917 off Sulphur Bay, *no. 39-28A,* 16 Mar. 1939. Nayarit, occasional on Lithothamnieae growing on *Porites* coral in littoral pools, I. Isabel, *no. 34-589A,* 3 Mar. 1934.

Corallinaceae

Plants with a thin basal layer from which may be developed a thick crust, a system of rigid branches, or an articulated branch system; structurally multiaxial, calcified except where flexibly jointed; reproductive organs in conceptacles sunken in the crust, sunken in or protruding from the calcified segments, or terminal on enlarged branchlets; tetrasporangia zonate.

It is impossible at this time to give a comprehensive account of the crustose species collected on the 1934 and 1939 Expeditions. Only a few of the most striking and perhaps the most easily identified are, therefore, included. About three-score collections, often including more than one species, have been put aside for future consideration, and there are also many records to be obtained from among the smaller corallines epiphytic on larger algae.

Even in the species given below, the identifications are offered with distinct misgivings. This group of plants has long needed monographic treatment, which has never been attempted for the articulated genera and which, when attempted for the crustose types by Foslie, failed because of his death, leaving only the excellent plates and fragments of text edited by Printz. Since in the crustose genera precise identification generally requires reproducing material of full growth studied in decalcified microtome sections, it is obviously an especially hard group to report upon from the small, often fragmentary collections brought in by pioneering exploratory parties from the field. In most instances, before completely satisfactory determinations can be made, a large bulk of material from each station will have to be studied by comprehensive laboratory methods, and this will have to await leisurely collecting. Further, comparison with type or at least authentic material must be made, and this is impossible in the present disturbed state of the world.

In the crustose genera the keys have been based on the published descriptions of the plants concerned, and only in the case of *Lithophyllum Farlowii,* where the writer's collections are probably the finest in existence, has an attempt been made to amplify these descriptions.

In reporting the articulated genera the writer has particular reason to acknowledge the kindness of the University of California, for the Curator of the Herbarium, Prof. H. L. Mason, has loaned extensive series of these plants for comparison, and without this help little confidence could have been felt in the determinations made.

KEY TO GENERA

1. Thallus not articulated 2
1. Plants with the erect portions flexibly jointed 6
2. Plants larger, crustose, lamellate or branched, but not flexibly jointed 3
2. Plants minute, epiphytic, the conceptacles not surrounded by an evident vegetative crust . . . . Choreonema
3. Crusts small, very thin and fragile, sometimes lightly calcified 4
3. Crusts thicker, either firmly attached to hard substrata or themselves rather massive; often with branched protuberances . 5
4. Tetrasporangial conceptacles discharging by several pores Melobesia
4. Tetrasporangial conceptacles discharging by a single pore Fosliella
5. Tetrasporangial conceptacles discharging through several pores . . . . Lithothamnium
5. Tetrasporangial conceptacles discharging through a single pore . . . . Lithophyllum
6. Fronds with conceptacles all lateral, often numerous, scattered over the segments 7
6. Fronds with terminal conceptacles, at least in part . . . 9
7. Medullary filaments in the segments and in the flexible joints one cell long in each instance . . . . Lithothrix
7. Medullary filaments in each segment several cells long . . 8
8. Medullary filaments in the segments of alternating long and short cells . . . . Amphiroa
8. Medullary filaments in the segments of cells of uniform length . . . . Bossea
9. Branching dichotomous . . . . Jania
9. Branching at least in part pinnate 10
10. Fronds with both terminal and lateral conceptacles . . Joculator
10. Fronds with terminal conceptacles only . . . . . Corallina

ARCHAEOLITHOTHAMNIUM Rothpletz, 1891[101]

Archaeolithothamnium Crosslandi Lemoine

Lemoine 1929, p. 57, pl. 2, figs. 1, 2.

Reported from I. Isabela, Archipiélago de Colón.

[101] With this entry and with similar ones following other genera of coralline algae, the writer introduces those records of Galapagos Islands calcareous marine algae which Lemoine published in 1929 on the basis of collections made by Cyril Crossland during the *Saint George* Expedition in 1924.

LITHOTHAMNIUM Philippi, 1837

Plants crustose, or erect and often branching from a crustose base; structurally of two layers, the basal or hypothallus spreading, the upper or perithallus transversely zonate; sporangial conceptacles soriform, superficial or somewhat immersed, at first separate but later those adjacent fusing, discharging through several pores; cystocarpic conceptacles superficial or slightly immersed, conical or subconical, at first with a projecting tip, discharging by an apical pore.

KEY TO SPECIES

1. Plants crustose, smooth or with warty prominences but without slender erect branches 2
1. Plants with erect branches clearly much longer than broad . 3
2. Plants firmly adherent to the substratum (often loosened by boring animals), with wartlike or irregular short simple excrescences 0.5-2.0 mm diam.; perithallus of subquadrate cells 6-9 μ diam., or cells vertically elongated to 7-14 μ; sporangial conceptacles at first convex, later flattened and hardly prominent, 300-500 μ diam. L. pacificum
2. Plants with a well-developed crust, bearing short simple approximate or coalescing projections 3.5-5.0 mm thick; perithallic cells 7-14 μ tall, 7-9 μ broad; medullary cells 14-20 μ tall, 7-9 μ diam.; sporangial conceptacles convex, flattened or depressed in the central part, 400-800 μ diam. . . . . L. validum
3. Plants enclosing hard objects, or sometimes free, branching relatively sparse but irregularly repeated, sometimes short and congested, often warty, 1-3 mm diam.; medullary cells 14-29 μ long, 9-14 μ diam.; sporangial conceptacles convex or flattened, little prominent, 300-650 μ diam.; cystocarpic conceptacles 400-700 μ diam. . . . . L. indicum
3. Plants free, irregular or subglobose, 0.5-2.5 cm diam.; sparingly repeatedly subdichotomously to irregularly branched, the branches approximate or a little remote, frequently a little tapered, 0.75-2.0 mm diam.; medullary cells 14-36 μ long, 7-14 μ diam.; sporangial conceptacles convex or flattish, moderately prominent, 300-650 μ diam. . . . . L. australe

Lithothamnium pacificum Foslie ?

Foslie 1929, p. 44, figs. 13, 14; Smith 1944, p. 221, pl. 49, fig. 3.

ECUADOR: Archipiélago de Colón, on lava rocks, Pta. Albemarle, I. Isabela, *no. 34-122,* 12 Jan. 1934. *Ibid.,* intertidal pools, I. Baltra, *no. 34-327* (probably f. *crassiuscula* Foslie), 22 Jan. 1934. *Ibid.,* intertidal on I. Bartolomé, near I. San Salvador, *no. 34-343C,* 23 Jan. 1934.

Lithothamnium validum Foslie[102]

Foslie 1906a, p. 10; 1910, p. 38, pl. 12, fig. 13; Setchell & Gardner 1930c, p. 177.

MÉXICO: Guerrero, dredged from 18 meters' depth at sta. 269, Ba. Petatlán, *no. 34-584,* 2 Mar. 1934. COSTA RICA: dredged from 18 meters' depth at sta. 253, Pto. Culebra, *no. 34-537,* 24 Feb. 1934.

Lithothamnium indicum Foslie

Foslie 1907, p. 7; 1904, p. 19, pl. 2, figs. 5-9 (as *L. fruticulosum* f. *clavulata*); Lemoine 1929, p. 42, pl. 3, fig. 1 (var. *subtilis*).

MÉXICO: Is. Revilla Gigedo, dredged from 37 meters' depth at sta. 132 off Braithwaite Bay, I. Soccoro, *no. 34-39* (partly near f. *subtilis* Foslie), 4 Jan. 1934. *Ibid.,* dredged from 62 meters' depth at sta. 134 off Sulphur Bay, I. Clarion, *no. 34-71,* 5 Jan. 1934, and *no. 34-36* (partly near f. *subtilis*), 17 Mar. 1939. *Ibid.,* dredged from 88-110 meters' depth at sta. 918, *no. 39-29,* 16 Mar. 1939. *Ibid.,* drifted onto beach, *no. 34-58,* 5 Jan. 1934. PANAMÁ: dredged from 27 meters' depth at sta. 251 off Is. Secas, *no. 34-521A,* 22 Feb. 1934.

Lithothamnium australe Foslie

Including f. americana Foslie and f. tualensis Foslie

Foslie 1895b, p. 8, figs. 6, 7 (as *L. coralloides* f. *australis*); 1900c, p. 13 (f. *americana* as a *nomen nudum*); 1904, p. 25.

Foslie (1895a, p. 90, pl. 16, figs. 24-31) figured plants from northern Europe as *L. coralloides* f. *australis* and indicated this, with others which he described in Latin, as new forms of the species, *"mscr."* However, he uses the same name (1895b, p. 8, figs. 6, 7) for a plant from "California,"[103] and he finally designates the latter plant as *L. australe* f.

[102] However, see Setchell & Mason 1943, p. 94, who discard this name.

[103] Actually, the Gulf of California, according to a later paper (1904, p. 25).

americana (1900b, p. 13), but without differentiating description. His figures (1895b, *loc. cit.*) are similar to the most slender form of our material. Lemoine (1929, p. 43 as *Mesophyllum australe*) recognized two variants of *L. australe* from I. Coiba, Panamá, namely v. *minutula* and v. *tualensis,* which Foslie had described as *formae* from the western Pacific (Foslie 1904, p. 24, pl. 2). The species as originally described (Foslie 1895a, *loc. cit.*) showed segments which were relatively long and slender, resembling Dawson's (1944, pl. 56, figs. 5-7, 9) material in part, but the writer had none so slender, and none like f. *brachiata* Foslie (1904, pl. 2, figs. 25-38), which Dawson felt corresponded to some material from the Gulf of California which he had collected. Rather, that recorded here varies, portions approaching f. *americana and others* approaching f. *tualensis* Foslie (1904, p. 24, pl. 2, figs. 10-17). Dawson also had this plant (*loc. cit.* pl. 57, figs. 14-16). The writer did not find anything corresponding to f. *minutula* Foslie (1904, p. 24). Curiously, the f. *americana* is omitted from the posthumous work edited by Printz (Foslie 1929, p. 39, pl. 17), although the later-described forms are included.

México: Is. Revilla Gigedo, dredged in abundance from 37 meters at sta. 132, Braithwaite Bay, I. Soccoro, *no. 34-37A* (mostly f. *tualensis*), 2 Jan. 1934. *Ibid.,* dredged sparingly from 63 meters at sta. 134, Sulphur Bay, I. Clarion, *no. 34-73,* (mostly f. *americana*), 5 Jan. 1934. *Ibid.,* rare as dredged at sta. 917 from 50 meters' depth, *no. 39-25* (near f. *tualensis*), 16 Mar. 1939. *Ibid.,* rare as dredged from 36-38 meters at sta. 919, *no. 39-37* (near f. *tualensis*), 17 Mar. 1939. Nayarit, rare as dredged from 22 meters' depth at sta. 970, off I. María Magdalena, Las Tres Marías, *no. 39-643B,* (near f. *tualensis*), 9 May. 1939. Panamá: dredged at Bahía Honda, *no. 34-511A* (a little f. *americana,* mostly f. *tualensis*), 22 Feb. 1934. *Ibid.,* dredged from 27 meters' depth at sta. 251 off Is. Secas, *no. 34-521B,* 22 Feb. 1934.

Lithothamnium Cottoni Lemoine

Lemoine 1929, p. 57, pl. 2, fig. 8.
Reported from I. Isabela, Archipiélago de Colón.

Lithothamnium pocillum Lemoine

Lemoine 1929, p. 58, pl. 2, fig. 8.
Reported without definite locality from the Archipiélago de Colón.

MELOBESIA Lamouroux, 1812

Plants crustose, completely attached to the support, composed of but a single layer of cells, or of but few layers, and thickest in the neighborhood of the conceptacles; tetrasporangia zonate, in conceptacles with several pores; spermatangia in conceptacles, lateral on two-celled filaments distributed over the bottom of the cavities; cystocarpic conceptacles conical, prominent.

Certain of the species included below were originally described in the subgenus, or genus, *Heteroderma* (Foslie 1900c, p. 21; 1905c, p. 102; 1905d, p. 8; 1909, p. 56), but the unsubstantial character of the distinctions ascribed to this genus are pointed out by Rosenvinge (1917, p. 237). Lemoine (1929, p. 59) uses the genus *Epilithon* for these species, which Foslie also used (1909, p. 55), but that genus is based on the same species as the genus *Melobesia,* which has priority. The species below are quite distinct from the Lithothamniums included here, which are substantially calcified, though they have also been put in that genus (Foslie 1929). Therefore, these three species have been retained in *Melobesia* and the description of the genus relaxed slightly over the form used in describing the Atlantic flora (Taylor 1937, p. 267).

KEY TO SPECIES

1. At most the margin of the frond monostromatic 2
1. Monostromatic over a considerable part of the thallus; monostromatic part with cells quadrate to radially elongated and 7-11 μ long, 6-8 μ broad; sporangial conceptacles 150-250 μ diam., feebly convex or in the center depressed, perforated by 25-50 pores; cystocarpic conceptacles conical, 140-240 μ diam., spermatangial conceptacles 70-100 μ diam. . . . . . . M. galapagensis
2. Near the margin monostromatic; marginal portion with cells 7-11 μ long, 4-7 μ wide, and in section 7-18 μ tall, but between the conceptacles much larger, to 36 μ tall, 14 μ broad; sporangial conceptacles 150-300 μ diam., feebly convex or plane, but slightly elevated, in the center depressed; cystocarpic conceptacles low conical; spermatangial conceptacles 80-100 μ diam. . M. mediocris
2. Plants crustaceous, purplish, small, commonly confluent, lightly calcified and thin, the margin translucent, of two cell layers, the central part to 9 cell layers and 50-100 μ thick; cells of the basal layer 12 μ long, 5-8 μ wide, and as high or higher; the upper cells 6-8 μ diam., up to 10 μ tall; the tetrasporangial conceptacles crowded, sometimes anastomosing, slightly convex, with the central portion of the roof depressed, with numerous pores, diam. 150-200 μ . . . . M. marginata

Melobesia galapagensis (Foslie) n. comb.

Farlow 1902, p. 98 (as *Melobesia corticiformis*); Foslie 1907a, p. 9, (as *Lithothamnion galapagense*); 1909, p. 55 (as *Epilithon galapagense*); 1929, p. 49 (as *L. galapagense*); Lemoine 1929, p. 59 (as *Epilithon galapagense*).

ECUADOR: Archipiélago de Colón, on *Pterocladia,* Black Beach Anchorage, I. Santa María, *nos. 34-216, 34-218A* and *34-268 (p.p.),* 18 Jan. 1934.

Melobesia mediocris (Foslie) Setchell & Mason

Foslie 1900b, p. 5 (as *Lithophyllum zostericolum* f. *mediocris*); 1907b, p. 26 (as *L. mediocre*); Nichols 1908, p. 347, pl. 3, figs. 1-5 (as *Lithothamnion mediocre*); Foslie & Nichols in Foslie 1909, p. 55 (as *Epilithon mediocre*); Setchell & Mason 1943, p. 45; Smith 1944, p. 219, pl. 49, fig. 1.

MÉXICO: Baja California, on sea grasses at Pta. Hughes, Cabo San Lazaro, *no. 34-661,* 7 Mar. 1934.

Melobesia marginata Setchell & Foslie

Setchell & Foslie in Foslie 1902, p. 10; Setchell & Foslie in Nichols 1909, p. 350 (as *Lithothamnion marginatum*).

MÉXICO: Baja California, on *Gelidium,* South Bay, I. Cerros, *no. 34-639 (p.p),* 10 Mar. 1934. ECUADOR: Archipiélago de Colón, on *Pterocladia,* Pta. Cristofer, I. Isabela, *no. 34-198 (p.p),* 16 Jan. 1934. *Ibid.,* on *Pterocladia,* Black Beach Anchorage, I. Santa María, *nos. 34-216* and *34-268 (p.p.),* 18 Jan. 1934. Guayas, on *Pterocladia, no. 34-457 (p.p.),* 8 Feb. 1934.

MESOPHYLLUM Lemoine, 1928

Mesophyllum laxum Lemoine

Lemoine 1929, p. 60, pl. 2, fig. 3.

Reported from I. San Salvador, Archipiélago de Colón.

LITHOPHYLLUM Philippi, 1837

Plants forming calcified crusts, plates, or erect, branching forms; conceptacles partly immersed, hemispheric-conical, with an apical pore; the tetrasporangia with a short stalk, arising from the peripheral basal tissue around a central group of short, paraphysislike filaments.

KEY TO SPECIES

1. Plants with terete erect branches 2
1. Plants showing an extensive basal layer, crustose or bracketlike, to 3-5 mm thick and sometimes several centimeters in diameter, eventually bearing erect platelike extensions to 3 cm tall, 1.3-1.7 mm thick, which join marginally to form a chambered plant with cavities 3-20 mm diam.; conceptacles numerous, but slightly elevated, 450-570 μ diam., formed on both the horizontal and the erect portions of the plant . . . . L. Farlowii
2. Plants remaining attached 3
2. Plants becoming free, the basal crust thin, to about 450 μ thick, enclosing a hard object, bearing short erect divaricate cylindrical branches to 3 mm diam., 3-7 mm long, with somewhat expanded ends; medullary cells 3-10 μ long, 2-7 μ diam.; conceptacles in the ends of the branches, little elevated, 700-950 μ diam. . . . . L. divaricatum
3. Erect branches relatively tall, redivided 4
3. Basal crust thin, about 0.2 mm thick, bearing erect slender branches 0.5-0.75 mm diam., 8 mm tall, or somewhat more if branched, the ends often a little swollen; medullary cells of the branches 7-12, rarely to 20 μ long, 3-9 μ diam. . . . L. bracchiatum
4. Branches commonly much exceeding 2 mm diam. L. amplostratum
4. Branches generally less than 2 mm diam. 5
5. Medullary cells forming alternate wide and narrow zones . . . . L. moluccense v. geminostratum
5. Medullary zones not of contrasting widths 6
6. Basal crust bearing crowded erect branches 1-2 mm diam., 5-20 mm tall, repeatedly divided and anastomosing; medullary cells 20-35 μ long; perithallic cells 10-15 μ long; in the f. *galapagense* the medullary cells reported to be 27-60 μ long, the perithallic cells 11-22 μ . . . . L. frutescens f. galapagense
6. Basal crust bearing smooth erect anastomosed branches about 1 mm diam., repeatedly divided, 5-20 mm tall, the ends rather truncate; medullary cells 20-40 μ long; conceptacles to 450-500 μ in internal, 800 μ in external diameter . . . L. trichotomum

Lithophyllum Farlowii Heydrich

Plates 39-42

Heydrich 1901a, p. 532, pl. 11, fig. 6; 1901b, p. 420 (as *L. claudescens*); Lemoine 1929, p. 61, pl. 1, fig. 3, pl. 2, fig. 5 (as *L. claudescens*); Setchell & Mason 1943, p. 95.

The growth habit of this beautiful species is very striking, but not unique. In its earlier stages it is represented by parallel forms in both *Lithophyllum* and *Lithothamnium,* in which latter genus *L. lichenoides* f. *agariciformis* (Johnst.) Foslie (1929, p. 43, pl. 11, fig. 9) has a very close superficial resemblance. In *Lithophyllum* the closest similarities are seen in *L. expansum* Phil. (Mediterranean), *L. decussatum* (Ell. & Sol.) Phil. (Mediterranean) and *L. Diguetii* (Hariot) Heydrich (Gulf of California). The latter appears to be a smaller plant, with little tendency to form chambers when mature; but, if it should prove to be a reduced northern form of the plant here under consideration, the name *Diguetii* has priority of about six years (Hariot 1895, p. 168).

This *Lithophyllum* grows on rocks in the surf near low tide line, and the primary thallus forms a cap on top of a rock, or projects as a bracket along its edge. In its primary stage it is more or less horizontal, similar in aspect to a bracket-fungus. The edge is subsimple to irregularly crenate, the surface flat to undulating, smooth but dull, the lower surface white, the upper more roseate. It may increase to a radius of 3-8 cm or even more before developing any chambers, and may become abundantly fertile, with the conceptacles chiefly on the under surface. Then erect projections occur on the upper surface, terete and tapering or ligulate, and these, at first scattered, become broader and flatter and meet, though they reach a centimeter or more in height before continuity is achieved, and the height of the upper margins of the chambers is by no means uniform. The thallus may reach a height of 6 cm, perhaps more, and a diameter of 15 cm or more; but, since these measurements were made upon specimens in the laboratory and since it is extremely difficult to remove the large ones intact from the rocks, it is probable that they become much broader. The chambers vary a great deal in size and in shape. They may be from 3 mm to 20 mm in diameter, most commonly somewhat less than 10 mm. They may reach a depth of 3 cm, but in thicker thalli they are commonly constricted or cut off by more or less complete secondary horizontal septa, so that a clear depth of the whole thickness to the horizontal layer is rarely seen in these larger specimens. While the growth of the chambers is entirely discontinuous in early stages, in large individuals they seem to start with more continuous ridges near the margin and to rise gradually, though even in old plants separate submarginal ligulate projections are common. The horizontal thallus may reach a thickness of 3-5 mm in the earlier growth phase, but in old plants it commonly disappears from the central portion, probably by the action of penetrating algae and worms, leaving a complex irregularly perforate mass. Occasionally near the overhanging edge pendant, as well as erect blades, are formed. Old thalli may be mechanically eroded from the upper surface also, and smoothed to comparatively uniform level. Here the thickness of the vertical septa is seen to be about 1.3-1.7 mm. The conceptacles are developed on the vertical portions as well as on the horizontal ones of this plant. They are most abundant on that side of the chamber which faces toward the outer margin of the plant, but probably not so abundant there as on the horizontal portion. They are about 450-570 μ diam., very little elevated, with a very small central pore; when decorticated the cavity appears to be about 300-450 μ diam.

ECUADOR: Archipiélago de Colón, horizontal-stage plants with a few erect projections occasional near low tide line, Tagus Cove, I. Isabela, *no. 34-176,* 13 Jan. 1934. *Ibid.,* abundant plants in all stages of development near low tide line in the surf on rocks, Black Beach Anchorage, I. Santa María, *no. 34-233,* 17 Jan. 1934. *Ibid.,* horizontal-stage plants occasional near low tide line on an islet in Gardner Bay, I. Española, *no. 34-431,* 31 Jan. 1934.

Lithophyllum divaricatum Lemoine ?

Lemoine 1929, p. 63, pl. 2, fig. 6.

MÉXICO: Is. Revilla Gigedo, rare as dredged from 36 meters at sta. 132, Braithwaite Bay, I. Soccoro, *no. 34-37B,* 2 Jan. 1934. Guerrero, rare as dredged from 18 meters' depth at Ba. Petatlán, *no. 34-584B,* 2 Mar. 1934. PANAMÁ: washed up on shore, I. Jicarita, *no. 34-507A,* 20 Mar. 1934. ECUADOR: Archipiélago de Colón, Lemoine *loc. cit.*

Lithophyllum bracchiatum (Heydrich) Lemoine

Heydrich 1901, p. 531 (as *L. lithophylloides* f. *bracchiata*); Lemoine 1929, p. 44, pl. 4, fig. 5 (as *L. brachiatum*).

MÉXICO: Is. Revilla Gigedo, abundant from lower tide pools along the shore of Sulphur Bay, I. Clarion, *no. 39-5,* 16 Mar. 1939. *Ibid.,* intertidal at Braithwaite Bay, I. Soccoro, *no. 34-9* (det. ?), 2 Jan. 1934. Nayarit, from crevices in the surf zone, I. María Magdalena, Las Tres Marías, *no. 39-672,* 9 May 1939. PANAMÁ: in tide pools exposed to severe surf, Is. Secas, *no. 39-121* (det. ?), 26 Mar. 1939.

Lithophyllum frutescens (Foslie) Lemoine

Lemoine 1929, p. 63, pl. 2, fig. 4.

Reported from I. Santa Cruz and I. Santa María, Archipiélago de Colón.

f. galapagense Foslie

Foslie 1929, p. 30, pl. 48, fig. 14 (as *Goniolithon frutescens* f. *galapagense*).

The medullary cells ranged to 40 μ long in *no. 34-340* and to 50 μ or a little more in *no. 34-326.*

ECUADOR: Archipiélago de Colón, shores of Ba. Cartago, I. Isabela, *no. 34-352D,* 13 Jan. 1934. *Ibid.,* littoral, in intertidal pools, I. Baltra, *no. 34-326,* 22 Jan. 1934. *Ibid.,* littoral, on the shores of I. Bartolomé, near I. San Salvador, *no. 34-340,* 23 Jan. 1934.

Lithophyllum trichotomum (Heydrich) Lemoine

Heydrich 1901, p. 538 (as *Lithothamnion trichotomum*); Lemoine 1929, p. 45; Dawson 1944, p. 267, pl. 58, figs. 1, 4-6.

For the aspect of this plant one has only the figures which Dawson gives, but fig. 1 *(loc. cit.)* is of type material. Foslie's monograph does not mention this species name. Size of the cells is a feature depended on to distinguish this from *L. bracchiatum,* which Lemoine (1929, p. 44) also records from Panamá, but which has cells about half as long, or less; in this material they reach 40 μ.

MÉXICO: Is. Revilla Gigedo, from tide pools along the shore of Sulphur Bay, I. Clarion, *no. 39-47A,* 17 Mar. 1939.

Lithophyllum amplostratum n. sp.[104]

Plate 43

Plants moderately large, forming clumps several centimeters in diameter and 2-4 cm thick; basal crust thin, commonly destroyed; erect branches moderately crowded, below freely anastomosing, above free, irregularly and erectly branched, the branches 2-6 mm diam., little tapered, the ends blunt; conceptacles crowded on the outer segments, slightly elevated, appearing 180-200 μ diam. and with a single pore; in section tetrasporangial conceptacles deeply immersed, oval, about 160 μ deep, 320 μ wide; perithallus thin, of few cell layers, cells 8-14 μ diam., 10-20 μ long; medulla very evenly and conspicuously zonate, the zones one cell deep, of somewhat varied thickness, rarely only 50 μ, generally 85-255 μ thick, of cells 8-13 μ diam.

[104] Lithophyllum amplostratum n. sp.—Plantae botryones aliquot cm diam., 2-4 cm crass. formantes; copiose irregulariterque ramosae, ramis teretibus obtusisque erectis, 2-6 mm diam.; perithallo tenui, cellulis 8-14 μ diam., 10-20 μ long.; medulla manifeste zonata, zonis crassitudine unius cellulae, cellulis 8-13 μ diam., 50-225 μ long. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-234A,* 17 Jan. 1934.

These plants somewhat resemble some forms of *L. pallescens* of the Gulf of California, and more strongly *L. Kostchyanum* of the Persian Gulf and *L. praetextatum* of Easter Id. (Foslie 1929, p. 37), but in these species the cells of the medulla are very much shorter than those in this Galapagos plant. In it they are conspicuously elongate, even about 15 times as long as wide. The zones they form are not of the same width throughout, but while they vary a good deal they do not alternate broad and narrow in any regular pattern. Long cells approaching this are found in the lamellate *L. decussatum* (Lemoine 1911, p. 139, fig. 69) and the slender terete branched *L. byssoides* (Lemoine 1911, p. 132, fig. 64), but are by no means equally long.

ECUADOR: Archipiélago de Colón, in intertidal pools, occasional at Black Beach Anchorage, I. Santa María, *no. 34-234A (TYPE),* 17 Jan. 1934.

Lithophyllum moluccense Foslie, v. **geminostratum** n. var.[105]

Plate 44

Plant with a thin crustose base, but the crust commonly destroyed, bushy above, forming masses a few centimeters in diameter; erect branches moderately crowded, to about 2-3 cm tall, irregularly dichotomously branched, terete and 0.75-2.50 mm diam., or occasionally fasciate-complanate and 2-3 mm wide, below frequently anastomosing, above the apices blunt; conceptacles crowded on the sides of the outer segments, only very slightly convex, about 200 μ diam., with a single pore; in section (apparently spermatangial) conceptacles immersed, 170-200 μ diam., the height about 40-60 μ, the floor flat, the roof moderately arched; perithallus of cells 5-6 μ diam., 6-10 μ long, in moderately regular layers; medulla notably and regularly zonate, each zone one cell thick, the broader zones alternating with 1-2 narrower ones, composed of cells 6-9 μ diam., 20-115 μ long.

This plant seems to be related to *L. moluccense* Foslie. It shows considerable superficial resemblance to the f. *pygmaea* (Heydrich) Foslie (1904, p. 67, pl. 12, figs. 7, 12-13). Structurally it shows alternating bands of very long and shorter cells described for *L. moluccense* (Foslie 1904, p. 67, fig. 26; Lemoine 1911, p. 135, figs. 65-67), but the alterna-

105 Lithophyllum moluccense Foslie v. geminostratum n. var.—Plantae botryones paucorum cm diam., 2-3 cm crass. formantes; copiose irregulariterque dichotome ramosae, ramis teretibus obtusisque, 0.75-2.50 mm diam.; cellulis perithalli 5-6 μ diam., 6-10 μ long.; medulla notabiliter irregulariterque zonata, zonis latis atque duabus angustis plerumque alternantibus, cellulis 6-9 μ diam., 20-115 μ long. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-234B,* 17 Jan. 1934.

tion is not a simple one, consisting of one broad band followed by a narrow band. However, Foslie (1904, p. 69, fig. 26B) discounts this somewhat by indicating that the bands may not be so distinctive. In our material they likewise may be subequal, but much more generally a broad band alternates with two subequal bands of about one third the width. As phases of variation one finds a simple 1:1 alternation, and cases where there were the two narrow bands, but one only half as wide as the other. Since the external form is so like *L. moluccense* and the definable differences are histological, the writer prefers to treat this as a variety of the species even though geographically isolated.

ECUADOR: Archipiélago de Colón, in intertidal pools, occasional at Black Beach Anchorage, I. Santa María, *no. 34-234B (TYPE),* 17 Jan. 1934.

Lithophyllum complexum Lemoine

Lemoine 1929, p. 60, pl. 2, fig. 7.

Reported without definite locality from the Archipiélago de Colón.

Lemoine (1929) described some 17 new species of Corallinaceae from the Galapagos Islands. Of these the writer can list but few here from his own collections; this is probably due to the fact that the simpler crustaceous corallines are for the most part still unstudied. The entries on Mme Lemoine's authority are therefore important for the completeness of this report.

Lithophyllum alternans Lemoine

Lemoine 1929, p. 64, pl. 1, fig. 3, pl. 2, fig. 9.

Reported from I. San Salvador and I. Santa María, Archipiélago de Colón. By Setchell and Mason (1943, p. 88) removed to *Goniolithon.*

Lithophyllum sancti-georgei Lemoine

Lemoine 1929, p. 66, pl. 4, fig. 2.

Reported from I. Isabela, Archipiélago de Colón.

Lithophyllum intermedium Foslie

Lemoine 1929, p. 66, pl. 1, fig. 3, pl. 2, fig. 3, pl. 3, fig. 6, pl. 4, fig. 7.

Reported from I. Isabela, I. San Salvador, I. Santa Cruz, and I. Santa María, Archipiélago de Colón.

Lithophyllum Rileyi Lemoine

Lemoine 1929, p. 68.

Reported from I. San Salvador, Archipiélago de Colón.

Lithophyllum tessellatum Lemoine

Lemoine 1929, p. 68, pl. 1, figs. 3, 6, pl. 4, fig. 7.

Reported from I. Isabela and I. Santa María, Archipiélago de Colón. By Setchell and Mason (1943, p. 89) removed to *Goniolithon.*

Lithophyllum mutabile Lemoine

Lemoine 1929, p. 70.

Reported without definite locality from the Archipiélago de Colón.

TENAREA Bory, 1832

Tenarea erecta Lemoine

Lemoine 1929, p. 70, pl. 3, fig. 6.

Reported from I. Isabela, Archipiélago de Colón.

FOSLIELLA Howe, 1920

Plants forming thin, lightly calcified crusts adherent to the substratum, of one to a few layers, the basal of radial cell rows; conceptacles superficial or slightly immersed, rounded conical, with a single pore; sporangia sometimes surrounding sterile central trabeculae; cystocarpic conceptacles similar, smaller.

Fosliella minuta, n. sp.[106]

Plants very small, encrusting, calcified, of irregular form and extent, the margin lobed; thickness about 22-30 μ, of one cell layer, the cells deeper than wide, the breadth being about 18 μ; tetrasporic conceptacles prominent, rounded, with an inconspicuous pore, or later the upper half broken away, diameter 80-100 μ; tetrasporangia 18-22 μ diam., 39-42 μ long, zonately divided.

[106] **Fosliella minuta** n. sp.—Plantae parvae, irregulares, marginibus lobatis; crassitudine circa 22-30 μ, strato uno cellularum 18 μ latitudine; conceptaculis tetrasporicis prominentibus, 80-100 μ diam., ostiolo inconspicuo; tetrasporangiis 18-22 μ diam., 39-42 μ long. Planta typica in loco dicto Pta. Santa Elena, Salinas, Ecuador, legit W. R. Taylor *no. 34-472A (p.p.),* 8 Feb. 1934.

PANAMA: scarce, on *Jania* in lower tide pools, Bahía Honda, *no. 39-133 (p.p.),* 26 Mar. 1939. ECUADOR: Guayas, epiphytic on *Jania,* littoral of the southeast side of Pta. Santa Elena, Salinas, *no. 34-472A p.p. (TYPE),* 8 Feb. 1934.

CHOREONEMA Schmitz, 1889

Plants minute, lightly calcified, of sparse endophytic parasitic monosiphonous branched filaments; pericarps rounded subconical, sessile, the wall of relatively large cells, with an apical pore.

Choreonema Thureti (Bornet), Schmitz, *f.*

Plate 45

Bornet in Thuret 1878, p. 96, pl. 50, figs. 1-8 (as *Melobesia Thureti*); Schmitz 1889, p. 455; Suneson 1937, p. 53, figs. 33-35, pl. 3, figs. 10-12.

These very interesting little plants were found on a few tufts of *Jania ungulata,* and in aspect agree excellently with the figures in Thuret's *Etudes Phycologiques.* The walls of the pericarps seem translucent and little calcified. No study of the reproductive structures was made. Bornet *(loc. cit.)* does not give measurements for the pericarps, but from the scale of his illustrations one may assume that the pericarps are a trifle shorter than broad as a rule, and about 92-128 μ tall, 80-128 μ wide. The present Galapagos material, using only the larger pericarps, gave measurements of 77-91 μ tall, 84-98 μ wide; these measurements, while less than those of the type material, overlap them, and one hesitates to describe these plants as a new species under such circumstances.

ECUADOR: Archipiélago de Colón, endophytic in *Jania,* intertidal on a reef north of Tagus Cove, I. Isabela, *no. 34-169B,* 13 Jan. 1934. Salinas, on *Jania* dredged along the village beach in 2-4 meters' depth, Schmitt *no. 12D-33 p.p.,* 19 Jan. 1933.

LITHOTHRIX J. E. Gray, 1867

Lithothrix Aspergillum J. E. Gray

Fragments showing a main axis of slightly compressed segments about 0.5 mm diam., and about as long, each segment bearing simple subopposite patent to erect branchlets of 0.2-0.25 mm diam., with segments a little longer or shorter than broad, slightly cask shaped, 2-3 mm long, and an occasional branchlet not in the plane or the frond; conceptacles generally in series on one side of a branch, single on each segment, or a second on the opposite side, extremely prominent, 0.18-0.20 mm diam., to 0.25 mm tall, rounded.

J. E. Gray 1867, p. 33, figs. a, b; Anderson 1891, p. 217 (as *Amphiroa Aspergillum*); Manza 1937a, p. 45; Smith 1944, p. 231, pl. 53, fig. 3.

MÉXICO: Baja California, in small amount among tufts of *Corallina*, South Bay, I. Cerros, *no. 34-645B,* 10 Mar. 1934.

AMPHIROA Lamouroux, 1812

Basal part usually a small disk, which bears erect branches di- or trichotomously divided, usually terete, but sometimes flattened or showing a thicker midrib and a thinner margin, divided into calcified segments alternating with flexible articulations; conceptacles lateral, sunken in the branches, often somewhat projecting.

Suneson 1937, p. 46.

KEY TO SPECIES

1. Branches throughout cylindrical or a little compressed, especially below a fork 2
1. Branches flat above, although the segments very near the base of the plant are commonly cylindrical or only compressed . . 8
2. Plants of various sizes, but the flexible joints not particularly distinctive 3
2. Plants with the flexible joints conspicuous, blackish . . . 7
3. Segments nearly cylindrical throughout, except sometimes below the forks 4
3. Segments commonly compressed, especially below a fork . . . . A. franciscana
4. Conceptacles single on each fertile segment, or at least only one on a side, relatively large . . . . A. minutissima
4. Conceptacles relatively smaller, commonly several in the length of a fertile segment 5
5. Plant with branches reaching only 0.5 mm diam. . . . A. annulata
5. Plant with the upper branches reaching 0.6 mm diam., the lower portions reaching 1.2 mm diam. 6
6. Segments 2-4 diameters long; plants to 4.5 cm tall . A. mexicana
6. Segments 5-7 diameters long; plants to 10 cm tall . A. peninsularis
7. Plants turflike, about 2-3 cm tall . . . . A. galapagensis

7. Plants tufted, to 12 cm tall, much coarser with heavier segments . . . . A. peruana
8. Branches narrow, the segments not broad and foliaceous . 9
8. Branches broader, since the segments become wide and subfoliaceous 11
9. Plants very small, closely branched 10
9. Plants of moderate size, of sprawling habit, the diameter of the compressed branches to 2.0-3.0 mm, the segments often forking very deeply once or even twice between successive articulations, the segments sometimes truncate at the ends, sometimes with a characteristic lunate incision, and the angles at the lower end even auriculate . . . . A. compressa
   9a. Habit more erect, segments 1.0-1.5 mm diam. . . v. tenuis
10. Segments above strongly compressed, reaching 0.4-0.5 mm diam., or at most 0.7 mm at a fork . . . . . . A. Crosslandii
10. Segments terete below, above very irregular, terete or flattened, to 1.0-2.0 mm wide, or even to 3.0 mm below a fork; articulations commonly absent at the forks . . . . . . A. polymorpha
11. Large coarse plants, the segments bearing branches commonly forked, the much-flattened upper branches reaching 2-4 mm in width, most commonly more strongly convex on one side than the other, upon which the conceptacles are borne, but not with a midrib . . . . A. dimorpha
11. Smaller plants, the segments generally showing a distinct midrib when flat and broad, though this may be indistinct when the segments are narrow and linear . . . . A. foliacea

Amphiroa minutissima n. sp.[107]

Plate 46, Fig. 1

Plants 7-10 mm tall, tufted, closely dichotomously branched at angles of 45°-60°, above somewhat complanate; segments terete below, terete or very slightly compressed above, 250-350 μ diam. below, gradually tapering, in the uppermost divisions about 200-250 μ diam., with truncate tips, the flexible articulations very narrow, one cell in length, and the calcified segments very short, 0.6-1.5 diameters in length; medulla with

[107] Amphiroa minutissima n. sp.—Planta ad 1 cm altitudine, arcte dichotome ramosa, segmentis calcifactis teretibus, ad nodum, autem, subcompressis, infra 250-350 μ diam., supra 200-250 μ, 0.6-1.5 plo diam. longitudine; pericarpis prominentissimis, 250-350 μ diam., in quoque segmento plerumque singulis, seriatim in ramo saepe contiguis. Planta typica in loco dicto Golfo Dulce, Costa Rica, coll. W. R. Taylor *no. 39-116C,* 26 Mar. 1939.

4 successively shorter elongate cells preceding each isodiametric cell in each filament, the cells forming transverse zones; pericarps very prominent, hemispherical or higher and commonly contracted a little at the base, 230-350 μ diam., usually one to a segment and often contiguous in series along a branch, occasionally two opposite on a segment.

This tiny species is chiefly notable for the very short strictly cylindrical segments which are hardly indented at the ends, and so, since the flexible articulation is very narrow, are only to be distinguished on close examination. The conceptacles are relatively large and seem to be chiefly superficial on the branch.

Costa Rica: rare, littoral, Golfo Dulce, *no. 39-116C (TYPE),* 26 Mar. 1939.

Amphiroa franciscana n. sp.[108]

Plate 48, Fig. 2; Plate 49

Plants forming close clumps on shells or stones, 1.5-2.5 cm tall from an inconspicuous crustose base, irregularly dichotomously branched at angles of about 60°, with frequent lateral branches, sometimes somewhat erect, at others the branching complanate and reflexed, producing a somewhat rosettelike habit; the segments cylindrical to somewhat compressed, especially below a fork; those supporting a dichotomy club shaped to deeply forked, sometimes twice forked between articulations, sometimes supporting 3 to even 4 branches terminally; diameter of segments below 250-375 μ, near the tips 180-200 μ, length of segments near the tips 1.5-2.35 mm; below 1.12-1.50 mm, but less at the extreme base; where compressed, the thickness one fifth to more often about two thirds the width; conceptacles prominent, about hemispherical, to 250-260 μ diam., most commonly placed along the margins of the compressed branches, to 2-7 on a side; medullary structure showing an alternation of 4 (sometimes 3 or 5) zones of large cells of decreasing length between each zone of very small cells and the next zone above.

México: Nayarit, frequent on large rocks as dredged from 24 meters' depth at sta. 970, I. María Magdalena, Las Tres Marías, *no. 39-643A,* 9 May 1939. Ecuador: Esmeraldas, dredged from 5.4 meters' depth off Ba. San Francisco, *no. 34-484 (TYPE),* 11 Feb. 1934. Guayas, on the southeast side of Pta. Santa Elena, Salinas, *no. 34-471,* 8 Feb. 1934.

108 Amphiroa franciscana n. sp.—Plantae caespitosae, 1.5-2.0 cm altitudine, e basi crustosa orientes, irregulariter dichotomae, ramis lateralibus frequentibus; segmentis cylindricis ad paululum compressa, iis dichotomiam sustinentibus clavatis ad profunde furcata, diametro infra 250-275 μ, supra 180-200 μ, longitudine infra 1.12-1.50 mm, supra 1.50-2.25 mm; conceptaculis prominentissimis, 240-260 μ diam. Planta typica in loco dicto Ba. San Francisco, Esmeraldas, Ecuador, legit. W. R. Taylor *no. 34-484,* 11 Feb. 1934.

Amphiroa annulata Lemoine

Lemoine 1929, p. 78, pl. 4, fig. 1.

MÉXICO: Is. Revilla Gigedo, on littoral rocks at Braithwaite Bay, I. Soccoro, *no. 34-27,* 2 Jan. 1934. COSTA RICA: stunted, in tide pools near the entrance, Golfo Dulce, *no. 39-116A,* 26 Mar. 1939.

Amphiroa peninsularis n. sp.[109]

Plate 48, Fig. 1

Plants to 10 cm tall, rose pink, flexible, irregularly dichotomously branched, erect, without much taper from base to apex; segments cylindrical or very slightly club shaped, occasionally bifurcate at the distal end, 0.8-1.2 mm diam. below, 0.5-0.8 mm in the terminal branches, in length 5-8 mm below, 4-7 mm above; smooth, or in the young segments with annular markings, or below roughened with numerous slightly elevated conceptacles about 0.4-0.5 mm diam.; structurally, showing in the medulla at intervals a zone of markedly small cells above which come four zones of long cells which are successively slightly shorter from one small-celled zone to the next above.

This plant is very probably the *A. nodulosa* of Phyc. Bor.-Amer. *no. 649* from False Bay, San Diego, California, collected by Mrs. E. Snyder, Jan. 1899. The histological structure is the same, but the specimens are a little larger. Kützing's type of *A. nodulosa* (1858, p. 19, pl. 41, fig. 1) came from Venezuela; while his specimens (2.5 cm tall) might be the upper parts of plants like ours, they show more taper and, if his drawing of the medulla is correctly placed on the plate, the cell length sequence is reversed. In the absence of comparative material it seems safest to describe the western plant as new. The fragments which Lemoine (1929, p. 73, pl. 3, fig. 7) describes as *A. van Bosseae* may be from a dwarf form of this plant, but ours are hardly so coarse, so irregular or so obscurely segmented as she describes for the Galapagos plant.

MÉXICO: Baja California, on rocks about South Bay, I. Cerros, *no. 34-646A (TYPE),* 10 Mar. 1934. Nayarit, common on large rocks dredged from 24 meters' depth at sta. 970, I. María Magdalena, Las Tres Marías, *no. 39-642A,* 9 May 1939. Guerrero, common in the littoral on rocks in the surf, Ba. Petatlán, *no. 34-568,* 2 Mar. 1934. ECUADOR: Esmeraldas, dredged from 5.4 meters' depth off Ba. San Francisco, *no. 34-483,* 11 Feb. 1934.

[109] Amphiroa peninsularis n. sp.—Plantae ad 10 cm altitudine, dichotomae, erectae, paululum teretes; segmentis paene cylindricis, diametro infra 0.8-1.2 mm, ad cacumina 0.5-0.8 mm, longitudine infra 5-8 mm, supra 4-7 mm; segmentis supra levibus aut paululum annulatis, infra per conceptacula subelevata asperatis, 0.4-0.5 mm diam. Planta typica in loco dicto South Bay, I. Cerros, Baja California, México, legit W. R. Taylor *no. 34-646A,* 10 Mar. 1934.

Amphiroa mexicana n. sp.[110]

Plate 47

Plants closely tufted, to 3.0-4.5 cm tall, the branching closely dichotomous, with few lateral branches, the divisions erect or, in the uppermost forkings, somewhat more spreading and more complanate; segments 0.8-1.2 mm diam., or in the tips only about 0.6 mm, in length 1.5-3.2 mm, generally 2-4 times as long as wide; generally terete or very slightly compressed, though more so below a fork, the segments bearing branches truncate or often equally or unequally bifurcate, the flexible nodes fairly evident; conceptacles numerous, equally distributed around the branches, very slightly elevated, about 350 μ diam., the pore minute.

These plants suggest *A. peninsularis,* but are smaller and more closely branched, with relatively stouter, shorter segments. The medullary filaments show alternating long and shorter segments. Perhaps the most typical alternation is like that found in *A. peninsularis, i.e.,* one transverse series of quite small cells following four of long, but successively shorter, cells. However, the zone of short cells was as often found succeeding only one, two, or three zones of longer ones.

MÉXICO: Guerrero, collected in some abundance along the shore inside the Morro de Petatlán, Schmitt *no. 120C-33 (TYPE),* 17 Mar. 1933.

Amphiroa galapagensis n. sp.[111]

Plate 51, Figs. 1-5

Plants turflike, to 4 cm tall, without recognizable basal crust, fairly regularly dichotomously branched, the branches erect, rather broader above; segments rose pink, the flexible joints distinct, blackish; segments in the lower portion of the plants subterete, those in the central and upper portions distinctly compressed, especially in the uppermost parts, the margins parallel or subcuneate, the upper angles somewhat truncate,

110 Amphiroa mexicana n. sp.—Plantae caespitosae, ad 4.5 mm altitudine, arcte dichotome ramosae, segmentis infra 0.8-1.2 mm diam., in cacuminibus 0.6 mm, plerumque 2-4 plo longioribus quam latis, teretibus praeterquam quod, praecipue infra furcam, subcompressa sunt, ramum ferentibus, saepe bifurcatis; conceptaculis radiatim dispositis, paulum elevatis, 350 μ diam. Planta typica in loco dicto Ba. Petatlán, México, coll. W. L. Schmitt *no. 120C-33,* 17 Mar. 1933.

111 Amphiroa galapagensis n. sp.—Plantae caespitideae, ad 5 cm altitudine, axibus erectis, dichotome ramosis, articulis flexibilibus distinctis, fuscis; segmentis calcifactis infra subteretibus, 0.8-1.0 mm diam., supra distincte compressis, ad 1.0-1.5 mm latitudine, crassitudine circa 0.25 magnitudinis. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-235,* 17 Jan. 1934.

occasionally the ends forked below, rarely in the upper branching; width below to 0.8-1.0 mm, in the middle and upper parts to 1.0-1.5 mm, and where most compressed about one fourth as thick; conceptacles not seen.

While not so conspicuously banded as *A. peruana,* banding was sufficiently apparent to be distinctive among smaller species of the area. The uppermost portions of the turfs were commonly bent to one side, and dwarfed specimens from exposed stations attributed to this species were almost appressed to the substratum, so that this feature would have been considered distinctive if better material had not been available.

Ecuador: Archipiélago de Colón, from intertidal rocks on a reef north of Tagus Cove, I. Isabela, *no. 34-180,* 15 Jan. 1934. *Ibid.,* common about Black Beach Anchorage, I. Santa María, *no. 34-235 (TYPE),* 17 Jan. 1934.

Amphiroa peruana Areschoug

Plate 50, Figs. 1, 2

Plants tufted, to 12 cm tall from an inconspicuous subcrustose base, somewhat irregularly dichotomously branched, the tapering branches erect; segments rose pink, flexible joints prominent and nearly 1.5 mm long, segments in the central portion compressed, simple, subcuneate to slightly bifurcate, to 6 mm long, 1-3 mm wide; uppermost segments compressed or, in the tapering ultimate branchlets, subcylindrical, 0.8-1.0 mm diam., 3-5 mm long; conceptacles numerous in the fertile segments, with one pore, very slightly elevated, 0.30-0.45 mm diam.

Areschoug, Phyc. Extraeurop. *no. 41;* Farlow 1902, p. 93.

This is a very striking and large species, the alternating black and pink bands being quite conspicuous. Materials from Areschoug's exsiccata and from the collections reported upon by Farlow were available for comparison. As represented in the herbarium of the University of Michigan, the plants called *A. peruana* by Manza, Ecol. Surv. So. Africa *nos. F-21, F-21A* and Papenfuss *no. 93,* are a smaller species more like what is here called *A. galapagensis,* but probably not identical with it. Manza's *A. ephedraea,* Ecol. Surv. So. Africa *nos. DC-10* and *EC-1,* are probably different species—the latter a small thing, the former much resembling the present species, though the upper branches are more attenuate.

Ecuador: Archipiélago de Colón, occasionally forming large, conspicuous colonies in the lower littoral pools near Black Beach Anchorage, I. Santa María, *no. 34-231,* 17 Jan. 1934.

Amphiroa compressa Lemoine[112]

Plate 52

Lemoine 1929, p. 75, pl. 3, fig. 5; Farlow 1902, p. 93 (as *A. dilatata*).

ECUADOR: Archipiélago de Colón, dredged from 14-27 meters' depth near the anchorage in Academy Bay, I. Santa Cruz, Schmitt *no. 319A-35,* 8 Dec. 1934. *Ibid.,* dredged from 3.5-5.5 meters' depth east of Wreck Bay, I. San Cristóbal, Schmitt *no. 41D-33,* 30 Jan. 1933. *Ibid.,* dredged from 27 meters' depth off I. San Cristóbal, Schmitt *(no number),* 15 Dec. 1934. *Ibid.,* forming fine flat rosettes which, after drying, disarticulated at a touch, dredged from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-300,* 19 Jan. 1934. *Ibid.,* abundant at from 12-18 meters' depth, *no. 34-368,* 27 Jan. 1934. *Ibid.,* dredged from 22 meters' depth at sta. 355 off Gardner I., I. Española, Schmitt *no. 355A-35,* 17 Dec. 1934.

Amphiroa compressa var. tenuis n. var. [113]

Plate 53, Fig. 1

Habit somewhat more erect, the segments narrower, about 1.0-1.5 mm diam., generally little over 1 mm, the segments generally truncate on the end, but the broadest showing the lunate incision characteristic of the species, but hardly auriculate at the angles.

MÉXICO: Nayarit, a narrow form rare as dredged from 24 meters at sta. 970, I. María Magdalena, Las Tres Marías, *no. 39-642B (TYPE),* 9 May 1939. ECUADOR: Manabi, on the shore 1 mile south of Manta, Schmitt *no. 403-35,* 20 Jan. 1935.

Amphiroa Crosslandii Lemoine

Lemoine 1929, p. 50, pl. 4, fig. 3.

MÉXICO: Is. Revilla Gigedo, on coralline rocks at Braithwaite Bay, I. Soccoro, *no. 34-30* (a small form), 3 Jan. 1934. Oaxaca, on rocks at Tangola-Tangola, *no. 34-555 (p. p.),* 28 Feb. 1934.

[112] This species, *A. Crosslandii* and *A. dimorpha,* when collected should invariably be preserved in 50 per cent alcohol, or at least in dilute formaldehyde. In fact, this is a very advantageous procedure when handling any of the articulated corallines. Before mounting as dried specimens the plants must be impregnated with shellac, or must be pressed down into glue on a cardboard, because otherwise the segments may immediately disarticulate when disturbed, and certainly will not withstand the slightest pressure. Current experiments show that a solution of polyvinyl alcohol with glycerine, urea, and formaldehyde gives an excellent flexible coating to protect these corallines, but it is not yet known how this material will stand the lapse of successive decades in herbarium storage.

[113] Amphiroa compressa v. tenuis n. v.—Plantae erectiores quam in specie, segmentis calcifactis angustioribus, circa 10 mm, raro ad 1.5 mm latitudine. Planta typica in loco dicto I. María Magdalena, Las Tres Marías, México, legit W. R. Taylor *no. 39-642B,* 9 May 1939.

Amphiroa polymorpha Lemoine

Plate 54

Lemoine 1929, p. 74, pl. 3, fig. 2.

Costa Rica: infrequent in tide pools near the entrance, Golfo Dulce, *no. 39-116B,* 26 Mar. 1939.

Amphiroa dimorpha Lemoine

Plate 55

Lemoine 1929, p. 76, pl. 3, figs. 3, 4, pl. 4, fig. 6.

México: Nayarit, a small form probably this species, the medullary sequence somewhat irregular, I. Isabel, *no. 34-588C,* 5 Mar. 1934. Ecuador: Archipiélago de Colón, dredged from 3.5-5.5 meters' depth in the bay, I. Santa Fé, sta. 46, Schmitt *no. 46C-33,* 2 Feb. 1933. *Ibid.,* intertidal on the lower rocks, and in the deeper tide pools near Black Beach Anchorage, I. Santa María, *nos. 34-236, 34-240B, 34-244B,* 17 Jan. 1934. *Ibid.,* intertidal on an islet in Gardner Bay, I. Española, *no. 34-429,* 31 Jan. 1934.

Amphiroa foliacea Lamouroux

Plate 56

Weber-van Bosse 1904, p. 92, pl. 14, figs. 1-11.

One familiar with the West Indian *A. Tribulus* (Ellis & Solander) Lamouroux notes at once how similar it is to *A. foliacea.* Indeed, Mme. Weber (*ibid.,* p. 93) mentions having received *A. foliacea* from the West Indies. However, the Caribbean plants the writer has found have been larger, more sprawling and less consistently broadly winged. With so few and such small individuals the name of the Pacific form is retained, since the material agrees very well with the illustrations given by Mme. Weber.

México: Nayarit, scarce as dredged from 24 meters' depth with other Amphiroas on large rocks at sta. 970, *no. 39-641,* 9 May 1939.

Amphiroa van Bosseae Lemoine

Lemoine 1929, p. 72, pl. 3, fig. 7.

Reported from I. Santa María, Archipiélago de Colón.

BOSSEA Manza, 1931A

Plants fragile, branching dichotomously or more or less alternately; segments below compressed or cylindrical, but above always compressed; flexible joints of a single zone of cells; calcified segments showing straight medullary filaments consisting of several zones of cells of equal length; conceptacles hemispherical to conical, on the flattened surfaces of the segments.

KEY TO SPECIES

1. Segments in the upper branches subequal or rather longer than broad . . . . B. angustata
1. Segments above subequal, or more commonly much broader than long 2
2. Upper segments thinner, reaching 2.5-3.0 times as wide as the length measured along the axis . . . . B. Gardneri
2. Upper segments thicker, larger, reaching about 1.5-2.0 times as wide as the length along the axis . . . . B. pachyclada

Bossea angustata n. sp.[114]

Plate 59

Plants to about 1 dm tall, bushy, without dominant main axes, subdichotomous to oppositely branched; segments of the primary axis near the base terete, those above the first forks becoming compressed, those in the upper segments thin, flat, rectangular to slightly wider at the distal end, the upper angles rounded to obtuse, never acutely produced, little wider than the articulation, the length and width about equal, or the length to one half greater than the width, rarely less except for segments bearing a branch, rarely reaching 2 mm; segments somewhat thicker in the center, but without evident costa; conceptacles generally 2 on one face of a segment, sometimes 3 or rarely 4, relatively large, so that two when side by side occupy nearly all the width of a segment, each with a central pore; terete or flat proliferations from the faces of the segments not uncommon, becoming several segments long.

This species has more slender branches than any of the large ones except *B. Orbigniana* and *B. Gardneri.* From the former it differs in that it is coarser and the upper segment angles are not acutely produced, a feature which makes the outer branches of *B. Orbigniana* acutely serrate (Phyc. Bor.-Amer. 398). From the latter it differs in narrower, proportionately longer segments which lack the rounded lateral lobes prominent in *B. Gardneri.*

MÉXICO: Baja California, at I. San Benito, coll. W. L. Schmitt, 6 Apr. 1933.

114 **Bossea angustata** n. sp.—Plantae ad 1 dm altitudine, fruticosae, subdichotome ramosae, infra segmentis teretibus, supra subcompressis ad plana, vix ad 2 mm lat., 2-3 mm long., ecostatis, rectangularibus aut in extremitate distali paululo latioribus, angulis superioribus rotundatis, paulo latioribus quam articulatione; conceptaculis plerumque duobus una in superficie segmenti. Planta typica in loco dicto I. San Benito, Baja California, México, legit W. L. Schmitt, 6 Apr. 1933.

Bossea Gardneri Manza

Plate 57

Manza 1937b, p. 563; 1940, p. 306, pl. 15; Smith 1944, p. 235, pl. 52, fig. 2.

These plants are equivalent to the more slender specimens determined by Manza and to be found in the herbarium of the University of California, except that they rarely have four conceptacles on each segment face, but instead generally have two. This character Manza (1937b, pp. 563, 564) emphasizes as a feature distinguishing these plants from *B. Orbigniana* (Decaisne) Manza (1937, p. 563), but more striking is the attenuate character of the latter, and the markedly serrate margin of the branches, caused by the sharp divergent upper angles of the segments. Manza's specimens of *B. Gardneri* show two conceptacles on each segment in the upper branches, and occasionally as many as 6 or 7 on the lower ones.

México: Baja California, on littoral rocks in pools at South Bay, I. Cerros, *no. 34-643A,* 10 Mar. 1934.

Bossea pachyclada n. sp.[115]

Plate 58

Plants to 1 dm tall, very bushy, closely dichotomously or trichotomously branched; segments of the primary axis at the base terete, those near the lower forks compressed, those in the upper segments glossy, thick, flat, the midline considerably thicker than the margin and sometimes faintly angled; below rectangular, above with the distal end transverse, rarely a little retuse, much broader than the proximal, the angles rounded, tapering sharply to the lower articulation zone, the width about 1.5-2.0 times the length, reaching about 4 mm; conceptacles generally two on one face of a segment, rarely 3 or 4, rather large, with a central pore.

México: Baja California, on littoral rocks in pools at South Bay, I. Cerros, *no. 34-643B,* 10 Mar. 1934.

The segments in the coarser California Bosseas have the lateral or wing section pretty much as wide at the bottom of the segment as at the top, or if not, the upper angles project distally. These features are not noted in this species, where there is a distinct angle between the nearly transverse upper margin and the sides of the segment above. In this

[115] Bossea pachyclada n. sp.—Plantae ad 1 dm altitudine, fruticosae, arcte subdichotome aut subtrichotome ramosae, segmentis infra teretibus, supra compressis ad planata, vix ad 4 mm lat., et circa 0.5-0.33 brevioribus quam latis, lineam mediam crassiorem atque paene costatam habentibus, rectangularibus ad truncato-cuneata, extremitate transversa multo latiore quam extremitate proximali; conceptaculis plerumque binis utraque in superficie segmenti. Planta typica in loco dicto I. Cerros, Baja California, México, legit W. R. Taylor *no. 34-643B,* 10 Mar. 1934.

species there is no abrupt transition between flattened distal branches and terete lower ones, as there is in *B. dichotoma* and *B. interrupta.* It comes closest, perhaps, to *B. californica* (Decaisne) Manza, but in that species the lower parts are less extensively terete or subterete, the upper segments are nearly rectangular to obcordate, with the wings projecting forward of the line of articulation, and the conceptacles are smaller and more numerous.

