

NEW RECORDS OF MARINE ALGAE FROM THE GALAPAGOS ISLANDS¹

By E. YALE DAWSON²

Recent collections made by the writer and his wife, C. Maxine Dawson, in the southern Galapagos Archipelago during early 1962 have brought to light several plants hitherto undescribed and a number of new distribution records for the archipelago. In addition, the studies have revealed some previously misidentified plants and some instances in which more than one name have been applied to geographical representatives of a single species. Some of the materials more difficult of interpretation, especially crustose corallinaceae, have not yet been studied adequately, and a number of taxonomic problems remain to be solved through examination of types not presently available. It is hoped that these matters can be dealt with later and the nomenclature of the Galapagos algae sufficiently clarified that a manual may be prepared for the use of marine biologists and others visiting the International Darwin Research Station on Academy Bay, Santa Cruz Island.

The present collections were made from February 9 to March 8, 1962, in the vicinity of the Darwin Station between Tortuga Bay and Punta Nuñez; at Wreck Bay, San Cristobal Island (just north of the abandoned freezer plant); on the seaward side of Punta Suarez, Hood Island; and at Villamil, Santa Isabel Island. Nearly all were obtained intertidally.

The specimens are cited by the writer's field collection numbers, and a first set is deposited in the Herbarium of the Allan Hancock Foundation.

Mr. Don Ollis of Santa Barbara, California, prepared the photographs. Dr. Hannah Croasdale prepared the Latin diagnoses. Mr. Jay N. Holliday, Jr. assisted with the laboratory processing of the collections.

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Cladophoropsis peruviana Howe D. 22096, in a mangrove thicket west of the Darwin Station; D. 22402, inner east lagoon of Tortuga Bay. In both cases the plants were growing with *Boodleopsis pusilla*.

Bryopsis hypnoides Lamx. Two collections are at hand of a much-branched, multifarious, soft, quite entangled plant that appears best to be identified with this widely distributed species, but distinctive characters are not clearly defined. D. 22127, Academy Bay; D. 22409, Tortuga Bay.

Bryopsis indica var. *triseriata* var. nov.

Plate 1, fig. 1; Plate 3, fig. 5

Loosely tufted, about 3 cm. high, consisting of several percurrent axes, barren except in their upper parts, each bearing a seemingly unilateral brush of deciduous pinnae on its curved tip; pinnae (unlike the type of the species) mostly in six distichous ranks, three on each side, the middle rank often disjunct or partly missing on more slender axes, the pinnae, especially lower ones, curved in such a way as to appear secund, becoming deciduous 5-8 mm. from the tip.

Planta laxe fruticulosa, c. 3 cm. alt. constans ex aliquot axibus percurrentibus, macris nisi in partibus superioribus, unoquoque scopulam ut videtur unilateralem pinnarum deciduarum in cacumine curvato ferente; pinnae (typo speciei dissimiles) plerumque in sex ordinibus distichosis, tribus utroque in latere, dispositae, ordine medio in axibus tenuioribus saepe disiuncto aut partim absente; pinnae, praecipue inferiores, ita curvatae ut secundae videantur, deciduae 5-8 mm. a cacumine factae.

TYPE: E. Y. Dawson 22450, March 1, 1962, in Herbarium Allan Hancock Foundation.

TYPE LOCALITY: Punta Suarez, Hood Island, Galapagos Archipelago. Only a single well-developed tuft was found on a violently surf-beaten rocky shelf on the seaward side of the point. The habit appears to be much like that reported by Taylor (1950) for specimens of *Bryopsis indica* from Eniwetok, Marshall Islands, but the alternately off-set intermediate rank of pinnae on the principal axes makes this a distinctive plant.

Derbesia neglecta Berth. D. 21981, abundantly fertile material from high tide pools in the spray zone, Hood Island.

Derbesia attenuata Daws. D. 22359, 22411, epiphytic on other algae, Tortuga Bay. Although this quite distinctive minute plant has been observed repeatedly during the past decade across the tropical Pacific, fertile material has not yet been encountered.

Derbesia marina (Lyngb.) Kjellm. D. 22431, fertile material from a surfy rock shelf on seaward Hood Island.

Caulerpa vickersiae Børg. D. 22391, very richly developed material from quiet water of inner east lagoon, Tortuga Bay.

Boodleopsis pusillus (Collins) Tayl., Joly & Bernatwz. D. 22094, on mud in a mangrove thicket west of the Darwin Station; D. 22402a, inner east lagoon, Tortuga Bay. In both cases these plants were growing with *Cladophoropsis peruviana*.

Acetabularia moebii Solms-Laub. D. 22246, on a coral fragment from about 6 meters depth, sandy bay just south of Academy Bay.

Sphacelaria novae-hollandiae Sonder D. 22249, on dead coral from about 6 meters depth, sandy bay just south of Academy Bay.

Chnoospora implexa J. Ag. D. 22388, abundant in quiet water of inner east lagoon, Tortuga Bay.

Sargassum howellii Setch. & Gard. ? D. 22420. The correspondence could not be determined fully because of somewhat incomplete development of the specimens found on a surf-beaten shelf on seaward Punta Suarez, Hood Island.

Erythrotrichia carnea (Dillw.) J. Ag. D. 22076a, on *Spermothamnion phycophilum*, Wreck Bay; D. 22337a, on *Griffithsia tenuis*, Tortuga Bay.

Erythrotrichia reflexa (Crouan) Thur. D. 22224, on *Spermothamnion*; D. 22241, on *Herposiphonia*. This material definitely and consistently is attached by a single basal cell and thereby differs from some interpretations of Couan's species. Both collections from Academy Bay.

Kylinia crassipes (Børg.) Kylin D. 22241, on *Herposiphonia*, Academy Bay.

Asparagopsis taxiformis (Delile) Collins & Hervey The gametophyte generation occurred abundantly on the ocean front reef at Tortuga Bay (D. 22333), while the sporophyte phase, *Falkenbergia hillebrandii*, was found epiphytic on *Rhodymenia* at a depth of about 8 meters in Academy Bay (D. 22240).

Galaxaura barbata Chou D. 22408. This species known hitherto only from two collections dredged from depths of 13-37 meters, is now found also in shallow, quiet water along the inner east lagoon wall at Tortuga Bay.

Gelidium schlerophyllum Taylor D. 22048, intertidal reef east of the Darwin Station, with young tetrasporangia.

Pterocladia pyramidale (Gardner) Daws. Experience with this plant at several Galapagos localities continues to impress me with the high probability that it is not a species distinct from *P. capillacea* of the Atlantic and Australian regions.

Gelidiella tenuissima Feldm. & Hamel Three collections of