JANIA Lamouroux, 1812

Plants arising from an inconspicuous disk, freely dichotomously branched, the branches segmented, the segments cylindrical, calcified, separated by uncalcified articulations; conceptacles usually single in swollen terminal segments of the main branches, which often continue further growth by the formation of a pair of branches lateral to the conceptacle.

Suneson 1937, p. 37 (as *Corallina rubens*).

KEY TO SPECIES

1. Branching wide angled, not congested 2
1. Branching erect, often congested above 3
2. Segments generally 50-100 μ diam., 4-10 times as long as broad . . . . J. capillacea
2. Segments 100-200 μ diam., 2-5 times as long as broad J. adhaerens
3. Branch tips not compressed 4
3. Branch tips compressed, expanded . . . . J. ungulata
4. Segments to 135 μ diam. below, and about 5-6 times as long as broad, somewhat more slender and relatively shorter above . . . . J. arborescens
4. Segments to 200 μ diam. below and about twice as long as broad, 120-150 μ diam. in the lesser branches . . . . . J. mexicana

Jania capillacea Harvey

Harvey 1853, p. 84; Taylor 1928, p. 206, pl. 29, figs. 2, 10; 1942, p. 94.

MÉXICO: Is. Revilla Gigedo, littoral pools about Braithwaite Bay, I. Soccoro, *nos. 34-28, 34-33,* 3, 5 Jan. 1934. ECUADOR: Guayas, in tide pools at Pta. Santa Elena, Schmitt *no. 530,* 17 Sept. 1926.

Jania adhaerens Lamouroux, *prox.*

Plants spreading, loosely branching at wide angles, segments below 190-225 μ diam., 0.4-0.8 mm long, little tapered toward the tips, terete throughout.

Børgesen 1915-20, p. 195, figs. 184-187; Taylor 1928, p. 205.

Lamouroux (1816, p. 270) presented *J. adhaerens* as follows: "408. J. ADHÉRENTE; rameaux divergents, mêlés, fragiles, de la grosseur au plus d'un cheveu, adhérents au papier par la dessication; coleur verdâtre. J. ADHAERENS; ramis divaricatis, intertextis, fragilibus, capillaribus, dessicatione chartae adhaerentibus. Méditerranée? Ded. Balbis." He did not illustrate this species. There is, therefore, nothing in the original publication to tell us the diameter or proportions of the segments exactly, and little about the general character of the plant.

One notes that Howe (1920, p. 589) and Børgesen (1915-20, p. 198) differ in their understanding of *J. adhaerens* and *J. capillacea.* It may be that the type of *J. adhaerens* does not exist; Howe recognizes that there is doubt respecting its Mediterranean source. Certainly Kützing's idea of it is more clear; he figured (1858, p. 40, pl. 83, figs. d, f) material from the Red Sea; fig. *d* represents, probably, a mixture of species, the erect type perhaps *J. rubens.* It is unwise to try to decide the diameter of the segments from his figures, but it is possible to establish their proportions and it appears, excluding uncharacteristic segments, that they are 5-8 times as long as broad. The writer has specimens from the Red Sea coll. Schimper *no. 938* from Kosseir, and from El Tor; their segment ratio ranges from 2.5-6.0 times as long as broad, and near the top of the plant or at upper forks sometimes the segments are even shorter. The diameters run from 110-185 μ, excluding aberrant attenuate branches. Areschoug in J. Agardh (1852, p. 559) considered *J. adhaerens* Lamouroux in the *Species Inquirendae,* and gave neither diameter nor proportions of the segments. The length ratio of 6-10 times the diameter for *J. adhaerens* appears in Yendo (1902, p. 24) with a diameter of 80 μ. Weber and Foslie (1904, p. 107) give no data. Okamura (1936, p. 529) gives the same ratio as Yendo. Børgesen *(loc. cit.)* cites Kützing's figures *g* and *h,* but these are figures of the variety *incrustata,* rather than the species as Kützing understood it, while fig. *i* is a portion covered with *Melobesia granulata.* Børgesen gives diameters of 30-60 μ in the upper segments and 100-150 μ in the lower parts of older plants, and a segment length of 5-8 diameters. DeToni (1905, p. 1839) quotes a length of 6-10 diameters for *J. adhaerens,* probably from Yendo, though Kützing (1849, p. 710) gives neither diameter nor proportions.

We have no access at this time to the Harveyan type of *J. capillacea,* nor does his description give the diameter measurements, but Howe *(loc. cit.)* gives a diameter of 50-100 μ, and the writer has collected similar plants from Florida and the Caribbean area. Harvey gives a segment length of 4-6 times the diameter for his *J. capillacea.*

To the plant which Børgesen calls *J. capillacea* he attributes a diameter of 150 μ, a length of 350-400 μ (interchanged by error in his text); he considers that the obtuse-angled forking and occasionally recurved branches are distinctive, but this is probably not so. The record in Hoyt (1920, p. 527) calls for a diameter of 100-200 μ, but figure 6 on plate 114 resembles neither *J. adhaerens* nor *J. capillacea* closely. There is every reason to respect Howe's interpretation of Harvey's species *J. capillacea;* the fact that he found segments often to be longer than Harvey did is not surprising in view of the more ample material available. There seems no particularly good reason for accepting Yendo's interpretation of *J. adhaerens,* for the materials collected in Japan and the Red Sea or Mediterranean may well have been different species. Rather, we should judge Lamouroux's species by what we have of Red Sea material since Kützing, who was in a good position to judge, did so; and that would point to *J. adhaerens* being a stouter species with shorter, but not distinctively shorter, segments.

ECUADOR: Esmeraldas, dredged from 5.4 meters' depth off San Francisco, *no. 34-482 p. p.,* 11 Feb. 1934.

Jania arborescens Yendo, *prox.* ?

Plants about 1 cm tall, sparingly branched below, closely corymbosely branched above, the lower segments 95-135 μ diam., the upper little less, in length the lower segments 0.55-0.85 mm, the upper segments somewhat shorter, about three times as long as broad, not distinctively flattened.

Yendo 1902, p. 25, pl. 3, fig. 5, pl. 7, fig. 6.

These specimens may represent the same species as *no. 34-169A,* referred with some doubt to *J. ungulata,* and neither may be exactly like the Japanese plants, but it seems best tentatively to distinguish the collections in some way until more ample material is available.

ECUADOR: Guayas, from rocks on the southeast side of Pta. Santa Elena, Salinas, *no. 34-472B,* 8 Feb. 1934.

Jania mexicana n. sp.[116]

Plate 60

Plants densely tufted, about 2 cm tall, the branching erect and dense, subcorymbose; axes below 170-205 μ diam., the segments 340-425 μ long, the ultimate branches 120-150 μ diam., with apices obtuse conical; con-

116 Jania mexicana n. sp.—Plantae caespitosae, ad 2 cm altitudine, ramificatione erecta subcorymbosaque; segmentis infra 170-205 μ, supra 120-150 μ diam.; apicibus ramorum obtuso-conicis; conceptaculis late pyriformibus, bilateraliter cornescentibus, et, saepe usque ad 4 furcationes crescentibus. Planta typica in loco dicto Ba. Petatlán, Guerrero, México, legit W. R. Taylor *no. 34-569,* 2 Mar. 1934.

ceptacles broadly pyriform, ultimately with two hornlike projections which may develop into branchlets of one to several segments that in turn may end in conceptacles and repeat; so conceptacles may support 1-4 successive forkings, in which case the branching becomes rather wider angled than in the sterile part.

This plant in habit suggests a dwarfed *J. rubens,* but the proportions and diameters of the segments are not in agreement. It is different also from Setchell & Gardner's (1930, p. 179) Guadeloupe Island plant, which is much more slender than *J. rubens* (L.) Lamour., *s. s.,* even as these are coarser.

México: Oaxaca, with driftweed in Ba. Tangola-Tangola, *no. 34-553,* 28 Feb. 1934. Guerrero, littoral on rocks in the surf at Ba. Petatlán, *no. 34-569 (TYPE),* 2 Mar. 1934.

Jania ungulata Yendo, *prox.*

Plate 45 *p. p.;* Plate 53, Figs. 2-4

Plants in close tufts, 1.0-1.5 cm tall, widely branched below, subcomplanate and closely corymbosely or subflabellately branched above, the lower segments 100-190 μ diam., 340-425 μ long below, short in the upper parts and often somewhat compressed, the terminal segments broad, and clearly compressed.

Yendo 1902, p. 26, pl. 3, figs. 7, 8, pl. 7, fig. 8.

These plants suggest the f. *brevior* Yendo; but, since he does not give measurements of his plant, it is difficult to be sure; the resemblance may be superficial and the plants only abnormal *J. adhaerens* Lamouroux, or possibly *nos. 34-169A* and *34-472* represent phases of the variation of *no. 34-569* here described as a new species, *J. mexicana.*

Ecuador: Archipiélago de Colón, intertidal from a reef north of Tagus Cove, I. Isabela, *no. 34-169A,* 13 Jan. 1934. Guayas, dredged off La Libertad, Schmitt *no. 12F-33,* 19 Jan. 1933.

JOCULATOR Manza, 1937

Joculator pinnatifolius Manza

Plate 61

Plants tufted, to 6 cm tall, sparingly branched from near the base and with several shorter branches near the tip; main axes with segments cylindrical at the base, trapezoidal above with the upper angles truncate, 0.9-1.1 mm long, generally longer than broad, the midline ridged; closely pectinate pinnate, the lateral branchlets 1-3 mm long, borne at the angles of the axial segments, of one, rarely to 4 segments, when single the segment flat and rather narrowly lanceolate, or above, cultriform; conceptacles about 0.45 mm diam., 0.55 mm long, broadly truncate conical, immersed in the end of the lateral branchlet, sometimes winged, or the lower part of the segment subcylindrical and stalklike, or the conceptacles strongly projecting from the face of the axial segments, when they may even be short stalked.

Manza 1937a, p. 47.

The supposedly distinctive feature of *Joculator*—that the conceptacles may be borne on the faces of the segments—is not unique, for it is a not infrequent occurrence on the classical *Corallina officinalis* Linnaeus of the New England coast.

Ecuador: Archipiélago de Colón, in intertidal pools of a reef north of Tagus Cove, I. Isabela, *no. 34-168,* 13 Jan. 1934. *Ibid.,* common on rocks in tide pools of the lower littoral, I. Santa María, *no. 34-240A,* 17 Jan. 1934.

CORALLINA Linnaeus, 1758

Plants with calcified, crustose bases spreading on the substratum, and often confluent; the bases giving rise to an indefinite number of erect axes which are terete to compressed, generally branching in a plane, the branching usually oppositely pinnate; articulated, the calcified joints cylindrical to flattened, the short flexible nodes ecorticate; conceptacles formed by the conversion of lateral or terminal pinnules, naked or bearing hornlike projections, the apex with a pore.

KEY TO SPECIES

1. Segments cylindrical to compressed 2
1. Segments compressed to quite flat . . . . C. officinalis
2. Main axes and chief branches not particularly prominent, the habit broadly pyramidal or involved 3
2. Main axes and chief branches percurrent, clearly marked, the fronds narrow 4
3. Small and delicate plants, the diameter of the axial segments about 0.2-0.4 mm . . . . C. gracilis
3. Larger and coarse plants, the diameter of the segments about 0.7-1.0 mm . . . . C. chilensis
4. Minor branches complanate, but irregularly radially disposed and imbricate about the chief branches . . . C. gracilis v. lycopodioides
4. Branching essentially complanate throughout, though less regular in the lower divisions . . . . C. vancouveriensis

Corallina chilensis Decaisne

Plate 62

Decaisne in Harvey 1847, p. 103; Smith 1944, p. 230, pl. 51, fig. 4.

These plants closely resemble material from I. San Lorenzo, Callao, Peru, in the writer's herbarium; but they are a little more sturdy than fragmentary material from Antofagasto, Chile, probably had been, both of which specimens the writer ascribes to *C. chilensis*. They are a little less closely pinnate and slightly larger and more irregular than Areschoug's Phyc. Extraeurop. Exsic. *no. 68* from Peru, as well as the plant illustrated by Kützing (1858, p. 32, pl. 66, fig. 1). The specimen under this name in Phyc. Bor.-Amer. *no. 499* from California differs from all in its more markedly flattened distal segments.

MÉXICO: Baja California, on rocks at Point Hughes, Cabo San Lazaro, *no. 34-609,* 7 Mar. 1934. E. Is. San Benito, Schmitt *(no number),* 4 June 1933. ECUADOR: Guayas, on the southern side of Pta. Santa Elena, Schmitt *nos. 162, 514,* 16, 17 Sept. 1926.

Corallina gracilis Lamouroux

This material is much more closely branched than Phyc. Bor.-Amer. *no. 399* from California, but the plants in form of the branches and branchlets are closer to it than to *C. officinalis* L.

MÉXICO: Baja California, in littoral pools at South Bay, I. Cerros, *no. 34-645A,* 10 Mar. 1934.

v. **lycopodioides** n. var.[117]

Plate 63

Plants 10 cm tall from a crustose base, the erect axes clustered, sparingly divided, when fully developed closely radially beset with short pinnately divided branches; lateral branches with short cuneate to deltoid somewhat compressed axial segments, the ultimate segments near the base of the plant cuneate, flat, but above the lateral ultimate branchlets cylindrical to club-shaped, 150-250 μ diam.; conceptacles on the ends of the branchlets ovoid to rounded conical.

[117] Corallina gracilis Lamouroux, v. lycopodioides n. var.—Plantae ad 10 cm altitudine, fasciculatae, axibus primariis subsimplicibus, ramis lateralibus brevibus, pinnatis inbricatisque radiatim praeditis; ramis lateralibus infra segmenta axialia, brevia, cuneata ad deltoidea, paululum compressa habentibus, ramulis, autem, subcylindricis, 150-250 μ diam.; conceptaculis ovatis ad rotundato-conica, ramulos terminantibus. Planta typica in loco dicto South Bay, I. Cerros, México, legit W. R. Taylor *no. 34-646B,* 10 Mar. 1934.

These plants have strong, tufted principal axes closely covered with overlapping pinnate ultimate branches and are even denser than Collins' Phyc. Bor.-Amer. *no. 650B* of his var. *densa.* Occasionally basal shoots resemble his Californian plants closely, but the tall ones are far more developed, with at least one degree of short lateral branching.

MÉXICO: Baja California, in the littoral pools at South Bay, I. Cerros, *no. 34-646B (TYPE),* 10 Mar. 1934.

Corallina vancouveriensis Yendo ?

Yendo 1901, p. 719, pl. 54, fig. 3.

MÉXICO: Baja California, at Point Hughes on Cabo San Lazaro, *no. 34-610,* 7 Mar. 1934.

Corallina officinalis Linnaeus

Taylor 1937, p. 271, pl. 36, figs. 1-5.

ECUADOR: Archipiélago de Colón, in pools in the lower littoral near Black Beach Anchorage, I. Santa María, *no. 34-240C,* 17 Jan. 1934.

Grateloupiaceae

Plants with a flat blade, or bushy with terete branches variously divided; structurally filamentous; sporangia tetrapartite, scattered or in nemathecia; carpogenic branches two celled, the immersed cystocarp discharging by a well-defined pore.

KEY TO GENERA

1. Thallus flat, soft, foliaceous or divided; sporangia scattered 2
1. Thallus membranous; sporangia in nemathecia . . Cryptonemia
1. Thallus branched, the firm divisions narrow; sporangia in nemathecia 4
2. Cortex parenchymatous in section . . . . Halymenia
2. Cortex of anticlinal cell rows 3
3. Thallus flat, entire or lobed; cortex of rows of short rounded cells, medulla of loosely forking filaments . . . . Aeodes
3. Thallus flat, subsimple or variously branched; cortex of short anticlinal filaments, the medullary filaments forming a network . . . . Grateloupia

3. Thallus flat, entire or lobed, thick and firm; cortex thick, of longer anticlinal rows, medullary filaments slender, in a thick dense layer . . . . Pachymenia
4. Thallus dichotomous or pinnate, flat or compressed; medulla of thin filaments, cortex loose within, dense without . . . Prionitis
4. Thallus dichotomous; medulla dense, netlike, cortex firm, dense . . . . Polyopes

Incertae Sedis

5. Plants pulvinate, parasitic on *Prionitis* . . . . . . Lobocolax

CRYPTONEMIA J. Agardh, 1842

Cryptonemia decolorata n. sp.[118]

Plate 83, Fig. 1

Plants small, when dried dark dull reddish, to about 5 cm high, staining the paper dark brown, thin, firmly membranous; irregularly branched, the branches contracted at the base, the apices rounded, the margins crisped and erose, submicroscopically aculeate dentate, width of branches 3-12 mm, thickness 80-100 μ; structurally the medulla of slender closely placed intertwined filaments about 2-3 μ diam. with coalescent walls, the subcortex irregular, of about two layers, the cells depressed, the inner being larger and about 9-12 μ in greater diam.; the cortex of close-placed cells, single or two superposed, rounded angular and 4-8 μ diam. in surface view, together about 5-9 μ deep, appearing laterally compressed in section; reproduction not seen.

MÉXICO: Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-656 (TYPE),* 9 May 1939.

AEODES J. Agardh, 1876

Thallus foliaceous, entire or irregularly lobed, moderately thin; structurally showing a very loose medulla of slender branched filaments and similar-appearing rhizoids; cortex comparatively dense, of small rounded cells; tetrasporangia scattered; cystocarps in small, scattered groups, immersed in the medulla, with a well-developed filamentous pericarp.

[118] Cryptonemia decolorata n. sp.—Plantae parvae, irregulariter ramosae, ramis 3-12 mm latitudine, ad basim contractis; apicibus rotundatis, marginibus crispatis, erosis, minute aculeato-dentatis; reproductione non observata. Planta typica in loco dicto I. María Magdalena, Las Tres Marías, México, legit W. R. Taylor *no. 39-656,* 9 May 1939.

Aeodes (?) ecuadoreana n. sp.[119]

Plant from a small holdfast to 75 cm tall or more and about as broad, rose red, thin but fleshy in texture, sessile, foliaceous, the margin undulate, slightly sinuate and with broad, indefinite lobes; thickness about 150 μ; filamentous in construction, the lacunose medulla of slender anastomosing filaments occupying nearly half the thickness; ganglionic filament junctions absent; the cortex of branched cell series, loose within, separated by more than their diameters, the inner cells thin-walled, 9-14 μ diam., occupying in one or two layers some 20 μ of thickness, the outer two or three layers more close, occupying about 20 μ additional, the surface cells 4-6 μ diam., with thick walls between the cells; cystocarps 0.20-0.33 mm diam., immersed and not distending the fresh thallus significantly, occupying the medullary area with a few filaments surrounding them, discharging by a pore on one side of the blade; carpospores large and relatively few in number, in groups, the mass attached laterally by a lobed cell.

ECUADOR: Archipiélago de Colón, frequent as dredged in 27 meters of water off Post Office Bay, I. Santa María, *nos. 34-292A, 34-295* (cystocarpic, *TYPE*), 19 Jan. 1934. *Ibid.,* dredged from 55 meters, *no. 34-389* (cystocarpic), 29 Jan. 1934.

GRATELOUPIA C. Agardh, 1822

Plants of moderate to considerable size, foliaceous to bushy, the branching generally pinnate and complanate, the branches flat; texture fleshy to membranous, moderately firm; structurally showing a medulla of slender filaments which anastomose radiately, surrounded by a jelly, and a cortex of anticlinal moniliform filaments covered by a more or less firm jelly; sporangia tetrapartite, immersed in the cortex; cystocarps minute, scattered or in groups, immersed in the cortex and surrounded by a thin pericarpic layer.

KEY TO SPECIES

1. Branching essentially pinnate . . . . G. filicina
1. Branching dichotomous, with marginal proliferations pinnately arranged . . . . G. cerrosiana

[119] Aeodes (?) ecuadoreana n. sp.—Plantae altitudine 75 cm, foliaceae, tenues sed carnosae, margine undulato, lobos latos indefinitosque habente; crassitudine 150 μ; filamentis medullaribus parietes tenues habentibus, iunctionibus ganglionicis absentibus; cortice e filamentis anticlinalibus ramosis constante; cellulis superficialibus 4-6 μ diam. per parietes crassos separatis; cystocarpis 0.2-0.33 mm diam. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-295,* 19 Jan. 1934.

Grateloupia filicina (Wulfen) C. Agardh, *f.*

Plants gregarious, to 5-6 cm tall, irregularly and sparingly pinnately branched, below subcylindrical to compressed, 1-2 mm diam., flattened in the middle parts and to 2-3 mm broad, near the tips again subcylindrical and about 1 mm diam.; dull purplish, below firm, above fleshy; structurally with a moderately close filamentous central medulla, outside of which there is a much looser arachnoid zone with anastomoses, and this supporting a cortex of anticlinal cell rows.

These sterile specimens seem rather more firm than one would expect for *G. filicina,* but the basal portions of that species are often firmer than the upper parts, and this may have been merely a dwarfed type. They are taller and broader than *G. Hancockii* Dawson (1944, p. 280, pl. 69, fig. 2), and would seem to differ in the texture of the tissue around the firm central medulla, but are not dissimilar in habit, though somewhat less branched.

MÉXICO: Guerrero, on rocks in shallow water, Ba. Petatlán, *nos. 34-573, 34-576,* 2 Mar. 1934.

Grateloupia cerrosiana n. sp.[120]

Plate 38, Fig. 2

Plants to 20 cm tall, fleshy to firm, dull purplish to brownish when dried, below shortly subcylindrical and stalklike, below the first fork flattened and strap-shaped, complanate, dichotomously divided 6-8 times, the tips obtuse, and in the upper part marginally beset with many ligulate or forked proliferations; branches 6-8 mm wide below, about half as wide in the upper divisions, to 1.0-1.5 mm thick; medulla wide, of loose anastomosing slender filaments in a general jelly matrix, the inner cortex of 2-3 series of small rounded cells in branching series, the outer cortex of several layers of progressively smaller cells in sparingly branched radial series, the outermost ones columnar.

These coarse plants show many thickened, dark purplish-red spots, 0.5-1.0 cm diam., which look like sori, but in section show normal vegetative structure; since they lack reproductive organs, the generic allocation is based on structure only.

MÉXICO: Baja California, rare at South Bay on I. Cerros, *no. 34-641 (TYPE),* 10 Mar. 1934.

[120] Grateloupia cerrosiana n. sp.—Plantae ad 20 cm altitudine, succulentae ad subcartilaginosas, infra stipitatae, supra segmentis ligulatis complanatae, 6-8-dichotomae, cacuminibus obtusis; supra a margine proliferae; ramis infra 6-8 mm latitudine, in segmentis cacuminum latitudine dimidia, 1.0-1.5 mm crassitudine. Planta typica in loco dicto South Bay, I. Cerros, México, legit W. R. Taylor *no. 34-641,* 10 Mar. 1934.

HALYMENIA C. Agardh, 1817

Plants of moderate to considerable size, foliaceous or bushy, generally of quite softly fleshy consistency; when branched, variously lobed or dichotomously or pinnately divided; structurally showing in the medulla slender filaments well separated in a soft jelly, often radiating from conspicuous ganglia, the cortex of large cells within, small cells without, not in evident filamentous arrangement; sporangia tetrapartite, scattered and immersed in the cortex; cystocarps immersed, with a pericarp of slender filaments, discharging through a definite pore.

KEY TO SPECIES

1. The plant freely dichotomously branched, the branches subterete . . . . H. Agardhii
1. Branches flat to foliaceous 2
2. Arachnoid medullary ganglionic cells not conspicuous . . 3
2. Arachnoid cells in the medulla prominent . . . H. actinophysa
3. Outer cortical cells to 9 μ diam.; plants to 30 cm tall, the lanceolate segments to 4 cm wide . . . . H. santamariae
3. Outer cortical cells 15-25 μ diam.; plants to 12 cm tall, narrowly ligulate, the segments to 1.5 cm broad . . . . . H. utriana

Halymenia Agardhii De Toni

Weber-van Bosse 1921, p. 237; Taylor 1928, p. 199, pl. 26, fig. 18, pl. 28, fig. 8.

MÉXICO: Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-646A,* 9 May 1939.

Halymenia santamariae n. sp.[121]

Plate 64, Fig. 1

Plant to 30 cm tall, foliaceous, divided into lanceolate segments 4 cm broad, or these lobed toward the apex, rose colored, gelatinous, thin, about 75 μ thick when soaked up; the medulla sparse, of slender filaments near

121 Halymenia santamariae n. sp.—Planta ad 3 dm altitudine, foliacea, gelatinosa, in segmentis lanceolatis 4 cm latitudine, ad cacumina lobatis, circa 75 μ crassitudine divisa; medulla sparsa, constante e filamentis parietem tenuem habentibus et refractivis, ganglia interdum formantibus; cortice constante e strate interiore imperfecto, et strato exteriore cellularum 6-9 μ diam., eadem fere crassitudine gelatinae separatarum; tetrasporangiis dispersis, 9 μ diam., ad 15 μ long. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-383,* 29 Jan. 1934.

the cortex which form a network and more refractive filaments which anastomose sparingly and occasionally form an inconspicuous polyradiate ganglionic structure, the cortex of an inner loose layer of colorless cells attached to the medullary filaments and an outer layer of small cells, rounded and 6-9 μ diam. in surface view, separated in the peripheral jelly by almost their own diameters; tetrasporangia scattered in the cortex, tetrapartite, spherical to oval, about 9 μ diam., to 15 μ long.

This species differs in thickness and absence of conspicuous ganglionic cells from *H. actinophysa* Howe, in its relative thinness and inconspicuous ganglioid cells from *H. californica* Smith & Hollenberg (1943, p. 216, figs. 18, 19).

ECUADOR: Archipiélago de Colón, one plant dredged from 55 meters off Post Office Bay, I. Santa María, *no. 34-383* (tetrasporic, *TYPE*), 29 Jan. 1934.

Halymenia utriana n. sp.[122]

Plate 64, Fig. 2

Plants small, to 12 cm tall, narrowly ligulate, simple or once forked, the divisions erect, rounded at the tips, tapering gradually from a width of 1.5 cm to the minute holdfast; texture soft membranous, color rose red, thickness 35-100 μ; the cortex of one, occasionally two layers of cells angular in surface view, 15-25 μ diam., and a medulla of anastomosing filaments which appear to have soft coalescing walls in the younger parts but below occupy about half the thickness of the blade, are looser and the walls apparently thinner, not being associated with marked ganglionic fusions of filaments; cystocarps about 0.25 mm diam., swollen on both sides of the blade, the carpospores forming a solid mass surrounded by a thin medullary filamentous layer.

COLOMBIA: Chocó, dredged in 37 meters' depth off Ba. Utria, *no. 34-501A* (sterile and cystocarpic, *TYPE*), 14 Feb. 1934.

Halymenia actinophysa Howe

Howe 1911, p. 509, pl. 34.

The arachnoid cells characteristic of this species are readily visible at moderate magnifications through the cortex of the fresh or soaked specimen, even without staining, readily differentiating it from the other West coast species.

[122] Halymenia utriana n. sp.—Plantae ad 12 cm altitudine, angustae ligulatae, subsimplices, cacuminibus rotundatis, ab 1.5 cm ad hapteron minutum attenuantes; molli-membranaceae, 35-100 μ crassitudine; gangliis perspicuis absentibus, cellulis corticeis superficiei 15-25 μ diam.; cystocarpis 0.25 mm diam., utrumque latus laminae distendentibus. Planta typica in loco dicto Ba. Utria, Chocó, Colombia, legit W. R. Taylor *no. 34-510A,* 14 Feb. 1934.

MÉXICO: Is. Revilla Gigedo, dredged from 56-102 meters' depth at sta. 921 near I. Clarion, *no. 39-38A,* 17 Mar. 1939. *Ibid.,* dredged at sta. 129 from 25-32 meters' depth at Braithwaite Bay, I. Soccoro, *no. 34-14* (tetrasporic), 3 Jan. 1934. *Ibid.,* from 41-84 meters' depth at sta. 924, *no. 39-66,* 18 Mar. 1939.

PACHYMENIA J. Agardh, 1876

Thallus foliaceous, simple or irregularly lobed, rather thick and fleshy; medulla thick, of slender filaments and rhizoids, the inner cortex loose, the larger cells with rhizoids interspersed, the outer cortex rather thick, of anticlinal rows of small cells; tetrasporangia scattered; cystocarps scattered, small, in the inner cortex and medulla, with a prominent spongy filamentous pericarp.

Pachymenia saxicola n. sp.[123]

Plate 65, Figs. 1, 2

Plants spreading to 7.5 cm from the holdfast, which is irregular, 0.5-1.0 cm diam., the blade sessile or a little peltate, appressed to the substrate, very firm in texture but the surface slippery, in the middle about 2 mm thick (soaked up), dull reddish purple; shape irregular, near the base broad, to 4-6 cm or more, or irregularly cleft and the widest branches only about 2 cm, from the margins of the outer segments very irregularly alternately branched and often closely beset with small ligulate proliferations; structurally showing a medulla of closely placed, elongated thick-walled cells in filaments, and an inner cortex of irregular large rounded cells with abundant filaments in the interstices; median cortex of large rounded cells with thick walls grading externally to a layer about 85 μ thick composed of anticlinal filaments once or twice branched, closely placed, with thin walls, about 3 μ diam. near the surface and the cells rather elongate, to 1-4 diameters; tetrapartite sporangia formed near the inner part of the outer cortex but extending nearly to the surface at maturity, large, oval, to 15-25 μ diam., 55-80 μ long.

123 Pachymenia saxicola n. sp.—Plantae ad 7.5 cm, e haptero 0.5-1.0 cm diam. orientes, sessiles aut subpeltatae, appressae, firmae sed lubricae, (madefactae) ad 2 mm crassitudine; forma irregulares, lobis ad basim 4-6 cm latitudine, aut in segmenta ad 2 cm lat. fissis, marginibus externis irregulariter ramosis et saepe ligulato-proliferis; tetrasporangiis ovatis, 15-25 μ diam., 55-80 μ long. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-256,* 18 Jan. 1934.

This plant appears to be close to *Pachymenia cuticulosa* Howe (1914, p. 171, pl. 63, text-fig. 4). The chief differences seem to lie in the thicker prostrate thallus with narrower branches which do not tend to have entire margins, the thinner outer cortex of more slender and closer anticlinal cell rows inside a softer and probably thinner cuticle, and the longer tetrasporangia which, since they were found in some sections and not in others nearby, may be formed somewhat locally.

Ecuador: Archipiélago de Colón, appressed to rocks, especially in crevices, intertidal; Black Beach Anchorage, I. Santa María, *no. 34-256 (TYPE),* 18 Jan. 1934.

POLYOPES J. Agardh, 1849

Thallus flat, dichotomously branched, the segments strap shaped and sometimes contracted slightly, of firm consistency; structurally showing a dense filamentous spongy medulla, the cortex also dense, of anticlinal rows of cells, within somewhat looser and larger, closer and of smaller cells without; tetrasporangia and cystocarps in special fertile branch tips somewhat segregated by a constriction; sporangia in slightly elevated nemathecia, tetrapartite; cystocarps very small, immersed in the locally thickened branch tips, lying in the inner cortex and somewhat extending into the medulla, with a spongy filamentous pericarp.

Polyopes Bushiae Farlow

Plants to 8 cm tall, dark reddish purple, texture firm fleshy, habit dichotomously branched, the branches above more close and fastigiate; flat throughout except near the base, to 3 mm broad below and but 1.0-1.5 mm in the ultimate branches; structurally showing a dense firm inner medulla of very slender filaments with coalesced walls, surrounded by a zone of larger filaments appearing subparenchymatous in transverse section, the cortex of anticlinal cell rows 3-5 cells long, the walls firm and closely joined, at least the outer 2-3 cells rectangular in section.

Farlow 1900, p. 75.

This material is of a more lax habit than that issued without description under the name of *Cryptonemia Bushiae* Farlow *ms.* in Phyc. Bor.-Amer. *no. 600* (1899), but not essentially different. The histological features of the two collections agree exactly. They show a great structural similarity to *Prionitis.* In this they differ sharply from Setchell & Gardner's (1924, pl. 28, fig. 61) figure of *Polyopes sinicola,* where the medulla of delicate filaments passes directly into the cortex, which has much longer anticlinal rows and certain other peculiarities, such as markedly large cells at each forking of these rows, and pyriform surface cells. DeToni (1915, pp. 1586, 1594) considers that *Prionitis* has three structural zones and *Polyopes* two. No fruit appears in the present material; so nothing can be done about a more critical estimate of the generic position of the species from that aspect.

MÉXICO: Baja California, on rocks at South Bay, Cerros, *no. 34-647,* 10 Mar. 1942.

PRIONITIS J. Agardh, 1851

Thallus compressed or flat, linear, dichotomously or pinnately branched with frequent adventitious lateral branchlets; firm to subcartilaginous; inner cortex lacunose within and penetrated by rhizoids, outwardly of enlarged rounded cells, the outer cortex of small cells in anticlinal rows; tetrasporangia in special lateral branchlets with thickened cortex, tetrapartite; cystocarps scattered on special fertile branchlets, immersed, projecting more or less into the medulla, surrounded by a relatively feeble filamentous pericarp.

KEY TO SPECIES

1. Axis and branches terete to a little compressed 2
1. Branches flat, subfoliar 3
2. Larger, 1-4 dm tall, the main axes subdichotomous, bearing irregular to pinnately disposed slender branchlets . . P. filiformis
2. Small, to 2 cm tall, dichotomously branched, complanate, with small adventitious branchlets bilaterally disposed below P. kinoensis
3. Dichotomously branched, the segments strap shaped, little tapering, with abundant adventitious branchlets on the margins of the segments 4
3. Segments linear lanceolate, with rather acute tips 5
4. Adventitious branchlets ligulate . . . . P. abbreviata
4. Adventitious branchlets spatulate to reniform . . P. Hancockii
5. Irregularly dichotomous throughout, the blades plane or nearly so . . . . P. albemarlensis
5. Dichotomous below, but the upper portions pinnate, the blades markedly crisped . . . . P. galapagensis

Prionitis filiformis Kylin

Plants to 45 cm tall, below freely alternately or irregularly subdichotomously branched, the upper segments long, sparingly to closely bilaterally beset with linear oblanceolate branchlets 5-10 mm long; major axes flattened above, to 2-3 mm wide, below subcylindrical, to 2 mm diam.; tetrasporangia abundant in the branchlets of sporangial plants; axis structurally showing a medulla of coarse and small longitudinal filaments intermixed, the inner cortex of moderately large cells, the outer of radial rows of small cells.

Kylin 1941, p. 13; Smith 1944, p. 244, pl. 56, fig. 1.

MÉXICO: Baja California, common on rocks at South Bay, I. Cerros, *no. 34-633* (tetrasporangial), 10 Mar. 1934.

v. delicatula n. v.[124]

Plate 66, Fig. 1

Plants tufted, to 13 cm tall, blackish purple, tough; slender, uniformly about 1 mm diam. throughout, erect axes subsimple to, in fully developed specimens, densely bilaterally pinnately beset with simple branchlets about 1 mm apart, commonly rather uniformly about 15 mm long, reaching 2-3 cm, these tapering somewhat to their bases.

These are smaller, slenderer, and much more distichous in appearance when fully developed than the typical plants collected at the same station. They show some similarity to *Prionitis Lyallii* f. *densissima* Harvey (Phyc. Bor.-Amer. *no. 948*), but are proportionately more slender.

MÉXICO: Baja California, on rocks at South Bay, I. Cerros, *no. 34-637 (TYPE),* 10 Mar. 1934.

Prionitis kinoensis Dawson, *f.*

Plants to 2 cm tall, bushy, branching dichotomous, complanate, the branches compressed above, 1.0-1.5 mm diam., later with short divergent secondary branches along the margins of the lower segments; structurally showing a very dense medulla internally of intertwined filaments, outwardly of looser and larger (anastomosing?) filaments, supporting a close cortex of anticlinal cell rows.

Dawson 1944, p. 284, pl. 67, fig. 1.

These plants suggest *P. kinoensis* in miniature, and probably represent only a dwarf form of that species.

ECUADOR: Archipiélago de Colón, on rocks, I. Bartolomé, *no. 34-344,* 23 Jan. 1934.

[124] Prionitis filiformis v. delicatula n. v.—Plantae caespitosae, ad 13 cm altitudine, circa 1 mm diam. ubique, axibus erectis subsimplicibus aut ramulos simplices, 1.5, raro ad 3 cm long., intervallis 1 mm, aeque, bilateraliter, pinnate praebentibus. Planta typica in loco dicto I. Cerros, México, legit W. R. Taylor *no. 34-637,* 10 Mar. 1934.

Prionitis abbreviata Setchell & Gardner, *prox.*

Plants to 10 cm tall, dull purplish, subcartilaginous; the axis compressed below, flat above, branching irregularly, to 2-3-chotomous, wide angled, the divisions 3-4 mm broad below, 6-7 mm above, strap shaped, abundantly beset on the margins with simple or forked ligulate proliferations; structure densely filamentous in the broad medulla, the filaments closely conjoined by their firm walls, outwardly larger in diameter and pseudoparenchymatous, giving rise to the cortex of closely united anticlinal cell series, the cortical cells square in section.

Setchell & Gardner 1942, p. 785, pl. 25, fig. 39, pl. 50, fig.b.

These specimens differ from the photograph of the type given by the authors in being somewhat larger, with smaller lateral proliferations or leaflets.

ECUADOR: Archipiélago de Colón, infrequent on rocks in the littoral region near Black Beach Anchorage, I. Santa María, *no. 34-247,* 17 Jan. 1934.

Prionitis Hancockii n. sp.[125]

Plate 67

Plants to 18 cm tall, bushy, dull purplish red, near the base compressed, above quite flat, erect spreading, branching 7-10 times irregularly pinnately to subdichotomously, the angles 30°-60° and usually rounded, the segments to 3-4 mm wide in the central part of the plant, 2-3 mm wide in the upper branches, those below somewhat longer than those above, in the central part marginally beset with numerous spatulate to kidney-shaped proliferations or fertile tetrasporiferous branchlets 2-3 mm long.

These plants resemble *no. 34-247* from the same station somewhat, but are much more erect and slender, more abundantly branched and with proliferous branchlets of a different form. They differ from *P. australis* J. Ag. in being smaller, lighter plants with more proliferations but less pronounced ultimate branch segments. In this difficult genus one cannot be very confident of the span of variation of any species without field experience much beyond what could be acquired during a quick exploratory trip.

ECUADOR: Archipiélago de Colón, occasional on rocks near Black Beach Anchorage, I. Santa María, *no. 34-224 (TYPE),* 17 Jan. 1934.

[125] Prionitis Hancockii n. sp.—Plantae ad 18 cm altitudine, fruticosae, erecte patentes, 7-10-irregulariter alterne aut subdichotome ramosae, segmentis supra planis, ad 3-4 mm lat., longioribus in parte inferiore plantae quam in parte superiore; ramulis proliferis marginalibus, spatulatis ad reniformes, 2-3 mm long., saepe tetrasporiferis. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-224,* 17 Jan. 1934.

Prionitis albemarlensis n. sp.[126]

Plate 68, Fig. 2

Plants clustered, from pulvinate holdfasts rising to a height of 3 dm, dull purplish red, in texture fleshy membranous above, subcartilaginous below; axes briefly slender and compressed below, flat and subfoliar above, irregularly but chiefly alternately marginally branched, the axes and branches lanceolate to subcuneate, the branches sometimes sharply contracted at the base but often not contracted, especially in the main divisions, the margins plane or a little undulate; structurally of closely packed slender thick-walled filaments in the medulla, the filaments thicker outwardly and bearing close radial rows of cells square in transverse section, to form the firm cortex.

These plants suggest *P. Lyallii,* but they seem to branch more widely from the base. They show a little tendency for concatenate branching, but give off lateral divisions with plane bases moderately or not contracted, and the divisions seem thinner and softer than those of *P. Lyallii.*

ECUADOR: Archipiélago de Colón, intertidal on a reef to the north of Tagus Cove, I. Isabela, *no. 34-163 (TYPE),* 13 Jan. 1934. *Ibid.,* intertidal on rocks near Black Beach Anchorage, I. Santa María, *no. 34-221B,* 17 Jan. 1934.

Prionitis galapagensis n. sp.[127]

Plate 68, Fig. 1

Plants clustered, to 15-18 cm tall, the holdfasts small, pulvinate, the erect portions compressed below, flat above, fleshy membranous to subcartilaginous, dull purple in color; branching irregularly pinnate, the lower branches approaching the chief axis in length, all simple, subsimple, or to moderately closely marginally bearing small simple or one-forked branchlets; main axes and branchlets linear lanceolate, to 5-10 mm wide, the margins nearly plane to closely and strongly crisped; axis densely filamentous, the slender filaments closely conjoined by their thick walls, outwardly pseudoparenchymatous and bearing a firm cortex of anticlinal rows of cells nearly square in section.

[126] Prionitis albemarlensis n. sp.—Plantae ad 3 dm altitudine, fasciculatae, irregulariter, alterne marginaliter ramosae, segmentis supra subfoliaribus, carnosis, lanceolatis ad subcuneata, ad basim plerumque non contractis, marginibus fere planis. Planta typica in loco dicto I. Isabela (anglice Albemarle I.), Ecuador, legit W. R. Taylor *no. 34-163,* 13 Jan. 1934.

[127] Prionitis galapagensis n. sp.—Plantae ad 15-18 cm altitudine, fasciculatae, irregulariter pinnate ramosae, ramis inferioribus ad axem primarium longitudine accedentibus, segmentis supra planis, carnoso-membranaceis, simplicibus aut ramulis parvis in margine modice praeditis; axe primario ramisque lineari-lanceolatis, marginibus valde arcteque crispis farctis. Planta typica in loco dicto Black Beach Anchorage, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-221A,* 17 Jan. 1934.

ECUADOR: Archipiélago de Colón, surf-beaten rocks near low tide line south of Black Beach Anchorage, I. Santa María, *nos. 34-221A (TYPE), 34-267B, 34-395,* 17, 18, 30 Jan. 1934.

LOBOCOLAX Howe, 1914

Lobocolax deformans Howe

Plants parasitic on *Prionitis,* on the surface forming irregular lumps to 1-5 mm broad and nearly as high; structurally largely a medulla of very delicate and very densely intricate filaments surrounded by a narrow cortex of anticlinal sparingly branched rows of cells about 5 μ diam. near the surface but a little deeper nearly 7 μ diam., appearing nearly square, the outer cuticle when intact thick and lamellate.

Howe 1914, p. 91, text-figs. 20-39, pl. 32, fig. A, pls. 64, 65; DeToni 6, p. 82; Kylin 1941, p. 13; Smith 1944, p. 247, pl. 56, fig. 3.

The appearance of a parasite which seems identical in general features to Howe's Peruvian plant, on a different species of *Prionitis* and in the northern hemisphere, is very interesting. Unfortunately the material is sterile and the identification based on vegetative characters alone. The cortex was commonly lost from the material found and the exposed medulla infiltrated with filamentous endophytes. The ordinal and family relationships of this genus are not satisfactorily established, as DeToni has pointed out. Smith's record *(loc. cit.),* appearing while this was in manuscript, carries the species still farther north, to the Monterey Peninsula, California.

MÉXICO: Baja California, frequent on *Prionitis filiformis* at South Bay, I. Cerros, *no. 34-634,* 10 Mar. 1934.

Kallymeniaceae

Plants foliaceous or divided, strap shaped, bushy; structurally the medulla loosely filamentous or apparently parenchymatous, more or less infiltrated with rhizoidal filaments, the cortex narrow, of a few cell layers, not in conspicuous anticlinal rows; sporangia tetrapartite, formed in the inner cortex; carpogenic branches formed on inner cortical cells, three celled, one or more on a common supporting auxiliary cell which may also bear lateral cells; sterile nutritive filaments intermixed with carpospore masses in the mature cystocarp, which is completely immersed or somewhat projecting.

KEY TO GENERA

1. Plants generally foliaceous . . . . Kallymenia
1. Plants with narrow, strap-shaped segments . . . . Callophyllis

KALLYMENIA J. Agardh, 1842

Thallus flat to foliaceous, simple, lobed or cleft, sometimes proliferous or perforated; structurally showing a loose medulla of thin-branched filaments and rhizoids, the cortex of cells smaller toward the surface, larger and less close placed within; sporangia tetrapartite, scattered in the cortex; carpogenic branches several on a common supporting auxiliary cell, cystocarps wartlike, immersed or projecting, scattered, the carpospores formed in masses with a filamentous investment.

KEY TO SPECIES

1. Blades linear, commonly narrowly oblanceolate, but occasionally forked . . . . K. tenuifolia
1. Blades broadly foliaceous 2
2. Stalk compressed 3
2. No compressed stalk, the segments foliaceous to the base, even when narrow . . . . K. latiloba
3. Blades subsimple, to about 150 μ thick . . . . . . K. Setchellii
3. Blades deeply subdigitately lobed, to 250 μ thick or more . . . . K. mutiloba

Kallymenia tenuifolia n. sp.[128]

Plate 72, Figs. 1-4

Plants consisting of delicate narrowly oblanceolate rose-red slightly nitent blades reaching 14 cm in length, 16 mm in width; the blades simple, occasionally 2-3-furcate, or lacerate, commonly proliferous from the margin or a broken end; base long attenuate, tip rounded, thickness 35-40 μ; in section the medulla of 3-4 layers of intertwined elongate cells with moderately thick firm coalescent walls, the cortex of one, occasionally two layers of squarish cells about 7-9 μ thick, and when seen in sur-

[128] Kallymenia tenuifolia n. sp.—Plantae praeditae laminis simplicibus anguste oblanceolatis, ad 14 cm long., 16 mm lat., interdum 2-3 furcatis; basi attenuata, cacumine rotundato, crassitudine 35-40 μ; cystocarpis minutis, dispersis, circa 150 μ diam. Planta typica in loco dicto I. Soccoro, México, legit W. R. Taylor *no. 39-67,* 18 Mar. 1939.

face view irregularly disposed, angular, 9-15 μ in diameter with thin firm walls; cystocarps minute, numerous and scattered over the blade except for the attenuate base, enclosed in a thin somewhat distended pericarp about 150 μ diam., projecting somewhat on both surfaces but more on the side where the ostiole is located, the cystocarp mass about 80 μ diam., enclosed in a filamentous investment, the spores mutually compressed, 9-11 μ diam.

These plants have much the habit of *K. angustata* Setchell & Gardner (1927, p. 78) as figured by Dawson (1943, p. 285, pl. 68, fig. 1), but are narrower, thinner, with smaller cystocarps, and a firmer medulla.

MÉXICO: Is. Revilla Gigedo, frequent as dredged from 41-84 meters' depth at sta. 924 near I. Soccoro, *no. 39-67* (cystocarpic, *TYPE*), 18 Mar. 1939.

Kallymenia Setchellii n. sp.[129]

Plate 69, Fig. 2

Plants from a small holdfast and a short compressed stalk arising to a height of 10 cm or more, dull red, fleshy, adhering well when young, simple or branched several times near the base to simple or slightly lobed foliaceous segments 5-7 cm broad, the base cuneate to obtuse; thickness (soaked up) to 150 μ, showing a thin filamentous medulla of refractive filaments, an inner cortex of colorless cells with one large layer near the medulla and one or two smaller ones without, the assimilative outer cortex of one, occasionally two layers of small cells which in surface view are rounded angular, 4-11 μ diam.; spermatangia scattered in patches over large areas of the blades of male plants, which appear rather blotchy, 2-4 to a surface cortex cell, most commonly three, and about 2.5 μ diam. from the surface, 5-6 μ tall in section; cystocarps numerous, scattered except near the lower part of the blade, 0.25-0.75 mm diam., projecting strongly on both sides of the blade, without special modification of the cortex over them, but eventually developing an ostiole on one face, the small carpospores surrounded by a thin layer of the filamentous medulla, divided into more or less obscure masses with skeins of sterile tissue between them.

ECUADOR: Archipiélago de Colón, dredged from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-292B (TYPE),* 19 Jan. 1934.

[129] Kallymenia Setchellii n. sp.—Plantae stipite brevi, altitudine ad 10 cm vel plus, succulentae, simplices aut foliaceo-lobatae e regione basali, segmentis 5-7 cm latitudine, basi cuneata ad obtusam; crassitudine (madefactis) ad 150 μ; dioeciae, spermatangiis 2-4 per omnem cellulam superficiei super magnas partes laminae; cystocarpis multis, 0.25-0.75 mm diam., utrumque latus laminae distendentibus. Planta typica in loco dicto Post Office Bay, I. Santa María, Ecuador, legit W. R. Taylor *no. 34-292B,* 19 Jan. 1934.

Kallymenia multiloba n. sp.[130]

Plate 70

Plants to 20 cm tall, 30 cm broad, deep rose red, darker toward the base; firmly gelatinous in texture; from a small holdfast a short compressed stalk a few millimeters in length expands into the blade which is cleft to near the base into cuneate segments narrow below, transversely expanded above into the 2-4 divisions, which are deeply subdigitately lobed, the segments 1-5 cm broad at the base, tapering to blunt or subacute apices; thickness 250-300 μ; structurally showing a moderately lacunose filamentous medulla about 125 μ thick of mixed thin- and thick-walled filaments, the former distinctly anastomosing; the inner cortex of three layers of moderately firm-walled cells, smaller and more compact outwardly, and one assimilatory layer of small rounded cells 4-9 μ diam. with rather thick lateral walls; spermatangia spherical, 2-4 μ diam., one or two developed on each surface cell of large areas of the blade; cystocarps of 0.5-1.0 mm diam., projecting, the spore mass surrounded by the filamentous medulla, of small groups of small carpospores separated by sterile tissue.

ECUADOR: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-291* (spermatangial, cystocarpic, *TYPE*), 19 Jan. 1934.

Kallymenia latiloba n. sp.[131]

Plate 71, Fig. 1

Plants to 15 cm tall, 25 cm broad, gelatinous, rose red, without significant stalk, from a small holdfast expanding to a flat blade, cleft nearly to the base into 2-3 primary segments, the segments expanding abruptly, deeply divided into broad blunt or emarginate ligulate to triangular segments; thickness about 200-300 μ (soaked up); structurally of a wide medullary area containing a very sparse, loose arachnoid tissue scantily

[130] Kallymenia multiloba n. sp.—Planta ad 20 cm altitudine, 30 cm latitudine, firme gelatinosa, minute stipitata, foliacea, lamina in segmentis angustis infra incisa, cuneata ad transverse expansa, profunde subdigitate lobata, segmentis infra 1-5 cm lat., apicibus obtusis ad subacutos; crass. 250-300 μ; planta dioecia, spermatangiis 1-2 per omnem cellulam superficialem super magnas partes; cystocarpis 0.5-1.0 mm diam., proicientibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-291,* 19 Jan. 1934.

[131] Kallymenia latiloba n. sp.—Planta ad 15 cm altitudine, 25 cm lat., vix stipitata, lamina in 2-3 segmentis primariis fere usque ad basim incisa, his vicissim segmenta lata, obtusa ad emarginata, ligulata ad triangularia habentibus; crass. (madefactis) 200-300 μ; tetrasporangiis dispersis, 28-32 μ long., 21-25 μ diam.; cystocarpis multis, 1-2 mm diam., modice proicientibus. Planta typica in loco dicto I. Española, Ecuador, legit W. R. Taylor *no. 34-417,* 31 Jan. 1934.

traversed with delicate somewhat refractive fibers about 1.5 μ diam., and a cortex of two cell layers, the inner loose, of rounded very thin-walled cells 70-175 μ diam. in surface view, the outer assimilative layer of cells irregularly rounded in surface view, 6-9 μ diam., with conspicuous walls between and a moderately thick jelly layer outside; tetrasporangia scattered, formed in the inner cortex, oval, 28-32 μ long, 21-25 μ diam.; cystocarps abundant, to 1-2 mm diam., moderately projecting, eventually rupturing the cortex to develop an ostiole on one or both faces of the blade, the small spores in irregular masses with much sterile tissue between.

ECUADOR: Archipiélago de Colón, dredged in 27-55 meters off Tagus Cove, I. Isabela, *no. 34-138B* (cystocarpic and tetrasporic), 13 Jan. 1934. *Ibid.,* dredged at sta. 157 in 18-32 meters, *no. 34-190* (tetrasporic), 15 Jan. 1934. *Ibid.,* dredged at sta. 169 off Academy Bay, I. Santa Cruz, *no. 34-324,* 20 Jan. 1934. *Ibid.,* frequent as dredged in 37-55 meters at sta. 203 from a rocky bottom near an islet in Gardner Bay, I. Española, *no. 34-417* (cystocarpic, *TYPE*), 31 Jan. 1934.

CALLOPHYLLIS Kützing, 1843

Plants fleshy membranous, flat, dichotomous, laciniate or pinnate; structurally showing an inner medullary parenchyma of large cells in some species intermixed with short rhizoidal ones, and a cortex of short indefinite anticlinal rows of small rounded cells; sporangia tetrapartite, scattered in the cortex; carpogenic branches single on the supporting auxiliary cell, the other lateral cells remaining sterile; cystocarps immersed, with the carpospores formed in small groups among medullary cells and more or less compressed nutritive filaments, discharging through one or more pores.

KEY TO SPECIES

1. Freely branched; margin sparingly dentate . . . . C. violacea
2. Sparingly branched; margin entire . . . . C. ligulata

Callophyllis violacea J. Agardh

Setchell 1923, p. 16, pl. 5, fig. 13; Kylin 1941, p. 16.

The material was scanty and the genus difficult; some pieces appear to be rather coarse for the species to which they are assigned.

MÉXICO: Baja California, dredged off Point Hughes on Cabo San Lazaro, *no. 34-608* (cystocarpic), 7 Mar. 1934.

Callophyllis (?) ligulata n. sp.[132]

Plate 72, Fig. 5

Plants to more than 13 cm long, dull rose colored, membranous, thin and flaccid; probably in part decumbent, attaching by a small disciform holdfast, the stipe minute, slender, the base of the blade tapering, above to 2-4 mm, rarely to 6 mm broad, once or twice dichotomously branched, the segments to more than 5 cm long, the apices obtuse; small secondary holdfasts attaching to solid objects (shells, coral fragments) occasional on the margins of the blades; adventitious branches occasionally developed from the margin or damaged ends, similar to young plants in form; thickness 120-250 μ, reaching the greater dimension in fertile parts of older plants; structurally showing a medulla of large firm-walled cells to 190-220 μ diam., in 2-4 layers; the outer cells much smaller than those in the center; cortex of one cell layer or two in older or fertile portions, the cells roundish, 4-6 μ diam., about 4 μ deep; cystocarps minute, scattered, slightly swollen, the overlying cortex of several cell layers with the cells in tiers, the medullary cystocarp not attached by any special basal cell, enclosed by an investment of slender filaments, the carpospores in masses about 60 μ diam., each enveloped in a filamentous sheath, the spores 10-13 μ diam.

These plants look very much like Setchell & Gardner's (1937, p. 80, pl. 15, fig. 35) figures of *Sarcodiotheca linearis,* but differ markedly in the fewer layers of depressed cortical cells and the absence of medullary filaments, though a few filaments near the cystocarp may wander between neighboring medullary cells. In one piece scattered tetrasporangia were found, young and old intermixed in the same portion of the blade, formed in the cortex and partly covered by it, dividing tetrapartitely. This would be a conclusive character, but unfortunately when a later attempt was made to confirm it, no more sporangial specimens could be found, and the observation is therefore somewhat under suspicion. Furthermore the cystocarp is of a different character from that appropriate to *Sarcodiotheca* (Kylin 1925, p. 36, fig. 21 as *Anatheca furcata*), for there is no sterile central tissue. They seem to be close to *Callophyllis* in cystocarp structure (Kylin 1925, p. 33, fig. 19), but the vegetative structure lacks any considerable number of small cells between the large ones of the central medulla, and the plants differ much in habit. Weber-van Bosse (1928, p. 399, pl. 7, fig. 11) places a somewhat similar plant from the East Indies in *Polycoelia,* although it has only one cortical cell layer, but

[132] Callophyllis ligulata n. sp.—Plantae altitudine ad 13 cm vel plus, stipite minuto, tenui, laminis 1-2 dichotomis, ad 2-4 mm lat., 120-250 μ crass.; cystocarpis minutis, dispersis. Plantae typicae in loco dicto Archipiélago de Colón, Ecuador, legit W. R. Taylor *no. 34-351A,* 26 Jan. 1934.

Polycoelia has only one great medullary cell layer where ours is as much as two large and two small cells in thickness. The structure of the decumbent crowded *Weberella* (Schmitz 1897, p. 402; Okamura 1936, p. 678) is somewhat closer, but the cystocarps are superficial. It seems impossible to place this in any accepted genus without discrepancies, but the writer is unwilling to erect a genus for it, since in dredged material features are often environmentally distorted.

ECUADOR: Archipiélago de Colón, dredged from 106-110 meters' depth at sta. 190 between I. Santa María and I. Santa Cruz, *no. 34-351A* (cystocarpic, *TYPE*), 26 Jan 1934. COLOMBIA: Valle, dredged near I. Gorgona, *no. 34-493A,* 12 Feb. 1934.

Cruoriaceae

Plants forming expanded crusts with marginal growth, adhering by the under surface, above forming erect crowded filaments lightly united; sporangia zonate or tetrapartite; spermatangia formed on the erect filaments; carpogenic branches two to four celled, on the erect filaments, from the fertilized carpogonium by short oöblast filaments making vegetative unions with assimilatory filaments and ultimately giving rise to gonimoblasts, all of the cells of which form carpospores.

PETROCELIS J. Agardh, 1862

Plants crustose, horizontally expanding on the substratum; attached by a basal layer of flabellate-radiating filaments which does not develop rhizoids, but which bears on top erect filaments loosely associated in a general gelatinous matrix; sporangia intercalary in the erect filaments, or terminal, single or seriate, irregularly tetrapartite; spermatangia borne on the ends of the erect filaments; carpogenic branches generally two celled, lateral on the erect filaments; carpospores formed in small spindle-shaped masses, scattered in the cortical layer.

Petrocelis sp.

Plants forming a smooth blackish crust, drying dull purplish red, indefinitely spreading, the surface dull, splitting somewhat on drying by small vertical clefts; thickness 150-320 μ, showing a hypothallus about one third of the thickness, of somewhat parenchymatous discolored horizontal cell rows, these ascending centrifugally to form the epithallus of erect filaments which are sparingly 1-2 times dichotomously branched, 4.5-9.3 μ diam. below, 2.0-4.5 μ diam. above, the cells in section rectangular, generally subequal to shorter than broad, rarely longer, the end cells of the filaments contiguous, the smooth surface covered by a firm tough cuticle which remains intact upon crushing the specimen, the filaments themselves however also moderately firmly laterally united, not easily separated; reproduction not seen.

ECUADOR: Archipiélago de Colón, forming a smooth blackish crust on volcanic rock, I. Bartolomé near I. San Salvador, *no. 34-342,* 23 Jan. 1934.

These specimens had more of the firmness of *Hildenbrandia* than of *Petrocelis,* but are rather thick and the filaments did separate, although reluctantly, under pressure. Lacking reproduction, it is not thought best to attempt to give a name to these plants. They do not show the anastomoses of *P. franciscana* Gardner (1917, p. 391), the filaments branch and rest on a thick hypothallus, so differing from *P. haematis* Hollenberg (1943, p. 575).

Petrocelis sp.

Plants encrusting, of moderate thickness, light brownish red, 2-3 cm diam.; basal layer of radiating branched filaments; erect rows of cells about 16 μ diam., the total thickness to 350 μ, the tip cells conical; readily dissociating with pressure after decalcification; reproduction not seen.

MÉXICO: Is. Revilla Gigedo, on coralline fragments dredged from sta. 134 at 56 meters off I. Clarion, *no. 34-74B,* 5 Jan. 1934.

Sebdeniaceae

Thallus flat, foliaceous, cleft or lobed; structurally showing a medulla of filamentous construction and a dense cortex with larger cells within, smaller without; sporangia tetrapartite, scattered in the cortex; cystocarps protuberant, cells elongating to form a subfilamentous pericarpic investment around the carpospore mass, with a group of nutritive cells at the base of the mass of gonimoblasts, of which most of the cells form carpospores.

SEBDENIA Berthold, 1882

Sebdenia rubra n. sp.[133]

Plate 73

Plants to 10 cm tall, dark rose red, nitent when dry, membranous; from a very small holdfast an ovate to suborbicular or subreniform blade arising, with or without a very short stalk, simple or cleft nearly to the

[133] Sebdenia rubra n. sp.—Planta ad 10 cm altitudine, foliacea, membranacea nitens cum sicca est, stipite minuta, lamina ovata ad subreniformem, simplici aut in 2-3 segmentis similaribus divisa, margine integro ad paululum undulatum, crass. (madefacta) ad 150-175 μ; medulla praebente filamenta parietes tenues habentia et filamenta pauca, perspicuissima, refractivissima, sparse anastomosantia; tetrasporangiis 9-11 μ diam., 15-18 μ long.; cystocarpis multis, 0.1-0.2 mm diam., paululum proicientibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-384,* 29 Jan. 1934.

base into two or three similar segments, the margin entire or slightly undulate, the thickness to 150-175 μ (soaked up); structurally showing a medulla about 90 μ thick consisting primarily of a fairly close network of filaments 4-5 μ diam. with thin walls and granular contents, among which there is a network of sparingly anastomosing very highly refractive filaments, 7-20 μ diam., which is readily seen through the cortex when the specimen is wet; the inner cortex loose, of cells about 7 μ diam., separated by intervals of 5-7 μ, grading gradually through 5-7 layers of smaller and more closely placed cells in tiers to the surface layer of radially oval cells about 2.0-4.0 μ long, separated by 1.5-4.0 μ of wall thickness and covered by a firm, clearly delimited surface jelly about 3 μ thick; outer cells in surface view rounded, with thick lateral walls, 3.5-5.5 μ diam.; sporangia tetrapartite, scattered, immersed in the cortex, about 9-11 μ diam., 15-18 μ long; cystocarps numerous, 0.1-0.2 mm diam., slightly protuberant, with a pore on one surface, the carpospore mass surrounded by a few pericarpic filaments, attached to a single basal cell, the spores small, broadly oval, about 15 μ long.

These blades seem to differ from Howe's (1914, p. 163) *S. heteronema* in being smaller, in their simpler form, lacking innovations, the more slender refractory medullary filaments which rarely meet in polyradiate ganglia, the smaller cortical cells, shorter tetrasporangia, and other minor features.

ECUADOR: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *nos. 34-250A, 34-297* (cystocarpic and tetrasporic), 19 Jan. 1934. *Ibid.,* dredged from 33 meters off Post Office Bay, *no. 34-384* (cystocarpic, *TYPE*), 29 Jan. 1934.

Solieriaceae

Plants plane or bushy, subsimple or branched, the branches round or somewhat compressed, firmly fleshy; structurally showing a loosely filamentous medulla and a falsely parenchymatous cortex with smaller cells without, larger within; tetrasporangia formed at the surface of the cortex, zonate; carpogenic branches of three or four cells borne in the inner cortex, the scattered auxiliaries similarly placed; cystocarps immersed, showing a central fusion mass or sterile tissue, and discharging by a pore.

KEY TO GENERA

1. Plants bushy, the branches terete . . . . Agardhiella
1. Plants simple or bushy, the branches compressed to strap shaped or foliaceous . . . . Sarcodiotheca

AGARDHIELLA Schmitz, 1889

Plants branching, the branches terete, tapering moderately firm; medulla diffuse, filamentous, with a soft jelly between the filaments, the inner cortical cells large, colorless, the outer ones small and bearing chromatophores; tetrasporangia formed beneath the surface of the cortex, zonate; spermatangia covering large areas of the cortex of small plants, each cortical cell bearing three to five supporting cells, which each carry two or three spermatangia; cystocarps large, the carpospore mass in the inner cortex and medulla, distending the outer cortex so as to project slightly, the carpospores terminal on the gonimoblasts, discharging by a pore.

Agardhiella tenera (J. Agardh) Schmitz

Taylor 1937, p. 286, pl. 38, fig. 4, pl. 41, fig. 2, pl. 59, fig. 9.

There is nothing distinctive about the figures or description of *A. mexicana* Dawson (1943, p. 288, pl. 69, fig. 1). A conspicuous main axis is often wanting in the eastern form. Tetrasporic plants of *A. tenera* develop abundant "spinulose projections" when the tetraspores germinate *in situ.* This is a common phenomenon in southern New England waters.

MÉXICO: Is. Revilla Gigedo, an attenuate form dredged from 45 meters' depth at sta. 919 near I. Clarion, *no. 39-34,* 17 Mar. 1939. ECUADOR: Archipiélago de Colón, dredged from 33 meters' depth at sta. 157, Tagus Cove, I. Isabela, *no. 34-183,* 15 Jan. 1934. *Ibid.,* dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-229,* 19 Jan. 1934. *Ibid.,* from 55 meters, *no. 34-385* (tetrasporic and carposporic), 29 Jan. 1934. *Ibid.,* dredged from a rocky bottom at 37-55 meters near an islet in Gardner Bay, I. Española, *no. 34-411* (cystocarpic), 31 Jan. 1934.

SARCODIOTHECA Kylin, 1932

Thallus flat, angularly divided; medulla somewhat loose, of comparatively thin filaments, the cortex large celled within, smaller celled without; tetrasporangia scattered in the outer cortex, zonate; cystocarps scattered, the gonimoblasts lying in the medulla surrounding and radiating from a small-celled sterile tissue, the seriate carpospores interspersed with isolated sterile strands, the whole somewhat unilaterally protuberant, discharging by a pore.

KEY TO SPECIES

1. Branches not foliaceous, generally less than 1 cm wide . . 2
1. Branches wider, reaching 2-3 cm below the forks . S. ecuadoreana
2. Branches thin, commonly over 5 mm wide; stalk cylindrical . . . . S. tenuis
2. Branches extremely divergent, fleshy, commonly under 4 mm wide; without distinctive cylindrical stalk . . . . S. divaricata

Sarcodiotheca tenuis n. sp.[134]

Plate 74, Fig. 2

Plants to about 7.5-10.0 cm tall, thin, fleshy membranous, rose red, from a brief cylindrical stalk expanding to a 5-6-times dichotomous thallus with segments 5-7 mm broad, somewhat tapering down to each fork, the angles 60°-90° with rounded sinuses, the tips divergent, generally acute; structurally with a scanty filamentous medulla, an inner cortex of about two layers of thin-walled cells, the innermost large and the outer assimilatory cortex of one layer of cells 14-20 μ diam. which are angular in surface view with a firm wall; cystocarps marginal, sometimes appearing minutely pedicellate, ostiolate, spherical to pyriform, the surrounding wall with a moderately thick parenchymatous outer tissue not showing particularly regular arrangement of the oval cells which compose it, and a thin filamentous inner layer; spore mass spherical with a sterile center of cells larger within, smaller without, connected with the wall tissue by a few filaments, completely surrounded by short gonimoblasts 2-3 cells long.

This proposed new species differs somewhat from the others in the shape of the thallus, but most definitely in the texture, the thallus being extremely thin and delicate for plants of this group, soaking up to about 150 μ thick, and when dry not adhering well to paper except at the tips of the branches.

ECUADOR: Archipiélago de Colón, dredged in 27 meters off Post Office Bay, I. Santa María, *no. 34-271A (TYPE),* 19 Jan. 1934.

Sarcodiotheca divaricata n. sp.[135]

Plate 74, Fig. 1

Plants to 15 cm tall, spreading and bushy, dull purplish red, rather firm and crisp in texture, adhering well to paper on drying; flat throughout except at the attenuate tips, 8-12 times dichotomously branched at angles of 80°-100°, the segments 2-4 mm broad below, generally about 1 mm in the divaricate tips; soaking up to 0.25 mm thick, but much

[134] Sarcodiotheca tenuis n. sp.—Plantae ad 7.5-10.0 cm altitudine, stipite brevi, thallo 5-6-dichotome ramoso, carnoso-membranaceo, segmentis supra 5-7 mm lat., ad omnem furcam deorsum attenuatis, cacuminibus divergentibus, acutis; pericarpis marginalibus, aspectu minute pedicellatis, ostiolatis, sphericis ad pyriformes. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-271A,* 19 Jan. 1934.

[135] Sarcodiotheca divaricata n. sp.—Plantae ad 15 cm altitudine, textura firmae crispaeque, 8-12-dichotome ramosae angulis latis, segmentis infra ad 2-4 mm lat., in cacuminibus divaricatis 1 mm latis; ad 250 μ crass. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-316,* 20 Jan. 1934.

thicker when fresh; structurally showing a medulla of more or less scattered filaments, an inner cortex of about three layers of colorless cells quite large within, smaller without, and the assimilative cortex of one layer of cells which from surface view are angular with firm walls and are between 11-20 μ diam.

The specimens from Post Office Bay differ from the type in being shorter and broader, in some instances reaching 1 cm in width, rapidly decreasing toward the tips. No fruit was observed in either collection; so the generic assignment is tentative.

ECUADOR: Archipiélago de Colón, dredged from 55 meters' depth near Wreck Bay, I. San Cristóbal, Schmitt *no. 352B-34,* 15 Dec. 1934. *Ibid.,* dredged from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-271B,* 19 Jan. 1934. *Ibid.,* dredged in abundance off Academy Bay, I. Santa Cruz, *no. 34-316 (TYPE),* 20 Jan. 1934. Probably also: dredged in 9 meters off I. Baltra, *no. 34-332,* 22 Jan. 1934.

Sarcodiotheca ecuadoreana n. sp.[136]

Plate 75, Figs. 1, 2

Plants clustered from a small holdfast, to 10-15 cm tall, dull purplish red, fleshy membranous, adhering well to paper; below subcylindrical and about 1 mm diam. when dried except at the extreme base, cuneate above and more or less so in each segment, strap shaped, more or less regularly dichotomously branched, or in the upper segments occasionally trichotomous, soaking up to over 0.3 mm thick, reaching a width of 8-12 mm above each fork, the apices variable, sometimes rounded, sometimes sharply bifurcate and either spreading or forcipate; the lower segments eventually marginally beset with numerous secondary branchlets which are commonly cylindrical at the base, as are proliferations at points of damage; structurally showing a scanty medulla of slender filaments scattered or in small groups with outside of it a few layers of large thin-walled cells and a thin assimilative cortex of small thin-walled cells 6-8 μ diam.; tetrasporangia zonate, scattered in the cortex of the upper branches, 28-40 μ diam., 45-55 μ long in section; spermatangia about 2 μ diam.,

136 Sarcodiotheca ecuadoreana n. sp.—Plantae ad 10-15 cm altitudine, fasciculatae, carnoso-membranaceae; infra subcylindricae, et 1 mm lat., in margine proliferae; supra plus minus regulariter dichotome ramosae, segmentis ligulatis, paullum cuneatis, latitudine super furcas ad 8-12 mm crassitudine (madefactis) ad 0.3 mm vel plus, apicibus rotundatis ad bifurcatos, divergentibus ad forcipatos; tetrasporangiis dispersis, 28-40 μ diam., 45-55 μ long.; plantis dioeciis, spermatangiis circa 2 μ diam., in cellulis superficialibus super magnas partes; pericarpis prominentibus confertisque, primo in margine aut in proliferationibus, postea superficialibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-359,* 29 Jan. 1934.

produced from surface cells of the male plants over large areas of the thallus; cystocarps prominent, to 1-2 mm diam., marginal in young plants or in proliferations, later facial, but in the small marginal branchlets cystocarps, the outer tissue about the spores parenchymatous, of oval cells, the inner layers filamentous, the spore mass with a center of colorless sterile cells which may break down in old, large cystocarps, surrounded by the carpospores and anchored to the surrounding tissue by trabeculae.

This plant seems rather closely related to *S. furcata* (Setchell & Gardner) Kylin (1932, p. 16), but is a smaller species with pinnate secondary branching and a tendency for aggregation of the cystocarps, chiefly in the secondary branches. The Pta. Cristofer specimen is rather peculiar and is included tentatively as a piece past maturity. It consists of a fragment of one fork about 14 cm long and 3 cm wide below, with one forked proliferation 8 cm long. The material is tetrasporic. Over the face there are many small plantlets, from mere granules up to some a centimeter in length. Around the margin are a few larger ones, indeed one over 2 cm long, and a few of these are marginally cystocarpic, and others are spermatangial. They probably arose from germinated tetraspores. This fragment may indicate that the species can attain considerably larger size than is ascribed to it.

MÉXICO: Nayarit, dredged from 21.5 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-651,* 9 May 1939. COSTA RICA: dredged off Pto. Culebra, *no. 34-527B* (cystocarpic), 24 Feb. 1934. ECUADOR: Archipiélago de Colón, dredged in 27-55 meters off Tagus Cove, I. Isabela, *no. 34-135* (cystocarpic), 13 Jan. 1934. *Ibid.,* dredged from 18-32 meters at sta. 157, *no. 34-188* (tetrasporic), 15 Jan. 1934. *Ibid.,* drifting off Pt. Christopher, *no. 34-199* (proliferous), 16 Jan. 1934. *Ibid.,* dredged from 36 meters' depth opposite Gordon Rocks, I. Santa Cruz, Schmitt *no. 316F-34* (cystocarpic), 8 Dec. 1934. *Ibid.,* dredged from 13-18 meters' depth off Post Office Bay, I. Santa María, *no. 34-359* (cystocarpic and tetrasporic, *TYPE*), 29 Jan. 1934. *Ibid.,* dredged in 27 meters, *no. 34-276A* (tetrasporic), 19 Jan. 1934. *Ibid.,* dredged in 9 meters, I. Baltra, *no. 34-333* (cystocarpic), 22 Jan. 1934.

Rhabdoniaceae

Thallus cylindrical or flattened, radially or bilaterally branched; apical growth with a central filament which commonly becomes obscure; medulla filamentous, the cortex of close, somewhat obscurely radial rows of cells, the inner large, the outer progressively smaller; tetrasporangia zonate, scattered in the cortex; cystocarps immersed, without special pericarp tissue, the carpospores radiating from a large fusion cell, discharging through a pore.

CATENELLA Greville, 1830

Catenella repens (Lightfoot) Batters

Plants creeping or pulvinate, the axes to 3 cm long, dull purple, dichotomous or trichotomous or in part pinnately branched, the branches segmented, like the axis, the segments compressed, narrowly ellipsoid to ovate; tetrasporangia in long acute segments; cystocarps in short, ovate to subspherical segments.

Taylor 1942, p. 103.

ECUADOR: Archipiélago de Colón, from *Rhizophora* roots in a lagoon near buildings, Academy Bay, I. Santa Cruz, *no. 34-301C,* 20 Jan. 1934. Esmeraldas, on roots of *Rhizophora* along the shore of Bahía San Francisco, *no. 34-490B,* 11 Feb. 1934.

Catenella impudica (Montagne) J. Agardh

COLOMBIA: Valle, on mangroves at the mouth of the Río Dagua, Bahía Buenaventura, coll. E. P. Killip *no. 33003,* 3 Feb. 1939 (det. C. K. Tseng).

Hypneaceae

Plants bushy, cushionlike to large and virgate; growing from an apical cell and usually showing a persistent axial cell row, the cortex falsely parenchymatous; tetrasporangia zonate, immersed at the surface of the swollen parts of small lateral branchlets; cystocarps showing gonimoblasts associated with nutritive tissue within a swollen, poreless pericarp.

HYPNEA Kützing, 1813

KEY TO SPECIES

1. More or less matted or entangled 2
1. Erect and bushy, very coarse, dark red, drying blackish . . . . H. Johnstonii
2. Without characteristically elongated branches 3
2. With some branches long, erect 5
3. Small, densely matted . . . . H. spinella
3. Loosely entangled 4
4. Small, somewhat bushy to entangled . . . . . . H. cervicornis
4. Larger but slender, caespitose but diffuse and loose H. Marchantae
5. Small, densely matted, with erect fertile branches elongate . . . . H. pannosa
5. Large, somewhat entangled below, with little-divided virgate branches emergent for a few centimeters . . . . H. californica

Little can be done with the numerous dwarfed and partially developed forms of this genus found in shallow-water collections, often intermixed with other genera. At best, the species tend to be polymorphic, and unless well developed there is little hope of effecting even an approximate determination.

Hypnea Johnstonii Setchell & Gardner

Setchell & Gardner 1924, p. 758, pl. 23, figs. 19-21, pl. 57.

MÉXICO: Baja California, among Corallinae and coarse calcareous sand in shallow water, Point Hughes on Cabo San Lazaro, *no. 34-664,* 7 Mar. 1934.

Hypnea californica Kylin

Kylin 1941, p. 20, pl. 6, fig. 16.

These, especially the Ecuadorean, were small specimens much resembling *H. Valentiae.* However, they are probably best allocated to Kylin's new species.

MÉXICO: Guerrero, on rocks in Ba. Petatlán, *no. 34-572A,* 2 Mar. 1934. ECUADOR: Guayas, on the rocky southeast side of St. Elena Point, Salinas, *no. 34-460A,* 8 Feb. 1934.

Hypnea pannosa J. Agardh

Plate 71, Fig. 2

Kützing 1868, p. 9, pl. 27, figs. i, k.

Comparison with authentic material loaned by the Field Museum of Natural History has convinced the author that his Mexican material is identical with *H. pannosa* J. Agardh. The type locality is on the Pacific coast of Mexico. For the lack of reference material, this species has been ill known. The Ecuadorean material is not quite so like the typical thing, being looser. Farlow (1902, p. 98) correctly reports this species from Tagus Cove and Turtle Point, I. Isabela, Ecuador. Dawson (1944, p. 291) reports it from the Gulf of California.

MÉXICO: Nayarit, on rocks, I. Isabel, *no. 34-588D,* 5 Mar. 1934. *Ibid.,* dredged from 21.5 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-654,* 9 May 1939. PANAMÁ: crevices of rocks in high tide pools, Islas Secas, *no. 39-125,* 26 Mar. 1939. ECUADOR: Archipiélago de Colón, forming mats on intertidal rocks, Black Beach Anchorage, I. Santa María, *no. 34-269,* 18 Jan. 1934.

Hypnea Marchantae Setchell & Gardner

Setchell & Gardner 1924, p. 759, pl. 23, figs. 22, 23, pls. 42a, 56.

This material appears to be more delicate than some authentic specimens of the species, and to show very few proliferous spines. It does not seem outside the plausible interpretation of *H. cervicornis,* which is, however, essentially Atlantic-Caribbean in distribution. Material from Ecuador was so like Caribbean material that it was, indeed, finally assigned to that species.

COLOMBIA: Valle, dredged off I. Gorgona, *no. 34-493B,* 12 Feb. 1943. ECUADOR: Salinas, dredged at 3.5 meters' depth off La Playa, La Libertad, Schmitt *no. 14D-33,* 20 Jan. 1933.

Hypnea cervicornis J. Agardh

Taylor 1942, p. 104.

ECUADOR: Guayas, along the shore in pools, Salinas, Schmitt *no. 507* (tetrasporic), 12-14 Sept. 1926.

Hypnea spinella (C. Agardh) Kützing

Børgesen 1915-20, p. 384, fig. 369.

MÉXICO: Guerrero, forming mats on rocks, Ba. Petatlán, *no. 34-572B,* 2 Mar. 1934.

Plocamiaceae

Plants bushy, the branches compressed to flat and membranous, forking from the margin alternately to form a flat blade, the lateral branches bearing branchlets in small, usually pectinate groups; apical cell and axial row evident, the cortex apparently parenchymatous; tetrasporangia borne on special small branchlets, zonate; carpogenic branch of three cells, borne on a supporting auxiliary cell; cystocarps scattered along the margins of the thallus or in special branchlets, without evident pores.

PLOCAMIUM Lamouroux, 1813

Plocamium pacificum Kylin

Kylin 1925, p. 42.

These specimens show a great deal of variation in size and habit. Sometimes when very luxuriant the branches are 2.5 mm broad and the branchlets regularly pectinately divided, with the penultimate segments 1.0-1.5 mm diam. Sometimes even on the same plant some parts develop a confused and entangled slender branch system with little resemblance to the other, and nearly without pectinate subterminal branching, but all fertile specimens have the character of *P. pacificum*. Consequently the whole series is considered as belonging to this one species.

MÉXICO: Baja California, at South Bay, I. Cerros, *no. 34-626*, 10 Mar. 1934. *Ibid.*, Pta. San Bartolomé, at Ba. Thurloe, *no. 34-616*, 9 Mar. 1934. *Ibid.*, Cabo San Lazaro, at Point Hughes, near low tide on rocks, *no. 34-591*, 7 Mar. 1934. Is. Revilla Gigedo, rare as dredged at sta. 136 from 59 meters off Sulphur Bay, I. Clarion, *no. 34-59*, 5 Jan. 1934. ECUADOR: Archipiélago de Colón, rare fragments dredged at sta. 143 off I. Wenman, *no. 34-80*, 11 Jan. 1934. *Ibid.*, from the reef to the north of Tagus Cove, near low tide line, I. Isabela, *no. 34-161*, 15 Jan. 1934. *Ibid.*, floating offshore, and on surf-beaten rocks at Pt. Christopher, *nos. 34-196, 34-202B*, 16 Jan. 1934. *Ibid.*, I. Santa María, *Hassler* Exped. *no. 1014*, June 1872. *Ibid.*, occasional near low tide line on rocks, Black Beach Anchorage, *no. 34-220*, 17 Jan. 1934. *Ibid.*, dredged off Academy Bay, I. Santa Cruz, *no. 34-325*, 20 Jan. 1934.

Gracilariaceae

Plants bushy, branched, the branches cylindrical or flattened, dichotomously to subpalmately or pinnately divided, firm to cartilaginous; structure parenchymatous; sporangia scattered on the surface, or somewhat aggregated, tetrapartite; spermatangia formed in crypts; carpogenic branches of two cells, the carpogonium fusing with the cell below and with others to form a large cell from which the gonimoblasts are produced; cystocarp with a large basal placenta, discharging through a pore in the thick, projecting pericarp.

KEY TO GENERA

1. Sporangia scattered; pericarp not generally connected with the center of the cystocarp . . . . Gracilaria
1. Sporangia in scattered, slightly elevated nemathecia; pericarp connected by sterile strands with the sterile center of the cystocarp . . . . Tylotus

GRACILARIA Greville, 1830

Plants bushy, cylindrical or flattened, fleshy to cartilaginous, dichotomously to alternately branched, often proliferous; structurally with a broad medulla of large colorless cells and a narrow small-celled cortex; sporangia scattered at the surface of the cortex, tetrapartite; spermatangia generally formed in crypts; cystocarps spherical with a basal placental tissue, the pericarp much swollen, ostiolate.

KEY TO SPECIES

1. Cylindrical throughout 2
1. Slightly compressed above, and especially below the forks . 3
1. Flattened or foliaceous 4
2. Main axes slender, sparingly divided, but with many very slender shorter lateral branches . . . . G. confervoides
2. Main branches coarse, reaching 3 mm diam., simple or sparingly branched from near the base . . . . G. panamensis
3. Branching dichotomous . . . . G. cerrosiana
3. Branching at least in part pinnate . . . . G. pinnata
4 Segments thicker, fleshy to subcartilaginous 5
4. Segments broad, thin but fleshy; dichotomous to polychotomously forked at wide angles 7
5. Plants less than 1 dm tall, segments narrower 6
5. Plants large, over 1 dm tall, the segments erect, to 1.5 cm broad above the forks, and wider than below them . . . G. Johnstonii
6. Lower segments narrow, little broader than the acute-tapering end segments . . . . G. linearis
6. Lower segments broad, to 1 cm or more, rapidly decreasing in width toward the obtuse to acute end segments . G. Skottsbergii
7. Segments 1-6 times as long as broad, the branch apices somewhat narrowed . . . . G. tenuifolia
7. Segments 1-3 times as long as broad, at wider angles, the apices broadly rounded truncate . . . . G. brevis

Gracilaria confervoides (L.) Greville

These plants belong to the elongate form of the species sometimes called f. *longissima* Harvey.

MÉXICO: Is. Revilla Gigedo, dredged from 56-102 meters' depth at sta. 921 near I. Clarion, *no. 39-43,* 17 Mar. 1939. *Ibid.,* dredged at sta. 129 from 25-36 meters' depth off Braithwaite Bay, I. Soccoro, *no. 34-12* (tetrasporic), 2 Jan. 1934. *Ibid.,* dredged from 41-84 meters' depth at sta. 924, *no. 39-65,* 18 Mar. 1939. ECUADOR: Guayas, on the northwest beach near Pta. Santa Elena, Salinas, *no. 34-451A* (cystocarpic), 8 Feb. 1934. *Ibid.,* dredged from 11 meters, Ba. Salinas, Schmitt *no. 481A-35,* 11 Feb. 1935.

Gracilaria panamensis n. sp.[137]

Plate 76, Figs. 1-4

Plants from a small disklike holdfast arising to a height of 16.5 dm, simple or moderately alternately branched near the base, the branches becoming like the main axis, terete throughout, very slender near the base of the plant, above expanding to 1.5-3.0 mm diam., the branches somewhat perceptibly contracted to their bases; outer cortex very small celled, two cells thick, the inner of several layers, a little larger, the medulla of very large thick-walled cells; cystocarps very prominent, 0.5-1.25 mm diam., on branches commonly thicker than tetrasporic branches of the same length, the pericarp thick, without trabeculae between it and the placenta.

These plants seem much more often simple and much larger than the type of *Gigartina lemanaeformis* Bory (Bory de St. Vincent 1827-29, p. 151), but when they are small and branch relatively freely they resemble closely the type specimen as illustrated by Howe (1914, p. 128, pl. 52, as *Cordylecladia lemanaeformis*). The surface cells are hardly twice as tall as broad, while in Peruvian material which probably is *C. lemanaeformis* they are columnar, 3-4 diameters high. They are much taller, thicker and less branched than *G. Sjostedtii* as described by Kylin (1930, p. 55). The species is no doubt closely related to *G. Sjostedtii* of northern waters, but is held separate until the two forms can be connected with assurance.

Costa Rica: dredged at Pto. Culebra, *no. 34-526* (cystocarpic), 24 Feb. 1934. Panamá: abundant as dredged at sta. 960 from a bottom of sand and coralline algae at 3.5-9.0 meters' depth between I. Taboga and I. Urava, *no. 39-625* (cystocarpic and tetrasporic, *TYPE*), 2 May 1939. Ecuador: Archipiélago de Colón, dredged at sta. 157 from 18-33 meters' depth off Tagus Cove, I. Isabela, *no. 34-187* (tetrasporic and cystocarpic), 15 Jan. 1934. *Ibid.,* common as dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-283* (cystocarpic), 19 Jan. 1934. *Ibid.,* common as dredged off Academy Bay, I. Santa Cruz, *no. 34-323* (tetrasporic and cystocarpic), 20 Jan. 1934. *Ibid.,* dredged from 36 meters' depth opposite Gordon Rocks, Schmitt *no. 316H-34,* 8 Dec. 1934. *Ibid.,* dredged from 13 meters at sta. 182 near I. Bartolomé, I.

[137] Gracilaria panamensis n. sp.—Plantae ad 16.5 dm altitudine, simplices aut prope basim modice alterneque ramosae, ramis axi similibus, cylindricis, supra ad 3.0 mm diam. attingentibus, basibus, autem, saepe constrictis; medulla e cellulis magnis, parietes crassos habentibus constante, cortice externo e stratis duobus cellularum minimarum constante. Planta typica in loco dicto I. Taboga, Panamá, legit W. R. Taylor *no. 39-625,* 2 May 1939.

San Salvador, *no. 34-345,* 24 Jan. 1934. *Ibid.,* one piece dredged off a sandy bottom at 37-55 meters' depth off an islet in Gardner Bay, I. Española, *no. 34-404,* 31 Jan. 1934. Guayas, from the northwest beach near Pta. Santa Elena, Salinas, *no. 34-451B* (cystocarpic), 8 Feb. 1934.

Gracilaria cerrosiana n. sp.[138]

Plate 77, Fig. 1

Plants to 25 cm tall, dull purplish red, cartilaginous, bushy, the erect branches subterete below, slightly compressed above, especially at the forkings; branching irregularly dichotomous, the segments to 6 cm long below but closer above, 2-3 mm diam. below, but in the ultimate segments 1.5-2.0 mm, the tips slightly tapered, rather obtuse; structurally showing a broad parenchymatous medulla and a narrow cortex of 1-2 layers, of which the outer cells are radially elongate, to 10 μ diam., 20 μ tall.

MÉXICO: Baja California, on rocks at South Bay, I. Cerros, *no. 34-636 (TYPE),* 10 Mar. 1934.

Gracilaria pinnata Setchell & Gardner

Setchell & Gardner 1924, p. 751, pl. 61.

These specimens were somewhat closer bilaterally branched than figured, and without short spur branches.

MÉXICO: Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-650,* 9 May 1939.

Gracilaria Johnstonii Setchell & Gardner

Plants to 23 cm tall, subcartilaginous, dark rose red, at the base contracted and subcylindrical, 1-2 mm diam., above gradually expanded to the flat blades which branch, chiefly dichotomously, 4-5 times, but frequently irregularly or polychotomously, the segments in the middle parts of the plant to 1.0-1.5 cm broad above the forks, narrower toward the rounded tips; cystocarpic plants often subsimple, generally less branched than the tetrasporic individuals, the cystocarps prominent, about 0.75-1.25 mm diam.

[138] Gracilaria cerrosiana n. sp.—Plantae ad 25 cm altitudine, fruticosae, ramis infra cylindricis, supra paulum compressis, irregulariter dichotomis; segmentis infra ad 6 cm long., supra arctioribus, diam. infra 2-3 mm, supra 1.5-2.0 mm; cortice ex 1-2 stratis cellularum constante, cellulis externis radiatim elongatis, ad 10 μ diam., 20 μ altitudine. Planta typica in loco dicto South Bay, I. Cerros, legit W. R. Taylor *no. 34-636,* 10 Mar. 1934.

Setchell & Gardner 1924, p. 572, pl. 22, figs. 11-14, pl. 60.

The habit of plants assigned to this species varies widely. Some, especially cystocarpic individuals, have long segments between the erect forkings, or are subsimple; others are irregularly forked at wide angles a little more than in Setchell & Gardner's plate 60. No satisfactory segregation could be effected.

MÉXICO: Baja California, dredged at 14-18 meters' depth off Pta. Thurloe, Schmitt *no. 283D-34,* 9 Mar. 1934. Nayarit, dredged off I. Isabel, *no. 34-586* (cystocarpic), 3 Mar. 1934. ECUADOR: Archipiélago de Colón, dredged at sta. 159 in 18-32 meters off Tagus Cove, I. Isabela, *no. 34-149C* (cystocarpic), 15 Jan. 1934. *Ibid.,* dredged at Academy Bay, I. Santa Cruz, *no. 34-313* (tetrasporic and cystocarpic), 20 Jan. 1934. *Ibid.,* dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-290* (tetrasporic and cystocarpic), 19 Jan. 1934. *Ibid.,* dredged from 13-18 meters' depth (tetrasporic and cystocarpic), *no. 34-358,* 27 Jan. 1934.

Gracilaria linearis Kylin, *prox.*

Plants to about 4 cm tall, subsessile, flat, fairly regularly 4-6 times dichotomously branched, the upper branches about one fourth as wide as the segments near the base of the plant.

Kylin 1941, p. 22, pl. 7, fig. 19.

These probably represent a juvenile form of this plant, the branching when best developed resembling the upper parts of Kylin's plants.

ECUADOR: Esmeraldas, dredged in 5.4 meters off Bahía San Francisco, *no. 34-487,* 11 Feb. 1934.

Gracilaria Skottsbergii n. sp.[139, 140]

Plate 78, Fig. 2

Plants to 6-8 cm tall, dull reddish purple, the texture firmly fleshy, near the stipe compressed and slender, cuneate expanded to the blade, which is broad near the base and with segments 2-3 cm wide, but by a very close series of irregularly dichotomous forkings is divided into sharply narrower segments, so that after 7-8 stages the tips are only 1-2 mm broad; tetrasporangia scattered; cystocarps scattered, prominent, the broad sterile base connected by filaments across the spore mass to the pericarp.

139 Gracilaria Skottsbergii n. sp.—Plantae ad 6-8 cm altitudine, infra compressae, cuneato-expansae ad laminam 2-3 cm lat., irregulariter dichotome furcatam in 7-8 gradibus usque ad divisiones 1-2 cm latitudine. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-360,* 27 Jan. 1934.

140 Named in recognition of the work on Pacific algae done by Dr. Carl J. F. Skottsberg.

ECUADOR: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-280A* (tetrasporic, cystocarpic), 19 Jan. 1934. *Ibid.*, dredged from 12-18 meters, *no. 34-360* (cystocarpic, *TYPE*), 27 Jan. 1934.

Gracilaria tenuifolia n. sp.[141]

Plate 78, Fig. 1

Plants to 15 cm tall, bright rose red, thin, crisply membranous-fleshy in texture, near the base slender and compressed, gradually widening to the blade which is rather irregularly 7-10 times dichotomously or occasionally polychotomously divided, the segments narrow, below somewhat cuneate, above more strap shaped, to 5 mm broad above the 20°-60° forks, the sinuses slightly rounded, the apices a little more narrow, obtuse; to 130-260 μ thick, structurally showing a medulla of 2-3 layers of very large thin-walled cells and a cortex of 1-2 layers of small close-placed cells, each about 6-8 μ deep and as broad or somewhat broader; sparingly proliferous, the branchlets with slender bases and at first ligulate but later branching like the parent plant; sporangia tetrapartite, scattered over the upper branches below the final fork, prominent in the thin cortex, 25-35 μ diam.; cystocarps very prominent, entirely above the general thallus surface, showing a contracted base and a pericarp considerably thickened near the top, with a pore, the carpospore mass covering a large sterile basal tissue which is connected by occasional filaments with the pericarp.

Dawson's *Gracilaria veleroae* (1944, p. 297, pl. 70, fig. 2 in part) may represent a less luxuriant phase of this same plant, but one cannot be sure from his description, particularly since the orientation of the cortical cells is not clearly stated.

MÉXICO: Is. Revilla Gigedo, abundant as dredged at sta. 129 from 25-32 meters off Braithwaite Bay, I. Soccoro, *no. 34-13* (tetrasporic and cystocarpic, *TYPE*), 2 Jan. 1934. *Ibid.*, rare as dredged at sta. 135 from 45 meters' depth off Sulphur Bay, I. Clarion, *no. 34-47* (cystocarpic), 5 Jan. 1934. *Ibid.*, dredged from 41-84 meters' depth at sta. 924, *no. 39-68,* 18 Mar. 1939. *Ibid.*, dredged from 51-79 meters' depth at sta. 917, *no. 39-23,* 16 Mar. 1939. *Ibid.*, dredged from 45 meters' depth at sta. 919, *no. 39-33,* 17 Mar. 1939. *Ibid.*, dredged from 56-102 meters' depth at sta. 921, *no. 39-39,* 17 Mar. 1939.

141 Gracilaria tenuifolia n. sp.—Plantae ad 15 cm altitudine, infra compressae, supra dilatatae in laminam 7-10 dichotome aut polytome furcatam, segmentis angustis, paululum cuneatis ad ligulata, ad 5 mm latitudine, apicibus paululum angustatis, obtusis; planta tenui et crispate membrano-succulenta; medulla constante e 2-3 stratis cellularum magnarum, parietes tenues habentium, cortice ex 1-2 stratis cellularum parvarum confertarumque constante. Planta typica in loco dicto Braithwaite Bay, Soccoro I., México, legit W. R. Taylor *no. 34-13,* 2 Jan. 1934.

Gracilaria brevis n. sp.[142]

Plate 37, Fig. 2

Thallus to 5 cm tall, or perhaps more, fairly regularly to 6 times dichotomously branched, the axis 1-2 mm diam., subterete below, the branches strap shaped, 3-10 mm broad, 180-250 μ thick (partly soaked up), at the apices rounded or retuse; structurally showing a broad medulla of large cells 40-120 μ diam., in the center, toward the surface considerably smaller, the cortex of a layer of rounded cells 3-9 μ diam., with thick walls between them, the outer cuticle 3-10 μ thick; cystocarps superficial, the pericarps contracted below but sessile, the walls thick, of cells in radiating rows; cystocarp basally attached, with a large expanded central sterile tissue.

ECUADOR: Guayas, occasional in tide pools, Pta. Santa Elena, Schmitt *no. 524* (cystocarpic, *TYPE*), 17 Sept. 1926.

TYLOTUS J. Agardh, 1876

Tylotus ecuadoreanus n. sp.[143]

Plate 69, Fig. 1

Plants tufted, to 9 cm tall from a small discoid holdfast, profusely branched, when dry dull purple, darker toward the margins and more glaucous toward the center of the segments; short stalked, above flat and irregularly dichotomously branched at intervals of 0.5-1.5 cm, somewhat tapered toward the upper segments, to about 5 mm wide below, 1-2 mm in the terminal branchlets, the tips blunt; in structure showing a parenchymatous medulla of a few layers of large cells; tetrasporangia produced in ill-defined sori first formed near the branch tips and not extending the full width of the branch, these sori being left behind as the tips grow and divide, and gradually becoming decorticate as the sporangia are discharged, so that the thallus bears many pale roughened spots; sporangia tetrapartite, oval, 24-28 μ diam., dispersed among paraphysal extensions of the cortex cells which develop in tiers of about 3 cells, the total length being about 45 μ; cystocarps scattered sparingly over the female plants,

[142] Gracilaria brevis n. sp.—Planta ad 5 cm altitudine; ad sexies dichotome furcata, axe infra 1-2 mm diam. et subterete, supra complanato et 3-10 mm lat., 180-250 μ (vel plus ?) crassitudine; apicibus rotundatis aut retusis, cystocarpis superficialibus prominentibusque. Planta typica in loco dicto Pta. Santa Elena, Ecuador, coll. W. L. Schmitt *no. 524,* 17 Sept. 1926.

[143] Tylotus ecuadoreanus n. sp.—Plantae ad 9 cm altitudine, profuse ramosae, supra planae et irregulariter dichotome intervallis 0.5-1.5 cm, segmentis infra ad 5 mm lat., supra 1-2 mm lat., cacuminibus obtusis; tetrasporangiis 24-28 μ diam., in soris male definitis, ad cacumina ramorum primo formatis; cystocarpis prominentibus, basim contractam atque pericarpum ostiolatum habentibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-270,* 18 Jan. 1934.

prominent, the base contracted, the apex produced and ostiolate, the sterile basal tissue broadly attached to the thallus, connecting with the pericarp by trabeculae across the spore mass.

ECUADOR: Archipiélago de Colón, in tufts on surf-beaten rocks, Black Beach Anchorage, I. Santa María, *nos. 34-261* (cystocarpic), *34-270* (tetrasporic, *TYPE*), 18 Jan. 1934.

Phyllophoraceae

Plants bushy, dichotomously branched, the branches cylindrical to membranous; structurally showing a pseudoparenchymatous medulla and obscurely filamentous cortex of anticlinal cell rows; sporangia in slightly elevated nemathecia, mono- or tetrasporangial, the tetrapartite sporangia being produced in anticlinal series; spermatangia developed on outgrowths from surface cells; carpogenic branches three celled, borne on supporting auxiliary cells which with other cells of the branch produce sterile outgrowths, the carpospores being in irregular masses interwoven with these and within a sterile sheath.

KEY TO GENERA

1. Branches broadly strap shaped; branching complanate Stenogramma
1. Branches narrow, filiform, terete or a little flattened . . . 2
2. Branches terete . . . . Ahnfeltia
2. Branches compressed, at least at the forks . . . Gymnogongrus

AHNFELTIA Fries, 1835

Plants bushy, wiry, dichotomous or unilaterally branched, sometimes proliferous; slender branches terete, of multiaxial growth, the firm medulla of many slender longitudinal filaments, the firm cortex of anticlinal cell rows; reproduction by monosporangia in cushionlike nemathecia.

KEY TO SPECIES

1. Branches generally more than 1.5 mm diam . . . A. Durvillaei
1. Upper branches generally less than 1.0 mm diam. 2
2. Closely di-polychotomously forked, reaching 7 cm in height; the surface appearing dull when dry . . . . A. Svensonii
2. Rather irregularly dichotomously forked, reaching 3 cm in height; the surface appearing slightly nitent when dry . . . . A. gigartinoides

Ahnfeltia Durvillaei (Bory) J. Agardh

Plate 79, Fig. 1

Plants to 30 cm tall, texture tough, dull purplish red, branching habit erect, sparingly dichotomously divided below with the intervals 5-10 cm, more closely branched above with the intervals 1-2 cm, segments 1.5-2.5 mm diam., the apices rounded; proliferous branchlets occasionally numerous on the lower segments, 0.5-1.0 cm long.

Howe 1914, p. 110, pls. 44, 46.

Some of these specimens *(nos. 34-214, 34-252)* are quite close to Howe's *(loc. cit.)* figures of this species and to Kützing's figures (1867, pl. 58) as *Chondrus umbellatus*. However, *no. 34-401* is much taller than these, and *34-399* taller, more slender and with numerous patent proliferations on the lower segments. This latter resembles the Californian plant issued as Phyc. Bor.-Amer. *no. 430,* there called *Ahnfeltia concinna,* a plant originally described from Hawaii but reported from Peru before Howe's publication. It does not resemble *Gymnogongrus implicatus* Kützing (1869, pl. 69), or *G. Polyides* Areschoug (Kützing 1869, pl. 70), both considered by De Toni (1897-1905, p. 256) to be synonyms of *A. concinna.*

ECUADOR: Archipiélago de Colón, I. Rabida, *Hassler* Exped. *nos. 1011, 1012,* June 1872. *Ibid.,* common in the high littoral near Black Beach Anchorage, I. Santa María, *nos. 34-214, 34-252,* 17, 18 Jan. 1934. *Ibid.,* intertidal on surf-beaten rocks south of the Anchorage, *nos. 34-399, 34-401,* 30 Jan. 1934.

var. **implicata** (Kützing) Howe

Plants intergrading with the species, the characteristic feature being a decrease in the length of the branch segments and a greater angle of forking, which involves first the top of the plant and then in the extreme examples of the variety the whole plant, so that it becomes densely crowded and reduced to a height of 2-3 cm.

Howe 1914, p. 112, pl. 45B.

These specimens show moderate similarity to Kützing's figure (1869, pl. 69) of *Gymnogongrus implicatus,* but are rather more regularly branched and the segments less twisted.

ECUADOR: Archipiélago de Colón, dense firm clumps on littoral rocks near Black Beach Anchorage, I. Santa María, *no. 34-250B,* 17 Jan. 1934. Some specimens of *no. 34-252* cited as belonging to the species are transitional and show similar congestion of branches but only in the uppermost part of the large plant.

Ahnfeltia Svensonii n. sp.[144, 145]

Plate 77, Fig. 2

Plants tufted, to 7 cm tall, dark red, blackening on drying, the surface dull, firmly fleshy, terete or slightly compressed at the forkings, closely and divaricately dichotomous or rarely polychotomous, below somewhat proliferous, the segments 5-10 mm long, 0.7-2.0 mm diam., somewhat tapered upwardly, the tips rather obtuse; structurally the axis in section showing a large medulla of subparenchymatous aspect with firm cell walls surrounded by a narrow cortex of short cylindrical cells in radial rows of 3-4 cells' depth; cystocarps scattered, somewhat projecting, often occupying a large part of the diameter of the branch, the carpospore mass immersed, without any sterile base or center, with no defined pericarp, but with a thicker cortex above it which eventually breaks down to a large irregular pore.

This plant has somewhat the habit of Howe's *A. Durvillaei* v. *implicata,* but the branching tends to be more irregular and it is a slenderer and softer plant, the branches on drying often becoming quite flat. It is likewise more slender and less horny than those which the writer tentatively refers to *A. gigartinoides* J. Agardh.

Ecuador: Archipiélago de Colón, on littoral rocks at Black Beach Anchorage, I. Santa María, *no. 34-251 (TYPE),* 17 Jan. 1934.

Ahnfeltia gigartinoides J. Agardh, *prox.*

Plants to 3 cm tall, tough, horny, dull reddish purple or blackish, slightly nitent; irregularly dichotomously branched, the branches reaching about 1 mm diam., terete, the tips a little tapered.

These specimens seem a little more regularly branched than Kützing figures them (1869, pl. 71) from Liebmann's Mexican material; Setchell & Gardner (1930, p. 152) express a suspicion that the species is simply dwarf *A. concinna.*

México: Nayarit, on surf-beaten rocks near high water mark, I. Isabel, *no. 34-587,* 5 Mar. 1934. Ecuador: Salinas, from south side of Pta. Santa Elena, Schmitt *no. 5E,* 16 Sept. 1926.

[144] Ahnfeltia Svensonii n. sp.—Planta ad 7 cm altitudine, teres aut ad furcas paululum compressa, arcte divaricate dichotoma, segmentis 5-10 mm long., 0.7-2.0 mm diam., vix attenuatis, cacuminibus obtusis; cystocarpis dispersis, paululum eminentibus, porum irregularem efficientibus. Planta typica in loco dicto I. Santa María, Ecuador, *no. 34-251,* legit W. R. Taylor *no. 34-251,* 17 Jan. 1934.

[145] Named in recognition of the botanical exploration of the Galapagos Islands by Dr. Henry K. Svenson in 1930.

GYMNOGONGRUS Martius, 1833

Plants small, bushy, repeatedly forking; firm to horny in texture, the branches flat to cylindrical, sometimes proliferated; medulla of angular rounded cells, the cortex of small cells in anticlinal rows; sporangia in nemathecia, irregularly tetrapartite.

KEY TO SPECIES

1. Branch segments compressed 2
1. Branch segments terete or nearly so G. Griffithsiae v. galapagensis
2. Branching spreading, increasingly close and corymbiform above, breadth uniform throughout . . . . G. Smithii
2. Branching more erect, rather irregular, the lower segments commonly wider than the upper . . . . G. martinensis

Gymnogongrus Smithii n. sp.[146, 147]

Plate 80, Fig. 1

Plants forming small tufts to 3.5 cm tall, dull red in color, regularly polychotomously divided, the intervals less toward the tips, the branches rather erect, of equal length, producing an even corymbose habit; segments compressed, diameter throughout very equal, 0.75-1.20 mm, thickness 0.50-0.65 mm, slightly broader below a fork and a little tapered down to the next division point; apices quite blunt, rounded to truncate or emarginate; texture fleshy; in section showing a large medulla of thick-walled cells which are somewhat more regular in arrangement toward the outer part and moderately sharply grade into the close radial rows of 4 or 5 small cells which make up the cortex; spermatangia spindle shaped, formed in colorless patches on the upper 1-2 divisions, covering the breadth of the segment.

This species is smaller than *G. leptophyllus* J. Agardh (Kylin 1941, p. 26), more regularly branched, and of firmer texture, at least as judged by Phyc. Bor.-Amer. *no. 239a.* It somewhat resembles *G. tenuis* also, but the relatively thicker, narrower segments are of more constant dimensions.

ECUADOR: Archipiélago de Colón, in the high littoral near Black Beach Anchorage, I. Santa María, *no. 34-241* (cystocarpic and spermatangial, *TYPE*), 17 Jan. 1934.

146 Gymnogongrus Smithii n. sp.—Planta ad 3.5 cm altitudine, polytoma, intervallis inferioribus longioribus quam superioribus, segmentis compressis, ad 0.75-1.25 mm diam., 0.50-0.65 mm crass., apicibus obtusis; cystocarpis parvis, subinflatis, singulis ad cacumina ramorum; spermatangiis in maculis in 1-2 divisionibus summis. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-241,* 17 Jan. 1934.

147 Named in appreciation of the contributions of Professor G. M. Smith to our knowledge of Pacific coast marine algae.

Gymnogongrus Griffithsiae (Turner) Martius, v. **galapagensis** Piccone & Grunow

Plate 80, Fig. 2

Plants to 7.5 cm tall, dichotomously erectly branched, branches very slender, subterete, when dry 75-225 μ diam., very locally dark red and much swollen.

Piccone *in* Piccone & Grunow 1886, p. 60, the type from I. San Cristóbal, Ecuador.

ECUADOR: Archipiélago de Colón, I. Rabida, *Hassler* Expedition *no. 1009,* June 1876. *Ibid.,* near high tide line on rocks near Black Beach Anchorage, I. Santa María, *nos. 34-263, 34-267C,* 18 Jan. 1934.

Gymnogongrus martinensis Setchell & Gardner

Setchell & Gardner 1937b, p. 78, pl. 12, fig. 31.

The material assigned directly to this species reached a height of 3.5 cm and branched irregularly dichotomously 3 or 4 times in a rather more wide-angled fashion than figured by the authors. However, the identification was confirmed by detailed direct comparison with the type material kindly loaned by the California Academy of Sciences.

MÉXICO: Guerrero, on rocks, Ba. Petatlán, *no. 34-580,* 2 Mar. 1934.

Gymnogongrus martinensis, f.

Thallus small, dark red when fresh, dull and blackish when dry, of tough consistency, the base a small disk thin at the edges, the axis short, stout, nearly cylindrical, when branched often dividing about its own breadth above the base, to about 15 mm tall, simple or 1-3 times dichotomously branched, with occasional lateral proliferations, the branches compressed below, flat and to 200-350 μ thick; structurally showing a thick cuticle, a cortex of short 1-2 times branched anticlinal rows of assimilatory cells, and a medulla of several layers of thick-walled cells with, in the central portion, some slender filaments among them; cortical cells from the surface appearing 2.5-3.0 μ diam., rounded, irregularly distributed except that they commonly appear in pairs, with thick lateral walls; reproduction from somewhat elevated darker nemathecia.

This material seems to represent a dwarf form of *G. martinensis,* as confirmed by comparison in detail with the type material. It differs in some features, which have been elaborated in the description.

MÉXICO: Is. Revilla Gigedo, scarce, on rocks forming little clumps at about mid-tide level, with *Gelidium pusillum,* Braithwaite Bay, I. Soccoro, *no. 39-49B,* 18 Mar. 1939.

Gymnogongrus melanothrix Grunow

Piccone 1886, p. 60; 1889, p. 31; Farlow 1902, p. 96.

Reported from I. San Cristóbal and I. Santa María, Archipiélago de Colón.

Gymnogongrus vermicularis J. Agardh

Piccone 1886, p. 61; Farlow 1902, p. 96.

Reported from I. San Cristóbal, Archipiélago de Colón.

STENOGRAMMA Harvey, 1841

Stenogramma interrupta (C. Agardh) Montagne

Plants to about 5 cm tall, dull rose red, 5-6 times irregularly dichotomously divided, the segments very little tapered to the base, 2-7 mm wide above the forks, the apices broadly rounded; tetrasporangia forming anticlinal rows in small scattered bifacial sori; female plants producing the procarps in an interrupted midriblike line which later involves the carpospores.

Kylin (1941, p. 26) recognizes the California material (such as Phyc. Bor.-Amer. *no. 380*) as a species *S. californica* established by Harvey (1830-41, p. 408) and later by him reduced to synonymy (Harvey 1853, p. 163, pl. 19, figs. C1-C4). This supposed independent species is described as differing in having wider blades 10-20 mm in breadth, whereas the European plant has them but 5-10 mm. The present material, though apparently well developed, is well within the range of the earlier-described species.

México: Is. Revilla Gigedo, dredged from 57 meters at sta. 2829, *Hassler* Exped. *no. 30* (tetrasporic, carposporic), 1 May 1888. Ecuador: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-281,* 19 Jan. 1934.

Gigartinaceae

Plants plane or bushy, subsimple or branched, developing with an axis of numerous filamentous initials, the medulla ultimately pseudoparenchymatous, the cortex somewhat obscurely filamentous, the small outer cells in anticlinal rows; sporangia in sori, developed from branching rudiments, tetrapartite; spermatangia formed in sori on the surface; procarps present, the three-celled carpogenic branch carried on a supporting auxiliary which after fertilization forms slender, branching gonimoblast filaments which ramify into the medulla and produce a diffuse cystocarp without a definite pore.

KEY TO GENERA

1. Blade little and only marginally proliferous, dichotomous to polychotomous, the segments strap shaped to sublanceolate, the sori somewhat swollen . . . . Chondrus
1. Blades subspinulose or much proliferated from faces and edges, variously and often copiously divided, the segments terete to foliar, the proliferations usually nodular to terete, in part containing the cystocarps . . . . Gigartina

CHONDRUS Stackhouse, 1797

Plants bushy, slender and compressed below, the branches flattened above, linear to broadly cuneate, repeatedly dichotomous, firmly membranous to subcartilaginous; structurally showing a filamentous medulla with lateral radial filaments forking dichotomously to produce a small-celled cortex; sporangia tetrapartite, formed in obvious sori in the medulla, the fertile areas somewhat swollen; spermatangia in superficial sori on young branches; cystocarps soriform, in the medulla.

KEY TO SPECIES

1. Basal segment near the holdfast compressed to subcylindrical, the upper segments of the branches to 8-12 mm wide C. Hancockii
1. Basal segments short, flat, irregularly closely branched, the upper segments of the branches sparingly divided, to 2-3 cm wide . . . . C. albemarlensis

Chondrus (?) Hancockii n. sp.[148]

Plate 81, Fig. 1

Plants to 12 cm tall, olive or blackish when fresh, drying dull reddish purple, below cartilaginous, above fleshy membranous; holdfast small, lower axis compressed, about 1 cm above the base becoming flat and 0.5-0.7 cm broad, above complanately branching 4-6 times dichotomously or occasionally unilaterally, reaching 8-12 mm broad above the forks, and strap shaped, the apices rounded, margins plane or a little undulate; pro-

[148] Chondrus Hancockii n. sp.—Plantae ad 12 cm altitudine, infra compressae, supra complanate atque 4-6-dichotome ramosae, ad 8-12 mm latitudine, ligulatae, apices rotundatos et margines planos ad subundulatos habentes; nematheciis dispersis, 0.3-1.0 mm diam.; in structura corticem externum constantem e 2-3 stratis cellularum praebentibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-392,* 30 Jan. 1934.

liferous from the lower stalklike portion, these branchlets once or twice forked; structurally showing a wide pseudoparenchymatous medulla with cells elongated in longitudinal section, and thick walls, the inner cortex of 1-2 layers of smaller cells and the outer cortex of 2-3 layers of cells, the inner more rounded, the outer more square in section; sporangia tetrapartite, crowded in nemathecia in the central medulla, often in small clusters.

Ecuador: Archipiélago de Colón, gregarious on surf-beaten intertidal rocks south of Black Beach Anchorage, I. Santa María, *nos. 34-230, 34-392 (TYPE),* 17, 30 Jan. 1934.

Chondrus (?) albemarlensis n. sp.[149]

Plate 81, Fig. 2

Plants to 12-15 cm tall, dull purplish and nitent, base slightly contracted, compressed, very short, above flat and very irregularly branched, the lateral branches small, the central continuing upward, membranous, forked 3-4 times, the divisions commonly to nearly 2 cm, rarely to 3 cm broad, near the rounded subacute tips 1 cm wide; structurally showing a wide pseudoparenchymatous medulla with cells elongated in longitudinal section, the walls thick, the inner cortex of 1-2 layers of smaller cells and the outer cortex of one, occasionally two layers of cells square in section; sporangia tetrapartite, the sporangia in nemathecia crowded in the central medulla, the sporangia in short series formed laterally on the medullary filaments, the nemathecia 0.3-1.0 mm diam., young and old sori intermixed over the upper part of the blade below the last fork, often merging, not perforating the blade when mature.

These plants at first sight resemble *nos. 34-230* and *34-393,* but are more consistently broad to the tips and show a very different growth habit in the lower parts of the plants. In structure they are very similar, but have a thinner cortex. In the absence of sexual material the allocation of these two species to *Chondrus* is necessarily tentative. The position of the tetrasporangia discourages an assignment to *Rhodoglossum.*

Ecuador: Archipiélago de Colón, from surf-beaten rocks at Pt. Christopher, I. Isabela, *no. 34-206 (TYPE),* 16 Jan. 1934.

149 Chondrus albemarlensis n. sp.—Planta ad 12-15 cm altitudine, irregulariter ramosa, infra compressa, super ramos centrales plana, supra membranacea, 3-4-furcata, divisionibus ad 2-3 cm lat., prope cacumina 1 cm lat., cacuminibus rotundatis, subacutis; nematheciis dispersis et aetatibus intermixtis, 0.3-1.0 mm diam., in structura medullam externam constantem ex uno vel interdum duobus stratis cellularum praebentibus. Planta typica in loco dicto I. Isabela, Ecuador, legit W. R. Taylor *no. 34-206,* 16 Jan. 1934.

GIGARTINA Stackhouse, 1809

Plants foliar to bushy, firm fleshy, dark reddish purple, simple to abundantly branched, the branches terete to compressed or foliar; structurally showing a filamentous medulla surrounded by a cortex of anticlinal branched rows of small cells; tetrapartite sporangia in immersed, rather spreading sori, the sporangia developed from cells of the inner cortex; cystocarps generally crowded in special laterally projecting fertile nodules or branchlets, the fleshy pericarp eventually rupturing.

KEY TO SPECIES

1. Segments of the branching thallus terete . . . . . G. serrata
1. At least the broader segments of the thallus flat 2
2. Plants very small, about 5 cm tall, only the broadest upper blades markedly flat; slender subfiliform teeth abundant G. leptorhynchus
2. Plants much larger and more firm, in large part flat . . . 3
3. Main branches pseudodichotomously forked, flat above, contracted below, the margins minutely and closely aculeate serrate, the surface aculeate papillate above; lower portions moderately pinnately branched, the divisions lanceolate . . . . G. armata
3. Main branches elongate, abundantly pinnately branched, the divisions linear lanceolate; throughout on margins and faces fimbriate with abundant small proliferations . . . . . G. Chauvinii

Gigartina serrata Gardner

Plants to 25 cm tall, stiff and dull red in color, the axis naked below, above irregularly dichotomously branched 3-5 times, cylindrical throughout, 2-3 mm diam., the upper segments pinnately beset with short branchlets which in the fertile cystocarpic state become recurved and more or less crowded.

Gardner 1927, p. 334, pls. 60-62.

These plants had less of a pinnate aspect and less elongate terminal segments than Gardner illustrates. However, they were cystocarpic and mostly well advanced to maturity. They do not resemble the regularly bipinnate plants which Harvey (1853, p. 174, pl. 27, figs. C1-C3) refers to *G. canaliculata* and are more consistently cylindrical than those which Howe (1914, p. 100) refers to *G. Lessonii* (Bory) J. Agardh. The type locality for *G. serrata* is Ensenada, Baja California, about 250 miles farther north than I. Cerros.

México: Baja California, on rocks at South Bay, I. Cerros, *no. 34-635,* 10 Mar. 1934.

Gigartina leptorhynchus J. Agardh

Setchell & Gardner 1933, p. 267, pl. 46.

MÉXICO: Baja California, common on intertidal more or less sand-covered rocks about South Bay, I. Cerros, *no. 34-630,* 10 Mar. 1934.

Gigartina Chauvinii (Bory) Montagne

Setchell & Gardner 1924, p. 744, pl. 70.

ECUADOR: Archipiélago de Colón, infrequent and ill-developed in the high littoral, as near Black Beach Anchorage, I. Santa María, *nos. 34-209, 34-222,* 17 Jan. 1934.

Gigartina armata J. Agardh

Setchell & Gardner 1933, p. 269, pl. 47, fig. 2.

MÉXICO: Baja California, on rocks at South Bay, I. Cerros, *no. 34-638,* 10 Mar. 1934.

Rhodymeniaceae

Plants filiform to commonly fleshy membranous and sometimes hollow; with a modified multiaxial type of development, but appearing structurally parenchymatous; asexual reproduction by tetrapartite sporangia formed just below the surface; carpogenic branches of three cells, the auxiliary borne upon the same supporting cell beside the carpogonium; cystocarp with a loose pericarp, discharging by a pore.

KEY TO GENERA

1. Plant with slender firm axis and pyriform to spherical hollow branches . . . . Botryocladia
1. Plant without specialized branchlets 2
2. Thallus peltate 5
   Thallus not peltate 3
3. Cystocarps scattered over the face of the fertile segments; the firm membranous thallus dichotomously forking, often marginally proliferous 4
3. Cystocarps marginal; the soft thallus peltate, round or radiately lobed, or subfoliaceous and irregularly lobed, or dichotomous . . . . Fauchea
4. Holdfast inconspicuous, percurrent stem absent . . Rhodymenia
4. Holdfast fibrous, a distinct erect axis bearing lateral forking membranous branches evident . . . . Dendrymenia
5. Thallus soft . . . . Fauchea
5. Thallus firmly fleshy . . . . Herpophyllon

FAUCHEA Montagne, 1846

Thallus solid, compressed or flat, rather regularly dichotomously branched; medulla of large cells without accompanying rhizoids, cortex with more or less evident anticlinal filamentous rows of cells; tetrasporangia in irregular, somewhat nemathecioid sori on the thallus surface; cystocarps within a swollen pericarp with or without hornlike projections; the carpospores arising from a basal reticulate placenta.

KEY TO SPECIES

1. Plant erect and dichotomously branched . . . . F. galapagensis
1. Plant repent, flagelliferous, irregularly branched . F. rhizophylla
1. Plant involved, irregularly branched and curled . . . F. crispa

Fauchea galapagensis n. sp.[150]

Plate 82, Figs. 1, 2

Plants to 10 cm tall (or more ?), the very short stipe 1 mm diam., hardly enlarged to form the small holdfast, expanding immediately to the cuneate base of the thin, gelatinous, dull rose-colored complanate blade; the thallus dividing 3-5 times irregularly dichotomously to form strap-shaped nontapering segments to 1 cm wide below, 3 mm in the ultimate branches; structurally with a medulla of large thin-walled colorless cells in 1-3 layers, supporting an assimilative cortex of evident filaments in loose branching anticlinal series, the cells of the inner part a little larger and irregular in shape, these branching outwardly to oval cells which are 4-6 μ diam., all with thin walls and well spaced in the soft gelatinous matrix; spermatangia developed from the surface cells, widely and evenly distributed over considerable ill-defined areas; cystocarps crowded, marginal, projecting in a single series along the edges of the plant; carpogenic branches probably two (or three ?) celled, very small, immersed in the cortex; cystocarps when partly matured showing a basal arachnoid tissue of larger cells near the base of the spore mass, smaller and more slender ones farther away, and this tissue at first filling the upper cavity of the pericarp; gonimoblast mass arising from a large erect oval cell which is directly connected with the basal tissue, most of the cells of the gonimoblast being converted to spores, but a few large ones above the

[150] Fauchea galapagensis n. sp.—Plantae ad 10 cm altitudine, stipite brevissimo, lamina tenui, gelatinosa, abrupte expansa 3-5 irregulariter erecteque dichotome furcata, segmentis infra ad 1 cm lat., supra 3 mm lat.; cystocarpis confertis, marginalibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-375,* 29 Jan. 1934.

oval supporting cell remaining sterile; at maturity the carpospore mass filling the pericarp cavity, largely displacing the upper arachnoid tissue and, a pore having been developed, discharging to the exterior.

The most obviously related Faucheas of the Pacific coast are *F. Sefferi* Howe from Baja California (1911, p. 506) and *F. Fryeana* Setchell (1912, p. 239) from Washington. From the first these plants differ in their more erect branching, greater width, and more closely placed cystocarps. From the latter they differ in more erect and less extensive branching, less extreme tapering from the basal segments to the apical, more crowded cystocarps, and a nonfimbriate margin; they are also probably much softer in texture.

ECUADOR: Archipiélago de Colón, dredged from 55 meters off Post Office Bay, I. Santa María, *no. 34-375* (cystocarpic, *TYPE*), 29 Jan. 1934. *Ibid.*, dredged from a rocky bottom at 37-55 meters near an islet in Gardner Bay, I. Española, *no. 34-413* (spermatangial), 31 Jan. 1934.

f. **pygmaea** n. f.[151]

Plants to 3 cm tall, narrowly branched from the base or the lower part undivided or once forked, 3-6 mm broad, commonly marginally closely beset with simple or 1-3 times forked proliferous branches 0.5 mm, rarely to 2.0 mm wide, divaricately branched; tetrapartite sporangia scattered in the cortex, not in recognizable sori, rounded oval, about 22 μ diam., 28 μ long.

These little plants probably represent a condensed form of the species described above, of which typical sporangial plants were not secured.

ECUADOR: Archipiélago de Colón, dredged from a rocky bottom at 36-55 meters' depth near an islet in Gardner Bay, I. Española, *nos. 34-414, 34-415* (tetrasporic, *TYPE*), 31 Jan. 1934.

Fauchea rhizophylla n. sp.[152]

Plate 79, Fig. 2

Plants repent spreading, crisp in texture, light rose red, at first peltate, the blade disciform, round from a short penetrating stalk, later enlarging and the disk becoming 3-5 angled with concave sides, the angles attaching

[151] Fauchea galapagensis f. pygmaea n. f.—Plantae ad 3 cm altitudine, e basi anguste furcatae aut indivisae, 3-6 mm lat., ornatae; in margine proliferationibus simplicibus aut 1-3-divaricate furcatis, 0.5-2.0 mm lat.; tetrasporangiis dispersis, 22 μ diam., 28 μ long. Planta typica in loco dicto I. Española, Ecuador, legit W. R. Taylor *no. 34-415,* 31 Jan. 1934.

[152] Fauchea rhizophylla n. sp.—Plantae repentes, crispae textura, primo peltatae, disciformes, postea dilatatae, factae 3-5 angulatae, latera concava habentes, efficientes ad angulos haptera secundaria flagelliformia, quae laminas secundarias usque ad 3-4 generationes sustinent. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-370,* 29 Jan. 1934.

and producing flagelliform holdfasts 5-15 mm long, which at their ends give rise to oval to fusiform secondary blades which may repeat the process more sparingly so that 3-4 generations may attach to the parent disk; the disks structurally showing a medulla with one or two central cell layers with colorless rather thick-walled cells to 100-250 μ diam., and on each face 1-2 layers of smaller cells; cortex of 1-2 close basal layers of rounded cells and radial cell rows 2-3 layers deep, the cells rather loosely placed.

The flagelliform haptera of this plant penetrated the sponge on which it grew quite deeply, and the blades lay against its surface. In the absence of any reproductive organs the generic assignment of this plant is provisional.

ECUADOR: Archipiélago de Colón, spreading over and rooted in a large sponge dredged from 55 meters' depth off Post Office Bay, I. Santa María, *no. 34-370 (TYPE),* 29 Jan. 1934.

Fauchea (?) crispa[153]

Plate 83, Fig. 2

Plants small, firm and crisp in texture, somewhat involved, very irregularly branched and curled, the segments 2-5 mm wide, the apices rounded, thickness about 170 μ; structure showing a medulla of 2-3 layers of somewhat compressed cells about 120 μ diam., a subcortex on each side of two layers of cells about 15 μ diam., and a one-layered cortex of rounded cells 3-5 μ diam., separated by lateral walls of about 1-3 μ; cystocarps commonly marginal, about 0.3 mm diam., less often facial, superficial but sessile, with a thick ostiolate pericarp, the carpospore mass basally attached with a small-celled loose placental tissue, and without filamentous investment in the mature stages, though a very few filaments were visible in young stages.

MÉXICO: Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-662B* (cystocarpic, *TYPE*), 9 May 1939.

This plant resembles *Gloioderma japonica* Okamura (1936, p. 664, fig. 316) in habit, though smaller and closer branched, but the thallus structure is without evidence of filamentous character. In this it suggests *Leptofauchea,* except that the thallus is of more cell layers than *L. nitophylloides* (J. Ag.) Kylin (1931, p. 9, fig. 3b). It also differs from *Gloioderma* in the absence of hornlike projections on the pericarps. Since there

[153] Fauchea crispa n. sp.—Plantae parvae, crispatae, irregulariter ramosae intricataeque, segmentis 2-5 mm diam., circa 170 μ crass., apicibus rotundatis; cystocarpis plerumque marginalibus, 0.3 mm diam. Planta typica in loco dicto I. María Magdalena, Las Tres Marías, legit W. R. Taylor *no. 39-662B,* 9 May 1939.

is little filamentous tissue in the pericarp and since the tetrasporangia are unknown, it seems best to make a nominal assignment of this plant to the genus *Fauchea.*

HERPOPHYLLON Farlow, 1902

Plants firmly fleshy, prostrate, subcircular to irregularly expanded, attached by a stalk which is generally central; internal structure parenchymatous, with thick cell walls, cortex of short anticlinal cell rows; sporangia tetrapartite, associated with paraphysislike structures in verruciform sori.

Herpophyllon coalescens Farlow

Plate 66, Figs. 2-6

Plants commonly gregarious, the adjacent individuals concrescent; thallus firmly fleshy, dull purplish red, nitent when dry, at first obconical with a very small holdfast and short stalk tapering toward the base, later more infundibuliform, reaching 10-15 mm tall, 10-25 mm diam. at the flat to depressed top, which is circular to slightly irregular; later appearing peltate, with a depressed center, though sometimes submarginally attached, the disk of the thickened thallus parallel or even appressed to the substratum, to 2-3 cm diam., the margin irregularly subangular and the sides often emarginate; structurally with a massive colorless parenchymatous medulla, the cell walls near the outer part thick, those cells near the center to 150 μ diam., the outer ones smaller; cortex of two or three cell layers in branching subfilamentous anticlinal series, the inner larger and roundish, the outermost oval to subcylindrical, 4-8 μ diam., 12-18 μ tall, closely placed with thin lateral walls and a slightly thickened outer membrane, forming a definite surface layer; tetrasporangia formed in thickened cortical areas of looser construction, the sporangium replacing a branch of one of the cortical cell rows, the neighboring branch simulating a paraphysis.

Farlow 1902, p. 97.

This material was compared with the type specimens from the herbarium of Stanford University, and its identity is certain. Farlow described the tetrasporangia as cruciate, 56 μ long, 15-20 μ diam., and indicates that the sori may become verruciform. In the present material the sporangia were immature.

ECUADOR: Archipiélago de Colón, in crevices and on rock faces at about high tide line, near Black Beach Anchorage, I. Santa María, *no. 34-265,* 18 Jan. 1934.

RHODYMENIA Greville, 1830

Plants forming moderate to large fronds, branched, the segments flat, linear to foliaceous, chiefly dichotomously divided, but often proliferous from the margins; growth from an apical meristem; structurally showing a parenchymatous medulla of large colorless cells and a thin cortex of small cells which becomes thickened by the formation of anticlinal rows in the fertile portions; sporangia scattered or formed in sori between these cell rows, tetrapartite; three-celled carpogenic branches and two-celled auxiliary branches on the same supporting cell, with the carpospores formed from the outer gonimoblast cells, the cystocarp within a somewhat swollen loose pericarp opening by a distinct pore.

KEY TO SPECIES

1. Plant decumbent, the branches narrow, very brittle R. decumbens
1. Plant erect 2
2. Plants to 2.0 dm tall, segments narrowly linear, 0.75-3.0 mm wide . . . . R. Dawsonii
2. Plants less than 1 dm tall 3
3. Clearly stoloniferous, the blades with stalks 1 cm or more in length . . . . R. Palmetta
3. Not evidently stoloniferous, the blades closely dichotomous with blunt tips and no considerable stalk 4
4. Segments 3-5 mm wide . . . . R. californica
4. Segments 1-3 mm wide . . . . R. divaricata

Rhodymenia californica Kylin

Plants 3 cm tall, tufted, purplish red, 3-4 times dichotomously branched at wide angles, the thin segments 3-5 mm broad, the apices truncate rounded; tetrasporangia with paraphyses in sori near the tips of the terminal divisions.

Kylin 1931, p. 21, pl. 9, fig. 22.

The scanty Post Office Bay specimens are smaller than the maximum of Kylin's type collections as described above, but seem in general to agree with his figures and descriptions.

ECUADOR: Archipiélago de Colón, dredged at 55 meters near Wreck Bay, I. San Cristóbal, Schmitt *no. 352A-34,* 15 Dec. 1934. *Ibid.,* dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-280B,* 19 Jan. 1934.

Rhodymenia divaricata Dawson

Dawson 1941, p. 141, pl. 23, fig. 31.

This material corresponds closely to Dawson's illustration, but is, like his, sterile and adds nothing to his diagnosis. It is quite possibly a small, narrow form of *R. californica* Kylin.

ECUADOR: Archipiélago de Colón, dredged from 27 meters off Post Office Bay, I. Santa María, *no. 34-282,* 19 Jan. 1934.

Rhodymenia decumbens n. sp.[154]

Plate 84, Fig. 1

Plants decumbent, very brittle, fleshy but thin, when dry dull reddish and dull of surface, with no evident stalk, the more or less interlaced branches forking dichotomously, the angles wide, between 80° and 110°, the sinuses slightly rounded, 5-25 mm between the forkings, the segments strap shaped, 1.5-2.0 mm broad, the apices obtuse; reproduction unknown.

This plant somewhat suggests *R. divaricata* Dawson, but is a much bigger thing, forming rather extensive mats. Without fruit the generic assignment is not assured.

ECUADOR: Archipiélago de Colón, dredged off shore in 9 meters of water, I. Baltra, *no. 34-331 (TYPE),* 22 Jan. 1934.

Rhodymenia Dawsonii n. sp.[155, 156]

Plate 84, Fig. 2

Plants to 2 dm tall, gregarious, bushy, firm in texture, dull red in color and when dry dull or a little glaucous; fairly regularly dichotomously branched 7-10 times, near the base the axes compressed, about 1 mm diam., but above quite flat, the lower segments to 2-3 mm in width, the upper ones 0.75-1.0 mm, the terminal segments somewhat tapered, rounded acute at the tips; structurally showing a medulla of moderately

154 Rhodymenia decumbens n. sp.—Planta decumbens, fragilis, tenuis, sine stipite perspicua, ramis in angulis 80°-110° dichotome divisis, implectis, segmentis ligulatis, 1.5-2.0 mm latitudine, cacuminibus obtusis. Planta typica in loco dicto I. Baltra, Ecuador, legit W. R. Taylor *no. 34-331,* 22 Jan. 1934.

155 Rhodymenia Dawsonii n. sp.—Plantae ad 2 dm altitudine, fruticosae, textura firmae, axe ad basim compresso, ramis supra planis, 7-10 dichotome divisis, segmentis infra 2-3 mm lat., supra 0.75-1.0 mm lat., cacuminibus rotundato-acutis; tetrasporangiis in soris 1-2 mm diam. ad cacumina segmentorum obtusorum; cystocarpis marginalibus aut submarginalibus in segmentis superioribus tenuibus prominentibusque, ad 1.0-1.25 mm diam. Planta typica in loco dicto Cabo San Lazaro, Baja California, México, legit W. R. Taylor *no. 34-602,* 7 Mar. 1934.

156 Named in recognition of the studies of this genus made by Dr. E. Yale Dawson.

large firm-walled colorless cells three or four cells thick, rather gradually graded to the cortex of two or three layers, the outer cells small; tetrasporangia in very small sori about 1-2 mm diam., at the tips of somewhat blunt terminal segments; cystocarps chiefly marginal or submarginal on slender upper segments, prominent, to 1.0-1.25 mm diam., the ostiole a little produced, the carpospore mass largely filling the cavity and attached to the base by one large cell.

MÉXICO: Baja California, dredged off Point Hughes, Cabo San Lazaro, *no. 34-602 (TYPE),* 7 Mar. 1934.

Rhodymenia Palmetta (Esper) Greville

Plants stoloniferous below, the creeping parts wiry, at intervals bearing single erect blades which have slender stalks 2-3 cm long, gradually expanded to membranous blades with a total length of 8-10 cm; blades tapered to the stalk, flat, irregularly 1-6 times dichotomously forked, the divisions gradually tapered upward, not cuneate at each segment, the width below 4-6 mm, above 2-3 mm, the tips rounded, forming an additional blade occasionally as an outgrowth from the upper end of the stalk, the margin of the primary blade near the base, or the sinus of the first forking; tetrasporangia in sori at the rounded or spatulate branch tips, 2-3 mm diam., with spore discharge breaking away to leave a perforation or the sharp lateral sterile margins of the tip intact, in section showing no distinctive modification of the cortex in the sorus area, where it is only one or, occasionally, two cells thick.

The identity of these plants is puzzling. When collected, they were assumed to be juvenile plants of *Dendrymenia flabellifolia.* However, no intergrades were to be found, especially regarding the prominent erect axis so characteristic of that species. These are reproductively mature plants. The writer was unable to find any feature by which they could be distinguished from *R. Palmetta,* most characteristically a north European species. Wyatt's Algae Danmoniensis *no. 109* (seen in the author's herbarium and in Herb. Kew.) is certainly essentially the same, and so are specimens collected by Griffith from Kilkee, Co. Clare, in Herb. Kew. The European specimens vary greatly in breadth and taper of the segments. However, with more (and especially cystocarpic) material for comparison, tangible characters justifying segregation, now lacking, may be found. They also resemble *R. attenuata* Dawson (1941, p. 139, pl. 19, figs. 10, 11, pl. 25, fig. 35) except that they are not so slender, particularly near the base of the blade, and in the sorus area there is none of the nemathecioid modification with stimulation of the cortex to produce anticlinal rows of cells.

ECUADOR: Archipiélago de Colón, occasional on surf-beaten rocks south of Black Beach Anchorage, I. Santa María, *no. 34-223* (tetrasporangial), 17 Jan. 1934, and *34-393,* 30 Jan. 1934.

DENDRYMENIA Skottsberg, 1923

Dendrymenia flabellifolia (Bory) Skottsberg

Plate 85

Plants clustered, the fibrous base somewhat flagelliferous, the axes simple or branched, to 35 cm tall, ultimately denuded below, developing dull reddish purple membranous subsessile blades, these on immature axes distichous, oblanceolate, on older plants the blades in pyramidal spiral succession from the apex, 1-6 times irregularly dichotomously forked, to 6 cm long, the segments to 2-4 mm wide above the dichotomies, the apices rounded to spatulate; tetrasporangia in sori at the branchlet tips, the sori with a narrow sterile margin.

Farlow 1902, p. 99; Howe 1914, p. 124, pl. 49 (both as *Rhodymenia flabellifolia*); Skottsberg 1923, p. 16, figs. 3d, 3e.

There is a good deal of difference in luxuriance between these two groups of collections; those from Black Beach are much like Howe's illustrations, but those from Pt. Christopher are more luxuriant, the axes less branched, more pyramidal, and with much longer blades. It is from the latter that the description is chiefly drawn. Farlow's *(loc. cit.) R. flabellifolia* from Elizabeth Bay is probably a very attenuate phase of this plant with the blades widely spaced on a slender stem, but his specimens from Iguana Cove and Tagus Cove, likewise on I. Isabela, are compact and bushy. On examination of his specimen at the Farlow Herbarium it was evident that the succeeding sections of axis and blade arose either from the face of the blade near its base or from the lower margin, or from the axis below the blade; there was no "amplexicaul" decurrent margin from the blade above.

ECUADOR: Archipiélago de Colón, a fragment floating off Pt. Christopher, I. Isabela, *no. 34-197,* 16 Jan. 1934. *Ibid.,* attached to rocks in the surf zone at the point, abundant and very well developed, *no. 34-204,* 16 Jan. 1934. *Ibid.,* on surf-beaten intertidal rocks south of Black Beach Anchorage, I. Santa María, *no. 34-400* (tetrasporic), 30 Jan. 1934.

BOTRYOCLADIA Kylin, 1931

Plants with a terete, wiry, generally branching stem which bears oval to spherical hollow vesicular branchlets; vesicles with large more or less colorless inner cortical cells inside, associated with gland cells facing the cavity, and smaller cortical cells outside; tetrapartite sporangia or cystocarps scattered at the surface of the vesicles.

KEY TO SPECIES

1. Plants very tiny, less than 1 cm tall, with a few very thin-walled small vesicles . . . . B. tenuissima
1. Plants several centimeters tall, with large vesicles . . . . B. pseudodichotoma

Botryocladia tenuissima n. sp.[157]

Plants minute, solitary or to three on a base, vesiculate on a short stipe, the stipe 35-140 μ long, the oval sac 1.0-2.25 mm diam., structurally showing an inner cortical layer of thin-walled polygonal cells 30-60 μ diam., smaller and rounder near the apex, larger and a little elongate toward the base, the outer cortex very slight, consisting of cells 4.5-12.0 μ diam., with chromatophores, arranged along the lines of contact of the inner cortical cells in a single row, or occasionally in as many as three irregular rows, of which one is larger and somewhat under the other two, in no case covering more than a minor part of the underlying cell; sporangia tetrapartite, immersed at the angles between the inner and the outer cortical cells, round-oval, to about 20-24 μ long; internally projecting glandular cells problematical, but if present single, small, and scattered.

These tiny, fragile specimens seem quite mature, since richly tetrasporangial. Notable is the exposure of the inner cortex cells to the surface, and the general absence of outer cortex cells except along the contact margins of the underlying cells. No clearly recognizable gland cells were seen. This seems to be the smallest species of the genus yet recorded, while the specimens of *B. pyriformis* secured off Aruba I. (Taylor 1942, p. 117) with sacs to 5 cm long, carried the largest vesicles.

ECUADOR: Archipiélago de Colón, very rare as dredged from 55 meters off Post Office Bay, I. Santa María, *no. 34-382A* (tetrasporic, *TYPE*), 29 June 1934.

Botryocladia pseudodichotoma (Farlow) Kylin

Plants to 5 cm tall (and elsewhere reported to 2 dm), from a small irregular holdfast, the axes and branches cartilaginous, slender and terete, dividing alternately, terminating in oval vesicles 1-3 cm long, 7-13 mm

[157] Botryocladia tenuissima n. sp.—Plantae solitariae aut fere solitariae, vesiculatae in stipite brevi, vesicula 1.0-2.25 mm diam., praedita atque, solis in marginibus cellularum corticis interni conterminarum, strato corticeo imperfecto cellularum 4.5-12.0 μ diam., in 1-3 ordinibus; tetrasporangiis ad angulos inter cellulas medullares, rotundato-ovatis, 20-24 μ long. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-382A,* 29 June 1934.

diam., purplish red, thin walled; structurally the vesicles showing a surface layer of small rounded-angular cells 6-9 μ diam., with under them a layer of somewhat larger cells along the lines of contact of the large inner cortical cells, which in a single layer bound the cavity, these cells largely rounded, angular or with angular cells in the interstices, reaching 120-240 μ diam.; oval gland cells in loose groups of 8-14, situated on some of the inner cortex cells.

Bliding 1928, p. 52.

These specimens were mostly very small, only that from I. Santa María seeming nearly typical. In examining it no gland groups with over 14 cells were found, most being about 9. Bliding *(loc. cit.)* indicates that in the typical plant the number ranges to 20. Since no other better distinctions were found, this probably does not justify recognition of the Galapagos plants as a new species.

MÉXICO: Is. Revilla Gigedo, dredged from 41-84 meters' depth at sta. 924 near I. Soccoro, *no. 39-61A,* 18 Mar. 1939. *Ibid.,* Nayarit, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-663,* 9 May 1939. ECUADOR: Archipiélago de Colón, dredged from 13 meters' depth at sta. 182 near I. Bartolomé, I. San Salvador, *no. 34-346,* 24 Jan. 1934. *Ibid.,* dredged from 45-55 meters' depth off Gordon Rocks near I. Sta. Cruz, Schmitt *no. 317D-34,* 8 Dec. 1934. *Ibid.,* dredged at 54 meters off Black Beach Anchorage, I. Santa María, *no. 34-391B,* 30 Jan. 1934. *Ibid.,* dredged from a rocky bottom at 36-55 meters' depth near an islet in Gardner Bay, I. Española, *no. 34-418,* 31 Jan. 1934.

Champiaceae

Plants usually bushy, branches cylindrical or compressed, delicately membranous, or somewhat firm in the older portions; developing from an apical meristem with a cortex of small cells without, large cells within, and a cavity traversed by a few longitudinal medullary filaments which bear lateral secretory cells; tetrahedral sporangia formed just below the surface of the sporangial plants; spermatangia formed by the surface cells of the male plants; carpogenic branches three or four celled, the auxiliary secondarily derived from the same supporting cell as the carpogenic branch; carpospores discharged from a prominent ostiolate pericarp.

KEY TO GENERA

1. Plants not septate; bases of branches often contracted and closed . . . . Lomentaria
1. Plants septate throughout . . . . Champia

LOMENTARIA Lyngbye, 1819

Lomentaria Baileyana (Harvey) Farlow

Taylor 1937, p. 308, pl. 35, fig. 10, pl. 41, fig. 4, pl. 43, fig. 6.

MÉXICO: Is. Revilla Gigedo, dredged from 57 meters at sta. 2829, *Albatross* Exped. *no. 28* (cystocarpic), 1 May 1888. COSTA RICA: a few small pieces dredged off Pto. Culebra, *no. 34-525,* 24 Mar. 1934.

CHAMPIA Desvaux, 1808

Champia parvula (C. Agardh) Harvey

Taylor 1937, p. 310, pl. 43, figs. 8-10.

ECUADOR: Esmeraldas, dredged one specimen at Bahía San Francisco, *no. 34-488,* 11 Feb. 1934.

Ceramiaceae

Plants usually bushy, filamentous branches uniseriate, naked or corticated, the cortex if present developed from nodal segments on the persistent axial row, restricted or spreading over the internode; growth commonly from an evident apical cell; sporangia superficial or stalked, sometimes immersed in the nodal cortication, tetrapartite, tetrahedral or occasionally developing polyspores; spermatangial branchlets more or less in colorless clusters; carpogenic branches of four cells upon a supporting cell which produces sterile and auxiliary cells near the carpogonium; cystocarp naked or immersed in a jelly, or partly surrounded by involucral cells or filaments, of one or more groups of gonimoblasts with the outer cells producing the carpospores.

KEY TO GENERA

1. Evidently segmented, the oval to spherical coenocytic segments visible to the naked eye . . . . Griffithsia
1. Segmentation of the axis obscure, the segments, if large, covered by corticating cells 2
2. Plants filamentous in habit, sparse to bushy 3
2. Plants spongy in structure, flabellate in habit . . . Haloplegma
3. Uncorticated, or with rhizoidal cortication 4
3. Corticated by nonrhizoidal otugrowths from the nodes . . 10
4. Branching generally completely alternate 5

4. Branching generally, at least in part, obviously opposite . . 8
5. Plants less than 1 cm tall 6
5. Plants moderate to large in size 7
6. Minute creeping plants, the cystocarps with a pericarplike investment . . . . Lejolisia
6. Plants larger, the cystocarp without close cellular investment . . . . Spermothamnion
7. Branching bushy or complanate, the sporangia tetrahedral . . . . Callithamnion
7. Branching markedly complanate, reproducing by polysporangia . . . . Pleonosporium
8. Branchlets of two types produced, those on the ab- and adaxial sides of the lesser branches differing in form from those on the faces of the branch (so-called "transversal" branchlets) . . . . Platythamnion
8. Branchlets not differentiated 9
9. Sporangia terminal on the ordinary lateral branchlets . . . . Gymnothamnion
9. Sporangia on the ab- or adaxial sides of the branches or branchlets . . . . Antithamnion
10. Cortex with cells regularly arranged in the larger branches 11
10. Cortical cells limited to the nodes and not arranged in regular longitudinal rows, or spreading over the internodes and there sometimes in somewhat regular rows . . . . Ceramium
11. Branchlets with cortication limited to the nodes; branches above with cortication in transverse rows, this near the base of the plant obscured by rhizoidal overgrowths . . . . Spyridia
11. Branches of all orders with regular longitudinal rows of corticating cells, the nodes commonly with a ring of spinelike cells . . . . Centroceras

CALLITHAMNION Lyngbye, 1819

Plants tufted, the base discoid, fibrous or rhizomatous; of monosiphonous naked or corticated filaments with dichotomous or alternate branching; cells plurinucleate and with many small chromatophores; sporangia borne on the upper side of the branches, tetrahedral or more rarely bipartite; spermatangia forming small colorless tufts near the bases of the branchlets on the upper side; cystocarps borne on the axial cells, usually bilobed.

KEY TO SPECIES

1. Plants small 2
1. Plants several centimeters tall . . . . C. soccoriense
2. Axis not reaching 100 μ diam. 3
2. Axis below exceeding 100 μ diam. 4
3. Branching radial . . . . C. epiphyticum
3. Branching bilateral . . . . C. rupicolum
4. Cells of the branchlets seldom more than two diameters long, the end cells not aculeate . . . . C. pacificum
4. Cells of the branchlets commonly more than two diameters long, the end cells aculeate . . . . C. ecuadoreanum

Callithamnion soccoriense n. sp.[158]

Plate 86, Fig. 2

Plants to 6-7 cm tall, the branching loosely spreading, the chief axes percurrent, alternately branched, uncorticated, 90-140 μ diam., the cells 360-540 μ long; ultimate branching complanate, the penultimate branches often naked for nearly the lower half of their length, bilaterally branched above, the ultimate branchlets 8-15 cells long, 40-55 μ diam., the cells 2-3 diameters long, slightly inflated, the branch tips somewhat sharply tapered, the last 2-4 cells being much smaller than those below, but the apex not acute; tetrasporangia sessile, single near the base of the branchlet on the upper side, or occasionally a second on the next higher cell, obovoid, about 48 μ diam., 55 μ long, sometimes on the penultimate branch; spermatangia not seen; cystocarps near the tips of minor branches, commonly singly lobed, about 120 μ diam.

MÉXICO: Is. Revilla Gigedo, epiphytic on larger algae as dredged from 24-32 meters at sta. 129 off Braithwaite Bay, I. Soccoro, *no. 34-19* (tetrasporic and cystocarpic, *TYPE*), 3 Jan. 1934.

Callithamnion pacificum n. sp.[159]

Plants delicate, flaccid, bushy, to 3 cm tall; main axes percurrent with few main branches, below to 140-220 μ diam., the cells about as long

[158] Callithamnion soccoriense n. sp.—Plantae ad 6-7 cm altitudine, laxe ramosae, axibus primariis percurrentibus, alterne ramosis, ecorticatis, 90-140 μ diam., cellulis 360-540 μ long.; ramificatione ultima complanata, ramulis 40-55 μ diam., cellulis 2-3 plo longioribus quam latis; tetrasporangiis sessilibus, singulis prope basim ramuli in latere superiore, 48 μ diam., 55 μ long. Plantae typicae in loco dicto I. Soccoro, Is. Revilla Gigedo, México, legit W. R. Taylor *no. 34-19,* 3 Jan. 1934.

[159] Callithamnion pacificum n. sp.—Plantae delicatae, fruticosae, ad 3 cm altitudine, axibus primariis ecorticatis, percurrentibus, infra ad 149-220 μ diam., cellulis 90 μ diam., 4 plo longioribus quam latis, ramulis sursum curvatis, attenuatis, irregulariter aut bilateraliter pinnatis, 0.5-1.0 mm long., ad basim 65 μ diam., cellulis circa 1.5 plo diam. longitudine. Planta typica in loco dicto I. Soccoro, México, legit W. R. Taylor *no. 39-66B,* 18 Mar. 1939.

as broad, in the middle portion and larger branches somewhat zigzag, about 90 μ diam. and the cells to 4 diameters long; longer branches alternate, irregularly disposed, lesser branches and branchlets irregularly alternate to regularly bilaterally pectinate, the upcurved ultimate branchlets 0.5-1.0 mm long, of 8-12 cells, at the base to 65 μ diam., tapering considerably toward the summit, with cells about 1.5 diameters long, the end cells often small but not themselves aculeate; cystocarps sparse, generally on the upper portion of penultimate branches, about 90 μ diam.

There is a good deal of similarity between this species and *C. soccoriense* from the same locality; lacking extensive suites of specimens, the thicker main axis with shorter cells and the shorter cells of the branchlets seem to be adequate distinguishing features.

MÉXICO: Is. Revilla Gigedo, on coarser algae dredged from 41-84 meters' depth at sta. 924 near I. Soccoro, *no. 39-66B* (cystocarpic, *TYPE*), 18 Mar. 1939.

Callithamnion ecuadoreanum n. sp.[160]

Plants 1-2 cm tall, very flaccid, freely alternately branched, uncorticated, the axis to 150 μ diam. below, and the cells 5-10 diameters long, the axis bearing a few leading branches but otherwise rather sharply demarcate from the minor side branches, which are more slender and have much shorter cells; branchlets 7-15 cells long, 36-54 μ diam. below, at the tips very markedly tapered and short celled, the end cells sharply aculeate and small; tetrasporangia sessile, seriate on the upper side of ultimate fertile branchlets, from the basal cell upward for 4-6 segments, and also on the branches of the penultimate order, subspherical, reaching a diameter of 50-60 μ; spermatangia not seen; cystocarps singly or bilobed, to 150-180 μ diam., on the ultimate branchlets near their bases or on other small subterminal branches.

Gardner's (1927, p. 378) *C. californicum* seems to have some features in common with these specimens, such as the acute-tipped branchlets, but ours have thicker axes and larger, spherical tetrasporangia.

[160] Callithamnion ecuadoreanum n. sp.—Planta 1-2 cm altitudine, flaccida, alterne ramosa, encorticata, axe 150 μ diam., cellulis 5-10-plo diam. longitudine; ramis magna ex parte non indeterminatis, tenuioribus, cellulas breviores habentibus; ramulis 7-15 cellularum longitudine, 36-54 μ diam., partibus extremis, cellulas breves habentibus, ad cellulas cacuminis aculeatas abrupte attenuantibus; tetrasporangiis sessilibus, seriatis in latere superiore ramulorum, subsphaericis, 50-60 μ diam.; cystocarpis singulis aut binis, ad 150-180 μ diam. ad bases ramulorum ultimorum aut subterminalium. Planta typica in loco dicto I. Española, Ecuador, legit W. R. Taylor *no. 34-402,* 31 Jan. 1934.

ECUADOR: Archipiélago de Colón, rare as dredged in 55 meters off Post Office Bay, I. Santa María, *no. 34-373,* 29 Jan. 1934. *Ibid.,* dredged from a sandy bottom at 36-55 meters off an islet in Gardner Bay, I. Española, *no. 34-402* (tetrasporic, cystocarpic, *TYPE*), 31 Jan. 1934.

Callithamnion epiphyticum n. sp.[161]

Plants 0.5-1.0 cm tall, very flaccid, freely and repeatedly alternately branched, the main axes not persistent, uncorticated, 35-45 μ diam. below, the cells 2-3 times as long as broad; minor branches divaricate; branchlets 10-15 μ diam. at the base, the lower cells 3-5 diameters long, gradually tapering from the base to the minutely rounded apex, the upper cells 4.5-8.0 μ diam. and 35-45 μ long; tetrasporangia oval, to 35 μ diam., 50 μ long, sessile on the upper side of the ultimate branchlets and on the lesser upper branches; spermatangia not seen; cystocarps bilobed, on the upper branches, the lobes to 35 μ long, 28 μ diam.

These plants suggest *C. ramosissimum* Gardner (1927f, p. 404) but differ in numerous details, including the absence of gland cells, smaller sporangia, and notable tapering of the branchlets.

ECUADOR: Archipiélago de Colón, epiphytic on the coarser algae, dredged from 35-55 meters' depth off an islet in Gardner Bay, I. Española, *no. 34-403* (tetrasporic and cystocarpic, *TYPE*), 31 Jan. 1934.

Callithamnion rupicolum Anderson, *prox.*

Anderson 1894, p. 360.

This material is very small, about 5 mm tall, and may represent Collins' f. *pygmaeum* (Phyc. Bor.-Amer. *no. 1797*), but the writer's material of that number is not sufficiently good to confirm the relationship. The branching in each order seems bilateral and the branchlets, unless establishing secondary axes, are simple or bear 1-3 similar alternate branchlets. The tetrasporangia, one to three on the upper side of the branchlets, are less numerous than they are in Gardner's material (Phyc. Bor.-Amer. *no. 1648*) and his own collections, *no. 2532,* referred to the species itself.

161 Callithamnion epiphyticum n. sp.—Plantae 0.5-1.0 cm altitudine, flaccidae, copiose alterneque ramosae, incorticatae, axe 35-45 μ diam., cellulis 2-3 plo diam. longitudine; ramulis 10-15 μ diam., cellulis ad basim 3-5 plo diam. longitudine, attenuantibus, autem, ad apicem minute rotundatum e cellulis superioribus 4.5-8.0 μ diam., 35-45 μ long. constantem; tetrasporangiis ovatis, ad 35 μ diam., 50 μ long., sessilibus in latere superiore ramorum ultimorum subultimorumque; cystocarpis binis, lobis ad 35 μ long., 28 μ diam. Planta typica in loco dicto I. Española, Ecuador, legit W. R. Taylor *no. 34-403,* 31 Jan. 1934.

ECUADOR: Archipiélago de Colón, occasional on an exposed rock with *Gymnothamnion,* Pta. Albemarle, I. Isabela, *no. 34-120 p. p.,* (tetrasporic), 12 Jan. 1934.

ANTITHAMNION Nägeli, 1847

Plants tufted, of uncorticated uniseriate filaments; branches repeatedly opposite or whorled, sometimes one member of the pair suppressed, or in the ultimate branching sometimes truly alternate; refractive colorless gland cells often present, appressed to the cells of the branchlet; sporangia tetrapartite, carried on the smaller branchlets, or replacing branchlets of the last order; spermatangia in patches of colorless condensed filaments on the branches of the last order; cystocarps formed on the lowest cells of the vegetative branchlets, the upper portions of which often do not develop fully.

KEY TO SPECIES

1. Plants large, some centimeters in height, the terminal cells of the branchlets obtuse . . . . A. occidentale
1. Plants small, the terminal cells of the branchlets acute A. veleroae

Antithamnion occidentale Kylin

Kylin 1925, p. 47, figs. 30a-d.

The present specimens, although sterile, compare well with authentic specimens of Kylin's collecting, and others from Puget Sound. They represent a rather lax and irregular form, but Kylin's specimens and his description show that there is considerable variation in the species.

ECUADOR: Archipiélago de Colón, a major item as dredged from 36-55 meters off a sandy bottom near an islet in Gardner Bay, I. Española, *no. 34-406,* 31 Jan. 1934.

Antithamnion veleroae n. sp.[162]

Plants small, creeping below and attached by lobed disciform haptera on short rhizoidal branches, the main filaments to 50-65 μ diam., and the

[162] Antithamnion veleroae n. sp.—Planta parva, infra repens; filamentis primariis ad 50-65 μ diam., cellulis circa 100-150 μ long.; ramis erectis brevibus, 0.2-0.5, raro ad 1.5 cm altitudine, irregulariter ramosis; ramulis paululum incurvatis, paribus oppositis, cellulis 20 μ diam., circa 25-30 μ long., cellulis cacuminum brevibus acutisque; glandicellulis in ramulis, tres cellulas vix contingentibus; tetrasporangiis sessilibus, 1-4 seriatis in latere superiore ramulorum ultimorum, 21-25 μ diam., 25-30 μ long.; cystocarpis ad cacumina ramorum erectorum formatis, conicis, 150 μ long., 75 μ diam. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-394B p. p.,* 30 Jan. 1934.

cells about 100-150 μ long; erect branches short, 0.2-0.5, rarely to 1.5 cm tall, irregularly branched; branches bearing somewhat incurved, essentially simple branchlets in alternating opposite pairs, seldom in whorls of four, the cells 20 μ diam., about 25-30 μ long, the terminal cells short, acute; gland cells present on the ultimate branchlets, to 25-30 μ long, when fully developed barely touching three branchlet cells; tetrasporangia oval, sessile, 1-4-seriate on the upper side of the ultimate branchlets, 21-25 μ diam., 25-30 μ long; spermatangia covering elongate branchlets, forming somewhat cylindrical masses 35 μ diam., 140 μ long, the percurrent axis chromatophorous; cystocarps formed near the tips of the erect branches, conical, 150 μ long, 75 μ diam.

This is a smaller plant than Kylin's (1925, p. 46, fig. 28e-g) *A. glanduliferum,* with slenderer axes; the glands are less numerous and never on adjacent cells as he figures them. His data are incomplete, so that it may be that this is a small variant of the species he described, for there are numerous similarities.

ECUADOR: Archipiélago de Colón, from surf-beaten rocks at Pt. Christopher, I. Isabela, *no. 34-207,* 16 Jan. 1934. *Ibid.,* the major element among epiphytes on *Prionitis* which grew on surf-beaten rocks south of Black Beach Anchorage, I. Santa María, *no. 34-394 p. p. (TYPE),* 30 Jan. 1934.

HALOPLEGMA Montagne, 1842

Haloplegma mexicanum n. sp.[163]

Plate 87, Fig. 1

Plants to 10 cm tall, tufted, rose pink above, discolored below, flabellately expanded, the branching irregularly alternate from the margin, the branches crenate to irregularly pinnately lobed or again branched; spongy throughout, above very thin and delicate but below thicker, internally consisting of branched uniseriate longitudinal filaments supporting a network of filaments in quadrilateral meshes, which at the surface of the plant bear groups of erect sharp-tipped free alternately branched filaments 7-8 cells in length, the cells 1-2 diameters long, 25-35 μ diam.; tetrasporangia borne in free filaments, tetrahedral, spherical, 60-72 μ diam.

[163] Haloplegma mexicanum n. sp.—Planta ad 10 cm altitudine, flabellata, ramosa irregulariter alterne e margine; ramis crenatis ad irregulariter pinnatos, spongiosis ubique, supra tenuibus, infra, autem, crassioribus; in superficie fasces filamentorum erectorum, acuminatorum, alterne ramosorum, 7-8 cellularum longitudine, 25-35 μ diam. ferentibus; tetrasporangiis in filamentis liberis positis, 60-72 μ diam. Planta typica in loco dicto I. María Magdalena, México, legit W. R. Taylor *no. 39-644,* 9 May 1939.

The present very delicate and well-developed specimens adhere closely to mounting paper. Sonder's *H. Preissii* (Kützing 1862, p. 19, pl. 62d-e), of which what appears to be original material is available, is much smaller, thicker, and has sharply serrate blades and obtuse-tipped free filaments. Kützing's *H. africanum* (1862, p. 19, pl. 63d-f) is simply rounded and has very short blunt free filaments 3-4 cells long. Montagne's *H. Duperreyi* (Montagne 1842, p. 28, pl. 7, fig. 1; Kützing 1862, p. 19, pl. 62a-c; Weber-van Bosse 1923, p. 315; Howe 1920, p. 580) likewise is smaller, thicker, and has short, divaricate-branched, blunt-tipped free filaments. The shape of the plant is not particularly distinctive. In the specimens of the Tres Marías collections the delicacy of the soft, thin plants is notable, the meshes being barely visible to the unaided eye. The peripheral filaments arise at the mesh nodes and occasionally between them as well. On a single base but one filament arises, which bears alternately two to four erect somewhat incurved branches, and these in turn may each have a secondary branch, but the number of tips in a group is seldom as high as eight. The apices are very acute. Mme. Weber-van Bosse's *H. Duperreyi* v. *sublittorale* is reported with dichotomously branched free filaments; the type of the species probably has them likewise dichotomous, but Howe does not state that they branch in his subsp. *spinulosum,* though he does say that two or three are present.

MÉXICO: Nayarit, dredged at sta. 970 from a bottom of coralline and other algae, I. María Magdalena, Las Tres Marías, *no. 39-644* (tetrasporic, *TYPE*), 9 May 1939.

SPERMOTHAMNION Areschoug, 1877

Spermothamnion phycophilum n. sp.[164]

Plate 4, Figs. 1, 2

Plants growing in dense soft spreading tufts, to 3-5 mm tall, dull brownish red, with creeping filaments bearing hapteral branches on the

164 Spermothamnion phycophilum n. sp.—Planta caespitosa, ad 3-5 mm altitudine, in filamentis serpentibus haptera ramosque erectos ferens; filamentis erectis simplicibus aut sparsissime alterneque ramosis, 36-72 μ diam., cellulis cylindricis, 60-180 μ long., supra, ad 25-40 μ diam. decrescentibus; planta tetrasporangia 50-70 μ diam., primo 4-6 in serie unilaterali prope partem mediam axis fertilis, in stipitibus sursum curvatis ferente, postea sporangia secundaria infra proferente; spermatangiis in serie unilaterali prope partem extremam axis fertilis; plantis cystocarpicis ramos divergentes habentibus, cystocarpis singulis ad cacumen axis primarii ramorumque fertilium unius vel duorum, crescentibus ad circa 180 μ diam.; carposporangiis 30 μ diam. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-397,* 30 Jan. 1934.

under side and erect branches on the upper; creeping filaments 32 μ to more generally 42-57 μ diam., the cells cylindrical to slightly swollen; haptera commonly on several adjacent cells, when present generally borne near the posterior end, unicellular, simple or rarely to 360 μ long or even longer, the end occasionally acute, generally expanded sharply into a lobed disk; erect filaments simple or very sparingly alternately branched, 36-72 μ diam., the cells cylindrical or very slightly swollen, 60-180 μ long or generally 2-3 diameters, rather more slender and with proportionately shorter cells near the tips, which are 25-40 μ diam. and slightly tapered to the rather obtusely rounded end cell; sporangia nearly spherical, tetrahedral, 54-70 μ diam., about 4-6 in unilateral series, or occasionally opposite, near the middle portion of the fertile axis, the first produced on 1-2-celled upcurved stalks formed at the upper end of the cells, the stalks frequently branching from below, and rebranching, the sterile apices arching part way around the older sporangia until they develop into secondary sporangia in turn; dioecious, the spermatangia in unilateral series of 6-10 clusters near the upper end of the fertile axis, each cluster sessile near the top of the supporting cell, oval cylindric, about 40-45 μ diam., 72-90 μ long; cystocarpic plants with more spreading branches than the other types, the cystocarps produced singly at the tip of the main axis and often on one or two lateral branches, commonly subtended by single or opposite spreading elongated sterile branches from the cell below, about 180 μ diam., the sterile central portion obvious, the carposporangia terminal on the gonimoblasts, about 30 μ diam.

This plant seems amply distinct from the rock-growing *S. Snyderae* Farlow, which is much taller and more branched, has much larger cells, and forms fewer sporangia. It is a good deal coarser than *S. Gorgoneum* (Montagne) Bornet (Taylor 1942, p. 121, pl. 4, figs. 1-4) and shorter celled than *S. macromeres* Collins & Hervey (1917, p. 132), which are the chief Atlantic tropical American species. It is of about the same size as the epiphytic *S. flabellatum* Bornet (Feldmann-Mazoyer 1940, p. 360, fig. 137) of the Mediterranean, but branches more sparingly, tapers less, and has shorter cells.

ECUADOR: Archipiélago de Colón, abundant on *Galaxaura* from surf-beaten rocks south of Black Beach Anchorage, I. Santa María, *no. 34-397* (tetrasporic, spermatangial, cystocarpic, *TYPE*), 30 Jan. 1934.

LEJOLISIA Bornet, 1859

Lejolisia colombiana n. sp.[165]

Plate 4, Figs. 3-10

Plant small, the basal filaments creeping, to 24 μ diam., the branches chiefly erect, to 3-5 mm tall, little tapered, about 18 μ diam., the cells about 100 μ long below, 70 μ long above, simple or very sparingly branched, the branches erect, the apical cells long, obtuse; sporangia unilateral on the erect branches, on 1-2-celled upcurved stalks, tetrahedral, oval, about 28 μ diam., 42 μ long; spermatangia in clusters terminating the erect axes or lateral branchlets, the clusters cylindric-oval, 100-115 μ long, 35 μ diam.; cystocarps generally terminal on few-celled lateral branchlets, only the outer gonimoblast cells forming carpospores, producing from below a close turbinate pericarplike investment reaching 175 μ diam., 150 μ long.

This extremely interesting new species is only the third in the genus, one being known from the Mediterranean area (Bornet 1859, p. 88, 2 pl.; Feldmann-Mazoyer 1940, p. 377, figs. 78, 148) and the other from New Guinea (J. Agardh 1892, p. 126, pl. 2, figs. 1-8). It is intermediate in size between the two, and differs in many details from either.

COLOMBIA: Valle, forming tufts, I. Gorgona, *no. 34-495B p. p., (TYPE),* 12 Feb. 1934.

GYMNOTHAMNION J. Agardh, 1892

Gymnothamnion elegans (Schousboe) J. Agardh

Taylor 1928, p. 194, pl. 27, figs. 1-4; Setchell & Gardner 1930, p. 167; Feldmann-Mazoyer 1940, p. 354, fig. 134.

These plants resemble Mme. Feldmann's illustrations very closely except that they are a bit more regularly filiculoid. In the Florida material the primary branchlets were regularly beset with lesser branchlets on the upper side, except in the lax lower part of the plant, but that was not the case with the erect tufted plants from Albemarle Point. Setchell and Gardner report this plant from I. Clarion, but otherwise it is not known from the eastern Pacific.

ECUADOR: Archipiélago de Colón, scarce on an exposed rock with *Callithamnion,* Pta. Albemarle, I. Isabela, *no. 34-120 p. p.,* (tetrasporic), 12 Jan. 1934.

[165] Lejolisia colombiana n. sp.—Filamentis basalibus serpentibus, ramis magna ex parte erectis, ad 3-5 mm altitudine, 18 μ diam., cellulis ad 100 μ diam., cellulis apicalibus longis obtusisque; tetrasporangiis unilateralibus in stipitibus 1-2 cellularum sursum curvatis, circa 28 μ diam., 42 μ long.; spermatangiis in corymbis cylindrico-ovatis, 35 μ diam., 100-115 μ long., cystocarpis terminalibus in ramulis lateralibus, investimento arcto, turbinato, pericarpiformique ad 175 μ diam., 150 μ long. inferiore a parte producto. Planta typica in loco dicto I. Gorgona, Colombia, legit W. R. Taylor *no. 34-495B,* 12 Feb. 1934.

PLATYTHAMNION J. Agardh, 1892

Plants bushy, filamentous, the branching complanate, monosiphonous, ecorticate; primary branching irregular, that on the main axes whorled in fours, 2 lateral branchlets in the plane of the frond elongate, 2 branchlets on the faces rosette or spurlike and on the lesser branches not developed; sporangia near the bases of the branchlets, tetrapartite; cystocarps near the bases of the branchlets, without special involucre.

KEY TO SPECIES

1. Lateral branchlets on the adaxial side of the lesser branches larger . . . . P. pectinatum v. laxum
1. Lateral branchlets subequal, or those on the abaxial side of the lesser branches larger . . . . P. reversum v. laxum

Platythamnion pectinatum Kylin, v. laxum n. v.[166]

Plants delicate, lax, somewhat entangled, the main axis to 200 μ diam., the cells to 600-650 μ long, bearing whorls of determinate branches on the upper quarter; determinate branchlets in 4 rows, the lateral longer, those on the faces ("transversal") smaller, sparingly branched and not rosettelike; lateral determinate branches bearing branchlets on the upper or adaxial side in two indefinite rows, these branchlets occasionally divided, about 21 μ diam. at the base, the apices acute; prominent gland cells commonly present near the upper ends of the branchlets in the younger portions of the plant.

These plants show little of the complanate habit of *Platythamnion*, but the attenuation and laxness may be due to the depth at which they grew. As they are sterile, the writer associates them with *P. pectinatum* Kylin (1925, p. 53, figs. 32d, 33e, 34a-c), with which they agree in the arrangement of the ultimate branchlets.

MÉXICO: Is. Revilla Gigedo, dredged in abundance at sta. 135 from 46 meters' depth at Sulphur Bay, I. Clarion, *no. 34-43 (TYPE)*, 5 Jan. 1934.

[166] Platythamnion pectinatum v. laxum n. v.—Planta laxa, axe primario ad 200 μ diam., cellulis ad 600-650 μ long., ramos determinatos in 4 ordinibus habens, ramis transversalibus parvis, sparse divisis, ramis lateralibus longioribus, ramulos in latere adaxiali ferentibus; ramulis circa 21 μ diam., saepe glandicellulas prominentes 20 μ diam. prope partem superiorem habentibus; apicibus acutis. Planta typica in loco dicto I. Clarion, México, legit W. R. Taylor *no. 34-43,* 5 Jan. 1934.

Platythamnion reversum (Setch. & Gard.) Kylin, v. **laxum** n. v.[167]

Plants to 13 cm tall, the axis sparingly divided, the upper branching closer and complanate; the ultimate branches bearing divaricate-divided branchlets on the upper and lower sides, those on the latter, or abaxial, side sometimes the larger, those on the faces obsolescent, but when present on the lower segments, subsimple.

These plants appear to represent a deep water form of *P. reversum* (Setchell & Gardner) Kylin (1925, p. 54, fig. 34d-f), with the so-called "transversal" or facial branchlets obsolescent on the small ultimate segments.

ECUADOR: Archipiélago de Colón, dredged at sta. 169 off Academy Bay, I. Santa Cruz, *no. 34-319* (cystocarpic, *TYPE*), 20 Jan. 1934. *Ibid.,* dredged from 55 meters off Post Office Bay, I. Santa María, *no. 34-371,* 29 Jan. 1934.

PLEONOSPORIUM Nägeli, 1861

Pleonosporium complanatum n. sp.[168]

Plate 86, Fig. 1

Plants to 15 cm tall (or more?), rose pink, soft, branching alternate and complanate in the lesser divisions; growth from the main apices by successive slightly oblique divisions, the young segments subequal; the chief axes near the base to 275 μ diam., the cells to 1.5-1.8 mm long, often with a few slender corticating filaments on the surface but these sometimes absent; chief axes bearing numerous alternate branches of equal or greater length and similar structure; secondary branches 1-2 cm long, sometimes continuing as tertiary chief axes, closely alternately and complanately beset with lesser branches and branchlets, the antepenultimate to about 5 mm long, somewhat zigzag, about 50-72 μ diam., the lowest

167 Platythamnion reversum v. laxum n. v.—Planta laxa, axe sparse diviso, ramificatione superiore confertiore complanataque; ramis ultimis in lateribus superioribus inferioribusque (vel abaxialibus) ramulos divaricato-divisos ferentibus, his interdum maioribus; ramulis transversalibus obsolescentibus, subsimplicibus cum in segmentis inferioribus apparent. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-319,* 20 Jan. 1934.

168 Pleonosporium complanatum n. sp.—Planta ad 15 cm altitudine, mollis, ramificatione alterna, et, in divisionibus minoribus, complanata; axibus primariis ad 275 μ diam. ad basim, paucis filamentis corticantibus saepe instructis; ramis secundariis ramulos minores ramusculosque arcte, alterne, complanateque ferentibus; ramusculis infimis et ultimis in latere inferiore cellulae infimae rami penultimi formantis, serie ultima 12-20 μ diam., tereti; polysporangiis 1-3, praecipue in latere superiore ramusculorum ultimorum ad basim. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-312,* 20 Jan. 1934.

ultimate branchlets formed on the lower side of the lowest cell of the penultimate branch, the last series slender, very slightly curved, 12-20 μ diam., tapering, the cells 1.2-1.5 diameters long, the tips obtuse; polysporangia sessile on the ultimate branchlets near the base, usually one or two, occasionally three on either side but chiefly on the upper.

This plant at first glance suggests a luxuriantly developed *P. pygmaeum* Gardner (1927, p. 379), but that plant has, among other differences, larger, stipitate sporangia.

Ecuador: Archipiélago de Colón, dredged in some quantity off Academy Bay, I. Santa Cruz, *no. 34-312* (tetrasporic, *TYPE*), 20 Jan. 1934.

GRIFFITHSIA C. Agardh, 1817

Plants erect, bushy, of notably large-celled falsely dichotomous or laterally dividing branches; cells multinucleate, with very many small chromatophores and a large central vacuole; commonly bearing delicate colorless repeatedly tri- to polychotomously branched hairs; tetrahedral sporangia whorled at the fertile nodes, partly covered by involucral cells in some species; spermatangia very small in caplike sori on the outer ends of the fertile cells; cystocarps laterally displaced, eventually appearing subtended by involucral cells on the sides of the fertile filaments.

Griffithsia pacifica Kylin (?)

Kylin 1925, p. 58; Smith 1944, p. 324, pl. 83, fig. 2.

Plants stout, to about 1 dm tall, the branches erect, somewhat tapering, the cells clavate cylindrical in the middle portions of the plant, about 1 mm diam., 3-5 mm long. Sterile, and therefore determination somewhat questionable.

México: Is. Revilla Gigedo, rare as dredged near Sulphur Bay from 46 meters at sta. 135, I. Clarion, *no. 34-44,* 5 Jan. 1934. Ecuador: Archipiélago de Colón, abundantly dredged near Post Office Bay at 55 meters, I. Santa María, *no. 34-376,* 29 Jan. 1934.

CERAMIUM Wiggers, 1817

Plants erect and bushy, or matted, branching dichotomous or pinnate, the segmented branches with a uniseriate axis of large cells corticated at the nodes by smaller cells, from which zones cortication may spread to more or less completely cover the internodes; sporangia tetrahedral, sessile, borne at the nodes or immersed more or less completely in the internodal cortication; spermatangia forming a layer on the fertile nodes; carpogenic branches four celled, the supporting cell cutting off an auxiliary after fertilization from which the gonimoblasts are produced, the carpospore mass in some species more or less completely surrounded by a few involucral branches.

KEY TO SPECIES

1. Nodal cortication nearly or quite covering the internodes, the cells more or less in longitudinal rows 2
1. Nodal cortication clearly restricted and bandlike, the older internodes chiefly exposed 3
2. Plants rose red, evenly dichotomous with proliferous branches below . . . . C. hoodii
2. Plants blackish purple, unequally dichotomous and so seeming to have a persistent axis with alternating subdichotomous branches . . . . C. Eatonianum
3. Nodes with clearly transverse cells along the lower border . . . . C. byssoideum
3. Nodes with cells of the lower border not predominantly transverse 4
4. Fertile nodes much swollen, but the tetrasporangia chiefly covered by involucral filaments; sterile nodes several cells deep . . . . C. fastigiatum
4. Fertile nodes with the tetrasporangia essentially exposed; sterile nodes narrow 5
5. Nodes narrow, of few cells, but chiefly 3-4 in the older segments; internodal cells about twice as long as broad; tetrasporangia reported to be 75-85 μ long . . . . C. personatum
5. Nodes very narrow, chiefly 1-2, occasionally to 3-4 cells deep, the lower internodes 4-6 times as long as broad; tetrasporangia 35-45 μ diam. . . . . C. affine

Ceramium hoodii n. sp.[169]

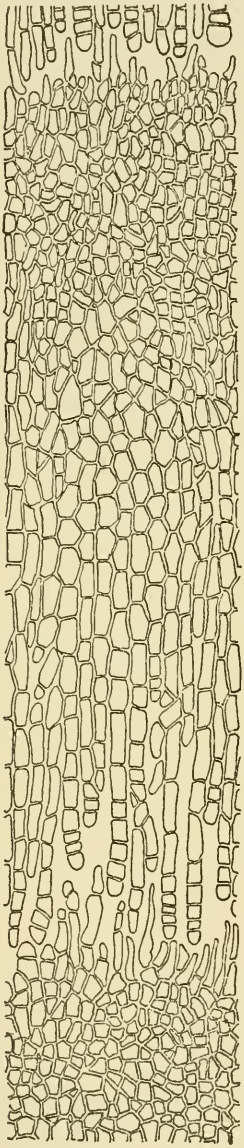
Plate 4, Figs. 11, 12; Text Figure 1

Plants at least to 4.5 cm tall, rose red, fairly regularly and equally dichotomously branched at intervals of 3-10 mm, only moderately taper-

169 Ceramium hoodii n. sp.—Plantae altitudine ad 4.5 cm vel plus, dichotome ramosae, breves proliferationes infra habentes, cacuminibus forcipatis, diametro infra ad 0.75 mm, supra ad circa 170 μ, segmentis supra brevibus, infra ad duplo longiora quam lata, internodis corticatis per cellulas in ordinibus longitudinalibus a nodis descendentes. Planta typica in loco dicto Gardner Bay, I. Española, Ecuador, legit W. R. Taylor *no. 34-407,* 31 Jan. 1934.

ing from base to apex, the tips of the branchlets erect or forcipate, in the lower parts especially with numerous slender proliferations; diameter below to about 0.75 mm, above about 170 μ; segments above for quite a distance much shorter than broad, the cortication of each sharply delimited from the next but without a definite naked zone; below the segments subequal to twice as long as broad, with the cortication much thinner below than near the top of the segment and cells over the internodes in distinct longitudinal series; reproduction unknown.

These plants look entirely like young stages of *C. rubrum* or *C. pacificum*. The nodal cortication in the young state consists of small angular cells somewhat irregularly disposed, completely covering the node and the short internode, but limited by a very sharp line. As the internode lengthens, the nodal cortication spreads downward, the cells being at first rectangular, in very distinct rows. When the full growth of the axis is reached, however, the cortication over the lower part of the internode is thin; some cell rows do not reach so far, the cells are more elongate and narrower, but still clearly in rows, and there is exposed no regularly naked segment of internode. Furthermore there is almost no upward growth of cortication from



Text Figure 1. *Ceramium hoodii.* The median portion of an older segment showing the longitudinal "filaments" well extended, at the lower end rather unusually irregular. The upper margins of two nodal zones appear, showing the small amount of cortication developing from this margin and consisting mostly of elongate cells, not segmenting "filaments." x 235. I. Española.

the nodal band. These details of cortication distinguish it from the species mentioned above, from *C. rubriforme* Kylin, and from *C. Areschougii* Kylin, north Atlantic species in which the internodal cortication is less complete and more irregular. On the west coast *C. Eatonianum* (Farlow) DeToni has a somewhat similar cortication, but a more uniform one, that about the node being less distinct from that over the internode than in ours, the internodal rows even more distinct, but the nodal bands in the young plants less clearly delimited. The habit of the two is unmistakable, for the unequal dichotomy produces a pyramidal habit in *C. Eatonianum*, which differs also in its blackish color. The west coast *C. codicola* J. Agardh is a much small plant, of specialized habitat, and with irregular arrangement of the corticating cells.

ECUADOR: Archipiélago de Colón, entangled with coarser algae as dredged from 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-298, p. p.*, 9 Jan. 1934. *Ibid.*, in fair quantity as dredged from 37-55 meters' depth off a sandy bottom near an islet in Gardner Bay, I. Española, *no. 34-407 (TYPE)*, 31 Jan. 1934.

Ceramium Eatonianum (Farlow) DeToni

Farlow 1875, p. 373 (as *Centroceras Eatonianum*); DeToni 1903, p. 1493.

MÉXICO: Baja California, with numerous other species of algae in mosslike turfs on intertidal rocks at South Bay, I. Cerros, *no. 34-648*, 10 Mar. 1934.

Ceramium byssoideum Harvey

Taylor 1928, p. 190, pl. 27, figs. 20, 21; Setchell & Gardner 1930c, p. 170, pl. 7, figs. 23, 24 (as *C. transversale*).

ECUADOR: Archipiélago de Colón, forming a fine mat on rocks, I. Wenman, *no. 34-90* (tetrasporangial), 11 Jan. 1934.

Ceramium fastigiatum Harvey, *prox.*

Taylor 1938, p. 333, pl. 47, figs. 3-5; pl. 48, figs. 2, 4; pl. 49, figs. 3, 4; pl. 51, fig. 7.

MÉXICO: Guerrero, with other small forms scraped from rocks, Ba. Petatlán, *no. 34-581* (tetrasporangial), 2 Mar. 1934. *Ibid.*, in considerable amount on barnacles, White Friars Is., *no. 39-627* (tetrasporangial), 7 May 1939. ECUADOR: Guayas, from tide pools at Pta. Santa Elena, Schmitt *no. 515-33* (det. with reservations by H. E. Petersen), 17 Sept. 1926.

Ceramium personatum Setchell & Gardner, *prox.*

Setchell & Gardner 1930c, p. 171, pl. 6, figs. 21, 22.

Costa Rica: in some abundance on rocks, infiltrated with sand, Port Parker, *no. 39-77,* 25 Mar. 1939.

Ceramium affine Setchell & Gardner, *prox.*

Setchell & Gardner 1930c, p. 172.

Ecuador: Guayas, on *Gracilaria* and other algae from the northwestern beach, Pta. Sta. Elena, *no. 34-452* (tetrasporangial), 8 Feb. 1934.

CENTROCERAS Kützing, 1842

Plants matted or bushy, filamentous, dichotomously branched and often laterally proliferated; growth apical, the axis uniseriate, completely corticated by regular longitudinal rows of rectangular cells, the nodes commonly spinulose; tetrasporangia verticillate in the terminal segments of axillary torulose proliferations; cystocarps lateral, bilobed, partly surrounded by short involucral branches.

Centroceras clavulatum (C. Agardh) Montagne

Børgesen 1915-20, p. 241; Taylor 1928, p. 189, pl. 28, figs. 6, 7; 1942, p. 123.

Frequently present in small amounts in shallow-water collections, and no doubt overlooked in some cases in assembling these records, which in general represent cases where this plant was a fairly evident element in the vegetation.

México: Baja California, intertidal on rocks at Pto. San Bartolomé, Bahía Thurloe, *no. 34-615,* 9 Mar. 1934. Nayarit, attached to surf-beaten rocks of I. María Magdalena, Las Tres Marías, *no. 39-634,* 9 May 1939. *Ibid.,* abundant, forming mats on rocks, I. Isabel, *no. 34-588B,* 5 Mar. 1934. Guerrero, abundant as sandy mats on rocks within reach of the surf, Bahía Petatlán, *no. 34-570,* 3 Mar. 1934. Oaxaca, common as sandy mats on rocks at Bahía Tangola-Tangola, *no. 34-549,* 28 Feb. 1934. Panamá: frequent in the higher, hot tide pools at Bahía Honda, *no. 39-136,* 26 Mar. 1939. Ecuador: Archipiélago de Colón, forming mats on rocks exposed at low tide, Pta. Albemarle, I. Isabela, *no. 34-112,* 12 Jan. 1934. *Ibid.,* I. Rabida, *Hassler* Exped. *no. 1008,* June 1872. *Ibid.,* among other algae near high tide line, Black Beach

Anchorage, I. Santa María, *no. 34-262,* 18 Jan. 1934. *Ibid.,* intertidal on rocks on an islet in Gardner Bay, I. Española, *no. 34-426,* 31 Jan. 1934. Manabi, in small mats of mixed algae, I. La Plata, *no. 34-475,* 10 Feb. 1934.

SPYRIDIA Harvey, 1833

Plant forming erect, bushy masses, much alternately or irregularly branched, the branches corticated by transverse series of longitudinally elongate cells, which eventually become subdivided and covered by rhizoidal downgrowths; ultimate branchlets of limited growth, consisting of a uniseriate axis bearing rings of small cells at the nodes, but the internodes long and translucent, the terminal and sometimes the lower nodes armed with a spine; sporangia tetrahedral, seriate on the upper side of the branchlets; spermatangia on the nodes of the branchlets; cystocarps surrounded by slender filaments at the tips of small branchlets.

Spyridia filamentosa (Wulfen) Harvey

Taylor 1937, p. 343, pl. 44, fig. 2, pl. 46, figs. 2-5.

PANAMÁ: Bahía de Panamá, common on rocks in shallow quiet water near the anchorage on I. Taboga, *no. 34-624,* 2 May 1939.

Delesseriaceae

Plants usually foliaceous, simple or somewhat branched, or bushy; the branches commonly from the margin and delicately membranous, the blades with or without a midrib, lateral veins or veinlets; growth from a cross-dividing apical cell and regular longitudinal or transverse cell rows derived from it, or from an ill-defined marginal growing region, or intermediate conditions; sporangia tetrahedral, usually in sori; spermatangia in superficial sori; two four-celled carpogenic branches borne together on a special segment from the supporting cell, which develops the auxiliary cells after fertilization, or one carpogenic branch suppressed; cystocarp with a central fusion cell, all or only the outer cells of the gonimoblasts forming carpospores, discharged through the ostiole of the thin inflated pericarp.

KEY TO GENERA[170]

1. Tetrasporangia in a single layer; cystocarps subglobose, very prominent; growth from a marked apical cell . . . Caloglossa
1. Tetrasporangia formed on both sides of the blade; cystocarps moderately prominent 2

[170] Largely based on Kylin 1924, p. 102 *ff.*

2. Cystocarps situated on the midribs of the fertile blades; shoot apex with cross-dividing apical cell; intercalary divisions absent from the cell rows of the first order; chief veins in section showing descending rhizoids 3
2. Cystocarps scattered over the fertile parts of the thallus . . 5
3. Procarps with two carpogenic branches and one group of fertile cells; intercalary cell divisions present in cell rows of the second order; thallus of more than one cell layer . . . . . Hemineura
3. Procarps with one carpogenic branch and two groups of sterile cells; thallus of one cell layer except for the veins 4
4. All tertiary apical cells maintained at the thallus margin; intercalary cell divisions absent; midrib present and at least in the oldest parts showing descending rhizoids between the larger cells; lateral veins and veinlets absent . . . . Hypoglossum
4. Not all tertiary apical cells maintained at the thallus margin; intercalary divisions in the cell rows of the second and higher orders present; besides the midrib, microscopic or macroscopic veins present; rhizoids running between the large cells of the midribs . . . . Delesseria
5. Apex of the blade with a cross-dividing apical cell; intercalary divisions present in the cell rows of the first order; no slender rhizoids among the large cells of the midribs 6
5. Apex of the blade without a prominent cross-dividing apical cell; intercalary divisions present; principal veins with descending rhizoids; branching from the thallus margin 7
6. Younger parts of the thallus of a single cell layer; midrib present and distinct; lateral veins opposite, thallus broad, generally pinnately lobed . . . . Phycodrys
6. Thallus throughout of several cell layers; midrib present, but lateral veins absent; cell rows of the second order with unequal development on the opposite sides . . . . Nienburgia
7. Microscopic veins absent 8
7. Microscopic veins present, the procarps with two groups of sterile cells, the carpospores terminal on the gonimoblasts . . . 9
8. Procarps with two groups of sterile cells, the carpospores in chains on the gonimoblasts; monostromatic in the younger parts; veins present or absent, but not dichotomous . . Myriogramme
8. Procarps with one group of sterile cells; the carpospores usually single and terminal on the ends of the gonimoblasts, but sometimes two together; veins absent . . . . Nitophyllum

9. Tetrasporangial sori single near the tips of the terminal segments . . . . Acrosorium
9. Tetrasporangial sori marginal or in marginal proliferations . . . . Cryptopleura

CALOGLOSSA (Harvey) J. Agardh, 1876

Plants forming flat, dichotomously forking blades with a marked percurrent midrib composed of elongated superficial cells obscuring a broad axial cell row, the lateral membrane of one cell layer, the cells in decussate rows; secondary branching proliferous from the midrib; tetrahedral sporangia formed in decussate series in sori near the tips of the blades; cystocarps sessile, prominent on the midribs, usually a single one near the distal end of a segment, enveloped in a thin pericarp.

Caloglossa Leprieurii (Montagne) J. Agardh

Taylor 1928, p. 161; 1937, p. 345, pl. 53, figs. 2, 3.

COLOMBIA: Valle, mouth of Río Dagua, Bahía Buenaventura, Killip *no. 33002 p. p.,* 3 Feb. 1939. ECUADOR: Archipiélago de Colón, with *Bostrychia* on the roots of *Rhizophora* in a lagoon near Pta. Albemarle, I. Isabela, *no. 34-100,* 12 Jan. 1934. *Ibid.,* with *Catenella* and *Bostrychia* on *Rhizophora* roots in a lagoon near buildings, Academy Bay, I. Santa Cruz, *no. 34-301B p. p.,* 20 Jan. 1934. Esmeraldas, on roots of *Rhizophora* along the shore of Bahía San Francisco, *no. 34-490A p. p.,* 11 Feb. 1934.

HEMINEURA Harvey, 1847

Thallus flat, foliaceous, with pinnate marginal subsidiary blades; each lobe with a midrib; structurally the cell rows of the second order showing intercalary divisions; procarps with 2 carpogenic branches; gonimoblasts with spores in chains.

Hemineura (?) Howellii n. sp.[171, 172]

Plate 88, Fig. 2

Plants to 15 cm tall from a small disciform holdfast, below stalked, the stalk eventually sparingly branched, above narrowly foliaceous, dull

[171] Hemineura Howellii n. sp.—Plantae ad 15 cm altitudine, stipitatae, supra anguste foliaceae, carnoso-membranaceae; segmentis 5-10 cm long., 4-10 mm lat., infra teretibus, ad cacumina rotundata paululum teretibus; costa adest, infra denudata ad formandos stipites; marginibus crenulatis ad prolifero-denticulatos; tetrasporangiis in maculis utroque in latere costae ramorum circularium ad lanceolato-stipitatos proliferorumque, ac formatorum e marginibus costaque segmentorum primariorum vegetativorum. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-225,* 17 Jan. 1934.

[172] Named in recognition of the botanical exploration of the Galapagos Islands by Dr. John T. Howell in 1932.

purplish red, firmly membranous; segments 5-10 cm long, 4-10 mm broad, tapering below, a little tapered and rounded at the tips, with a midrib which becomes denuded below and forms the stalks; the margins entire to crenulate or sparingly proliferous denticulate; normal branching marginal, the branches like the main axes, a little contracted at the base; structurally showing a medulla of notably large cells reaching 90-175 μ diam. which commonly form decussate rows, covered by a cortex of small cells which are not in any obvious order; growth from a prominent transversely dividing apical cell; tetrasporangia on stipitate proliferous branchlets formed from the margins and from the midrib, at first circular, 1.5-3.0 mm diam., later lanceolate, to 7 mm long or more, the sporangia in patches on each side of the midrib, leaving a narrow sterile margin.

The growing apex of this plant shows a notable transversely dividing apical cell. All axis cells of the first and second orders appear to bear branches, which on the former are equal and opposite, but on the latter appear on the lower side only. Apical cells of the outermost of these tertiary axes are elongate and prominent, and reach the margin, but the tertiary axes nearer to the midline of the blade are shorter, have less distinctive apical cells, and do not reach the margin. The aspect is somewhat intermediate between Kylin's (1924) fig. 6a and fig. 8. The blade in section shows in the upper segments a single medullary layer of large firm-walled cells occupying most of the thickness, covered by a very small-celled cortex of one cell layer, or of two cells at the junction of neighboring medullary cells. The thickness varies from 125-155 μ in the upper blades. Sections show the midrib to consist of large thick-walled cells in no particular order, unmixed with descending rhizoids, in the upper blades with a cortex of one cell layer, but in the lower denuded stalk portion covered by a thick cortex of small cells in anticlinal rows much as Kylin (1924, p. 52, fig. 42e) shows for *Yendonia crassifolia* (Ruprecht) Kylin. It is difficult to know in which segregate genus to place these plants, since the observed characters do not seem conclusive and cystocarpic plants are lacking.

ECUADOR: Archipiélago de Colón, occasional in tufts on surf-beaten rocks near Black Beach Anchorage, I. Santa María, *no. 34-225* (tetrasporic, *TYPE*), 17 Jan. 1934.

HYPOGLOSSUM Kützing, 1843

Thallus bushy, freely branched, the divisions foliaceous, narrow, delicate, except for the midribs of one cell layer, with the branching from the midribs; lateral veins and veinlets absent; apical cells of all orders maintained at the thallus margin, and intercalary divisions absent; tetrasporangia and spermatangia formed in large sori between the midrib and the blade margin; procarps with one carpogenic branch, cystocarps situated on the midribs, the gonimoblasts forming spores in chains, enclosed in prominent pericarps.

Hypoglossum abyssicolum n. sp.[173]

Plate 89, Figs. 1, 2

Plants small, to 9 cm tall, the lower branches denuded, slender and firm, sparingly divided, above broadly and delicately alate, the wings one cell thick and without lateral veinlets, the midrib becoming inconspicuous to the unaided eye in the ultimate divisions; blades in juvenile or sterile plants lanceolate, tapering nearly equally to the subacute base and apex, reaching 2.5 cm in length and 5 mm in width, but in older plants to 7.5 cm long, showing the typical apical growth of the genus; branches arising from the midrib; cystocarpic plants bushy, with blades to 3.5 cm long (or more ?) and 6 mm wide, the terminal when fertile commonly short and broad, 0.7-1.5 cm long, 4-5 mm wide, with broadly obtuse ends; cystocarps generally single on the midrib of the blade, 0.9-1.2 mm diam.

The plant discussed by Gardner (1927, p. 104) as *H. attenuatum* may well consist of rather depauperate individuals. If this be true, then the present specimens may be of the same species. Most of them were sterile and were likewise small and sparingly branched, but the blades tapered rather equally to both ends and they were rather broader and much less acute than Gardner describes. One sterile plant was 9 cm tall, sparingly branched, but the blades similarly tapered. The cystocarpic plant was, however, quite distinct, and the writer interprets it as approaching more closely the true habit of the species. It has, on more actively growing blades, the same rather acute tips seen on the sterile pieces, but the fertile lateral branch lobes of the same individuals are rounded to subtruncate or even emarginate. The plants are much more deeply rose colored when dried than is *H. tenuifolium* of the Caribbean area, but are probably closely related.

México: Nayarit, dredged from 24 meters' depth at sta. 970 off Las Tres Marías, *no. 39-649,* 9 May 1939. Costa Rica: rare fragments dredged off Pto. Culebra, *no. 34-529,* 24 Feb. 1934. Colombia: Valle, rare on I. Gorgona, *no. 34-494B,* 12 Feb. 1934. Ecuador: Archipiélago de Colón, rare as dredged from 56 meters' depth off Post Office Bay, I. Santa María, *no. 34-381* (cystocarpic, *TYPE*), 29 Jan. 1934.

173 Hypoglossum abyssicolum n. sp.—Planta ad 9 cm altitudine, sparsa divisa, infra denudata, supra delicate alata, costa sursum inconspicua evadente, venis lateralibus absentibus; laminis sterilibus lanceolatis, ad 2.5-7.5 cm long, 5 mm lat.; ramis e laminis fertilibus cystocarpicis 0.7-1.5 cm long., 4-5 mm lat., obtusis, enascentibus, cystocarpis plerumque in costa singulis. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-381,* 29 Jan. 1934.

DELESSERIA Lamouroux, 1813

Thallus foliaceous, branched, of one cell layer except for the veins, showing both midribs and macroscopic or microscopic side veins; branching through proliferation from the midribs, which in section show scattered rhizoids between the larger cells of the central portion; structurally showing a prominent apical cell which divides transversely, not all cells of the third order maintained at the thallus margin, and intercalary divisions present in the cell rows of the second and higher orders; tetrasporangia and spermatangia in sori between the veins; procarps with one carpogenic branch, the gonimoblasts with spores in chains, the pericarps prominent, situated on the veins.

Delesseria Hancockii n. sp.[174]

Plate 90

Plants to 85 cm tall, below denuded to a firm slender stalk which is very sparingly branched, above bearing a few large rose-colored blades 15-25 cm long which near their bases gradually break down, but are in general broadly oblong lanceolate, to 7 cm wide, rather obtuse at base and apex, the margin somewhat uneven to undulate; with pinnate venation, the midrib showing large and small cells intermixed in the central tissue, prominent to the apex and developing somewhat obliquely subopposite side veins at intervals of 3-7 mm, which are quite straight and visible to the unaided eye for about the first third of their length, and which can be traced with the microscope along a more irregular course to within a short distance of the margin, where they disperse in obscure wandering microscopic veinlets; branching of the frond originating from the face of the midrib; blade of one cell in thickness, except in the region of the veins and major veinlets; tetrasporangia in very numerous small scattered irregular sori about 0.2-0.5 mm diam. which occupy the blade area between the veins of the outer three fourths of the width of the leaf.

This large and handsome plant appears to be very different from anything described hitherto. It is broader and has more prominent veins than *D. lancifolia,* and the distribution of the tetrasporangia seems to be distinctive.

ECUADOR: Archipiélago de Colón, rare as dredged off Academy Bay, I. Santa Cruz, *no. 34-306* (tetrasporic, *TYPE*), 20 Jan. 1934.

[174] Delesseria Hancockii n. sp.—Planta ad 8.5 dm altitudine, stipitem sparse ramosum tenuemque et laminas paucas, oblongo-lanceolatas 15-25 cm long., ad 7 cm lat. habens; laminis in basi apiceque obtusis, margines subundulatos, costam perspicuam, venas laterales pinnatas suboppositasque, intervallis 3-7 mm, habentibus; tetrasporangiis in soris multis, dispersis, 0.2-0.5 mm diam., qui superficiem laminae inter venas partis ¾ externae folii occupant. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-306,* 20 Jan. 1934.

PHYCODRYS Kützing, 1843

Plants short stalked, forming broad foliaceous pinnate lobes which are monostromatic except for the veins, which consist of a midrib and opposite macroscopic pinnate lateral veins, the midribs in section not showing rhizoids among the large cells of the central portion; prominent apical cells present, dividing transversely; tetrasporangia formed in scattered sori, in marginal sori, or on small lateral proliferations; spermatangia formed in small scattered patches or in submarginal bands; carpogonia formed in pairs, the gonimoblasts producing spores in chains, the pericarps prominent.

Phycodrys pulchra n. sp.[175]

Plate 91, Figs. 1, 2

Plants to more than 2 dm tall, the lower parts denuded and forming firm irregularly alternately branching stipes, which continue above as the percurrent midribs of the blades; intact blades to 10-17 cm long, broadly lanceolate, about 5 cm in width, with a closely pinnately lobed margin, the lobes from ligulate to broadly lanceolate or rounded triangular, occupying about half the width or growing out to secondary blades similar to those which bear them, the lobes in turn marginally crenate or divided to subsidiary lobes; the strong midrib with irregularly alternate lateral veins of different sizes, or these obscure in the younger blades, but reaching to the marginal lobes, the veinlets minute, irregularly branched, generally obscure; tetrasporangial sori in the younger lobes, one on each side between the midrib and the margin, reaching a length of 5-15 mm, near the tip narrow, in the lower part of the sorus nearly a millimeter wide, the thallus thickened and the spores more or less covered by the cortex; cystocarps also in the marginal lobes along the veins, generally one, occasionally two, the more distal being younger, in size to 1 mm, or a little more, the pericarp prominent.

These plants differ from Setchell and Gardner's *Phycodrys elegans* (1937, p. 92, pl. 24, fig. 47) from I. San Cristóbal in several minor respects, particularly the width of the blades and their lobes. However, as there is much variation in other species of the genus, the present may prove nothing more than a particularly luxuriant variety of their plant, to which no doubt the relationship is close.

[175] Phycodrys pulchra n. sp.—Planta ad 2 dm altitudine, stipitibus irregulariter alterne ramosis, laminis 10-17 cm long., late lanceolatis, arcte pinnate lobatis, lobis late lanceolatis ad rotundato-triangulares, circa 0.5 latitudinis occupantibus; uno sororum tetrasporangialium utroque in latere costae loborum iuniorum, longitudinem 5-15 mm attingente; cystocarpis uno, interdum duobus, secundum venas loborum, ad circa 1 mm diam., pericarpium prominentem habentibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-382B,* 29 Jan. 1934.

ECUADOR: Archipiélago de Colón, floating off Pt. Christopher, I. Isabela, *no. 34-200* (tetrasporic), 16 Jan. 1934. *Ibid.*, rare as dredged at sta. 169 off Academy Bay, I. Santa Cruz, and richly branched in the stalk portion, though the blades not well developed, *no. 34-315* (tetrasporic), 20 Jan. 1934. *Ibid.,* frequent as dredged off Post Office Bay, I. Santa María, from sta. 167 at 27 meters' depth, *no. 34-274* (tetrasporic), 19 Jan. 1934. *Ibid.,* from 14-18 meters at sta. 193, *no. 34-355* (cystocarpic), 27 Jan. 1934. *Ibid.,* at sta. 197 (?), *no. 34-382B* (cystocarpic and tetrasporic, *TYPE*), 29 Jan. 1934.

NIENBURGIA Kylin, 1935

Thallus narrow, flat, with marginal branching; the edge beset with small teeth; throughout of several layers of cells, a midrib present, though often obscure, and lateral veins absent; apical cells prominent, the cell rows of the second order alternately well developed either to the right hand side or the left, the other side in each case incompletely developed; tetrasporangial and spermatangial sori, and cystocarps, developed in the upper parts of the thallus or on marginal proliferations from it.

Nienburgia Andersoniana (J. Agardh) Kylin

Plants bushy, to 12 cm tall, close to the base compressed, above pinnately branching, the branches flat, to 3-7 mm broad with a rather obscure midrib, the margins irregular to prominently serrate; reproductive organs near the ends of the terminal branches or in marginal proliferations; structurally of several cell layers, the central of large cells, the superficial of smaller ones particularly well developed in the midrib region.

Nott 1900, p. 32 (as *Nitophyllum Andersonianum*); Kylin 1924, p. 46 (as *Heteronema Andersoniana*); 1935, p. 230.

MÉXICO: Baja California, dwarfed iridescent plants in rock crevices near low tide line, South Bay, I. Cerros, *no. 34-631,* 10 Mar. 1934.

MYRIOGRAMME Kylin, 1924

Thallus flat, foliaceous, irregularly lobed or cleft, or deeply divided, of one cell layer above, but below of several similar layers; growth not from a single distinct, cross-dividing apical cell; macroscopic veins sometimes present, but microscopic veins absent; tetrasporangial sori relatively small, scattered; cystocarps scattered over the surface of the thallus, with the carpospores in chains.

Myriogramme Kylinii n. sp.[176, 177]

Plate 92; Plate 93, Fig. 1

Plants to 35 cm tall from a small disciform holdfast, short stalked, the stalk 1-3 cm long, simple or sparingly divided, above flabelliform, dull rose red, the blades cuneate or the lateral ones falcate, simple or split to the base into broad secondary blades, the distal end 3-7 cm broad, divided into short, pointed, truncate or redivided and narrow lobes 0.5-3.0 cm long, with broad rounded sinuses; margins entire; macroscopic veins prominent, numerous, subparallel, sparingly furcate and disappearing toward the tips, below 1-2 mm broad, darker and thicker than the membrane; veinlets and microscopic veins absent; the membrane with age splitting between the veins nearly to the base of the plant, reducing it to a long fringe; membrane one cell thick; veins showing a one-celled chromatophore-bearing cortex on each side and a medulla about 5 cells thick, the cells in moderately regular transverse series; reproductive organs not seen.

This very handsome plant cannot be placed with certainty among the segregates of *Nitophyllum* because only seen in the sterile state, but it undoubtedly belongs in the old collective genus *Nitophyllum*. It resembles very considerably *Myriogramme multinervis* (Hooker *f.* & Harvey) Kylin, but differs in frond size and shape, venation, and other features. The veins certainly seem nearly dichotomous, but divide sparingly. Occasionally a vein will arise independently between two others as the frond widens, and continue out and fork like the rest. Rarely a vein originating between two others will show distally a definite connection with each of them, but there is no systematic anastomosis. Growth from the forward margin appears to be without benefit of special apical cells, and intercalary divisions are general.

ECUADOR: Archipiélago de Colón, dredged at sta. 169 off Academy Bay, I. Santa Cruz, *no. 34-310 (TYPE),* 20 Jan. 1934.

[176] Myriogramme Kylinii n. sp.—Planta ad 35 cm altitudine, stipite 1-3 mm longitudine, subsimplici, laminis flabelliformibus, cuneatis aut laminis lateralibus falcatis, simplicibus aut usque ad basim fissis, parte extrema distali 3-7 cm latitudine, lobos acuminatos aut truncatos, sinibus latis rotundatisque, praebente; venis macroscopicis prominentibus, multis, subparallelis, sparse furcatis, infra fuscis et 1-2 mm lat., supra evanescentibus, membrana aliter crassitudine unius cellulae. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-310,* 20 Jan. 1934.

[177] Named in appreciation of the important systematic studies in this family of algae by Professor Harald Kylin.

NITOPHYLLUM Greville, 1830

Plants forming delicate flat membranous blades, dichotomously or subpalmately forked or lobed, lacking any veins, monostromatic except in the older or fruiting parts, without cross-dividing apical cells except on juvenile plants and proliferations; tetrasporangia in evident rounded sori; spermatangia in elongated sori; cystocarps scattered, with the carpospores generally single on the ends of the gonimoblasts, enclosed in a pericarp.

KEY TO SPECIES

1. Blades with a few broad, divaricate, tapering lobes, commonly fimbriate on the margins . . . . N. divaricatum
1. Blades with numerous segments, frequently redividing, the final segments commonly ligulate and about 1 cm wide . . . . N. galapagense

Nitophyllum galapagense n. sp.[178]

Plate 94, Figs. 1, 2

Plants to 35 cm tall, the base small and disciform, the stalk less than 1 cm long, the thallus above phylloid, dull rose red and delicate, nitent when dry; from a cuneate base, ovate or with a few elongate segments, dissected, the divisions ligulate to subspatulate or cuneate, redivided above, the margins in some specimens beset with ovate stipitate to sessile ligulate sterile proliferations, the larger proliferations and the tips of main branches ending in rounded ligulate lobes about 1 cm broad; growth by scattered marginal cell initials, not by a cross-dividing apical cell; intercalary cell divisions present; thallus in the central region 1-3 cells thick, with a rather thick cuticle; veins and veinlets absent, except for a vaguely defined thickening in the middle quite near the base; reproductive structures rather evenly distributed over the blades except near the base, the tetrasporangia in irregular oval or sublinear sori about 1 mm diam., 1-2 mm long; spermatangia in irregular oval sori 1-2 mm wide, 2-4 mm long, notably dull in appearance in the dried specimens; cystocarps 1-2 mm diam., in section showing the carpospores terminal on the branching gonimoblasts.

[178] Nitophyllum galapagense n. sp.—Planta ad 35 cm altitudine, stipite minore quam 1 cm long., lamina phylloidea e basi cuneata, nitente, ovata aut in segmentis paucis elongatis incisa, divisionibus ligulatis ad subspatulatas, supra redivisis, cacuminibus divisionum primariarum in lobos rotundatos ligulatosque circa 1 cm latitudine terminantibus; thallo 1-3 cellularum crassitudine, cuticulam manifestam habente; soris tetrasporangialibus irregulariter ovatis aut sublinearibus, ad 1 mm diam., 1-2 mm long.; spermatangiis in soris ovatis 1-2 mm lat., 2-4 mm long.; cystocarpis dispersis 1-2 mm diam. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-318A,* 20 Jan. 1934.

This very beautiful species, secured in some quantity and in full reproductive condition, appears by its lack of veins and the cystocarp structure, where a forking system of gonimoblasts arising from the placenta bears the large carpospores at the branch tips, to belong to the genus *Nitophyllum* in the restricted sense. The carpogenic branches, however, could not be studied. There seems to be no difficulty in recognizing it as distinct from the three species retained in the genus by Kylin (1924, p. 75). Of the California Nitophylla described by Nott (1900, p. 1) only *N. spectabile* approaches it in characters, but that species has narrower, more tapered lobes and, since Kylin removes it to *Myriogramme,* probably has entirely different cystocarp structure from what has been observed in the present material.

ECUADOR: Archipiélago de Colón, dredged off Academy Bay, I. Santa Cruz, *no. 34-314* (tetrasporic), *34-318A* (tetrasporic and sexual plants, *TYPE*), 20 Jan. 1934.

Nitophyllum (?) divaricatum n. sp.[179]

Plate 88, Fig. 1

Plants to 25 cm tall (or perhaps much more), foliaceous, from a branched holdfast an ill-defined stalk 1-2 cm in length supporting the broad dull red blades; blades deeply cut into a few wide tapering divaricate segments, with age becoming very irregular, the margins undulate and often fimbriate with small linear to lanceolate proliferations 1-5 mm long; growth at first from an apical cell which segments transversely, but as the blade broadens numerous such cells appear along the margin and the division is less regular; intercalary divisions present; 3-4 cells in thickness in the median region; macroscopic veins absent, although the central area near the base is somewhat thickened; microscopic veins vaguely recognizable in the younger portions; tetrasporangia in very small sori 0.1-0.5 mm diam., scattered in abundance over the middle portion of the blade, but generally absent from a marginal area 1.0-1.5 cm wide.

It does not seem practicable to indicate the segregated genus to which this material should be assigned, in the absence of cystocarps. Consequently, it is placed in *Nitophyllum* in the old, inclusive sense, not in the restricted one of Kylin. Certain fragments secured indicate that the lobes may become far broader than appears from the few intact specimens, per-

[179] Nitophyllum divaricatum n. sp.—Planta altitudine maior 25 cm, haptero ramoso, stipite male definito, laminis latis profunde incisis in segmentis paucis, latis, attenuatis divaricatisque, veteribus irregularibus, marginibus undulatis, saepe fimbriatis proliferationes parvas habentibus; lamina media in regione 3-4 cellularum crassitudine; venis inconspicuis microscopicisque, solis in portionibus iunioribus; tetrasporangiis in soris plurimis dispersisque, 0.1-0.5 mm diam., in portionibus marginalibus laminarum non repertis. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-307,* 20 Jan. 1934.

haps more than a decimeter; they are often abundantly perforate and the holes, like the margin, fimbriate with small proliferations. The areas with tetrasporangial sori are commonly darker than the sterile border, but the extreme margin is sometimes notably dark red.

ECUADOR: Archipiélago de Colón, a fragment dredged in 27-36 meters near Tagus Cove, I. Isabela, *no. 34-138A* (tetrasporic), 13 Jan. 1934. *Ibid.,* dredged off Academy Bay, I. Santa Cruz, *no. 34-307* (tetrasporic, *TYPE*), 20 Jan. 1934. *Ibid.,* fragments dredged from 55 meters' depth off Black Beach Anchorage, I. Santa María, *nos. 34-372, 34-390* (tetrasporic), 29, 30 Jan. 1934.

ACROSORIUM Zanardini, 1869

Thallus flat, freely branching in a plane from the margin, with microscopic veins; growth not from a single apical cell; tetrasporangial sori relatively large, single near the tips of the branches; cystocarps scattered, the gonimoblasts developing terminal carpospores.

KEY TO SPECIES

1. Definitely pointed or hooked branches present . . A. uncinatum
1. Pointed or hooked branches absent 2
2. Segments between the branches 4-10 mm wide, little narrower in the upper than in the lower parts of the plant. . A. Papenfussii
2. Segments between branches 2-5 mm wide, considerably narrower in the upper than in the lower segments . . . . . A. fragile

Acrosorium Papenfussii n. sp.[180, 181]

Plate 95, Fig. 1

Plants to 25 cm tall, delicately membranous in texture and dull rose colored; branching irregularly alternate to subdichotomous, occasionally digitate, the segments 1-4 cm long, 4-10 mm broad, little narrower in the upper than in the lower segments, strap shaped or a little broader at the top of a segment, the margins entire to a little irregular, but hardly crenate; branching somewhat erect, the angles generally rather narrow,

[180] Acrosorium Papenfussii n. sp.—Plantae ad 25 cm altitudine, delicatae, ramificatione irregulariter alterna ad subdichotomam aut digitatam, segmentis 1-4 cm long., 4-10 mm lat., ligulatis, marginibus paulum irregularibus; furcatis in angulis suberectis, sinibus rotundatis, cacuminibus obtusis; media in parte ad 6-10 cellularum crassitudinem crescentibus; venulis microscopicis, obscuris, anastomosentibusque; cystocarpis marginalibus aut submarginalibus, prominentibus. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-318B,* 20 Jan. 1934.

[181] Named in appreciation of the studies on marine algae by Dr. George F. Papenfuss.

about 15°-45°, the sinuses slightly rounded; tip segments blunt, 3-5 mm broad, rounded or emarginate; growth without a special transversely dividing apical cell; one cell in thickness near the tips, below near the margins to 4 cells thick and near the midline to 6-10 cells thick; veinlets obscure, microscopic, anastomosing; cystocarps frequent, marginal or submarginal, about 1 mm diam., prominent.

This plant in the absence of tetrasporic material cannot be assigned to the segregated genus *Acrosorium* with certainty. The material, while not abundant, was in excellent condition.

ECUADOR: Archipiélago de Colón, infrequent as dredged off Academy Bay, I. Santa Cruz, *no. 34-318B* (cystocarpic, *TYPE*), 20 Jan. 1934.

Acrosorium (?) fragile n. sp.[182]

Plate 95, Fig. 2

Plants to 15 cm tall, epiphytic, below concrescent, above free, flat throughout, delicate in texture and dull rose colored; branching irregularly alternate to subdichotomous, rarely opposite, or with short acute adventitious branchlets, the segments 1-3 cm long, 2-5 mm broad, considerably narrower in the upper than in the lower segments, strap shaped or a little broader at the top of a segment, the margins entire; branching generally divaricate at 60°-90°, with rounded sinuses, the tip segments 1-2 mm broad, with apices a little tapered and rounded; growth without a special transversely dividing apical cell, the thallus one cell in thickness above, 2-3 cells thick below; veinlets very obscure, microscopic, anastomosing.

Ample material in excellent condition for study was secured, except that it was all sterile, and consequently no assurance of its segregated generic status could be gained.

ECUADOR: Archipiélago de Colón, dredged off Academy Bay, I. Santa Cruz, *no. 34-317 (TYPE),* 20 Jan. 1934.

Acrosorium uncinatum (J. Agardh) Kylin

Plants 2-5 cm tall, entangled in other algae, branching subdichotomous to subpinnate, the branches narrow, 1-3 mm wide, thin, flat, the margin entire, irregular, or with occasional projections, the tips pointed or commonly hooked; structurally one cell thick except for the irregularly ramifying and anastomosing veins, where it is three cells thick.

182 Acrosorium fragile n. sp.—Plantae ad 15 cm altitudine, infra concrescentes, supra liberae, delicatae; ramificatione magna ex parte divaricate irregulariter alterna ad subdichotomam, versus partem plantae superiorem aliquantum angustata, segmentis 1-3 cm long., 2-5 mm lat., ad cacumina 1-2 mm lat., apicibus paulum teretibus rotundatisque; supra cellulae unius crassitudine, infra 2-3 cellularum, venulis obscurissimis microscopicis, anastomosentibusque. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-317,* 20 Jan. 1934.

Taylor 1930, p. 632, pl. 39 (as *Nitophyllum uncinatum*); Kylin 1924, p. 78, fig. 61.

This species may reach a height of 8 cm and the branches a width of 6 mm, but none were so luxuriant in the Point Hughes material, which was sterile.

MÉXICO: Baja California, dredged off Point Hughes on Cabo San Lazaro, *no. 34-605,* 7 Mar. 1934.

CRYPTOPLEURA Kützing, 1843

Thallus flat, freely branching from the margins; macroscopic veins present but lacking descending rhizoids; microscopic veins present; growth not from a single apical cell; tetrasporangial sori marginal or on marginal proliferations; cystocarps scattered, the gonimoblasts with terminal spores.

Cryptopleura lobulifera (J. Agardh) Kylin, *prox.*

Kylin 1924, p. 90, figs. 75, 76.

One specimen of diminutive proportions with a few tetraspores appeared to belong to this species, the histological characters in particular agreeing well.

MÉXICO: Baja California, dredged off Point Hughes on Cabo San Lazaro, *no. 34-600* (tetrasporic), 7 Mar. 1934.

Dasyaceae

Plants usually bushy, repeatedly branched, the branches bearing monosiphonous branched filaments of limited growth which may remain free or be united into a network; axes in some genera corticated by the development of a circle of pericentral cells, and also by rhizoidal filaments which grow down from the bases of the branchlets; monosiphonous branched filaments sometimes corticated at the very base, distally terminating in colorless hairs; sporangia produced in special branchlets or stichidia, tetrahedral; spermatangia borne in clusters on special lateral branchlets; four-celled carpogenic branches formed near the bases of the branched filaments, with an auxiliary associated with certain sterile cells formed from the same supporting cell.

KEY TO GENERA

1. Radially branched; tetraspores not covered by the outer cells of the stichidium . . . . Dasya
1. Dorsiventrally branched; tetraspores completely enclosed in the stichidium . . . . Heterosiphonia

DASYA C. Agardh, 1824

Plants erect, more or less bushy, with stout main branches covered with filiform branchlets; axis with 5 pericentral cells generally externally covered by a rhizoidal cortication; branchlets crowded, scattered, whorled or spirally inserted, sometimes polysiphonous at the base, uniseriate above, pseudodichotomously branched, the tips generally delicate; tetrasporangia in distinctive enlarged stichidial branchlets, the sporangia exposed at maturity; spermatangia in fusiform to subcylindrical clusters formed on the bases of lateral filaments; cystocarps in ovate or vasiform ostiolate pericarps, which are apparently short stalked.

Dasya Stanfordiana Farlow

Plate 97, Fig. 2

Farlow 1902, p. 94.

These plants reached a height of 25 cm, considerably above Farlow's largest recorded specimen. His plants came from I. Wenman and I. Isabela. The pericarps, which he does not record, are short stalked, a little broader than long, and the pore is slightly elevated.

México: Is. Revilla Gigedo, dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-648,* 9 May 1939. Ecuador: Archipiélago de Colón, dredged at sta. 157 from 18-32 meters' depth off Tagus Cove, I. Isabela, *no. 34-191,* 15 Jan. 1934. *Ibid.,* dredged at 27 meters' depth off Post Office Bay, I. Santa María, *no. 34-278* (tetrasporic), 19 Jan. 1934. *Ibid.,* dredged at 12-18 meters' depth, *no. 34-363,* 27 Jan. 1934. *Ibid.,* dredged at 55 meters' depth, *no. 34-374* (tetrasporic). *Ibid.,* dredged in abundance from a rocky bottom at 36-55 meters' depth near an islet in Gardner Bay, I. Española, *no. 34-422* (tetrasporic and cystocarpic), 31 Jan. 1934. *Ibid.,* dredged from 20 meters' depth, Schmitt *no. 356B-34* (cystocarpic), 17 Dec. 1934. *Ibid.,* dredged from 36 meters' depth, Schmitt *no. 362E-34,* 19 Dec. 1934.

HETEROSIPHONIA Montagne, 1842

Thallus chiefly erect, dorsiventrally organized, the stem commonly compressed; apex commonly a little recurved, branching alternate, bilateral, producing secondary axes and determinate branchlets; branchlets subdichotomous, monosiphonous above, but polysiphonous near their bases, or either poly- or monosiphonous throughout; axes with four or more pericentral cells, generally becoming enclosed by a rhizoidal cortex; tetrasporangia in distinctive stichidia, the sporangia remaining enclosed by the cover cells; spermatangial clusters generally elongate, acute, with a polysiphonous base; cystocarps in ovoid to urn-shaped pericarps.

Heterosiphonia erecta Gardner

Gardner 1927, p. 99, pls. 20, 21; Gardner *in* Setchell & Gardner 1937, p. 84, pls. 21-23; Kylin 1941, p. 34.

This Mexican material, unfortunately sterile, seems to represent an intermediate degree of coarseness, being somewhat larger than Phyc. Bor.-Amer. *no. 146,* but more delicate than, though quite as tall as, Gardner's *no. 2540.* The Ecuadorean material is both small and delicate.

México: Baja California, probably washed ashore at Point Hughes on Cabo San Lazaro, *no. 34-593,* 7 Mar. 1934. Ecuador: Guayas, from the rocky southeast side of Pta. Santa Elena, Salinas, *no. 34-468,* 8 Feb. 1934.

Rhodomelaceae

Plants usually bushy, generally filamentous but sometimes membranous expanded; growth from an apical cell, the axial row surrounded by pericentral cells and sometimes these in turn by a more or less irregular cortex; sporangia from segments formed on the inner side of the pericentral cells, tetrahedrally divided, the branches usually little modified, but sometimes stichidiumlike; spermatangial clusters developed from trichoblast rudiments; carpogenic branches four celled, produced on a pericentral cell associated with certain sterile groups and an auxiliary formed after fertilization; carpospores formed from the outer cells of the gonimoblasts, which are borne on a large fusion cell, and discharged through the ostiole of the prominent pericarp.

KEY TO GENERA

1. Thallus showing naked pericentral cells at least in the youngest branchlets 3
1. Thallus throughout with cortication obscuring the pericentral cells 2
2. Branchlets not particularly contracted at the base, the growing tip sunken . . . . Laurencia
2. Branchlets markedly contracted at the base, the growing tip generally projecting . . . . Chondria
3. Minute creeping plants with well-defined rhizomatous axis and simple or subsimple erect branchlets 9
3. Much larger plants, erect or, if creeping, the erect branches not simple 4

4. Axis relatively stout, bearing lateral determinate branches or branchlets 5
4. Axis and branches not clearly delimited . . . . . . Polysiphonia
5. Branching radial 6
5. Branching bilateral 8
6. Axis stout, heavily corticated, the determinate branches and branchlets dichotomous, monosiphonous . . . . Brongniartella
6. Axis stout, heavily corticated, the polysiphonous branchlets corticated at the base 7
6. Axis more slender, branchlets not crowded, not at all corticated, but polysiphonous . . . . Bryocladia
7. Axis completely surrounded by short simple divaricate corticated branchlets . . . . Digenia
7. Axis more loosely beset with short, alternately divided, determinate branches . . . . Bryothamnion
8. Branches not compressed, near the tips generally inrolled . . . . Bostrychia
8. Main branches compressed, not inrolled near the tips . . . . Pterosiphonia
9. Erect branches simple or subsimple, most likely to branch in the fertile individuals; dark in color . . . . Lophosiphonia
9. Erect branches simple, relatively short . . . . . Herposiphonia

LAURENCIA Lamouroux, 1813

Plants erect, bushy, seldom decumbent, the branches moderately firm to quite fleshy, usually cylindrical, in some species compressed, often alternately branched; apical cells protected by trichoblasts and sunken in an apical pit; tetrasporangia distributed over the short fertile branchlets at the surface; spermatangia united into paniculate clusters and immersed in the cuplike branch tips; pericarps sessile on the ultimate branchlets.

KEY TO SPECIES

1. Plants minute, chiefly decumbent, with subsimple erect branches . . . . L. clarionensis
1. Plants essentially erect 2
2. Plants small, less than 10 cm tall 3
2. Plants growing to be more than 10 cm tall 5
3. Axes and branches grading into the branchlets . . . L. intricata
3. Axes and main branches clearly demarcate from the very obtuse to truncate ultimate branchlets 4

4. Branchlets in part turbinate, scattered . . . . . . L. voragina
4. Branchlets not turbinate, more or less verticillate . . . . L. obtusiuscula v. corymbifera
5. Determinate branches and branchlets chiefly opposite . . . . L. oppositoclada
5. Branching throughout chiefly alternate 6
6. Habit paniculate, the main axes definitely percurrent L. peninsularis
6. Habit corymbose, the main axes dispersed into the densely clustering terminal branchlets . . . . L. congesta

Laurencia clarionensis Setchell & Gardner

Setchell & Gardner 1937b, p. 81, pl. 7, figs. 19-21.

MÉXICO: Is. Revilla Gigedo, on rocks near low tide line, Sulphur Bay, I. Clarion, *no. 34-51,* 5 Jan. 1934.

Laurencia intricata Lamouroux, *prox.*

Taylor 1928, p. 179, pl. 34, fig. 8.

A plant forming small tufts about 2 cm tall, entangled below but the taller erect branches radially alternately divided. This may represent a further development of Setchell & Gardner's *L. humilis* (1930, p. 156, pl. 9, figs. 32, 33), but it is even more like dwarfed forms which in the Caribbean are best referred to *L. intricata.*

MÉXICO: Guerrero, tufted on sandy rocks along the shores of Bahía Petatlán, *no. 34-578,* 2 Mar. 1934.

Laurencia obtusiuscula Setchell & Gardner, v. **corymbifera** Setchell & Gardner, *prox.*

Setchell & Gardner 1924, p. 761, pl. 23, figs. 15, 16, pl. 45, fig. b.

ECUADOR: Archipiélago de Colón, intertidal on rocks of an islet in Gardner Bay, I. Española, *no. 34-428,* 31 Jan. 1934.

Laurencia voragina n. sp.[183]

Plate 46, Fig. 2

Plants tufted or turflike, with short basal rhizomatous branches more or less coalescent, and with crowded erect axes to 2 cm tall; erect axes percurrent with few indeterminate branches, to about 0.5-1.0 mm diam.,

[183] Laurencia voragina n. sp.—Plantae caespitideae, infra subrhizomatosae, supra erectae, ad 2 cm altitudine, axibus primariis pauce divisis, percurrentibus, ramis infra denudatis, supra ramulos ascendentes determinatos brevisque arcte, alterne radiatimque ferentibus, his primo turbinatis, basibus vix contractis, adultis paene cylindricis, ad 0.40-0.55 mm diam. Planta typica in loco dicto White Friars Is., México, legit W. R. Taylor *no. 39-628,* 9 May 1939.

in transverse section showing the surface cortical cells not swollen, rounded angular, to about 30 μ diam. and about as deep, not appearing different from the outer medullary cells; medulla about 8-10 cells in radial dimension, the inner progressively much larger, but the pericentral cells hardly distinguishable; axes at the base somewhat denuded but for the most part very closely alternately radially beset with short determinate lateral ascending often curved branchlets which reach a length of 1-2 mm, are simple or more often alternately closely branched with 2-5 divisions; smaller branchlets or divisions turbinate, the expanded ends somewhat depressed, the bases hardly contracted, later somewhat lobed and eventually developing branchlets; older branchlets more nearly cylindrical, diameter to 0.40-0.55 mm; tetrasporangia near the ends of the branchlets, to 75 μ diam.

As with most small Laurencias, Chondrias, and Hypneas, the description of miniature species is dangerous except after prolonged field study, because the chances are so great that the plants are dwarf forms of larger species. The writer is familiar in the Caribbean with turflike forms of *Laurencia obtusa, L. intricata,* and *L. papillosa,* for example, where the individuals over large areas show little resemblance to their well-developed relatives, but where in a slightly sheltered nook of the same terrain all transitions establishing the relationship may be readily secured. However, in this instance the plants are ecologically important and nothing known to the writer in the flora of the area is entirely satisfactory as a larger-scale relative from which these plants could have been derived. The most plausible is *L. obtusiuscula* Setchell & Gardner (1924, p. 760) and especially the var. *corymbifera* Setchell & Gardner (1924, p. 761), but in ours the branches are more turbinate and more densely placed, but not verticillate.

MÉXICO: Guerrero, forming turfs near low tide line in the severe surf of White Friars Is., *no. 39-628* (tetrasporic, *TYPE*), 9 May 1939.

Laurencia peninsularis n. sp.[184]

Plate 98, Fig. 1

Plants bushy, about 2 dm tall, dull red, soft and adhering to paper when mounted, the elongated main axes sparingly branched, definitely percurrent, bearing at intervals of 5-10 mm short lateral branches, gen-

184 Laurencia peninsularis n. sp.—Plantae ad 2 dm altitudine, fruticosae, axibus primariis sparse ramosis, percurrentibus, ferentibus, in intervallis 5-10 mm, ramos laterales breves 1-2 cm long. qui ramulos alternos, cylindricos ad subclavatos, 0.3-0.5 mm diam., 1-3 alterne furcatos proferunt. Planta typica in loco dicto Point Hughes, Baja California, México, legit W. R. Taylor *no. 34-607,* 7 Mar. 1934.

erally 1-2 cm long, which are likewise percurrent, but in pyramidal fashion bear alternate cylindrical to somewhat club-shaped branchlets 0.3-0.5 mm diam. which fork alternately 1-3 times.

The sparingly divided main axes of these plants are somewhat virgate, and the close lateral branches form small paniculate clusters. They do not resemble Phyc. Bor.-Amer. *no. 1093,* called *L. pacifica* by Kylin (1941, p. 42), which as a whole has a pyramidal habit and the branchlets of which are short and much more congested than those of these specimens, and the plants more firm in texture.

MÉXICO: Baja California, on rocks at Pt. Hughes on Cabo San Lazaro, *no. 34-607 (TYPE),* 7 Mar. 1934.

Laurencia congesta n. sp.[185]

Plate 99, Fig. 1

Plants to 2 dm tall, bushy, dull blackish red; axes somewhat denuded below, 1.5-2.0 mm diam., erect, occasionally with one or two equal main divisions but generally simple, irregularly beset with subsidiary lateral branches; lateral branches erect, irregularly, chiefly alternately divided, the lower branchlets subsimple or 1-4 times pseudodichotomously forked, the subsidiary axes and their main divisions deliquescent above, producing in the upper parts of the plant densely congested corymbiform clusters; ultimate branchlets erect, somewhat clavate, about 0.5 mm diam.

The habit of this plant is extremely characteristic, for the other larger bushy species when of compact habit are essentially paniculate, rather than corymbose with the axes disappearing into more or less even-topped clusters.

ECUADOR: Archipiélago de Colón, on rocks in the littoral near Black Beach Anchorage, I. Santa María, *no. 34-217B (TYPE),* 17 Jan. 1934.

Laurencia oppositoclada n. sp.[186]

Plate 99, Fig. 2

Plants to 25 cm tall, dull blackish red, subcartilaginous below, only the young parts adhering to paper; erect bushy, the leading percurrent

[185] Laurencia congesta n. sp.—Plantae ad 2 dm altitudine, fruticosae, axibus infra paululum denudatis, erectis, plerumque simplicibus, ramos laterales, subsidiarios, erectos irregulariter praebentibus; ramis magna ex parte alterne divisis, ramulis inferioribus subsimplicibus aut 1-4-subdichotome furcatis, axibus primariis supra deliquescentibus; in fasciculos corymbiformes et confertos terminantibus; ramulis ultimis erectis, subclavatis, circa 0.5 mm diam. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-217B,* 17 Jan. 1934.

[186] Laurencia oppositoclada n. sp.—Plantae ad 25 cm altitudine, subcartilagineae, erectae fruticosaeque, axibus primariis percurrentibus ad basim sparse divisis, ramis ramulisque determinatis, intervallis 3-5 cm, magna ex parte suboppositis, singulis aut ad 3-4 simul, prope cacumina subpaniculatis factis, 0.5-1.2 mm diam., 3-15 mm long., clavatis ad subcylindricos, basim paululum contractam, apicem obtusum ad truncatum habentibus. Planta typica in loco dicto I. Santa María, Ecuador, legit W. R. Taylor *no. 34-217A,* 17 Jan. 1934.

axes chiefly arising near the base, where they may reach 2 mm diam., but above little over 1 mm, the lesser branches irregularly disposed; determinate branches chiefly nearly opposite at intervals of 3-5 cm, occasionally 3-4 at one level, somewhat paniculate near the stem tips, not consistently complanate, 0.5-1.2 mm diam., 3-15 mm long, the branchlets alternate or opposite, turbinate to club shaped or subcylindrical, with the base contracted and the apex obtuse to truncate.

These plants are very different in appearance from *L. subopposita* (J. Agardh) Setchell (1914a, p. 9) as figured by Yamada (1931, p. 221, pl. 15, fig. b), and even more from Kylin's figure (1941, p. 42, pl. 13, fig. 37). There are no hooked branches and the habit is erect, with clear dominant chief axes; the plants are relatively slender throughout. Surface cells of the branchlets are about as deep as they are wide in section. It may, however, be most closely related to *L. subopposita.*

ECUADOR: Archipiélago de Colón, on shore rocks in the surf, Pt. Christopher, I. Isabela, *no. 34-203,* 16 Jan. 1934. *Ibid.,* infrequent on littoral rocks near Black Beach Anchorage, I. Santa María, *no. 34-217A (TYPE),* 17 Jan. 1934.

Laurencia obtusa (Hudson) Lamouroux, v. **gracilis** Harvey

Piccone 1886, p. 80; Farlow 1902, p. 98.

Reported from I. San Cristóbal, Archipiélago de Colón.

CHONDRIA C. Agardh, 1817

Plants bushy, freely alternately branched, the branches generally terete and the branchlets constricted sharply at the base; growth from an apical cell, the tip surrounded by trichoblasts, sometimes tapering, sometimes retracted into an apical pit; axis with five pericentral cells and developing an ample pseudoparenchymatous cortex outside these; tetrasporangia near the surface of little-modified ultimate branchlets; spermatangial clusters of various shapes, generally forming colorless plates; cystocarps at the bases of modified trichoblast rudiments, enclosed by prominent ostiolate pericarps.

KEY TO SPECIES

1. Branches cylindrical 2
1. Branches flattened . . . . C. platyclada
2. Very small, about 2-4 cm tall, bushy . . . . . C. californica
2. Much larger, to 20 cm tall, the chief branches long extended, the outer portion naked . . . . C. flexicaulis

Chondria californica (Collins) Kylin

Plants to 3.0-3.5 cm tall, dull red, soft and tufted, with numerous axes from near the base, the axes alternately 1-3 times branched; branchlets tapering somewhat to the base, the tips tapering acutely, with a distinct apical cell; width to 1 mm or a little more below, to 0.5 mm in the branchlets; branchlets frequently arcuate or recurved, and sometimes with one to several fibrous holdfasts either well developed or in young stages; reproductive stages not seen.

Collins in Phyc. Bor.-Amer. *no. 636* as *Chondria tenuissima* forma *californica;* Kylin 1941, p. 41.

México: Baja California, on corallines at South Bay, I. Cerros, *no. 34-628,* 10 Mar. 1934. Costa Rica: dredged attached to shells at Pto. Culebra, *no. 34-524,* 24 Feb. 1934.

Chondria flexicaulis n. sp.[187]

Plate 100, Figs. 1-3

Plants to 20 cm tall or more, soft, rose red, alternately branched, the main axes 1.0-1.5 mm diam., chiefly produced near the base of the plant, of about equal length, with relatively few secondary axes, the tapered ends long extended, naked; short branchlets scattered alternately at intervals of about a centimeter, occasionally 2-4 together, 3-10 mm long, 0.5-1.0 mm diam., sharply contracted at the base or commonly pedicellate, spindle shaped, with the lower end slightly swollen; tetrasporangia in the ultimate pedicellate branchlets, which at first are elongate conical with the sporangia near the base, but with age become more club shaped with the lower part empty and the ripe sporangia near the tip; spermatangia forming obovate pedicellate disks 0.5-1.0 mm diam., especially near the base of the ultimate branchlets; cystocarps on distinct plants (dioecious), 4-10 chiefly alternately placed near the bases of the branchlets, commonly with one or two secondary branchlets arising near the base of the first.

These plants somewhat resemble *C. nidifica* Harvey (1858, p. 125, pl. 50) and Phyc. Bor.-Amer. *no. 1646.* They are, however, throughout soft and slender, and the tetrasporangial branchlets do not form the clusters figured by Harvey. It is possible that they are only a deep-water form of that species.

[187] Chondria flexicaulis n. sp.—Plantae ad 20 cm altitudine, alterne ramosae, axibus secundariis paucis, cacuminibus multum extensis, flexuosis nudisque; ramulis brevibus intervallis 1 cm aut simul, 3-10 mm longitudine, 0.5-1.0 mm diam., fusiformibus; tetrasporangiis intra ramos clavatos pedicellatosque, sporangiis ad cacumen; spermatangiis in discis obovatis, pedicellatis, ad bases ramulorum ultimorum orientibus; pericarpis pedicellatis, ore lato vasiformibus, magna ex parte ad bases ramulorum orientibus. Planta typica in loco dicto I. Santa Cruz, Ecuador, legit W. R. Taylor *no. 34-309,* 20 Jan. 1934.

ECUADOR: Archipiélago de Colón, dredged from 20-25 meters' depth off I. Baltra, Schmitt *no. 84B-33,* 18 Feb. 1933. *Ibid.,* dredged in quantity off Academy Bay, I. Santa Cruz, *no. 34-309* (tetrasporic and sexual, *TYPE*), 20 Jan. 1934. *Ibid.,* dredged from 35-55 meters' depth off a sandy bottom near an islet in Gardner Bay, I. Española, *no. 34-408* (tetrasporic), 31 Jan. 1934.

Chondria platyclada n. sp.[188]

Plate 93, Fig. 2

Plants to 10 cm tall, dull pink, somewhat fleshy, somewhat clustered, the main axes sparingly alternately branched, the branches cylindrical and firm below, but above expanded to 2-3 mm in width and flat, rather freely marginally alternately branched, the lesser branches becoming like the axis, linear lanceolate, the margin because of the presence of the next junior branch rudiments appearing serrate; tetrasporangiate branches acute, terminating the divisional series in pinnate fashion, fertile in the ultimate and occasionally the penultimate segments, which are 250-375 μ diam., 1.5-2.25 mm long, with the sporangia mostly midway of the length; pericarps marginal, short stalked, obovoid, about 550 μ diam.

COSTA RICA: dredged off Pto. Culebra, *no. 34-522* (cystocarpic and tetrasporic, *TYPE*), 24 Feb. 1934. ECUADOR: Cauca, dredged from 18 meters' depth off I. La Plata, *no. 34-477* (tetrasporic), 10 Feb. 1934.

BRYOTHAMNION Kützing, 1843

Plants erect, alternately branched and bushy, firm and rather stiff, dull reddish purple; branches terete or angled, with 6 to 8 pericentral cells and a broad cortex; minor branches of limited growth, simple or forked, bearing short to subulate branchlets along the angles of the branch, or if flattened, distichous.

188 Chondria platyclada n. sp.—Plantae ad 10 cm altitudine, fasciculatae, paulum succulentae, axibus primariis sparse alterneque ramosis, ramis infra cylindricis, supra planis, 2-3 mm latitudine, et in margine copiose alterneque ramosis, ramulis lineari-lanceolatis; ramis tetrasporangiatis acutis, in segmentis ultimis subultimisque, 250-375 μ lat., 1.5-2.25 mm long. fertilibus, sporangiis maxime ex parte media in portione; pericarpis marginalibus, stipitem brevem habentibus, circa 550 μ diam. Planta typica in loco dicto Pto. Culebra, Costa Rica, legit W. R. Taylor *no. 34-522,* 24 Feb. 1934.

Bryothamnion pacificum n. sp.[189]

Plate 96, Fig. 1

Plants bushy, to over 11 cm tall, the axis to about 2 mm diam., terete; main branching alternate, generally distributed though somewhat denser in the upper divisions, without dominant main axes, the intervals being 0.5-2.0 cm, in transverse section showing a distinct axial cell row, which is rather large and thick walled, to 150 μ diam., the 7 pericentral cells larger and surrounded by one complete and one partial layer of outer medulla; cortex of one layer of rather thick-walled cells, very irregular in form and position, about 25-40 μ diam. in surface view; patent determinate branches distributed throughout the plant, little congested at the main branch tips, spirally disposed, to about 1.5-2.0 mm in length, at the base becoming corticated, sharply tapering to the summit, with about 4-10 alternately placed acute uncorticated branchlets which are simple or bear 1-4 subsidiary aculeate branchlets; undivided branchlets relatively stout, to 40-90 μ diam., and to about 360 μ long, abruptly tapering to the small acute somewhat indurated tip cells; reproductive structures not seen.

These plants considerably resemble *B. triquetrum* in habit, but are much more slender in all parts. The determinate branches are exceedingly like those of *B. Seaforthii* f. *imbricata* J. Ag., but are shorter and much less closely imbricate, and the habit differs from the forms of that species. In the absence of reproductive structures the allocation to this genus is necessarily tentative, though the structural resemblances are very convincing.

MÉXICO: Nayarit, dredged from 5.5-9.0 meters' depth at sta. 971 near I. María Magdalena, Las Tres Marías, *no. 39-665 (TYPE),* 9 May 1939.

DIGENIA C. Agardh, 1822

Plants erect, bushy, the branches cylindrical, alternately or dichotomously divided, firm, in the main divisions heavily corticated, bearing densely placed short branchlets with 6 to 10 pericentral cells and one layer of cellular cortication; tetrasporangia in the irregular, largely uncorticated upper portion of fertile branchlets; spermatangia numerous near the tips of male branchlets; cystocarps ovoid, on the middle or upper parts of fertile branchlets.

[189] Bryothamnion pacificum n. sp.—Plantae fruticosae, plus quam 11 cm altitudine, identidem, radiatim, alterneque ramosae, sine axe primario dominante; ramis determinatis spiraliter dispositis, 1.5-2.0 mm long., infra corticatis, habentibus 4-10 ramulos alternatos, acutos, ecorticatosque, infra 40-90 μ diam., ante divisionem ad 360 μ long., cellulis cacuminis parvis acutisque. Planta typica in loco dicto I. María Magdalena, Las Tres Marías, México, legit W. R. Taylor *no. 39-665,* 9 May 1939.

Digenia simplex (Wulfen) C. Agardh

Taylor 1928, p. 175, pl. 24, fig. 20, pl. 33, fig. 7.

Both the DeToni and Engler-Prantl descriptions of this genus indicate that the maximum number of pericentral cells in the lateral branchlets is 8, but examination of the I. Soccoro material showed most commonly 9 or 10. The main axes show a well-defined relatively small-celled cortex with thicker walls, and a large-celled medulla with thin cell walls, but no recognizable axial or pericentral cells in the mature portions.

MÉXICO: Is. Revilla Gigedo, forming large tufts in the tide pools along the shore of Braithwaite Bay, I. Soccoro, *no. 39-51,* 18 Mar. 1939. COSTA RICA: common in tide pools near the entrance on the western side of the bay, Golfo Dulce, *no. 39-95,* 26 Mar. 1939.

BRONGNIARTELLA Bory, 1822

Brongniartella mucronata (Harvey) Schmitz

Plants erect, bushy, when well developed to 2-3 dm tall, with several axes from the expanded holdfast, alternately several times branched, the branches and indeterminate branchlets with 5 pericentral cells, early corticated; becoming naked below but above bearing determinate monosiphonous branchlets which fork dichotomously but commonly with one side of the fork not rebranching, tapering to the tips with the terminal cell small, very acute and slightly indurated; tetrasporangia single in the segments of lesser branches near the tips, somewhat spirally disposed.

Hoyt 1920, p. 506; Taylor 1928, p. 167, pl. 27, figs. 5, 6.

This species is represented by one fragment 5 cm tall, agreeing in all essentials with the somewhat variable West Indian plant. One notes that the lateral determinate branchlets are, on small and particularly slender branches, simple or subsimple and only in somewhat older or more sturdy parts become several times branched. They are, in our Mexican material, about 30 μ in diameter at the base and 18 μ in the lesser divisions. The tetrasporangia are 60-70 μ diam. There is little of generic value to distinguish *Veleroa* (Dawson 1943, p. 335) from *Brongniartella* except the number of pericentral cells, reported to be 4 instead of the 5 characteristic of well-developed shoots of *Brongniartella.*

MÉXICO: Nayarit, rare as dredged from 22 meters' depth at sta. 970 near I. María Magdalena, Las Tres Marías, *no. 39-660* (tetrasporic), 9 May 1939.

BRYOCLADIA Schmitz, 1897

Plants with a creeping, matted base, bearing erect filaments which are alternately branched, ecorticate, with 6 to 16 pericentral cells; lateral branches spirally placed, short and stiff, ultimately commonly recurved; tetrasporangia single in the segments, inserted along the outer side of the branchlets; pericarps urn shaped, stalked, on the lateral branchlets.

Bryocladia Dictyurus (J. Agardh) n. comb.

Plate 98, Fig 2

Plants tufted, 1.5-3.0, seldom to 5.0 cm tall, dull blackish purple, the base creeping and attached by haptera, the erect axes rather crowded, simple or occasionally divided, 150 μ to over 200 μ diam., the segments about 90 μ long, rather closely beset with divaricate branches 1-2 mm long, 30-40 μ diam., which branch alternately 3-4 times, the terminal divisions tapering sharply and ending in acute, spreading, or recurved tips.

Agardh, J. G. 1847, p. 16; Harvey 1853, p. 53 (both as *Polysiphonia Dictyurus*). Not *Polysiphonia Dictyurus* Hollenberg 1944, p. 479.

The type locality of this species is Vera Cruz on the western coast of México, a place now difficult exactly to locate, where it was collected by Liebmann. The present specimens seem considerably coarser than the type material at Lund which the writer has seen, but it has probably been browsed over and many coarse cut-off stems remain, the new growth being dense and not reaching typical height. The plants did not adhere to paper at all. These plants show the same general structure as *B. thyrsigera* (J. Agardh) Schmitz. In that species the main axes are more percurrent, the determinate branchlets more elongate. The habit of *B. Dictyurus* is more compact and the short branches near the tip produce a round-topped appearance to each; they spread more, are stouter and more rigid than in *B. thyrsigera*. They are as distinct from the main axis as in the Caribbean plant, or even more; and, since this is the chief distinguishing feature of the genus, it seems well to transfer this species to it.

MÉXICO: Guerrero, on coarser algae on the rocks near high tide line, Ba. Petatlán, *nos. 34-574, 34-577,* 2 Mar. 1934.

POLYSIPHONIA Greville, 1824[190]

Plants erect, or with a rhizomatous base, usually abundantly branched, the branches cylindrical, similar to the axis, growing from a definite apical cell; structurally composed of a central cell row surrounded by

[190] Identifications in the genus *Polysiphonia,* and notes on the various species, are included by the kindness of Professor G. J. Hollenberg.

four to twenty-four pericentral cells of equal length, and sometimes corticated by rhizoidal downgrowths; branched colorless trichoblasts sometimes present; tetrasporangia single in the fertile segments, forming considerable series in little-modified branches; spermatangia in colorless elongated cylindrical to spindle-shaped clusters developed on a trichoblast rudiment; procarps also developed on trichoblast rudiments, producing a carpogenic branch of four cells with auxiliary and sterile cells; after fertilization the pericarps sessile or short stalked, large, globose, ovate or subürceolate, ostiolate.

KEY TO SPECIES

1. Pericentral cells 5 or less 2
1. Pericentral cells more than 5 4
2. Plants erect 3
2. Plants small, matted or tufted; pericentral cells 4; trichoblasts present; branch tips incurved . . . . P. decussata
3. Pericentral cells 3-5; trichoblasts evanescent; branch tips straight . . . . P. homoia
3. Pericentral cells 5; trichoblasts absent; branch tips forcipate . . . . P. bifurcata
4. Plants erect; pericentral cells 12 . . . . P. Hendryi
4. Plants small, creeping, the tips often curved; pericentral cells 10 or 12 . . . . P. Howei

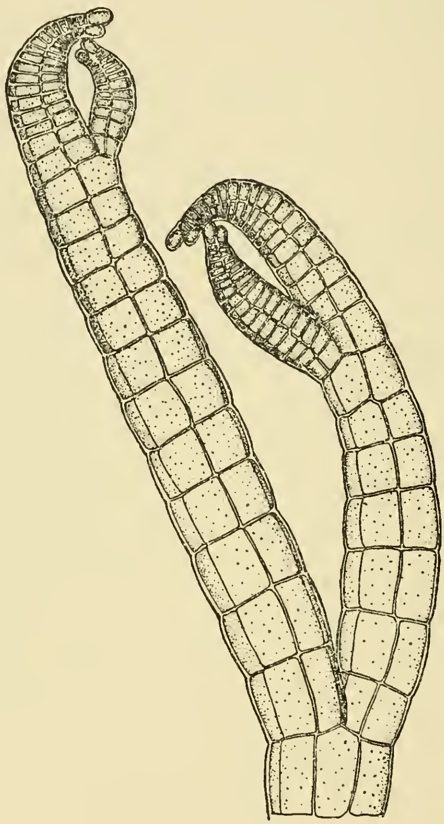
Polysiphonia homoia Setchell & Gardner

Setchell & Gardner 1930c, p. 162.

Plants to 20 cm tall, soft, rose red, the lower branching pseudodichotomous at wide angles, the upper alternate and ascending with the numerous main axes somewhat excurrent; branches arising axillary to the subsimple evanescent trichoblasts, contracted at the base, gradually tapered to the apex with prominent apical cells and considerably delayed longitudinal division of the segments; in section the stem with 5 pericentral cells below, ecorticate, reaching a diameter of 370 μ, the segments 480-550 μ long; in the middle portion of the plant the diameter is about 180 μ, the segments 480-600 μ long and twisted through as much as 100°; upper branches probably with 4 pericentral cells, the diameter about 65 μ, the segments about 70 μ long; tetrasporangia in series of about 4 in a branchlet, 90-120 μ long, 75-90 μ diam.; cystocarps showing a short-stalked turbinate to truncate-conical pericarp, the apex not produced, 240-320 μ diam., 280-320 μ long.

These plants agree rather well with Setchell & Gardner's description (1930, p. 162), except that they are much taller. Trichoblasts were not rare on material which had been mounted on mica from the fresh state, but were very inconspicuous and simple. The pericarps were not included in the original description; they vary a good deal in form and most generally are nearly turbinate, though a few large ones are wider nearer the base than the apex. The pore is large and its margin irregular.

México: Is. Revilla Gigedo, dredged in abundance at sta. 129 from 25-32 meters' depth, Braithwaite Bay, I. Soccoro, *no. 34-21* (tetrasporic and cystocarpic), 2 Jan. 1934.



Text Figure 2. *Polysiphonia bifurcata.* The apical portion of a branch system showing the strongly incurved tips and the absence of trichoblasts. Drawn by G. J. Hollenberg. x 435. I. Española.

Polysiphonia bifurcata G. J. Hollenberg n. sp.[191a]

Text Figure 2

Plants 2-4 cm tall, pseudodichotomously branched; main branches 200-225 μ diam., composed of turgid segments 1.00-1.75 diameters long; apical cells prominent, slender; pericentral cells 5, ecorticate; trichoblasts wanting; tetrasporangia 80-90 μ diam., in short series, bulging considerably and spiraling in the ultimate branches. Sexual plants and attachment organs unknown.

The most active growth is shown by *no. 34-405,* which is sterile, but is far more representative as far as the characteristic forking tips are concerned. In these forcipate tips the main axis is distinguished from the branch chiefly by the shorter pericentral cells at the base of the latter. No other species of *Polysiphonia* combines the characters of forcipate tips and 5 pericentral cells. A seemingly total lack of trichoblasts is an additional feature of considerable interest.

COSTA RICA: dredged from 9-16 meters' depth off a bottom of sand and mud, Playa Blancas, Schmitt *no. 460A-35,* 8 Feb. 1935. ECUADOR: Archipiélago de Colón, dredged in some abundance from a depth of 92 meters off a sandy bottom at sta. 204 near an islet in Gardner Bay, I. Española, *nos. 34-405, 34-410* (tetrasporic, *TYPE*), 31 Jan. 1934.

Polysiphonia decussata Hollenberg

Hollenberg 1942, p. 780, fig. 6.

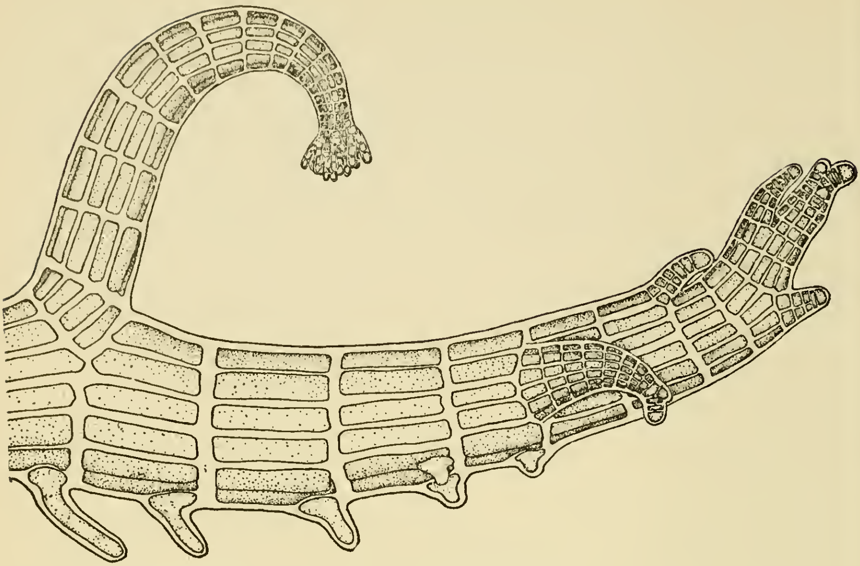
ECUADOR: Archipiélago de Colón, intertidal on rocks to the north of Tagus Cove, I. Isabela, *no. 34-174,* 13 Jan. 1934.

Polysiphonia Hendryi Gardner

Gardner 1927h, p. 101, pl. 24, figs. 1, 2, pl. 25; Smith 1944, p. 363, pl. 93, figs. 3, 4.

MÉXICO: Baja California, small tufted plants from the littoral, South Bay, I. Cerros, *no. 34-648,* 10 Mar. 1934.

191a Polysiphonia bifurcata G. J. Hollenberg n. sp.—Plantae 2-4 cm altitudine, pseudodichotome ramosae; ramis primariis 200-225 μ diam., compositis e segmentis turgidis 1.00-1.75 plo diam. longitudine; cellulis apicalibus prominentibus, tenuibus; cellulis pericentralibus 5, ecorticatis; trichoblastis non repertis; tetrasporangiis 80-90 μ diam., brevi in serie, aliquantum protuberatis et in ramis ultimis convolutis. Plantis sexualibus et organis affixionis ignotis. Planta typica in loco dicto Gardner Bay, I. Española, Ecuador, legit W. R. Taylor *no. 34-410,* 31 Jan. 1934.



Text Figure 3. *Polysiphonia Howei.* The apical portion of a creeping axis showing the ascending tip, with one erect branch and several less well developed. Drawn by G. J. Hollenberg. x 195.

Polysiphonia Howei Hollenberg n. sp.[191b]

Text Figure 3

Polysiphonia Howei Hollenberg sp. nov. Plants diminutive, creeping, densely matted, and forming patches several centimeters in diameter; prostrate branches 100-170 μ in diameter, composed of segments mostly about as long as broad or shorter, and attached by frequent unicellular rhizoids, arising one to several per segment at the distal ends of the pericentral cells, from which they are cut off by crosswalls; pericentral cells 10-12; branches arising exogenously on all sides and at irregular intervals but mostly either two or four segments apart from the tips of the prostrate branches, spiraling more or less to the right as viewed from the branch tip, the ventral and often the lateral branches either remaining undevel-

[191b] Polysiphonia Howei Hollenberg n. sp.—Plantae parvissimae repentes intertextae; ramis procumbentibus 100-170 μ diam., a rhizoideis adfixis ad apices terminalea circumcentralium cellularum ex segmentis omnibus; cellulis circumcentralibus 10-12; ramis exogenis radiantibus sed inferioribus etiamque saepe lateralibus deficientibus vel in ramos novos repentes transformatis; subsimplicibus erectis ramis primum arcuatis, 2-3 mm altis, raro 5 mm, 70-150 μ diam.; trichoblastis ad apices ramorum numerosis, demum deciduis; tetrasporangiis singulis in serie longa, 40-55 μ diam.; reproductio sexualis ignoto. Planta typica in loco dicto Whale Cay, Berry Is., Bahamas, legit M. A. Howe *no. 3478,* Jan. 29, 1905, in herb. New York Botanical Garden.

oped or giving rise to lateral prostrate branches; erect branches at first arching strongly toward the tips of prostrate branches, 2-3-(5) mm high, 70-150 μ in diameter, simple or with a very few branches; trichoblasts abundant toward the tips of erect branches, up to 650 μ long, closely and repeatedly branched in a strictly dichotomous manner, arising one per segment in a $\frac{1}{4}$ to $\frac{1}{5}$ spiral to the left, ultimately deciduous, leaving persistent scar-cells; tetrasporangia one per segment, 40-55 μ in diameter in relatively long and slightly spiral series in the tips of the erect branches; sexual organs unknown.

Type, Howe 3478, tetrasporic, collected by M. A. Howe from coral reefs at Whale Cay, Berry Is., Bahamas, Jan. 29, 1905. The type is in the herbarium of the N. Y. Bot. Garden. Additional collections by Howe from the Bahamas, from Bermuda Is., and from South Caicos, B. W. I., all in the herbarium of the N. Y. Bot. Garden seem definitely the same plant. All were labeled as *Lophosiphonia obscura,* but in spite of the habit of *Lophosiphonia,* these specimens are clearly excluded from that genus by reason of the exogenous origin of all or nearly all branches. The specimen in Phyc. Bor.-Amer. *no. 1892* from the Bahama Islands, distributed as *Lophosiphonia obscura,* is probably *P. Howei.*

Three collections from the Pacific Ocean are tentatively placed with this species, although slightly more slender and sterile. A collection (Univ. California Herb. *no. 237032*) by W. A. Setchell from Tutuila Is., Samoa, July 1920, has the same vegetative features as *P. Howei.* Two of the Taylor collections, listed below, are placed with this species also.

PANAMÁ: Bahía de Panamá, forming small entangled growths on rocks in quiet water near the anchorage, I. Taboga, *no. 39-620,* 2 May 1939. COLOMBIA: Chocó, a sparse growth on old wood, Bahía Cabita, Cabo Corrientes, *no. 34-497A,* 13 Feb. 1934.

PTEROSIPHONIA Falkenberg, 1889

Plants with a rhizoidal base, or erect, complanate, alternately distichously branched; axis polysiphonous, sometimes parenchymatously corticated, compressed to flat; branches by reason of the young branch initials appearing aculeate-dentate at the margins; tetrasporangia in longitudinal series in the flat branches or marginal branchlets; cystocarps formed laterally on upper branchlets, the pericarps ovoid, thick walled, ostiolate.

KEY TO SPECIES

1. Base rhizomatous; remaining ecorticate throughout . P. dendroidea
1. Erect throughout; the main axes becoming corticated . P. Baileyi

Pterosiphonia dendroidea (Montagne) Falkenberg

Plate 96, Fig. 2

Kylin 1941, p. 39.

These specimens, particularly those from Academy Bay, are very large and fine, reaching a height of 15-18 cm, but are sterile. Microscopically they agree closely with Phyc. Bor.-Amer. *no. 462.*

México: Baja California, dredged off Pt. Hughes on Cabo San Lazaro, *no. 34-604,* 7 Mar. 1934. Near Is. Revilla Gigedo, *Albatross* Exped. *no. 8,* sta. 2836, 4 May 1888. Ecuador: Archipiélago de Colón, growing on *Sargassum* south of Banks Bay, I. Isabela, *no. 34-132,* 13 Jan. 1934. *Ibid.,* abundantly dredged off Academy Bay, I. Santa Cruz, *no. 34-320,* 20 Jan. 1934. *Ibid.,* rare at Black Beach Anchorage, I. Santa María, *no. 34-228,* 17 Jan. 1934. *Ibid.,* dredged from 55 meters' depth off Post Office Bay, *no. 34-377,* 29 Jan. 1934.

Pterosiphonia Baileyi (Harvey) Falkenberg

Harvey 1853, p. 29 (as *Rytiphlaea Baileyi*).

México: Baja California, one specimen secured at South Bay, I. Cerros, *no. 34-629* (cystocarpic), 10 Mar. 1934.

LOPHOSIPHONIA Falkenberg, 1897

Plants filamentous, the primary axes creeping and attached by rhizoidal holdfasts, cylindrical, laterally branched, dorsiventral with the apex at first recurved; erect filaments of limited growth, very sparingly branched, the apices sometimes recurved and bearing on the convex side a series of deciduous trichoblasts; tetrasporangia formed in the upper branches of somewhat more freely divided filaments.

Lophosiphonia villum (J. Agardh) Setchell & Gardner

Setchell & Gardner 1903, p. 329; Kylin 1941, p. 40.

Costa Rica: plants forming mats tightly attached to rocks in the deeper tide pools, Golfo Dulce, *no. 39-115,* 26 Mar. 1939 (det. G. J. Hollenberg).

HERPOSIPHONIA Nägeli, 1846

Plants delicate, creeping, with a slender branching rhizomatous axis attached by haptera with disk-shaped ends, the apex commonly recurved, the dorsal side with determinate simple erect branchlets terminating in a tuft of trichoblasts; axis and erect branchlets regularly polysiphonous, ecorticate; tetrasporangia in a series in the erect branchlets; pericarps oval to globose, subterminal or lateral on the erect branchlets; spermatangia pedicellate near the tips of the erect branchlets.

KEY TO SPECIES

1. Main axes or long branches with some of the nodes regularly without a branchlet or a branch rudiment, the apices strongly upcurved, the diameter 75-150 μ; branchlets generally with 7-8 pericentral cells . . . . H. secunda
1. Main axes or long branches with a branchlet or a branch rudiment from each node; apices of the main branches slightly upcurved; branchlets generally with 12-14 pericentral cells H. tenella

Herposiphonia secunda (C. Agardh) Ambronn

Howe 1920, p. 574; Taylor 1928, p. 176, pl. 25, figs. 8-10.

PANAMÁ: on the tips of the branches of *Galaxaura* in tide pools, I. Jicarita, *no. 34-505B,* 20 Feb. 1934.

Herposiphonia tenella (C. Agardh) Ambronn

Howe 1920, p. 573; Taylor 1928, p. 177, pl. 25, fig. 11.

MÉXICO: Nayarit, rare as dredged on *Bryothamnion* from 6-9 meters' depth at sta. 971 near I. María Magdalena, Las Tres Marías, *no. 39-665 (p. p.),* 9 May 1939.

BOSTRYCHIA Montagne, 1838[192]

Plants filiform, dull purplish, ordinarily regularly bilaterally branched, the branches near the apex usually incurved; for the most part polysiphonous, the pericentral cells equaling the axial in length or divided transversely; rhizoidal, stoloniferous and erect branches often differentiated, the branchlets often monosiphonous at the tips; tetrahedral sporangia whorled in special siliquose branchlets with several sporangia in each segment; pericarps subglobose, terminal on the branchlets.

KEY TO SPECIES

1. Haptera consisting of transformed branchlets . . . B. radicans
1. Haptera formed by outgrowths of the pericentral cells . . 2
2. Cortication rhizoidal . . . . B. Calliptera
2. Cortication parenchymatous 3
3. Branchlets of the last order entirely monosiphonous . . B. tenella
3. Branchlets of the last order only monosiphonous for about 5-15 segments near the tips . . . . B. Binderi

192 Determinations in the genus *Bostrychia* were made or confirmed by Dr. C.-K. Tseng.

Bostrychia radicans (Montagne) Montagne

Montagne 1840, p. 199, pl. 5, fig. 3 (as *Rhodomela radicans*); 1850, p. 286 (as *Bostrychia radicans*), p. 287 (as *B. Leprieurii*); Taylor 1936, p. 374 (as *B. rivularis*); Post 1936, p. 13; Tseng 1943, p. 168.

Colombia: Chocó, on shaded rocks along the shore, above high tide line, Cabo Corrientes, *no. 34-496 p. p.,* 13 Feb. 1934. Valle, mouth of Río Dagua, Bahía Buenaventura, coll. E. P. Killip *no. 33002 p. p.,* 3 Feb. 1939. Ecuador: Archipiélago de Colón, on the roots of *Rhizophora* in a lagoon, Pta. Albemarle, I. Isabela, *no. 34-99,* 12 Jan. 1934. *Ibid.,* on the roots of *Rhizophora* growing along the seashore, *no. 34-117 p. p.,* 12 Jan. 1934. Esmeraldas, on the roots of *Rhizophora* along the shore of Bahía San Francisco, *no. 34-490A,* 11 Feb. 1934.

Bostrychia Calliptera (Montagne) Montagne

Montagne 1840, p. 198, pl. 5, fig. 2 (as *Rhodomela Calliptera*); 1850, p. 286 (as *Bostrychia Calliptera*); Post 1936, p. 24.

Panamá: abundant in the lower spray zone of the surf, in clefts and under ledges, *no. 39-132* (tetrasporic), 26 Mar. 1939. Colombia: Chocó, on shaded rocks along the shore, above high tide line, Cabo Corrientes, *no. 34-496 p. p.,* 13 Feb. 1934. Valle, mouth of Río Dagua, Bahía Buenaventura, coll. E. P. Killip *no. 33002 p. p.,* 3 Feb. 1939. *Ibid.,* from damp shaded shore rocks well above spray or ordinary high tides on I. Gorgona, *no. 34-495D,* 12 Feb. 1934. Ecuador: Archipiélago de Colón, on the roots of *Rhizophora* in a lagoon near Albemarle Pt., I. Isabela, *no. 34-99 p. p.,* 12 Jan. 1934. *Ibid.,* from *Rhizophora* roots in a lagoon near the buildings, Academy Bay, I. Santa Cruz, *no. 34-301B p. p.,* 20 Jan. 1934.

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Taylor 1928, p. 167; Post 1936, p. 25; Tseng 1943, p. 176.

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PLATE 1

Figs. 1, 2. *Boodlea composita, f.* Fig. 1, a small portion of a thallus to show its characteristics in the plane phase. x 15. Fig. 2, tip of a branchlet showing a hapteral cell attaching to a larger segment. x 73. Ecuador.

Figs. 3-6. *Derbesia longifructa.* Four oval-oblong sporangia attached to the supporting filaments, showing the basal septum or, in fig. 3, a definite stalk cell. Ecuador. x 115.

Figs. 7-9. *Derbesia Hollenbergii.* Portions of three filaments to show young subturbinate sporangia, and an old sporangium with an evident stalk cell. I. Santa María. x 70.

Figs. 10-13. *Codium isabelae.* Four peripheral utricles, each showing a much-thickened end wall and one or two gametangia. I. Isabela. x 70.

Figs. 14-16. *Codium santamariae.* Three peripheral utricles with slightly thickened end walls and solitaria gametangia. I. Santa María. x 70.

Figs. 17-18. *Acetabularia parvula* v. *americana.* Fig. 17, one segment of a disk and portions of others, to show the unarmed end wall. x 90. Fig. 18, insert, two coronal processes to show the hair scars. x 140. Is. Revilla Gigedo.


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PLATE 2

Figs. 1-6. *Derbesia prolifica.* Figs. 1, 2, tips of two filaments, each showing several gametangia. x 26. Figs. 3-6, portions of four filaments, each showing a spherical gametangium with a small basal cell or septum. x 70. I. Española.

Figs. 7-8. *Spongomorpha conjuncta.* Fig. 7, a small portion of the central strand system to show the binding rhizoidal filaments. x 16. Fig. 8, tip portion of a branch to show the blunt unilateral branchlets. x 60. I. Santa María.

Figs. 9-11. *Zosterocarpus abyssicolus.* Fig. 9, portion of a branch to show the branchlets, the young "sporangial" cells, and beginning gametangium development. Fig. 10, the tip portion of a branch to show the acute apex, the intercalary growth zones, and one of the yellow "sporangial" cells. Fig. 11, forks of two larger branches to show the character of the junction, and a well-developed gametangial zone. x 245. I. Santa María.

Figs. 12-17. *Sporochnus rostratus.* Six paraphysal branches from a fertile ramulus, to show the expanded end cell, young and old sporangia, and empty sporangial walls. x 330. I. Santa María.

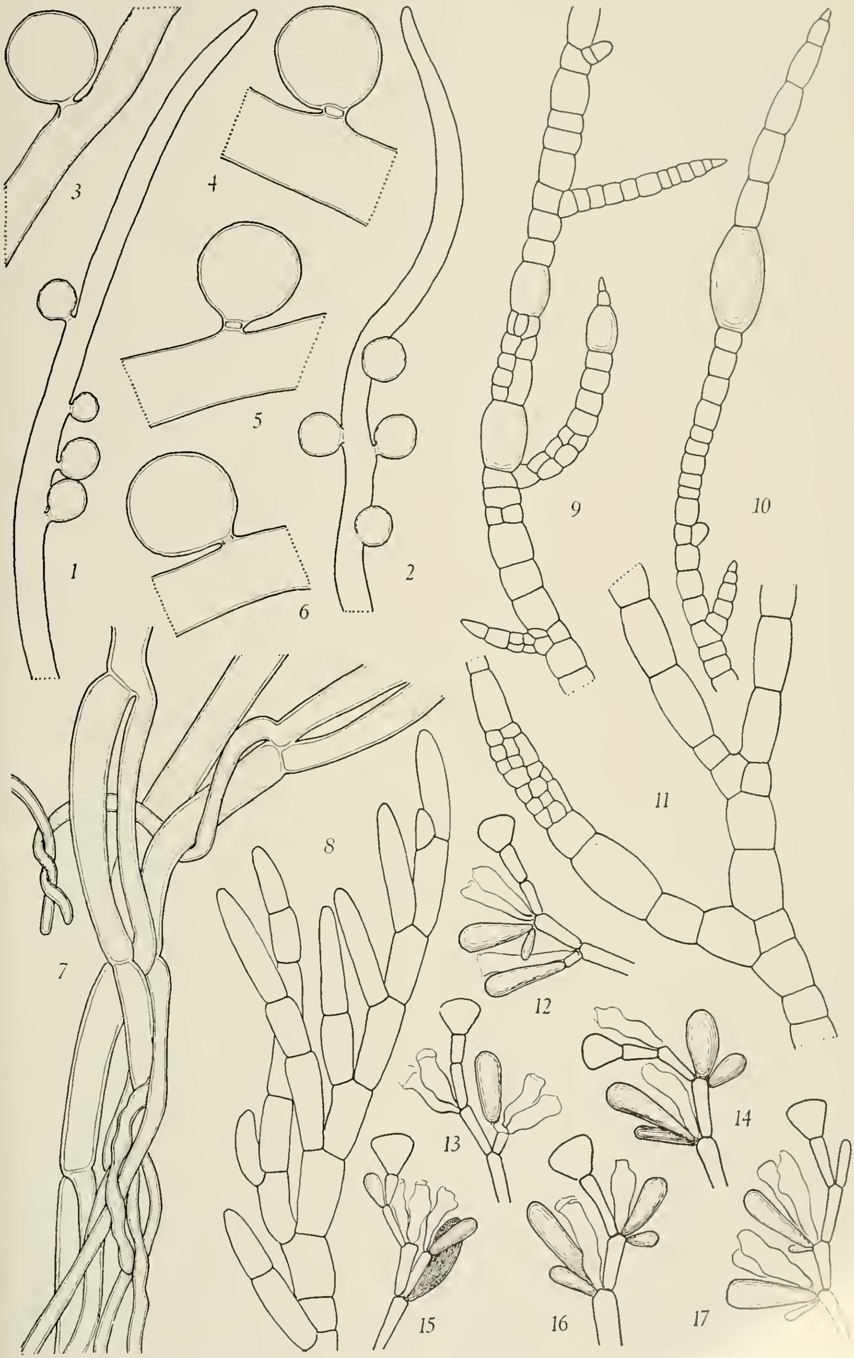
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PLATE 3

Figs. 1-8. *Sphacelaria mexicana.* Figs. 1-3, propagulae on their supporting branches, showing the two short arms and the stalk articulation. Fig. 4, a propagulum on a branch viewed from the lower margin. Figs. 5, 6, two detached propagulae showing progressive elongation of the arms in germination. Fig. 7, a detached propagulum viewed obliquely from below. Fig. 8, a portion of a filament apparently showing two empty sporangia. x 155. Is. Revilla Gigedo.

Figs. 9-16. *Carpomitra luxurians.* Figs. 9, 10, branched paraphyses with expanded end cells. Figs. 11-16, paraphyses with sporangia in various stages of development, and empty sporangial sacs. x 330. I. Santa María.

Figs. 17-21. *Spermothamnion phycophilum.* Fig. 17, a small portion of a basal filament with haptera and three erect filaments. Fig. 18, upper part of a tetrasporangial filament to show unilateral seriate sporangia, and the progressive development of branched sporangial clusters. Figs. 19, 20, portions of older filaments to show well-developed sporangial clusters. Fig. 21, tip of a male filament to show unilateral seriate spermatangial clusters; the forked character is unusual, and the series are usually longer, on a simple filament. x 70. I. Santa María.


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PLATE 4

Figs. 1-2. *Spermothamnion phycophilum*. Fig. 1, wide forks of a female plant showing a mature carposporangial cluster. Fig. 2, a narrowly forked vegetative filament. x 70. I. Santa María.

Figs. 3-10. *Lejolisia colombiana*. Figs. 3-7, portions of tetrasporangial filaments showing the long stalked sporangia and, in figs. 3 and 5, the long sterile filament tips. Fig. 6 shows the development of branchlets opposite sporangia, which occasionally occurs. Figs. 9, 10, tips of male filaments with terminal spermatangial clusters. Fig. 8, tip of a female filament, showing the pericarp-like investment which surrounds the cystocarp. x 155. Colombia.

Figs. 11-12. *Ceramium hoodii*. Fig. 11, tip of a filament showing the forcipate apex and the narrowly separated zones of nodal cortication composed of irregularly placed cells. Fig. 12, a portion of a young filament showing two segments and parts of two others, the nodal cortication irregular, the decurrent internodal cortication now well begun and consisting of clear longitudinal filaments. x 155. I. Española.

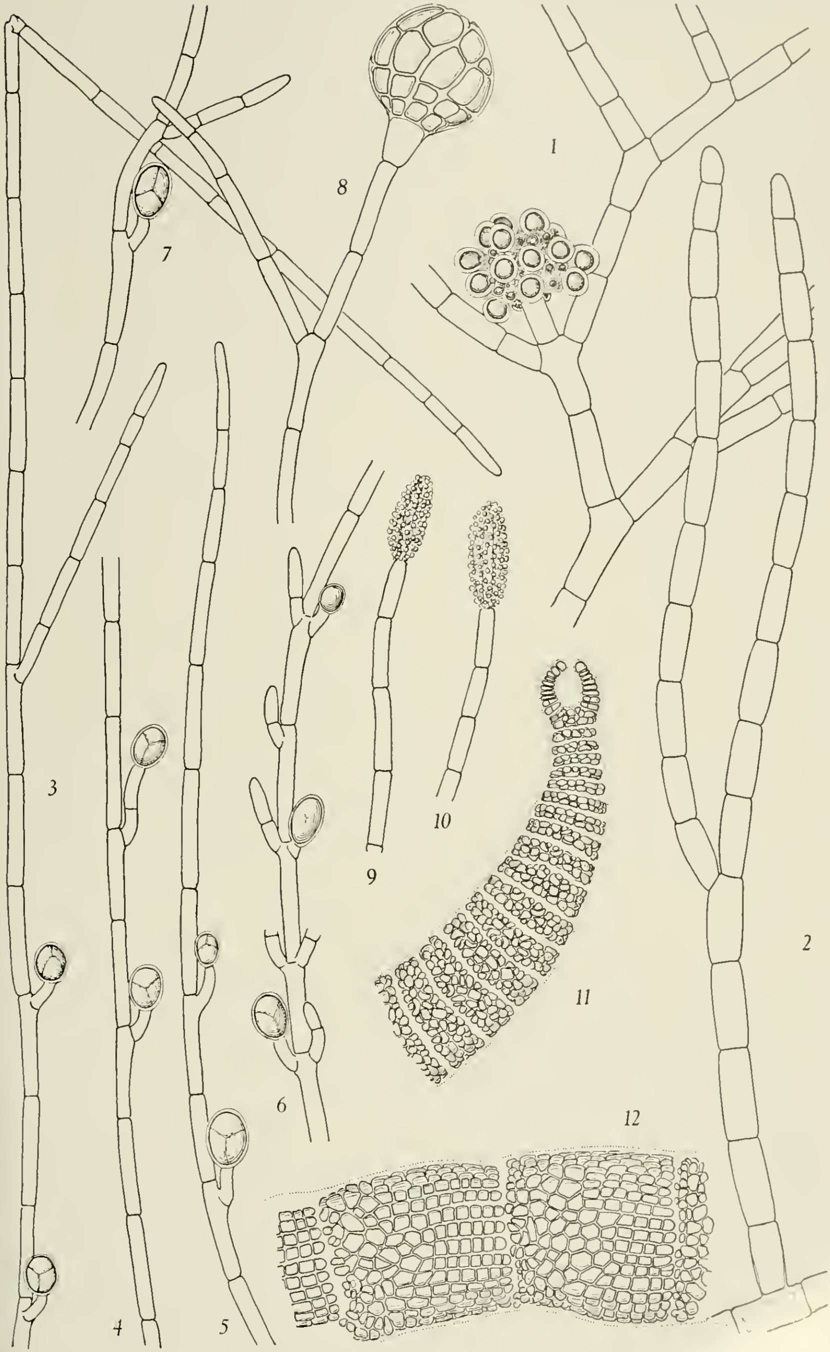
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PLATE 5

Fig. 1. *Gelidium pusillum* v. *cylindricum*. A small portion of a clump, mostly in the tetrasporangial state. The fertile portions appear slightly more swollen in the reproduction than in the fresh state. x 4.4. Ecuador.

Figs. 2-6. *Gelidium galapagense*. Fig. 2, a portion of a clump showing the rhizomatous portion and the erect branches with much-divided blades, which show tetrasporangial sori in the lobes. Fig. 3, a branch system with less-divided blades and larger sori. Figs. 4-6, a branch system of various degrees of simplicity. x 3.3. I. Isabela.

Fig. 7. *Gelidium pusillum* v. *pacificum*. A small portion of a tuft showing the basal and upper branches, the latter pinnately divided. The tetrasporangial sori appear in the tips of three branches, and the tip of one is indented owing to the disintegration of a matured sorus. x 3.0. I. Santa María.

Figs. 8-12. *Gelidium isabelae*. Portions of several branch systems to show the rhizomatous portions and the erect simple or subsimple blades. In fig. 12 one blade shows a tetrasporangial sorus. x 4.8. I. Isabela.

Fig. 13. *Gelidium sclerophyllum*. A portion of an unusually regularly pinnate axis, showing the lateral tetrasporangial branchlets with the sori in the tips surrounded by thickened sterile margins. One tip is perforated by the disintegration of a matured sorus. x 8.0. Ecuador.


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PLATE 6

Fig. 1. *Bryopsis galapagensis.* Portion of a clump showing habit and form of the fronds. I. Wenman. x 3.0.

Fig. 2. *Colpomenia ramosa.* A small plant showing the habit of branching of the species. Photographed from a specimen preserved in alcohol. I. Cerros. x 2.2.

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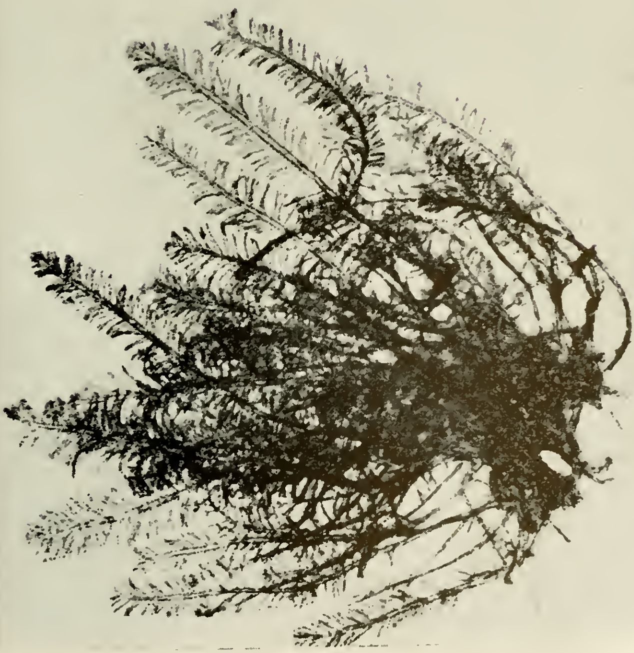

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PLATE 7

Fig. 1. *Codium isabelae.* Plant spread to show the habit of branching. I. Isabela. x 1.0.

Fig. 2. *Chlorodesmis mexicana.* Portion of a clump to show the growth habit. Note that the matted basal region is relatively loose and in no way like a stalk. I. Soccoro. x 1.4.

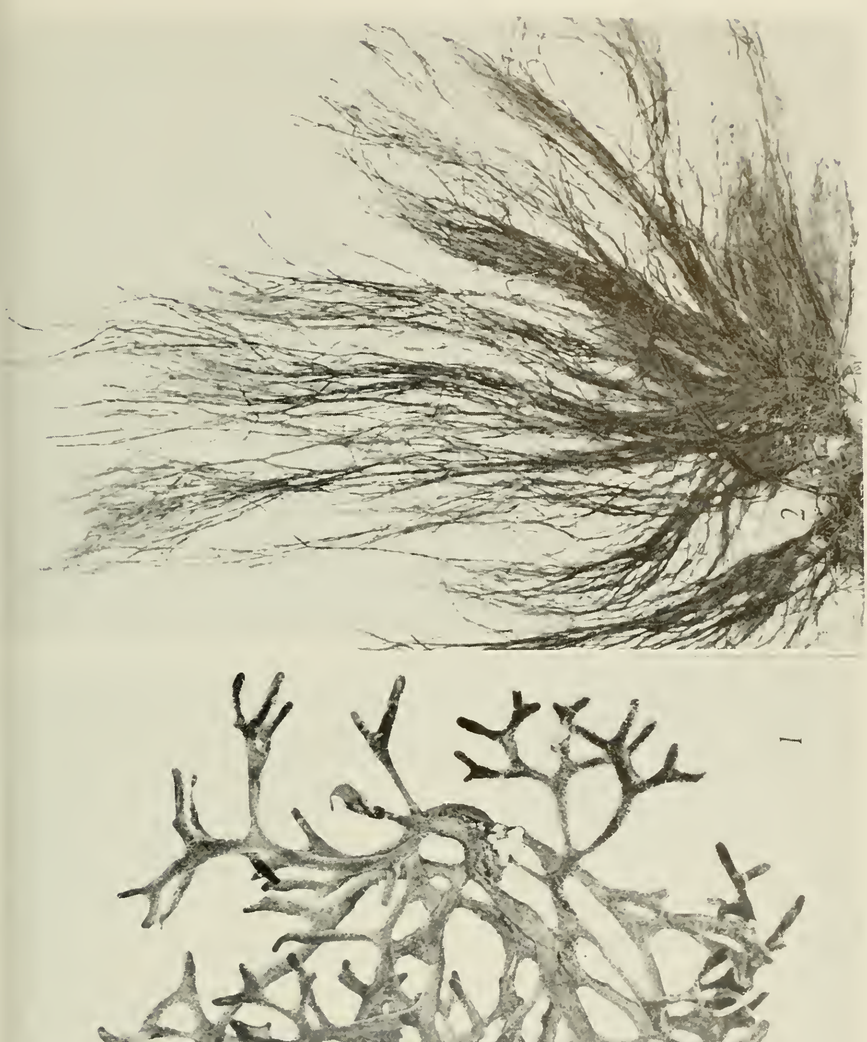
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PLATE 8

Fig. 1. *Dictyota major.* Habit of a young fertile plant. I. Española. x 1.2.

PLATE 9

Fig. 1. *Dictyota major.* Habit of a fully developed fertile plant. I. Santa María. x 0.4.

PLATE 10

Fig. 1. *Dictyota crenulata.* Habit of a portion of a clump to show the characteristics of the branching and margin. I. Socorro. x 1.5.

Fig. 2. *Dictyota concrescens.* Three portions of clumps partly disentangled, showing the method of branching of the upper segments. Baja California. x 1.1.

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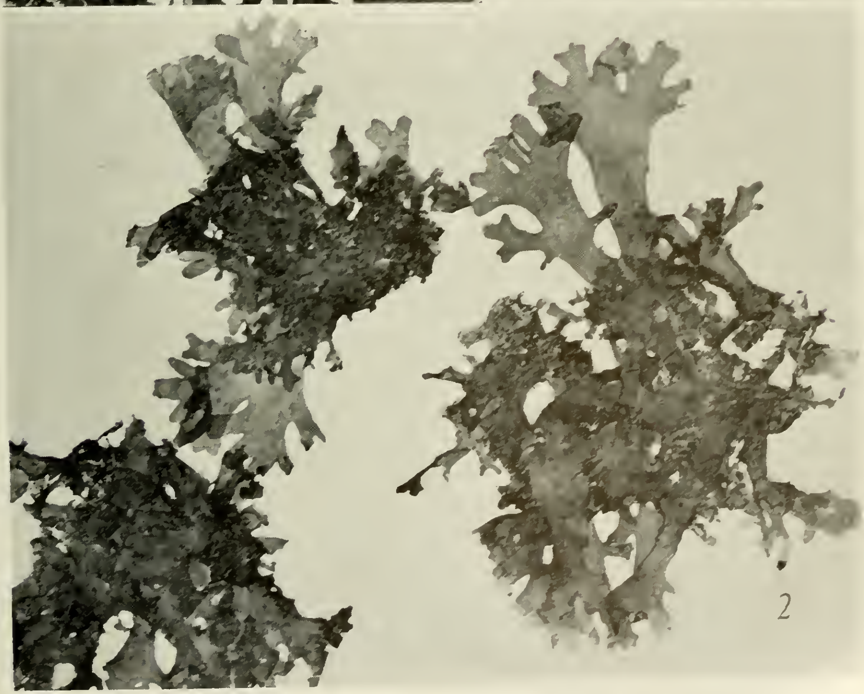

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PLATE 11

Figs. 1, 2. *Glossophora galapagensis.* Fig. 1. Several branches to show the character of the tips and the serration. x 1.0. Fig. 2. Habit of a complete well-grown plant to show the primary forking and the adventitious branching near the base. I. Isabela. x 0.3.


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PLATE 12

Fig. 1. *Spatoglossum veleroae.* Major portion of a well-grown plant showing the base and the upper branching, the broadest blades cut short. I. Santa María. x 0.4.

PLATE 13

Fig. 1. *Spatoglossum Schmittii.* Major portion of a plant of moderate size, showing the large cushionlike base, slender stem, the netlike basal parts of old blades and the tapering bases of younger ones. I. Santa María. x 0.4.

PLATE 14

Fig. 1. *Dictyopteris Cokeri.* Portion of an older branch system to show the branching character. The base and all the tips are missing, except the left-hand one. I. Santa María. x 0.3.

Fig. 2. *Spatoglossum ecuadoreanum.* Major portion of a well-developed plant showing the holdfast and the branching. Because of the highly crispate character of the blades the shape is ill shown in such a dried specimen. I. Santa Cruz. x 0.5.

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PLATE 15

Fig. 1. *Dictyopteris diaphana.* A well-developed specimen, practically intact, showing the small cushion-shaped base, the stalk, branching, and the midribs of the blades. I. Santa María. x 0.4.

PLATE 16

Fig. 1. *Carpomitra luxurians.* A well-developed fertile plant showing the large cushion-shaped holdfast and extensive slender branching. I. Santa María. x 0.4.

PLATE 17

Fig. 1. *Sporochnus rostratus.* A small portion of a young fertile plant to show the side branches and the rostrate character of the penicillate branchlets. I. Santa María. x 0.3.

Fig. 2. *Carpomitra luxurians.* A small portion of a fertile plant to show the young turbinate fertile branch tips with hair tufts at the apices. I. Española. x 1.2.

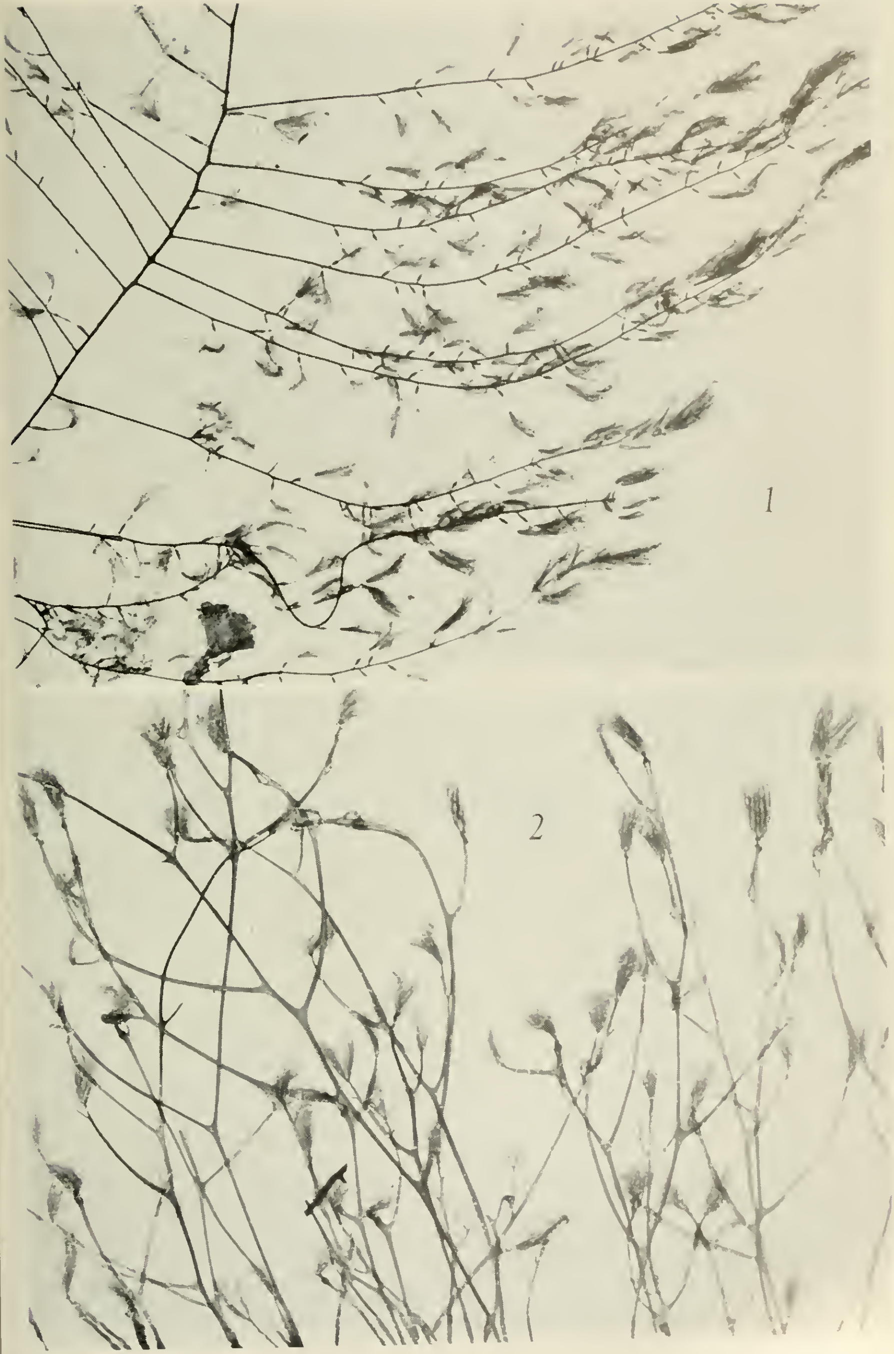
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PLATE 18

Fig. 1. *Desmarestia tropica.* Habit of the major portion of a young but well-developed plant including the inconspicuous base, the upper part of the main axis and most of the central branch tips cut off, but showing the characters of the branching of the main and lateral axes and, near the lateral margins of the plate, the branch tips. I. Santa María. x 0.4.

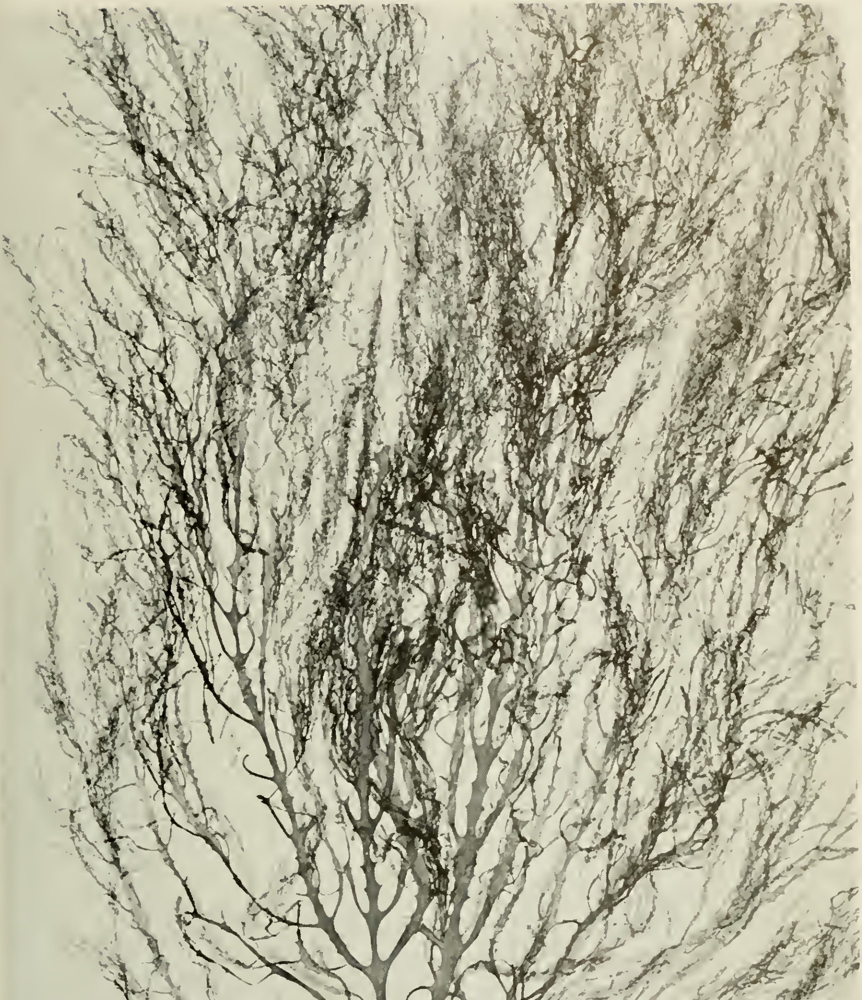

PLATE 19

Fig. 1. *Desmarestia tropica.* A small portion of a branch tip to show the serration, the young branchlets, and the hair tufts on the teeth near the tips. In most collections the hair tufts have been lost, probably by damage due to the inevitably rough handling resulting from dredging. I. Santa María. x 2.0.

PLATE 20

Figs. 1, 2. *Eisenia galapagensis.* Fig. 1. A young plant with holdfast, short slender stem, and with the central primary blade but moderately eroded at the tip, the basal lateral lobes not yet dominating the growth. Fig. 2. A considerably older fertile plant without holdfast, but with the short stem bifurcate at the top and with the first secondary blades well developed, showing large pinnate serrate lobes (the tips broken off) and a prominent median sorus area. I. Santa María. x 3.0.

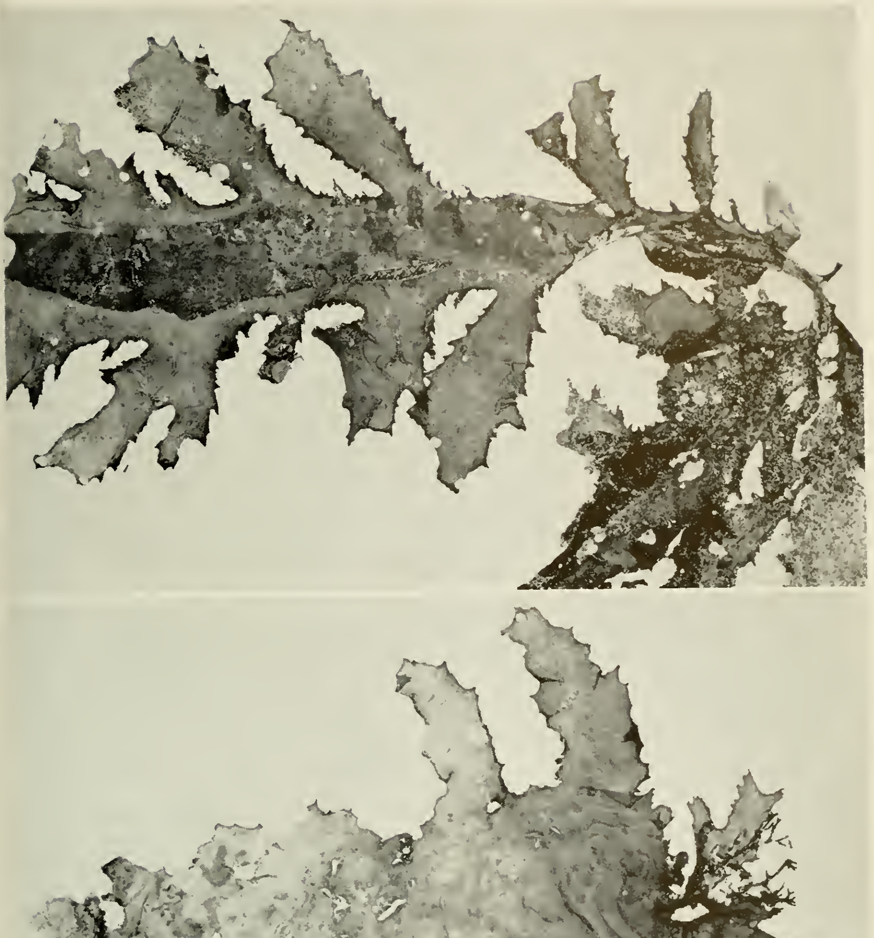

PLATE 21

Fig. 1. *Eisenia galapagensis.* Part of a well-developed plant showing numerous long, serrate, secondary blades with medium-sized pinnate lobes near the tips and smaller ones below. I. Santa María. x 0.4.

PLATE 22

Fig. 1. *Eisenia galapagensis.* Part of an old fertile plant showing several serrate leaves with lobes almost reduced to erose teeth. I. Santa Cruz. x 0.4.

PLATE 23

Fig. 1. *Blossevillea galapagensis.* Portion of a large fertile clump to show holdfast and branching. The inflorescence which is deflected to the lower left-hand corner, is quite typical. I. Santa María. x 0.4.

PLATE 24

Fig. 1. *Sargassum setifolium.* Upper portion of a large fertile specimen showing linear simple or sparingly forked leaves, loose branching, small sparingly forked receptacles and oval vesicles with evident apiculate, even subfoliar, tips. I. Isabela. x 0.9.

PLATE 25

Fig. 1. *Sargassum galapagense.* A small portion of the main axis of a densely leafy form of the species, showing a few fertile leafy branches. I. Isabela. x 1.1.

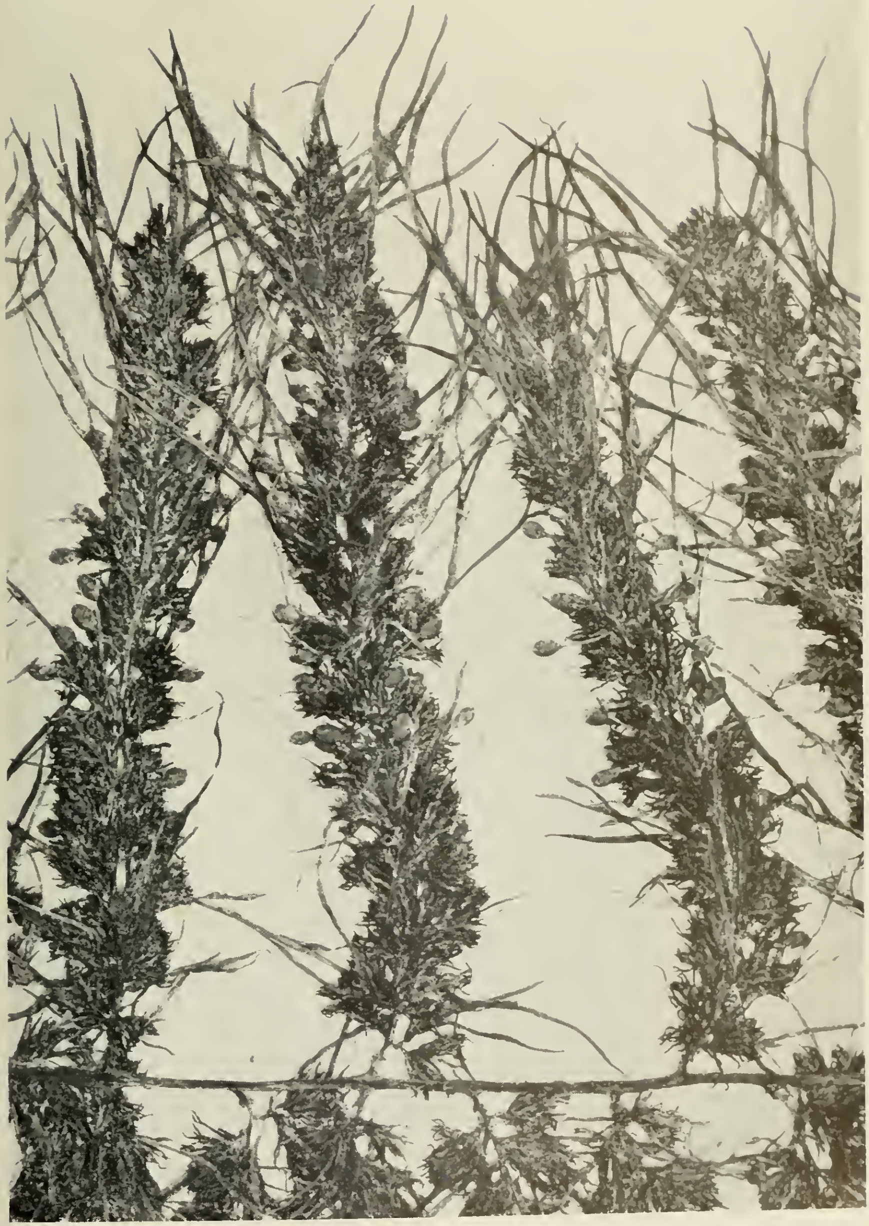

PLATE 26

Fig. 1. *Sargassum Templetonii.* A small portion of the axis of a large plant and a few lateral branchlets, showing the narrow, forked serrate leaves, loosely branched small receptacles, and large spherical vesicles. Above, a single leaf and attached inflorescence. I. Isabela. x 1.1.

PLATE 27

Fig. 1. *Sargassum albemarlensis.* Lower portion of the axis of a large plant with numerous lateral branchlets, showing the oblong leaves which, when large, are rather long, the small rather crowded receptacles, and vesicles. I. Isabela. x 1.0.

PLATE 28

Fig. 1. *Sargassum Howellii.* Upper portion of a small sterile plant showing serrate leaves with cryptostomata. I. Soccoro. x 1.5.

PLATE 29

Fig. 1. *Sargassum Liebmannii.* Major portion of a plant, the axes to the right certainly fertile, but the others showing more favorably the very obtuse irregularly dentate leaves. México. x 1.1.

PLATE 30

Fig. 1. *Sargassum pacificum* f. *megaphyllum.* A portion of the axis of a plant showing the small receptacles, large vesicles, and the very large blunt leaves with irregular, coarse, often bifurcate serrations and highly asymmetric bases. I. Isabela. x 1.2.

PLATE 31

Figs. 1, 2. *Sargassum ecuadoreanum*. Fig. 1. The major portion of a large plant showing the growth habit and large thin leaves. Ecuador. x 0.36. Fig. 2. A single old leaf from the same specimen to show the very coarse serration. x 1.3.


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PLATE 32

Fig. 1. *Scinaia Setchellii.* A major portion of a large clump to show the habit of branching. I. Santa María. x 1.1.

PLATE 33

Fig. 1. *Gelidium pusillum* v. *pacificum.* A small portion of a clump showing the attachment, rhizomatous horizontal branches, and erect blades, some of which on the right-hand side of the group are marginally branched. I. Santa María. x 2.5.

Fig. 2. *Gelidium sclerophyllum.* A small portion of a clump and one separated well-developed branch, both tetrasporic. Ecuador. x 2.9.

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PLATE 34

Figs. 1, 2. *Gelidium Hancockii.* Fig. 1. A small portion of a vigorous clump showing the flagelliferous base, the strong excurrent and sparingly divided main axes, and short, close-placed pinnate lateral branch systems. x 0.7. Fig. 2. The apical portion of a small side branch from the same plant, showing the serrations toward the tips of several branchlets. x 9.5. I. Santa María.


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PLATE 35

Fig. 1. *Pterocladia mexicana.* A small portion of a clump showing the base and the wide regular pinnate branching. Baja California. x 1.2.

PLATE 36

Fig. 1. *Pterocladia robusta.* Three branches showing slender bases, with the broad upper segments pinnately divided. I. Isabela. x 1.1.

PLATE 37

Fig. 1. *Pterocladia Okamurai* f. *densa.* A clump of moderate size showing densely crowded upper branching, but the lower axes and young shoots are relatively loose. Ecuador. x 1.0.

Fig. 2. *Gracilaria brevis.* A cystocarpic plant to show the character of the branching. Ecuador. x 1.4.

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PLATE 38

Fig. 1. *Leptocladia laxa.* A portion of a clump to show the branching habit. The epiphyte is *Acrosorium uncinatum.* Baja California. x 0.7.

Fig. 2. *Grateloupia cerrosiana.* A portion of a plant to show the branching and the abundant proliferations. I. Cerros. x 0.5.

PLATE 39

Figs. 1-5. *Lithophyllum Farlowii.* Early stages in the development of the plant. Figs. 1-3 show the initial horizontal shelflike stage from above, the pieces having been detached from the substratum. Fig. 4 represents a slightly older stage, the horizontal portion carrying small vertical blades in the central and lower parts, beginning the erect plate system. Fig. 5 is of the under side of an older horizontal portion, showing on the left-hand half numerous small conceptacles. I. Santa María. x 0.8.


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PLATE 40

Figs. 1, 2. *Lithophyllum Farlowii.* Intermediate stages in the development of the chambered portion of the plant. Fig. 1 shows a still prominent horizontal disk with numerous erect plates, a few of which have united to form chambers. Fig. 2 shows a more advanced stage. I. Santa María. x 0.85.

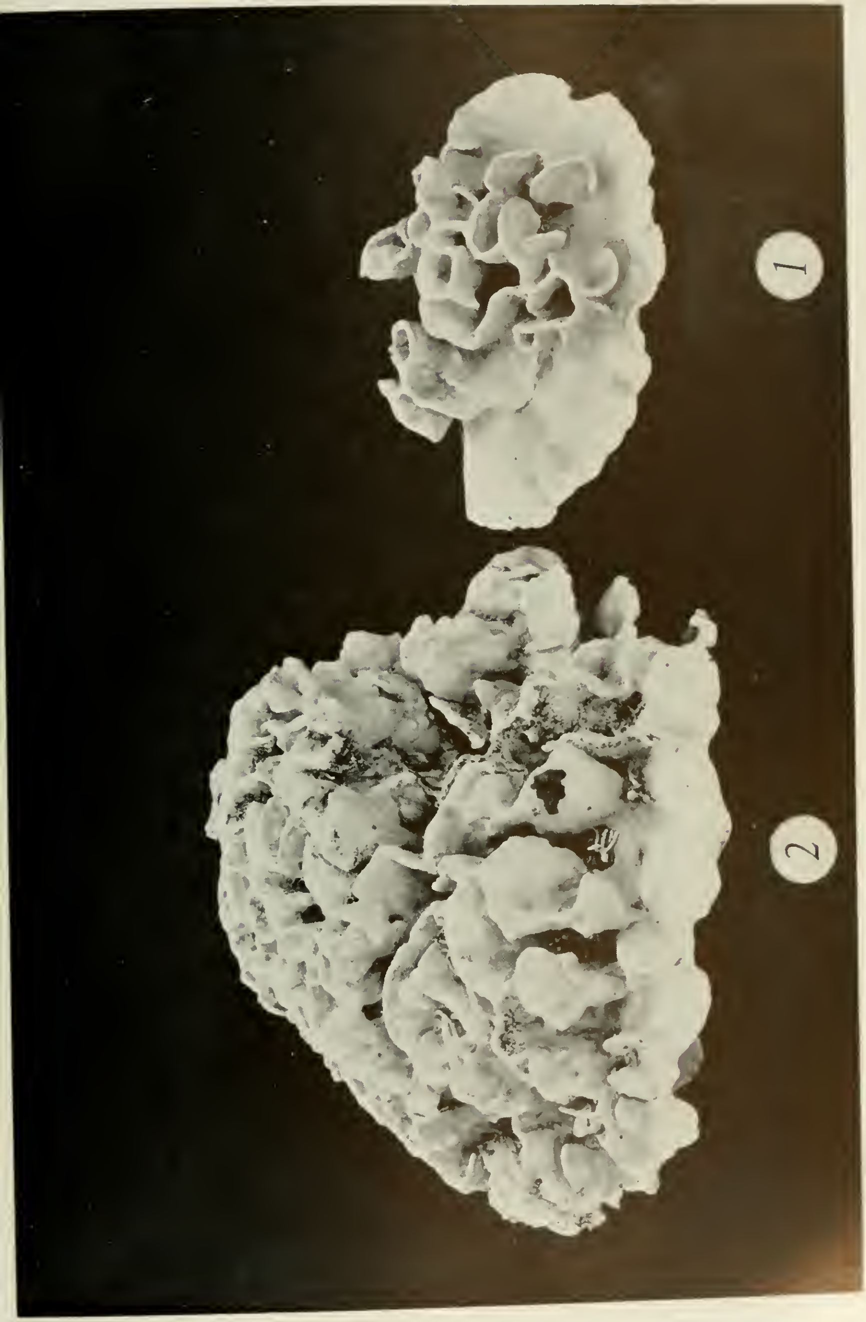
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PLATE 41

Fig. 1. *Lithophyllum Farlowii.* An advanced stage in thallus formation, with the horizontal portion nearly covered by vertical plates, those in the center (top of the figure) joining to form complete chambers, but those near the lower margin yet separate. I. Santa María. x 0.85.

PLATE 42

Fig. 1. *Lithophyllum Farlowii.* The beginning of the senescent stages of the thallus. The chambers in the central area (the upper two thirds of the figure) have become highly subdivided and small. The free edges of the septa have died and have been cut back noticeably by abrasion. However, the horizontal basal thallus is, on part of the periphery (the lower right-hand portion), still growing and producing young vertical plates. I. Santa María. x 0.95.

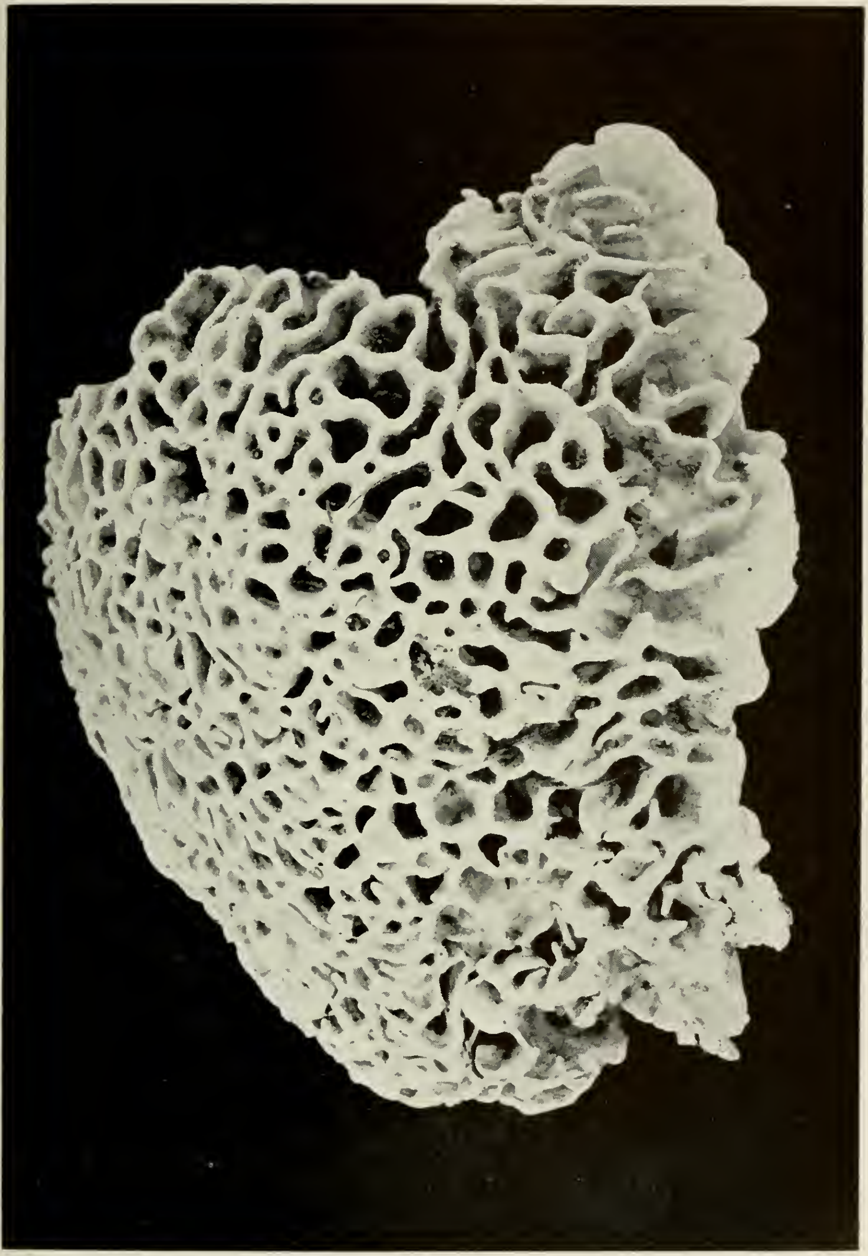

PLATE 43

Fig. 1. *Lithophyllum amplostratum.* Four clumps showing the diameter and arrangement of the branches. The lower left-hand figure shows their length and erect branching. In none does the anastomosis which occurs near the base show particularly clearly. The right-hand corner of the large central piece shows the margin of the basal crust. Ecuador. x 0.85.

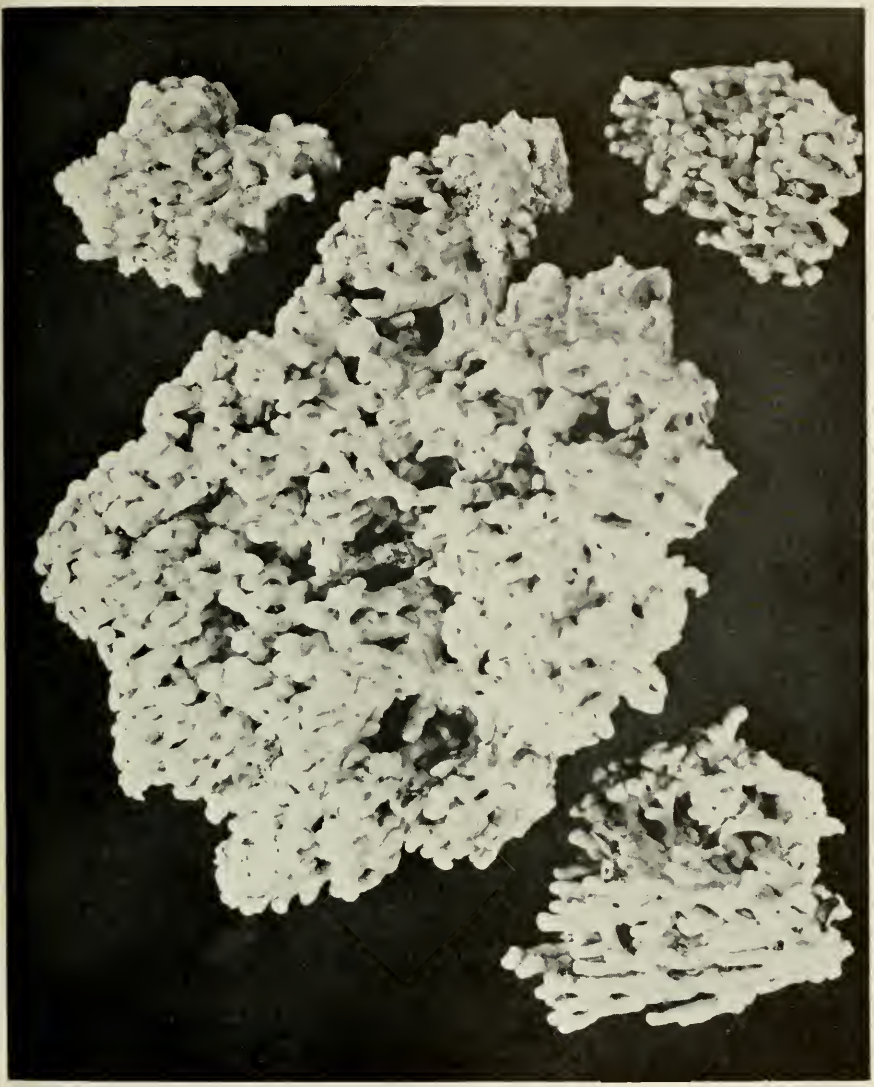

PLATE 44

Fig. 1. *Lithophyllum moluccense* v. *geminostratum.* Four clumps showing the diameter and arrangement of the branches. The larger lower figure shows the divergent forking. The right-hand figures show the extensive anastomosis which occurs near the base. Ecuador. x 1.2.

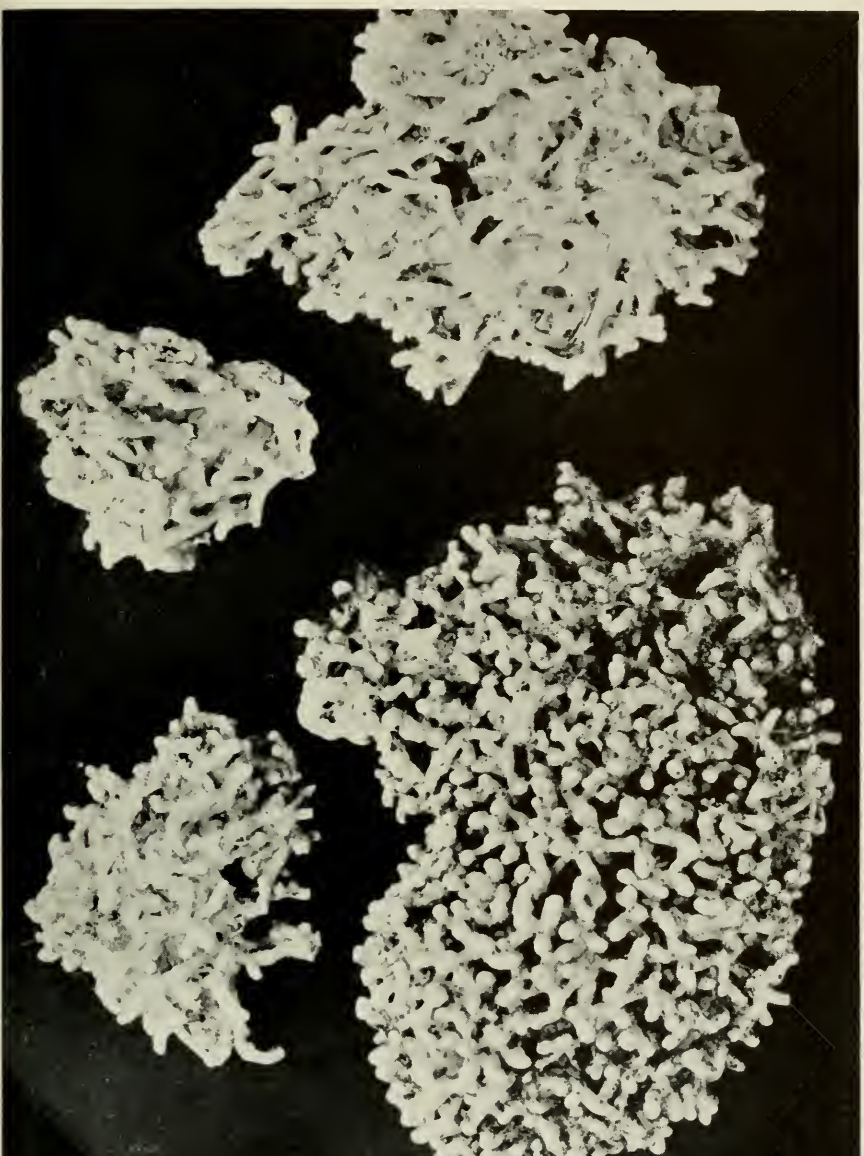

PLATE 45

Fig. 1. *Choreonema Thureti.* A small portion of a clump of *Jania* showing, in the central part of the plate, the lateral subspherical pericarps of *Choreonema.* Toward the right-hand side of the plate are branches ascribed to *Jania ungulata.* I. Isabela. x 20.0.

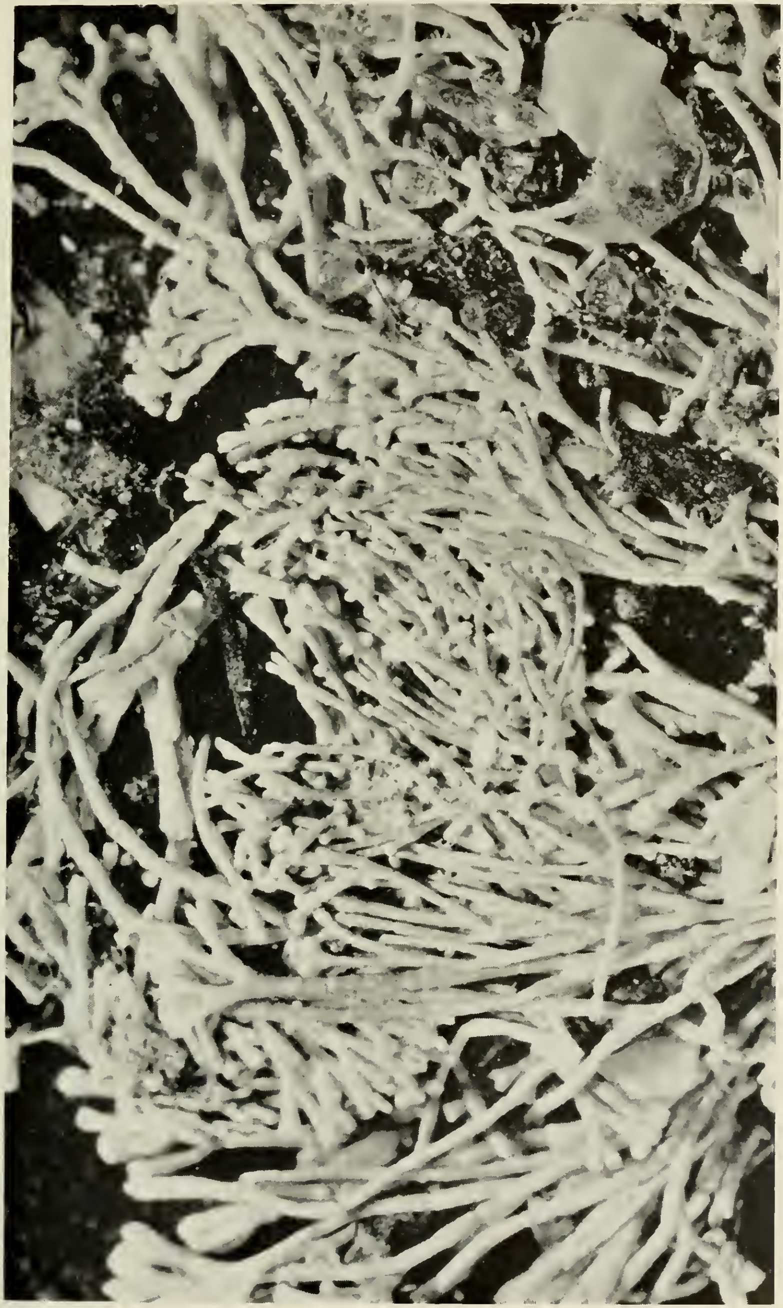

PLATE 46

Fig. 1. *Amphiroa minutissima.* A portion of a small clump viewed from above, showing the character of the branching. In several areas, especially toward the left, one may note the short segments of which the branches are composed. The conceptacles are mostly on the concealed side of the branches, but a few show just above the center and one very typical row toward the right side. The fragments toward the left-hand margin are of another species. Costa Rica. x 83.

Fig. 2. *Laurencia voragina.* Portions of a clump, photographed from alcohol-preserved material, to show the form and arrangement of the branches. México. x 2.4.

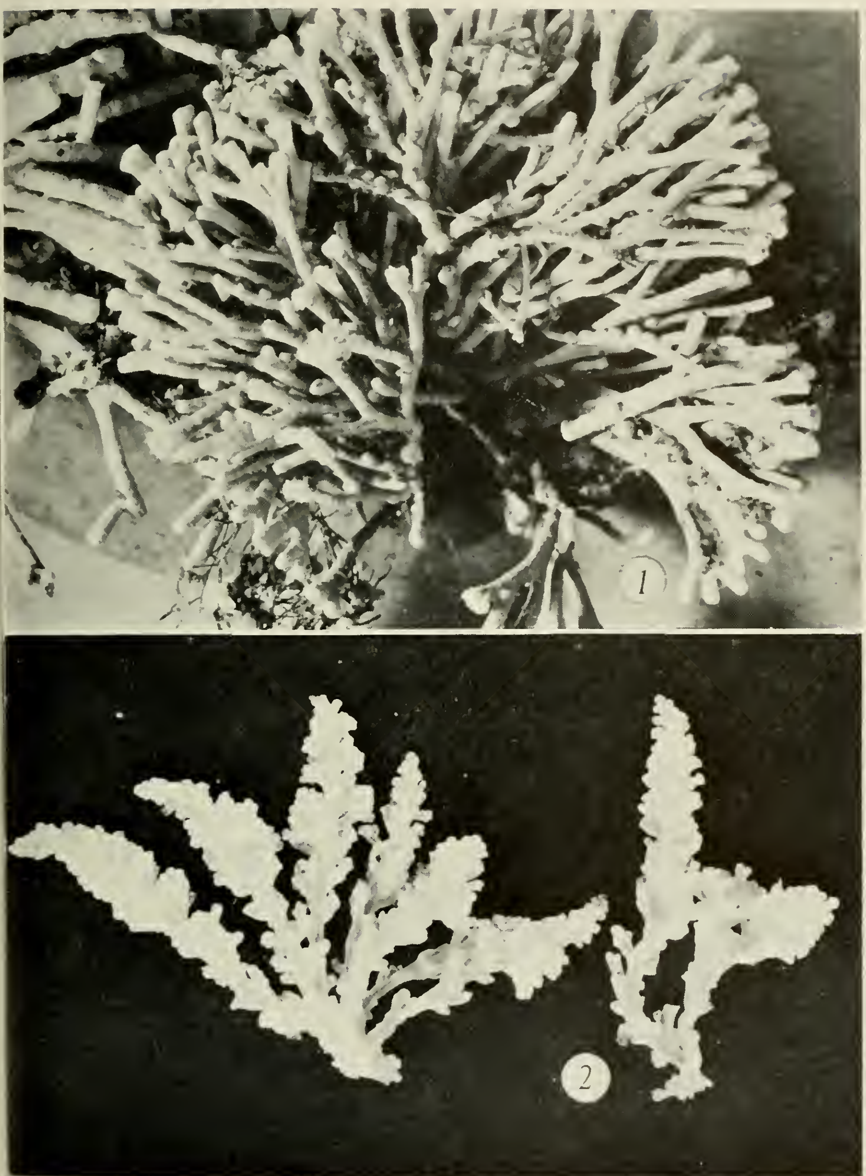

PLATE 47

Fig. 1. *Amphiroa mexicana.* Portions of two clumps, photographed from alcohol-preserved material. The large piece on the left is branched at relatively wide angles and is a little complanate; the three on the right are more erect. In all the form of the segments shows clearly; their marginal contour below is roughened by the numerous small conceptacles. México. x 2.0.

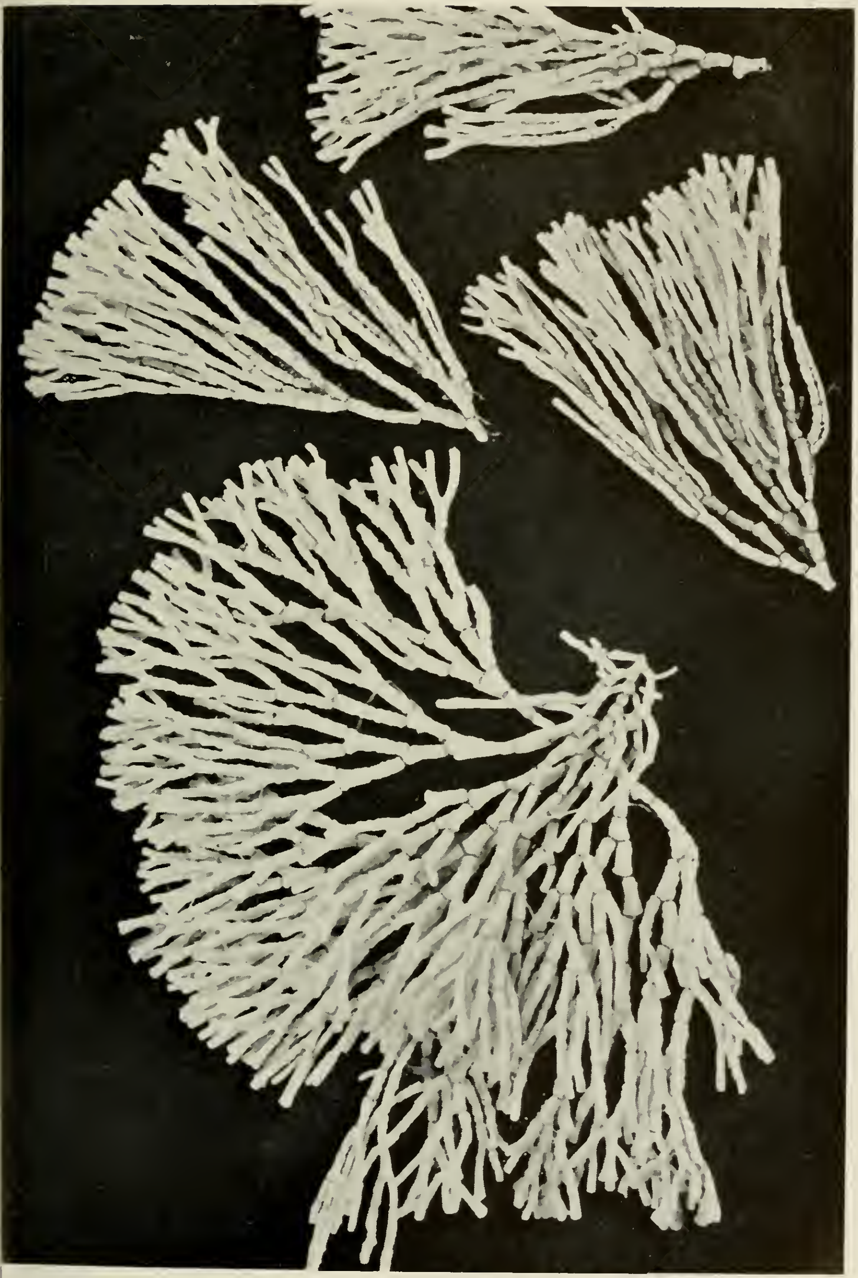

PLATE 48

Fig. 1. *Amphiroa peninsularis.* A portion of a clump, the base lacking, the branches somewhat entangled with *Hypnea.* I. Cerros. x 1.6.

Fig. 2. *Amphiroa franciscana.* A portion of a fertile clump showing numerous conceptacles on the upper branches. Ecuador. x 3.2.

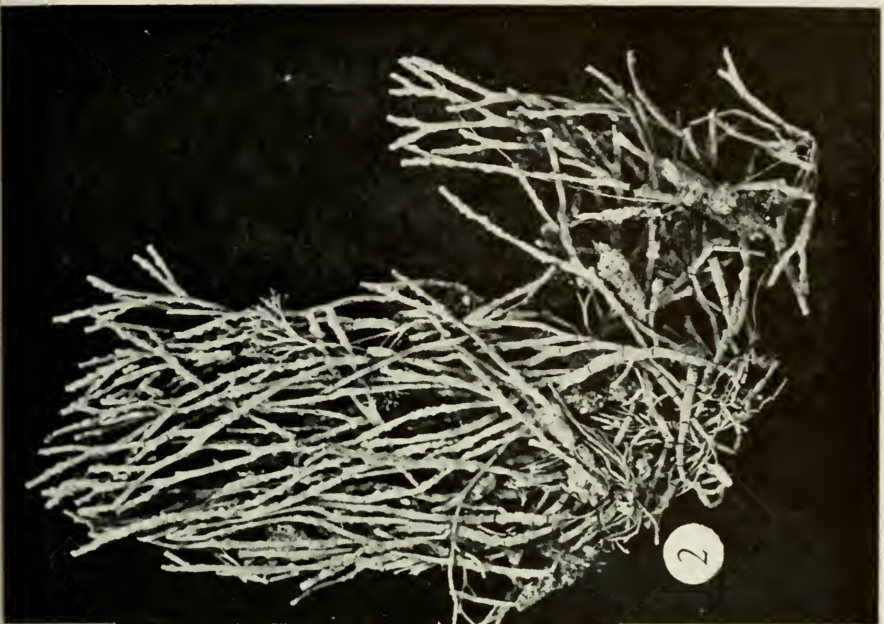
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PLATE 49

Fig. 1. *Amphiroa franciscana.* Two small clumps on corallines, from alcohol-preserved material, showing plants of a divergent habit, rather than strictly erect as in the preceding plate. México. x 2.5.

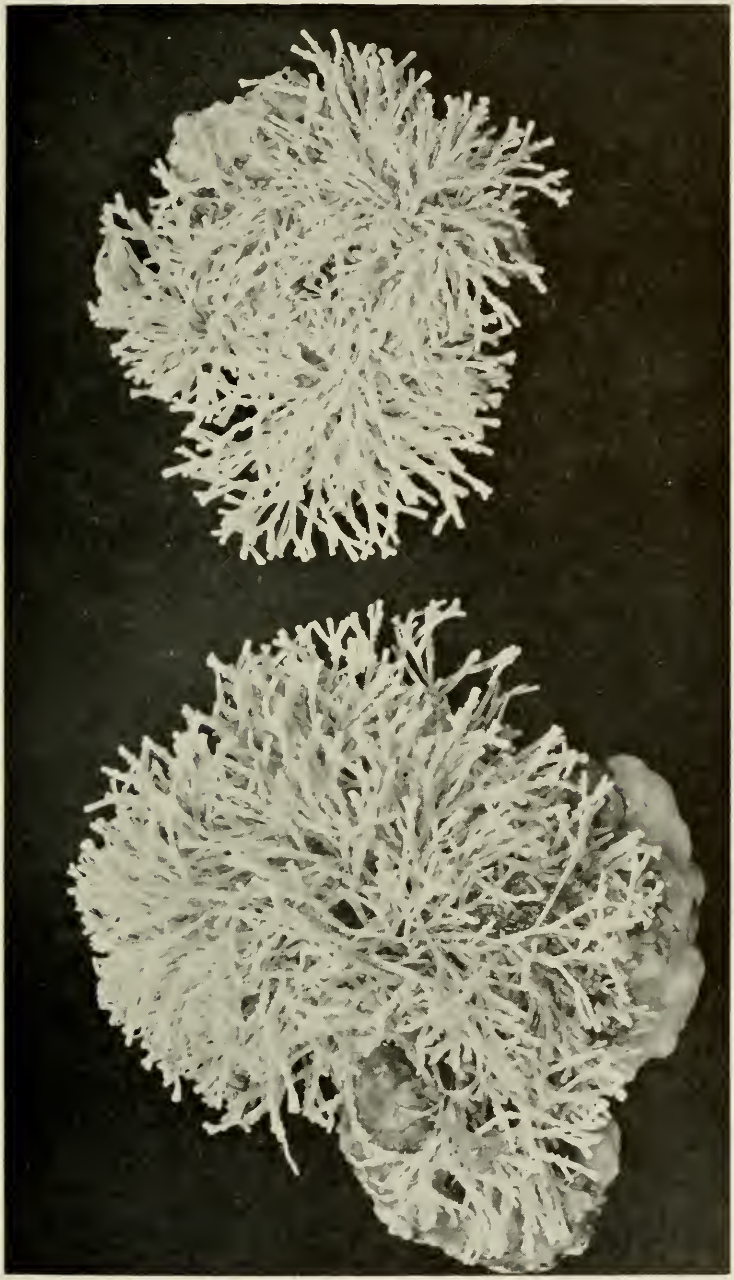

PLATE 50

Figs. 1, 2. *Amphiroa peruana.* Two portions of large clumps showing dense branching, the form of the segments, and the striking black nodes between the calcified segments. I. Santa María. x 1.1.

PLATE 51

Figs. 1-3. *Amphiroa galapagensis.* Figs. 1, 2. Portions of a turf-like mass, broken so as to show the habit of branching and the form of the segments. Fig. 3. A portion of the surface, showing the aspect from above. I. Santa María. x 1.0.

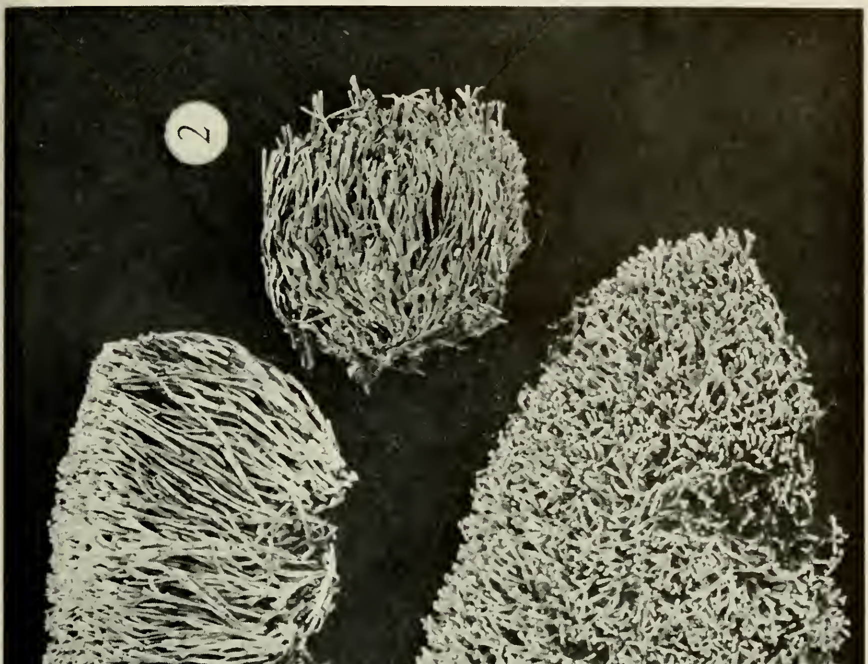
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PLATE 52

Fig. 1. *Amphiroa compressa.* Several pieces from clumps of this plant. The rosette habit is hardly distinguishable in these. The auriculate lower ends of segments are most visible in some of the pieces toward the upper part of the plate. In some places near the center they can be seen to be prolonged until nearly half as long as the segment itself. Gardner I. x 1.0.

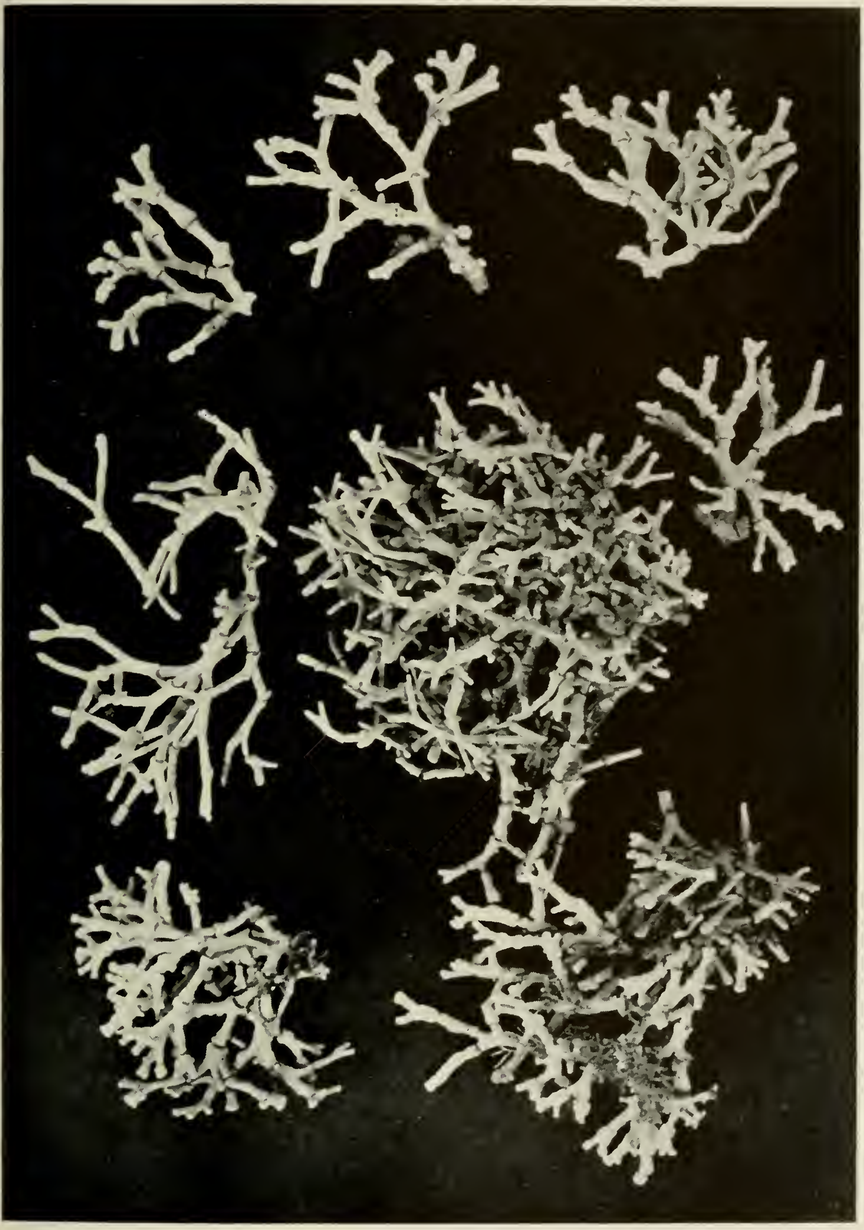

PLATE 53

Fig. 1. *Amphiroa compressa* v. *tenuis*. Three pieces on, or from, small bivalve shells, showing the more erect habit, narrower segments, and obsolete auricles which distinguish this plant from the species as shown in the preceding plate. From alcohol-preserved material. Ecuador. x 1.9.

Figs. 2-4. *Jania ungulata*. Three areas from somewhat damaged, dried specimens. In the absence of ample fluid-preserved material it was not possible to dissect out representative plants to show the habit in full. However these, especially figs. 2 and 3, do show the habit of the upper branching and the short, broad terminal segments quite well. I. Isabela. x 10.0.

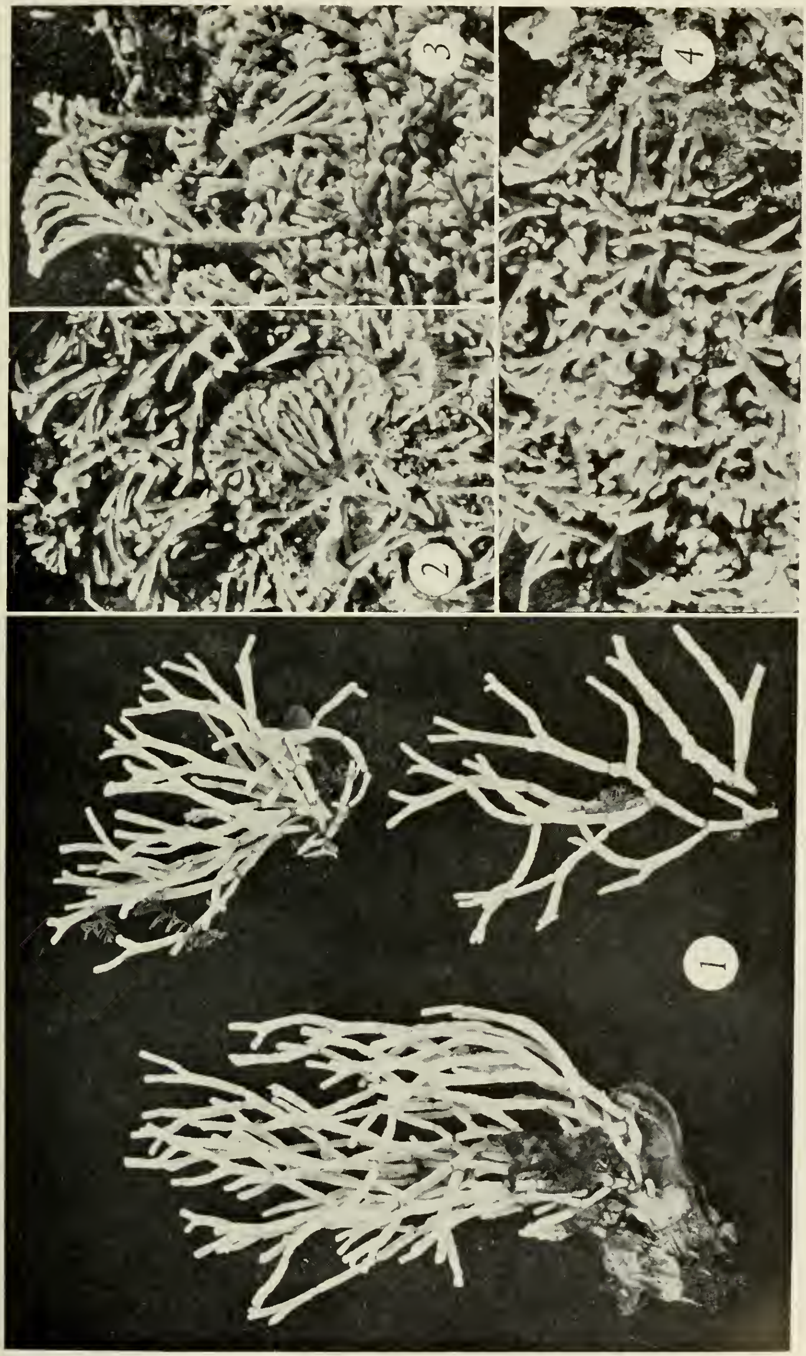
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PLATE 54

Fig. 1. *Amphiroa polymorpha.* Two small clumps to show the habit of branching and shape of segments. There is a good deal of an admixture of another species, especially in the left-hand figure. Costa Rica. x 2.5.

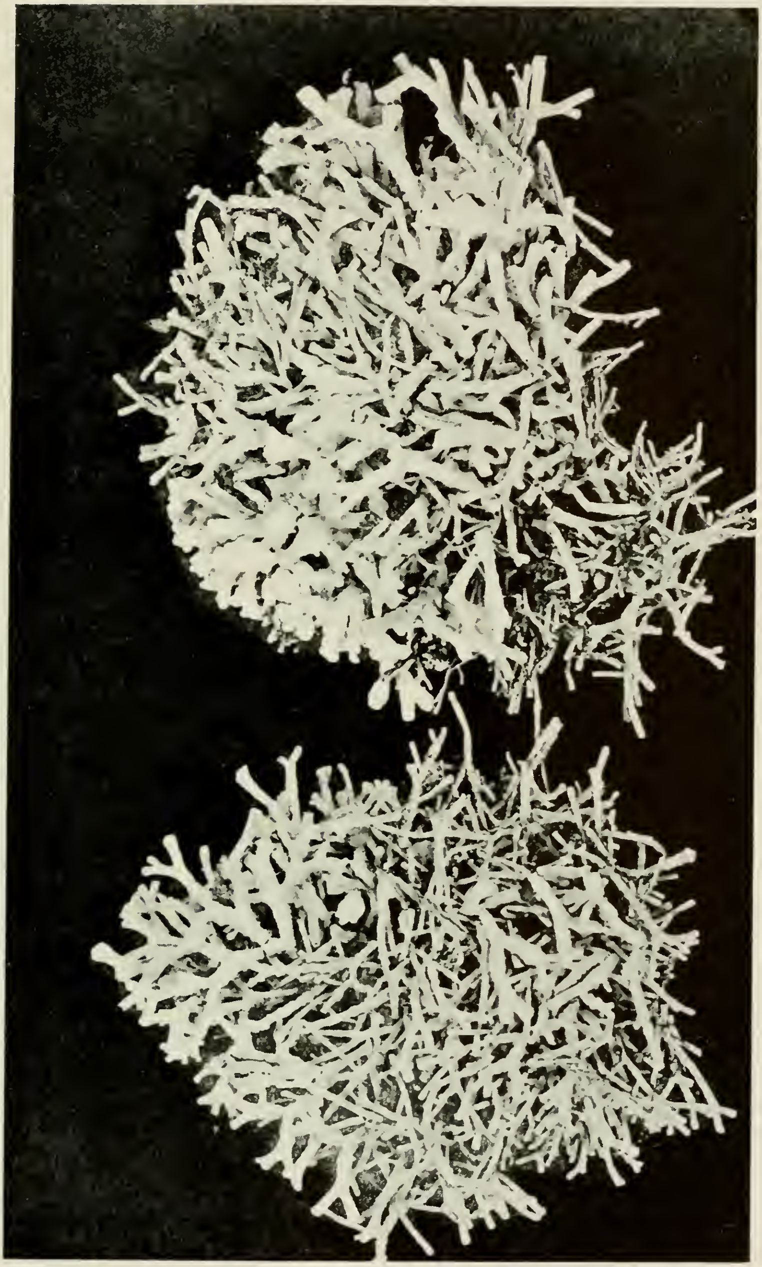

PLATE 55

Fig. 1. *Amphiroa dimorpha.* A fragment of a clump to show the habit of growth, and portions of several fertile branches to show the numerous small conceptacles. I. Española. x 1.3.

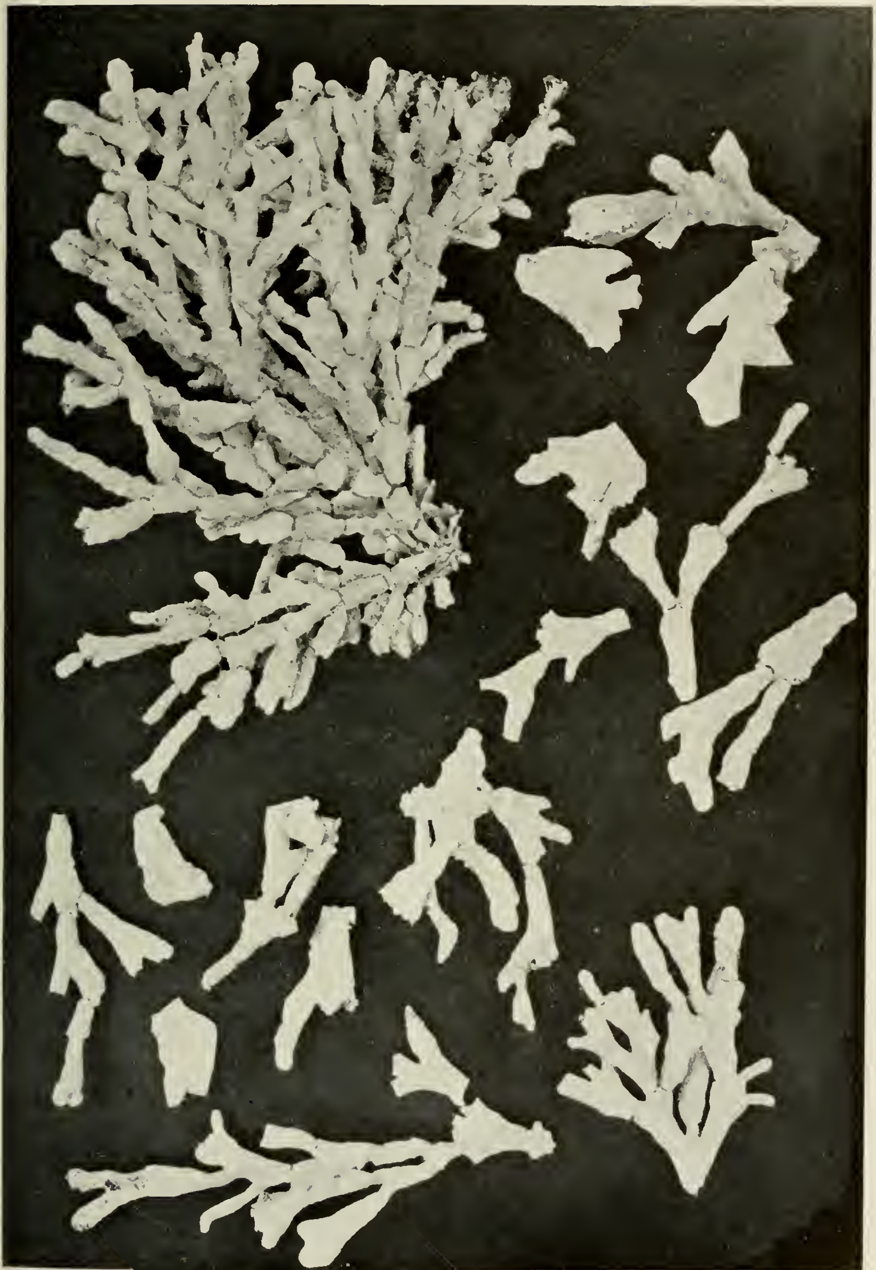

PLATE 56

Fig. 1. *Amphiroa foliacea.* Small portions of clumps of this species to show the variation in branching and in shape of the segments. The left-hand figures are typical of the broader types, and show the costa well. The upper center figure is intermediate and the upper right-hand one shows an extremely narrow example, with the branches hardly at all alate-bordered. The lower right-hand figure shows an extremely compact, stunted form. México. x 2.0.

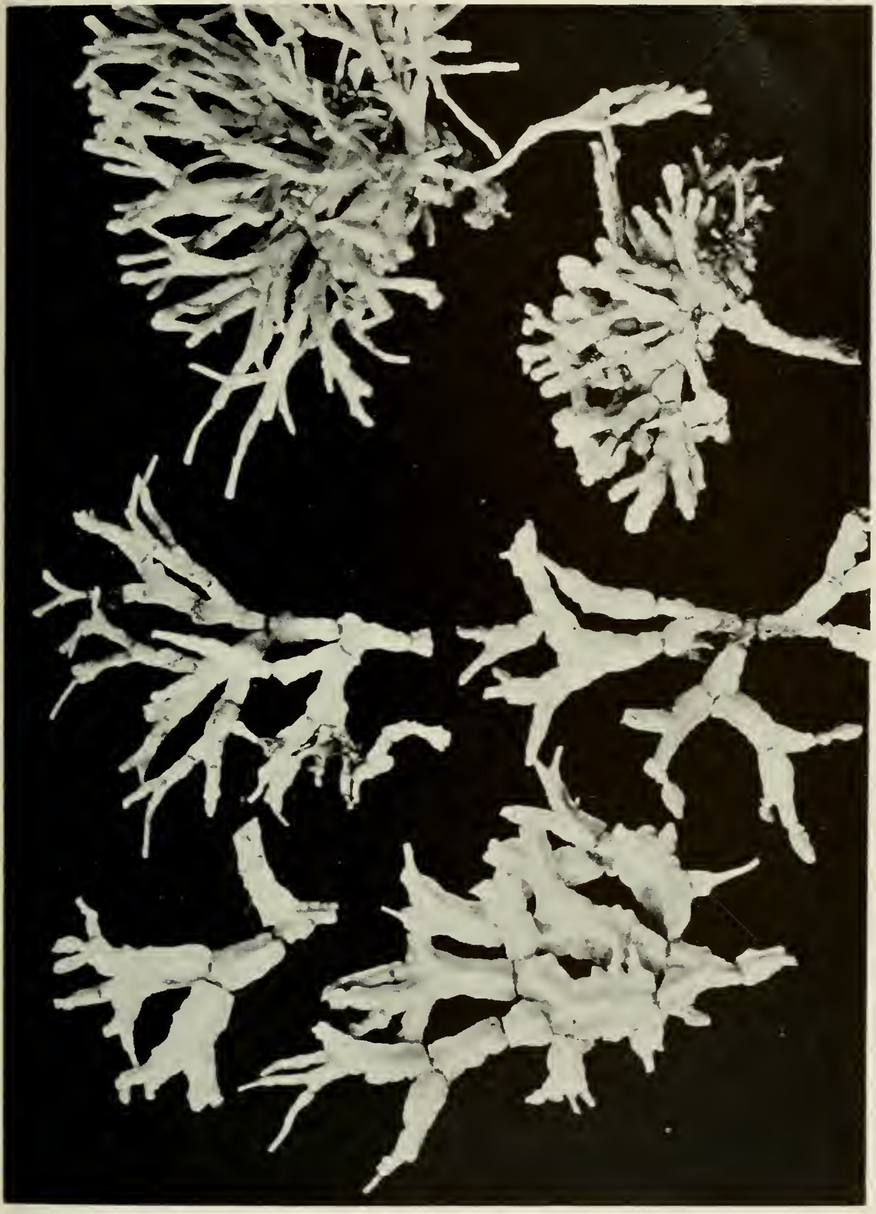

PLATE 57

Fig. 1. *Bossea Gardneri.* Portions of two tufts showing the basal portion and the upper branching, conceptacles being abundant, especially on the upper segments of the left-hand piece. I. Cerros. x 1.2.

PLATE 58

Fig. 1. *Bossea pachyclada.* Three somewhat fragmentary specimens. Unfortunately it was not realized with what ease or to what degree the corallines of this district would disintegrate after drying, and in the several years elapsing between the collection of material and the preparation of the illustrations, some, and notably the present, for the most part broke up into individual segments. However the shape of segments in the lower axes is quite evident, and in particular in the right-hand specimen, the shape of the upper segments. The conceptacles, abundant in the material, may also be seen in the right-hand specimen and in other scattered places. I. Cerros. x 1.2.

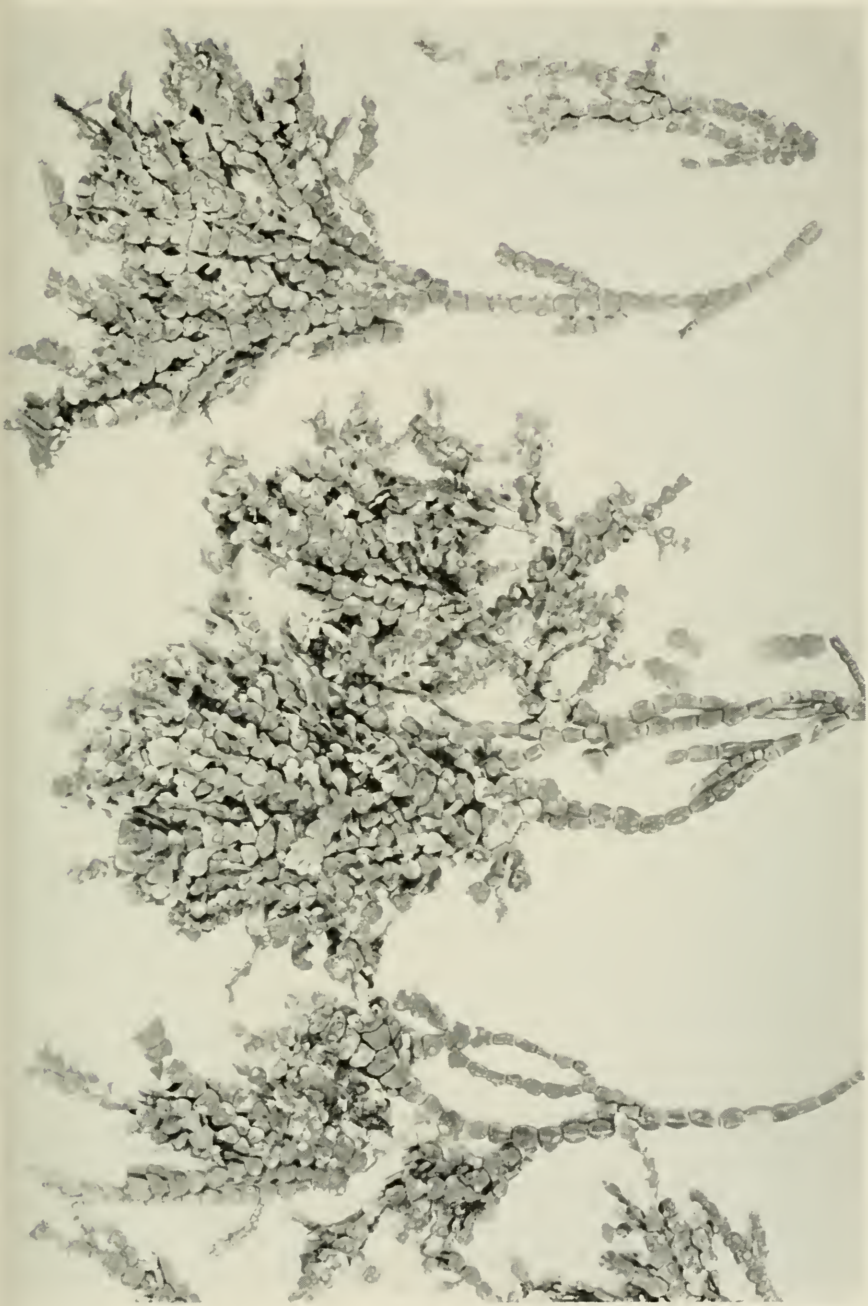

PLATE 59

Fig. 1. *Bossea angustata.* The larger portion of a plant complete to the base, showing the characteristic, rather narrow, hardly winged segments. I. San Benito. x 1.0.

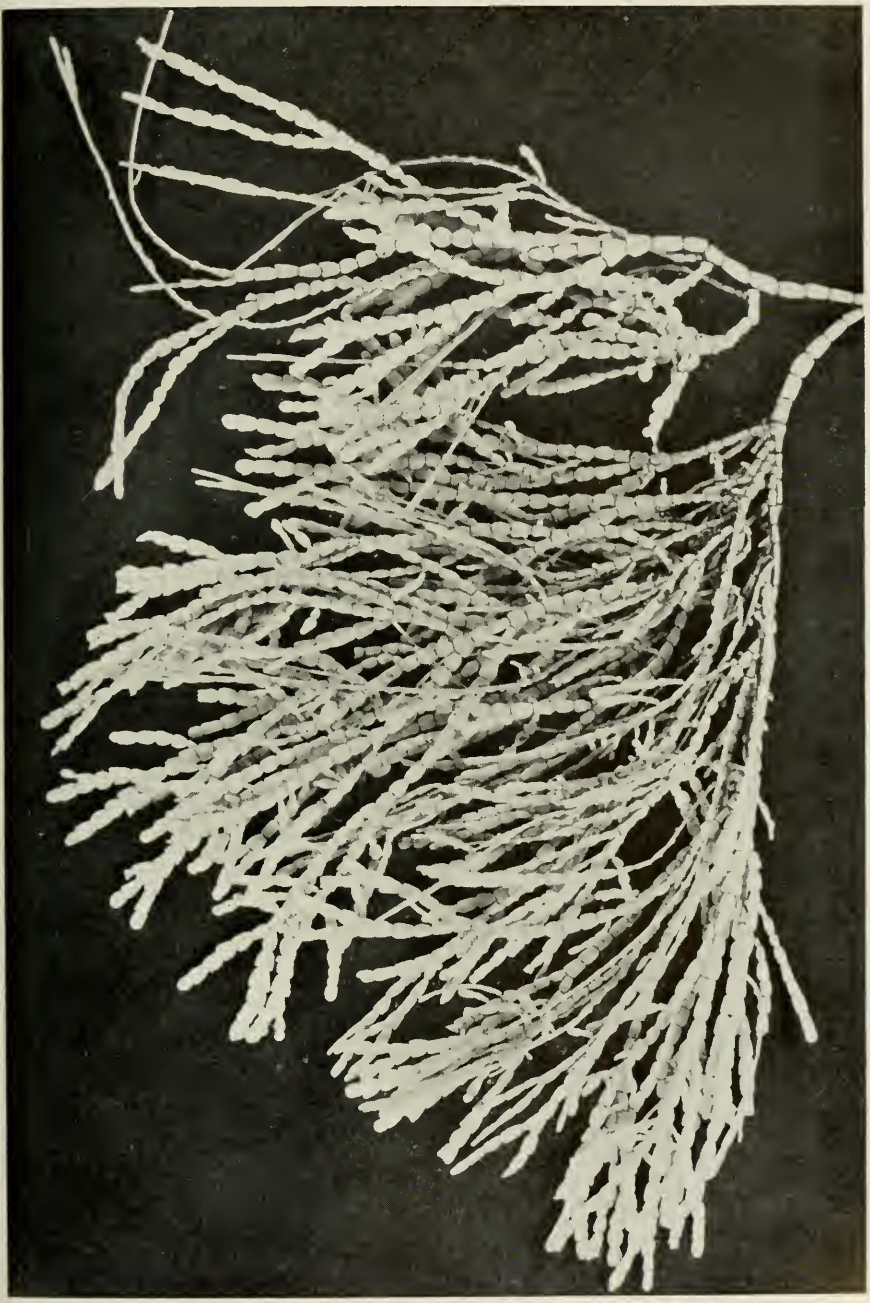

PLATE 60

Fig. 1. *Jania mexicana.* A relatively large, fertile clump showing the branching habit and the conceptacles. México. x 3.5.

PLATE 61

Fig. 1. *Joculator pinnatifolius.* A portion of a large clump to show the branching and, in the lower central part, numerous conceptacles. I. Santa María. x 1.8.

PLATE 62

Fig. 1. *Corallina chilensis.* Portions of two main branches showing the habit, the large complanate ultimate fronds, and the relatively slight flattening of the segments. I. San Benito. x 1.1.

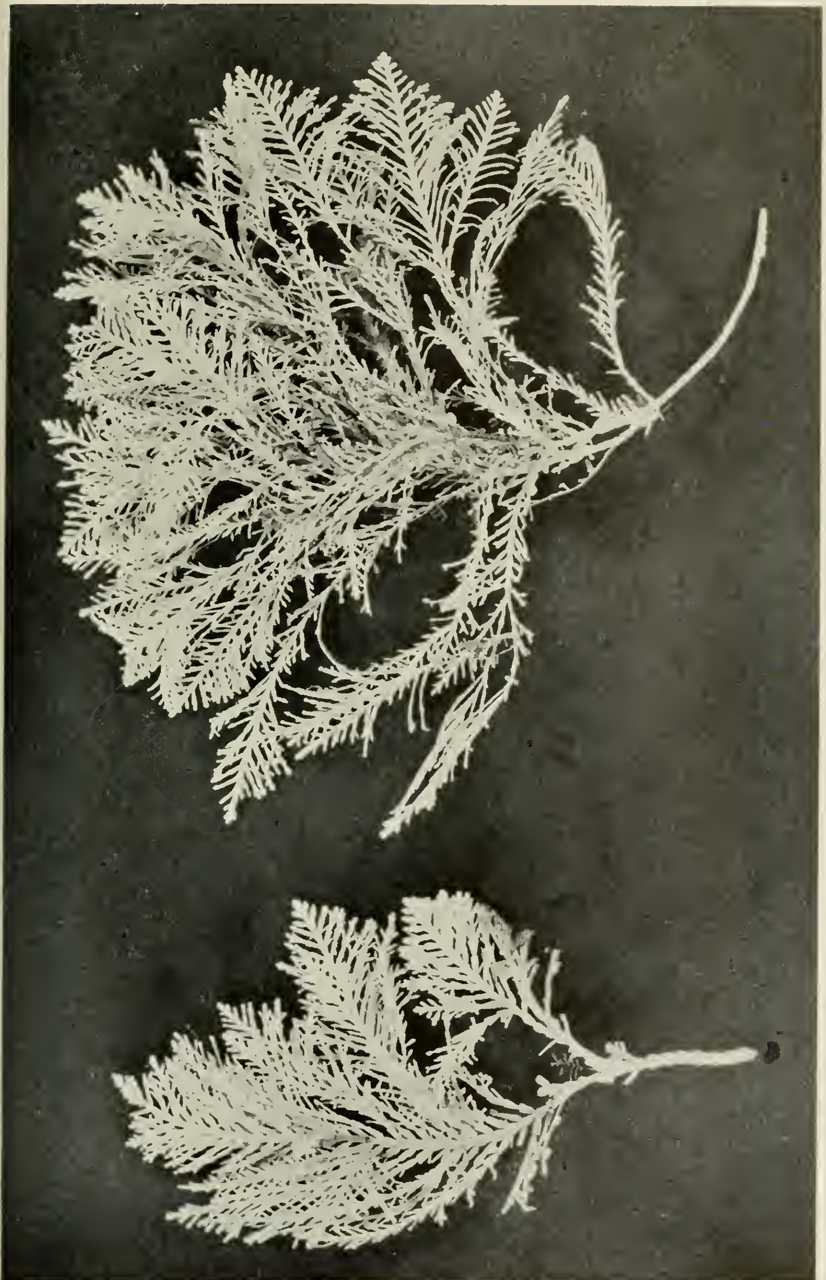

PLATE 63

Fig. 1. *Corallina gracilis* v. *lycopodioides.* Portions of three clumps showing crowding of the main axes on the basal portion, and the densely overlapping secondary branch and branchlet clusters. I. Cerros. x 1.0.

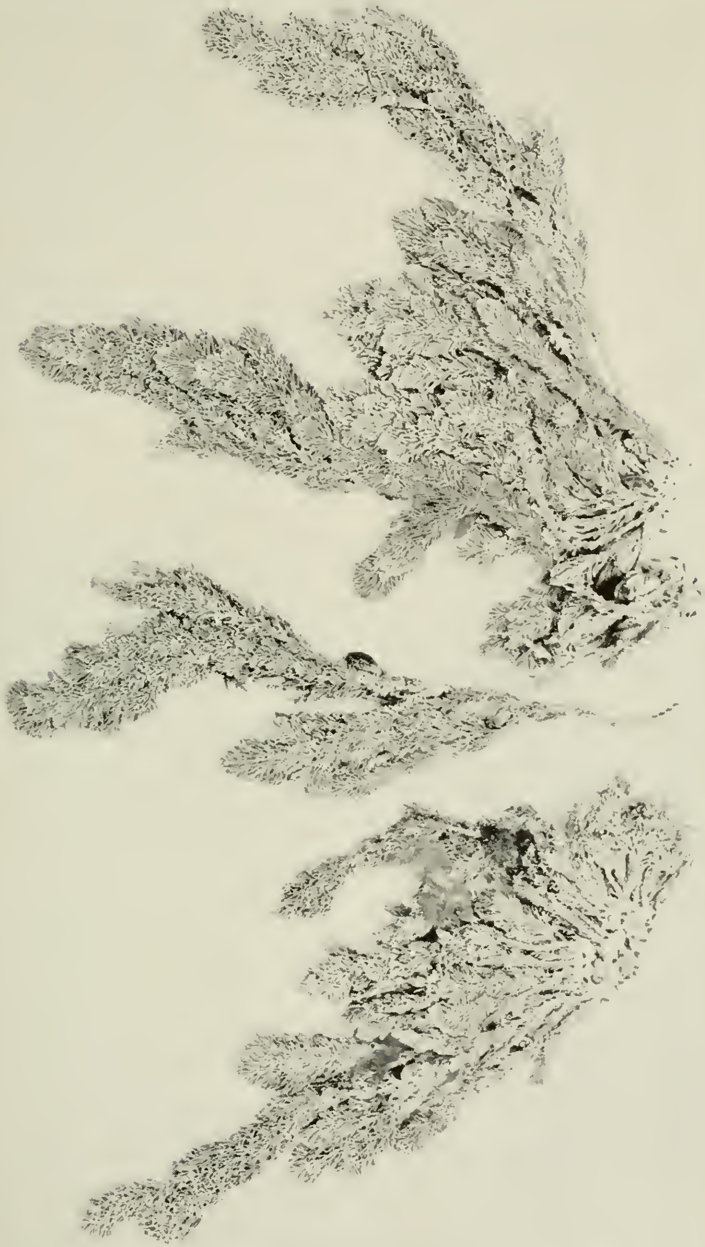

PLATE 64

Fig. 1. *Halymenia santamariae.* A tetrasporic plant, showing three lobes, attached by the somewhat irregular basal portion. I. Santa María. x 0.5.

Fig. 2. *Halymenia utriana.* Several fragmentary plants from the type collection, the left-hand forked one tolerably complete. Colombia. x 0.7.


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PLATE 65

Figs. 1, 2. *Pachymenia saxicola.* Two plants complete with holdfasts, and showing numerous marginal proliferations. Fig. 1 shows one chief forking and a few small lobes; it was photographed from the dorsal surface. Fig. 2 is freely branched, but the branches in part are broad; it has been photographed from the ventral side and shows the broad holdfast region. I. Santa María. x 0.85.


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PLATE 66

Fig. 1. *Prionitis filiformis* v. *delicatula.* A portion of a large tuft showing regular pinnate branching. I. Cerros. x 0.8.

Figs. 2-6. *Herpophyllon coalescens.* Portions of several plants are shown. Fig. 2 shows a young peltate individual from below, the holdfast with attached whitish detritus turned toward the right. Fig. 3 shows another young, somewhat funnel-shaped peltate specimen from the side. Figs. 4-6 show groups of older individuals which have coalesced laterally. They are photographed from below, the holdfasts project upward, and are recognizable by the attached whitish coralline sand. Toward the upper right-hand corner of fig. 5, one member of the group shows clearly in side view, attached to the others by part of its margin. This photograph was made from dried specimens. The preserved material, having become entirely decolorized, did not have a natural appearance when photographed, although it served well for accurate study of the form and structure of this little-known species. I. Santa María. x 0.9.


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PLATE 67

Fig. 1. *Prionitis Hancockii.* A single main axis showing the open dichotomous branching and numerous marginal stipitate ligulate to reniform tetrasporangial proliferations. I. Santa María. x 1.0.

PLATE 68

Fig. 1. *Prionitis galapagensis.* One axis with a primary fork and many lateral branchlets, showing the characteristic strongly crisped margins. I. Santa María. x 0.7.

Fig. 2. *Prionitis albemarlensis.* One plant with several axes showing the branching character and shape of the segments. I. Isabela. x 0.4.

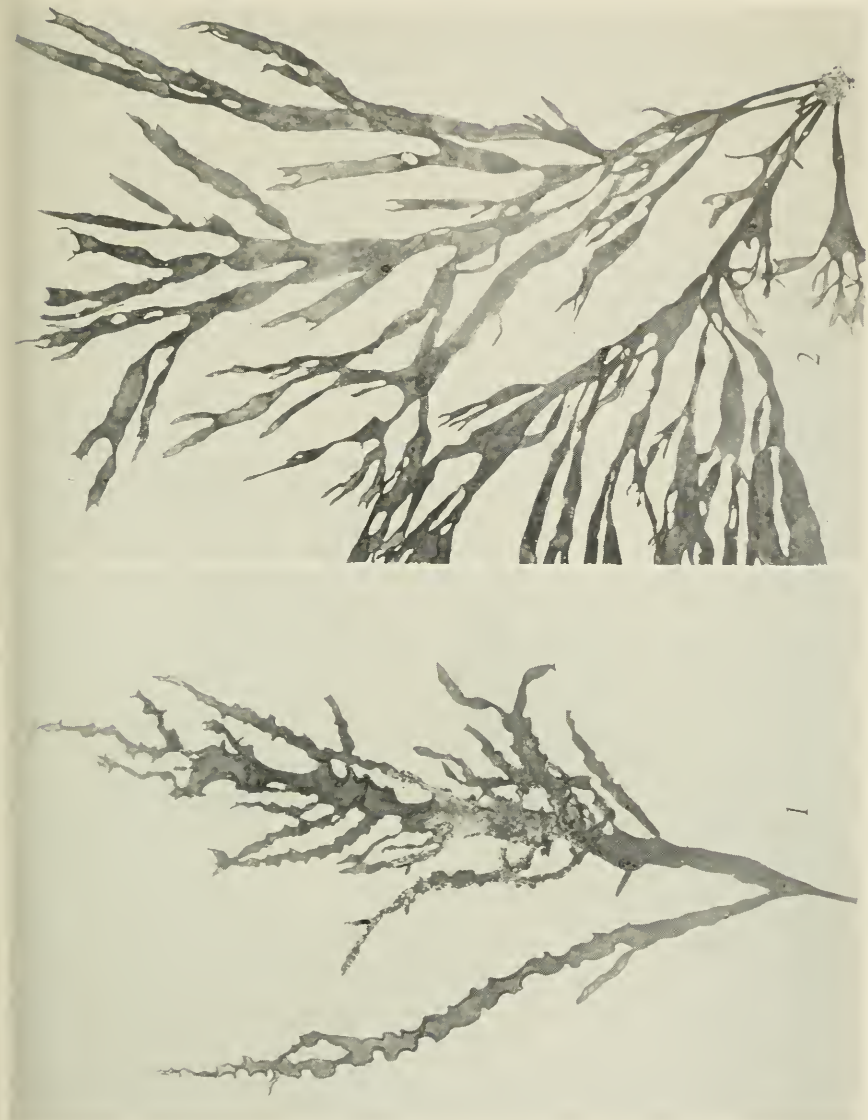

PLATE 69

Fig. 1. *Tylotus ecuadoreanus.* One large clump well spread out to show the habit of branching. I. Santa María. x 0.8.

Fig. 2. *Kallymenia Setchellii.* Portions of two plants, the lower cystocarpic, the upper with several lobes spermatangial. I. Santa María. x 0.6.

1

2

PLATE 70

Fig. 1. *Kallymenia multiloba.* The major portion of a large plant showing the base, branching, and form of the lobes. Young cystocarps are visible on most lobes, and large dark mature ones toward the upper right-hand part of the figure. I. Santa María. x 0.8.

PLATE 71

Fig. 1. *Kallymenia latiloba.* The major portion of a large plant showing the base with the branches flat to the bottom, and the lobing of the upper segments, which are richly fertile, with cystocarps of various ages and sizes. I. Española. x 0.6.

Fig. 2. *Hypnea pannosa.* Three small portions of typical clumps, to show the habit and branching. México. x 2.4.

1

2

PLATE 72

Figs. 1-4. *Kallymenia tenuifolia.* Figs. 1 and 2 show small, delicate, much proliferated individuals. Figs. 3 and 4 are more characteristic, but even fig. 4 is evidently a proliferation from an older plant. México. x 0.7.

Fig. 5. *Callophyllis ligulata.* Several specimens showing the narrow form of these plants, which seldom came up with the dredge except in fragments. Ecuador. x 0.8.


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PLATE 73

Fig. 1. *Sebdenia rubra.* The major portion of a well-developed specimen. Very many minute cystocarps are present on the outer two thirds of each lobe. I. Santa María. x 0.7.

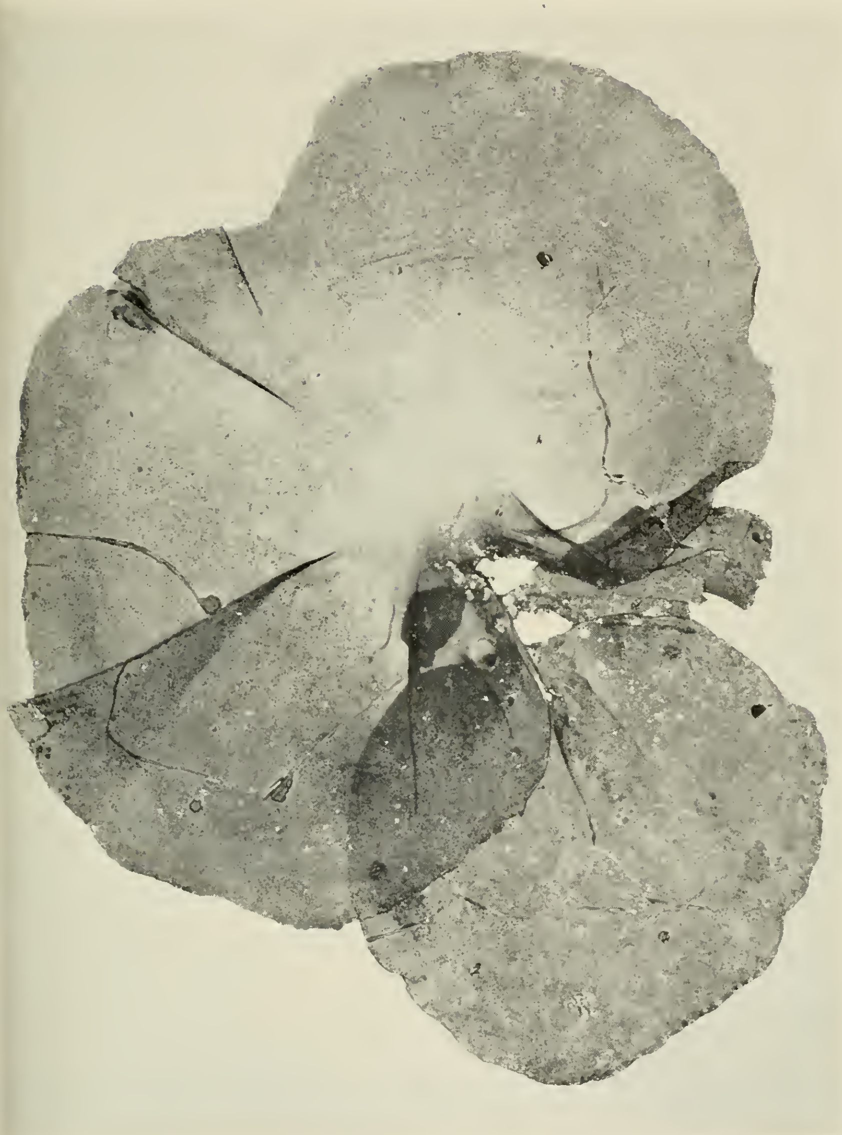

PLATE 74

Fig. 1. *Sarcodiotheca divaricata.* One branch system from a large clump, showing the habit of branching. Ecuador. x 0.6.

Fig. 2. *Sarcodiotheca tenuis.* Two portions of branches, the left-hand one fertile and showing the marginal cystocarps in various stages, the right-hand one apparently sterile. I. Santa María. x 0.7.

1

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PLATE 75

Figs. 1, 2. *Sarcodiotheca ecuadoreana*. Fig. 1. Portions of two cystocarpic plants, the upper showing the basal parts complete and the blades with young marginal fertile branchlets, the lower more mature and the branchlets in part nodulose with cystocarps. I. Santa María. x 0.5. Fig. 2. The major portion of a tetrasporic plant, showing the base and the branching habit. I. Santa María. x 0.6.


1
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PLATE 76

Figs. 1, 2. *Gracilaria panamensis*. Fig. 1. One cystocarpic plant, complete except that the upper end is obviously broken off, showing one small proliferation near the base. I. Santa María. x 0.5. Fig. 2. Basal portions of three tetrasporic plants, each showing three main axes, the upper portions broken off. Panamá. x 0.4.

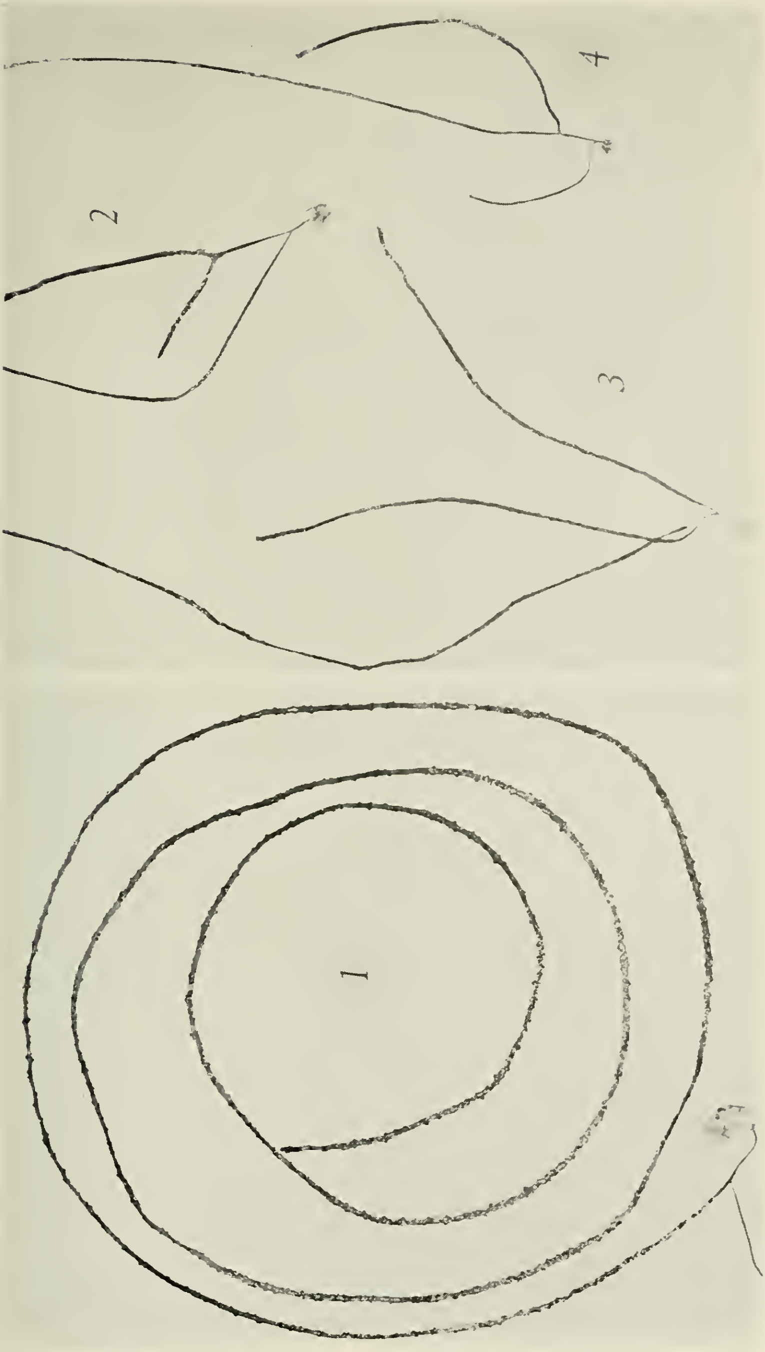
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PLATE 77

Fig. 1. *Gracilaria cerrosiana.* A small portion from a clump to show the branching habit. I. Cerros. x 0.6.

Fig. 2. *Ahnfeltia Svensonii.* A portion of a clump to show the primary dichotomous branching and proliferations in the lower portion. I. Santa María. x 1.4.


2
1

PLATE 78

Fig. 1. *Gracilaria tenuifolia.* Portions of two tetrasporic branch systems to show the habit. I. Soccoro. x. 0.9.

Fig. 2. *Gracilaria Skottsbergii.* A major part of a cystocarpic plant showing the base, the branching habit, and the cystocarps. I. Santa María. x 0.9.

1

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PLATE 79

Fig. 1. *Ahnfeltia Durvillaei.* A portion of a well-developed typical clump, to show the branching. I. Santa María. x 0.7.

Fig. 2. *Fauchea rhizophylla.* Portions of five plants disentangled from a sponge to show the flagelliform outgrowths from the segment tips and the centrifugal formation of young blades. I. Santa María. x 0.9.

1

2

PLATE 80

Fig. 1. *Gymnogongrus Smithii.* Portions of two branch systems to show the habit. I. Santa María. x 1.6.

Fig. 2. *Gymnogongrus Griffithsiae* v. *galapagensis.* The major portion of a cystocarpic clump, to show the crowding at the base and the attenuate dichotomous branching. I. Santa María. x 1.0.

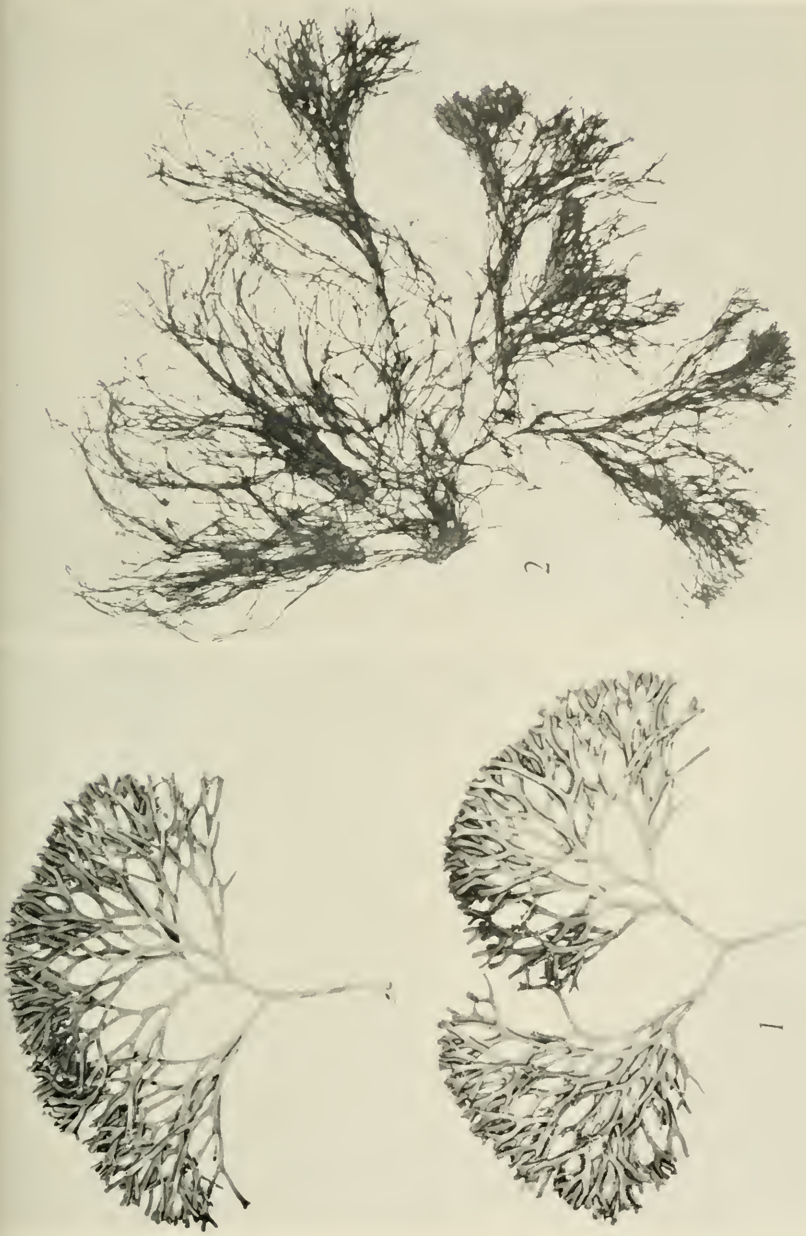
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PLATE 81

Fig. 1. *Chondrus Hancockii.* Portions of two plants showing the base and the upper branching, the upper plant to the right fertile, the lower one somewhat covered with epiphytes. I. Santa María. x 0.6.

Fig. 2. *Chondrus albemarlensis.* The major portion of a plant showing the irregular lower branching and the broad strap-shaped upper segments with numerous tetrasporic sori. I. Isabela. x 0.7.


2
1

PLATE 82

Figs. 1, 2. *Fauchea galapagensis.* Fig. 1. A large spermatangial plant, showing the habit of branching. I. Española. x 0.9. Fig. 2. The major portion of a large cystocarpic plant showing the base, the habit of branching, and many marginal cystocarps. I. Santa María. x 0.9.


1
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PLATE 83

Fig. 1. *Cryptonemia decolorata.* A portion of a clump to show the irregular branching and the form of the divisions. The toothed margins are most evident in the upper branches. México. x 1.6.

Fig. 2. *Fauchea crispa.* Portions of a clump to show the highly irregular branching and the form of the divisions. The cystocarps are evident both marginally and on the faces of the segments. México. x 1.6.

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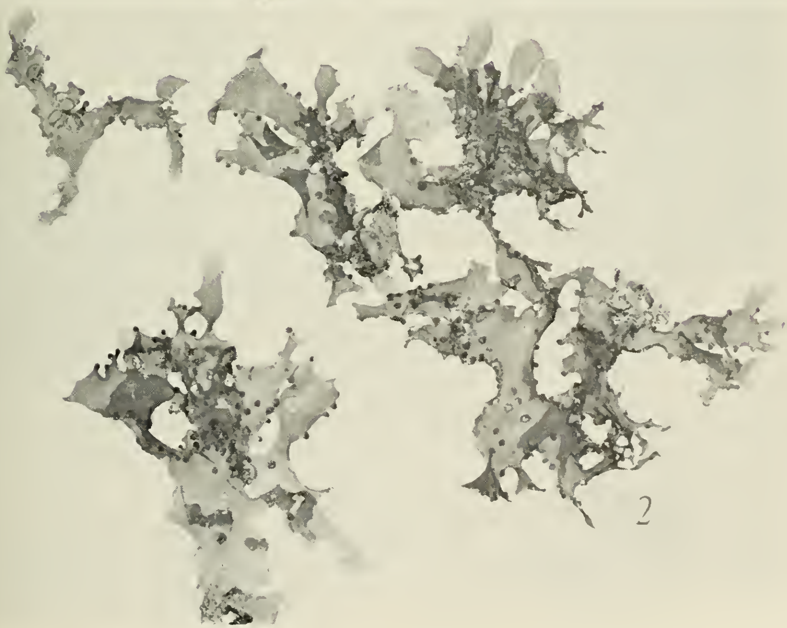

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PLATE 84

Fig. 1. *Rhodymenia decumbens.* A portion of a spreading plant to show the habit of branching. I. Baltra. x 1.0.

Fig. 2. *Rhodymenia Dawsonii.* A portion of a clump to show the habit of branching. Several of the branch tips in the upper center and upper right-hand side of the figure contain tetrasporangial sori. Baja California. x 0.8.

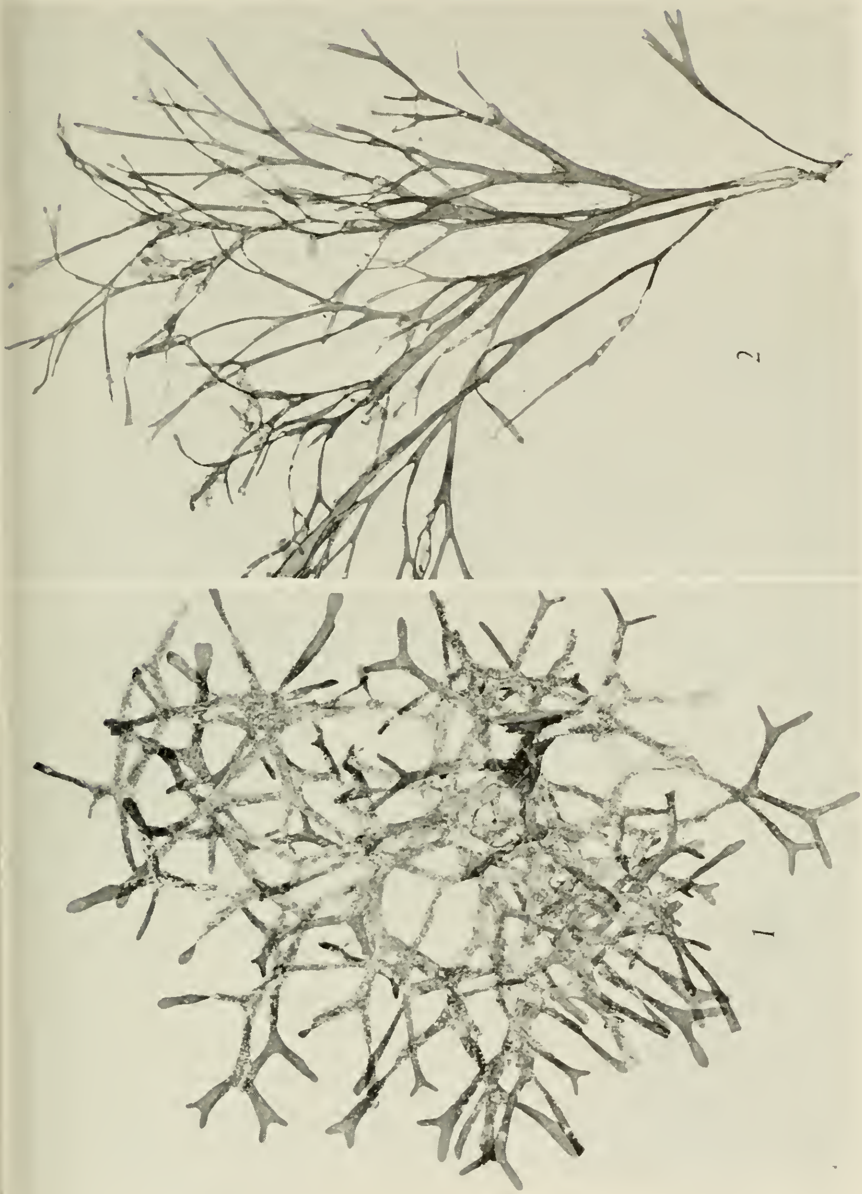
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PLATE 85

Fig. 1. *Dendrymenia flabellifolia.* The major portion of a clump showing the base, the long irregular denuded lower axes, and the somewhat pyramidal aspect of the foliiferous portion above. The forking of the blades shows fairly well, but the spiral arrangement of these on the axes does not, nor are the tetrasporangial sori distinguishable. I. Isabela. x 0.4.

PLATE 86

Fig. 1. *Pleonosporium complanatum.* The major portion of a branch system to show the habit. I. Santa Cruz. x 2.0.

Fig. 2. *Callithamnion soccoriensis.* The upper portion of a clump to show the habit. I. Soccoro. x 2.0.

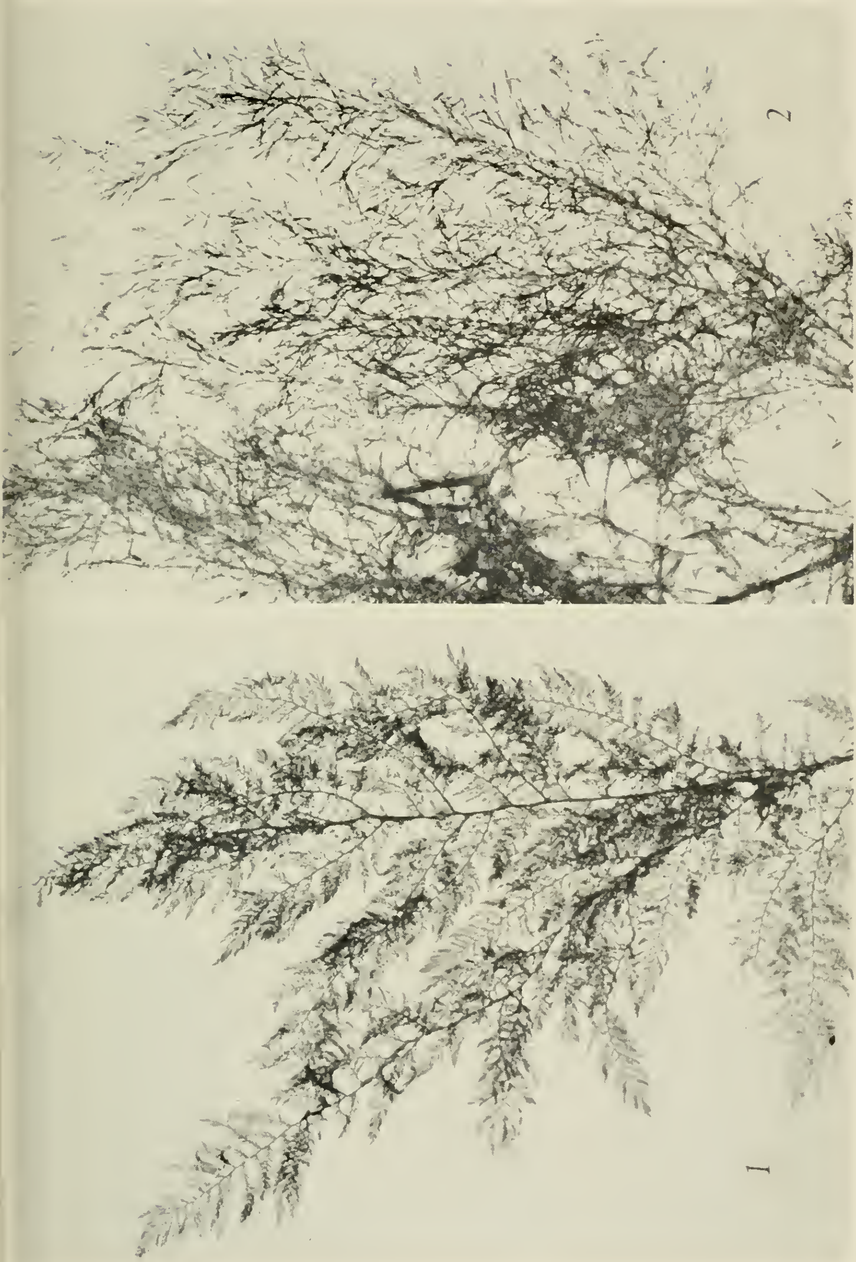
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PLATE 87

Fig. 1. *Haloplegma mexicanum.* The major portion of a well-developed plant to show the habit of growth. The size of reproduction does not favor the demonstration of the spongy texture of this plant, but in the thin upper portion it is somewhat visible. México. x 1.2.

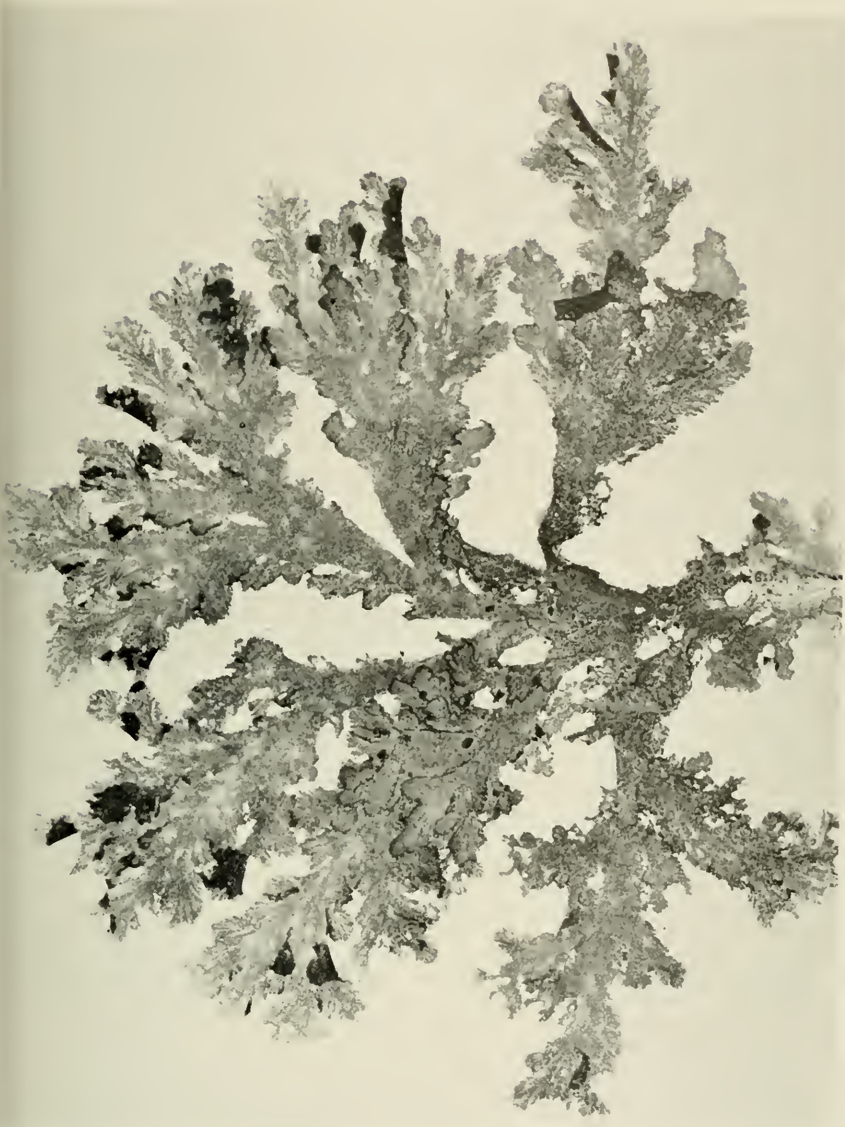

PLATE 88

Fig. 1. *Nitophyllum divaricatum.* A portion of a large fertile plant. The base is shown near the right-hand margin of the figure, and the lobing of the blades is characteristic. The dark edge and distinct light sterile border are very easily distinguished from the dark granular central region where the tetrasporic sori are located. I. Santa Cruz. x 0.6.

Fig. 2. *Hemineura Howellii.* A portion of a fertile plant. The base is shown toward the lower left-hand corner of the figure. The midribs are clearly shown in the foliar segments, which in the older parts (upper left) are crisped but in the younger ones (right-hand side) are plane. The fertile branchlets are shown in various stages, with the sterile midrib evident in some. I. Santa María. x 1.1.


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PLATE 89

Figs. 1, 2. *Hypoglossum abyssicolum.* Fig. 1. A portion of a sterile individual to show the branching and the shape of the segments. Mexico. × 1.8. Fig. 2. A portion of a cystocarpic individual to show the habit of branching, the broad, obtuse segments, and the position of the cystocarps c. Santa Maria. × 1.2.

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PLATE 90

Fig. 1. *Delesseria Hancockii.* A major portion of a well-developed individual. The lower part of the axis appears near the left-hand margin of the plate, but the holdfast is lacking. There are a few proliferous branches near the base, and then a long stem (derived from the denuded midrib) loops across the plate, curving beyond the lower and left-hand margins. It bears one lateral blade and ends in a very large terminal one, which is disintegrating below and somewhat damaged about the tip, presumably by the dredge. It shows the midrib and pinnate lateral veins, the sterile region in the center, and the tetrasporangial sori between the veins outside this. I. Santa Cruz. x 0.6.

PLATE 91

Figs. 1, 2. *Phycodrys pulchra.* Fig. 1. The major portion of a cystocarpic plant showing the base and one larger blade. This blade clearly shows the midrib and the lateral veins, and the position of the cystocarps in the lateral lobes. I. Santa María. x 0.6. Fig. 2. A blade from a tetrasporic plant, showing the form, venation, and sori. The younger sori appear black, and are paired in the younger lobes; the old empty sori appear as light patches in the major lobes of the blade. I. Santa María. x 0.6.

2

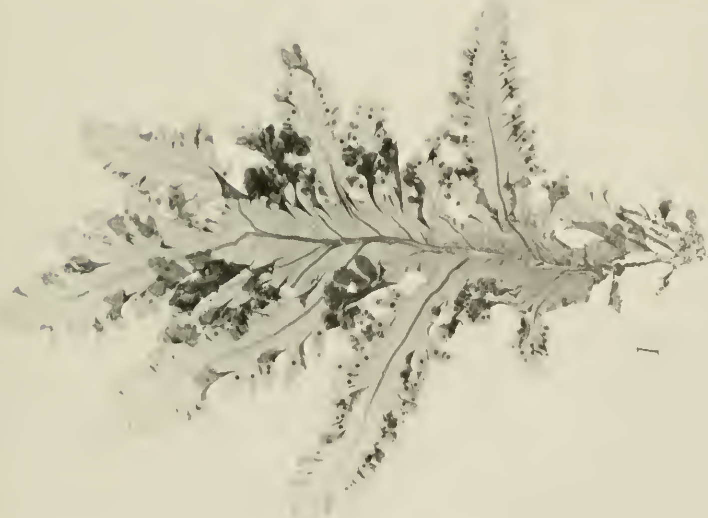

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PLATE 92

Fig. 1. *Myriogramme Kylinii.* A major portion of a well-developed young sterile plant showing the lower axis and several blades. These show the narrow, often curved base, forking veins, and the terminal lobes. I. Santa Cruz. x 0.6.

PLATE 93

Fig. 1. *Myriogramme Kylinii.* The major portion of an old plant, showing young blades toward the lower left and the fimbriate splitting of the old blades between the veins in the center. I. Santa Cruz. x 0.3.

Fig. 2. *Chondria platyclada.* A well-developed fertile plant showing the holdfast and flattened upper branching. The small branchlets appear dark because of the presence of tetrasporangia. Costa Rica. x 1.0.


2
1

PLATE 94

Figs. 1, 2. *Nitophyllum galapagense.* Fig. 1. A well-developed spermatangial blade showing the base with its thickened median region and minute stalk. Above, the blade is somewhat damaged, but the whole upper half is intact and shows characteristic irregular forking and marginal lobes. The sori of spermatangia are made very evident by care in illumination while photographing. I. Santa Cruz. x 0.4. Fig. 2. A major part of a tetrasporangial blade with one main fork, but with many small marginal lobes and proliferations. x 0.3.

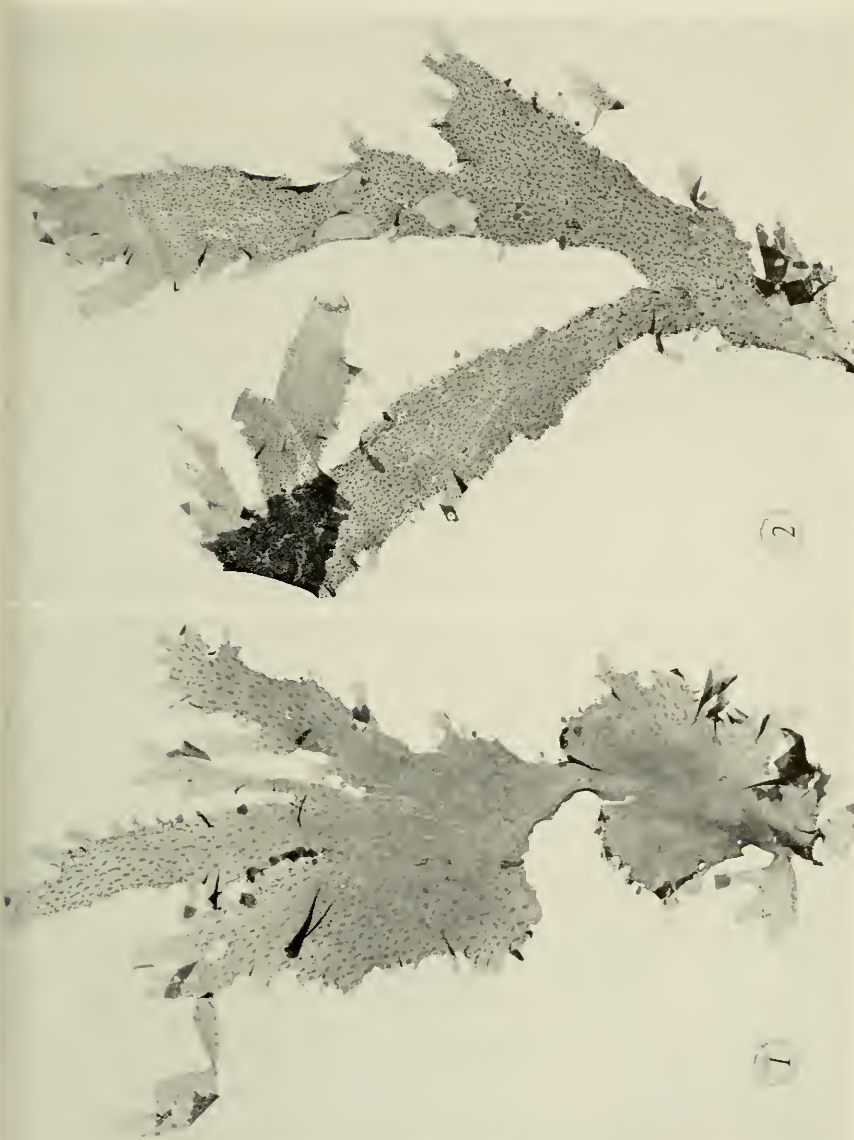
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PLATE 95

Fig. 1. *Acrosorium Papenfussii.* A major part of a fertile specimen showing the habit of branching and the marginal cystocarps. I. Santa Cruz. x 0.5.

Fig. 2. *Acrosorium fragile.* A major part of a sterile specimen showing the habit of branching. I. Santa Cruz. x 0.9.

2

1

PLATE 96

Fig. 1. *Bryothamnion pacificum.* A portion of a clump to show the relatively loose branching of this species. México. x 1.0.

Fig. 2. *Pterosiphonia dendroidea.* A small portion of a large clump to show the habit and branching. I. Santa Cruz. x 1.2.

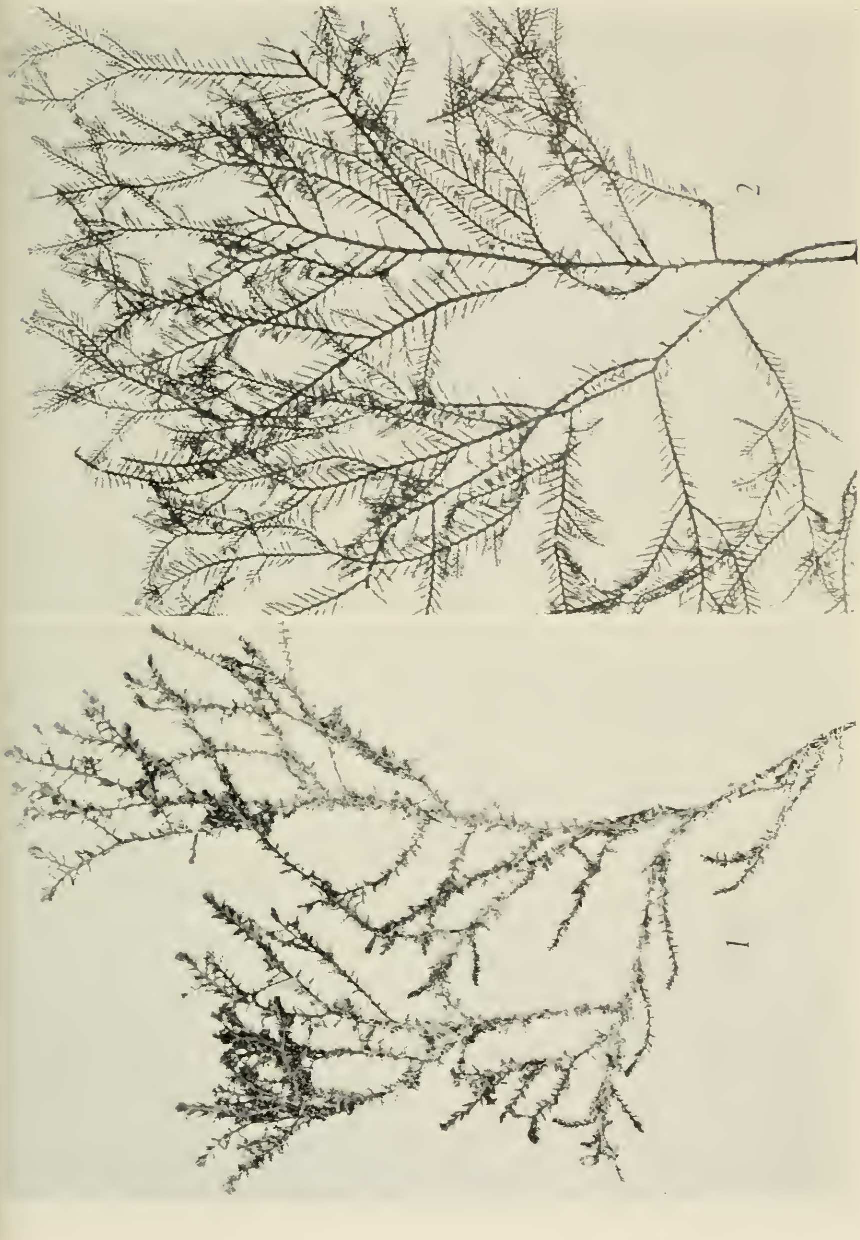
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PLATE 97

Fig. 1. *Asparagopsis Svedelii.* A portion of a plant to show the delicate habit. x 1.3.

Fig. 2. *Dasya Stanfordiana.* A portion of a well-developed tetrasporangial plant to show the habit. I. Española. x 1.3.


2
1

PLATE 98

Fig. 1. *Laurencia peninsularis.* A portion of a well-developed plant to show the habit. Baja California. x 0.7.

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2
1

PLATE 99

Fig. 1. *Laurencia congesta.* Portions of three branches to show the corymbiform congestion in the upper ramification. I. Santa María. x 0.6.

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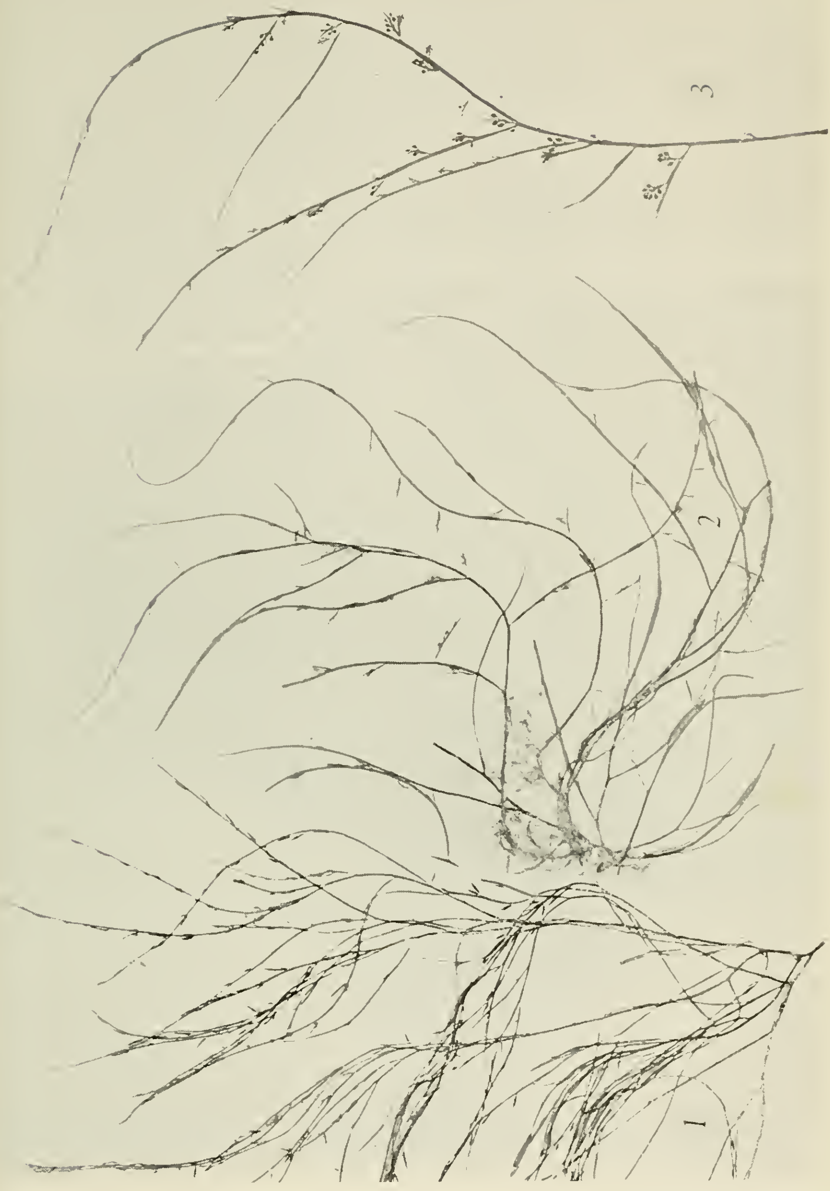
2
1

PLATE 100

Figs. 1-3. *Chondria flexicaulis.* All of the specimens show the excurrent attenuate tips of the main branches, and the general open branching habit. Fig. 1. A portion of a tetrasporangial individual to show the more erect habit and scattered fertile branchlets. x 0.6. Fig. 2. A portion of a spermatangial plant to show the spreading habit and the spermatangial plates clustered along the branchlets. x 0.8. Fig. 3. A branch from a cystocarpic individual to show the arrangement of the cystocarps on the branchlets. x 0.9. All from I. Santa Cruz.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ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 12 COMPLETE

PACIFIC MARINE ALGAE OF THE ALLAN HANCOCK EXPEDITIONS TO THE GALAPAGOS ISLANDS

(PLATES 1-100)

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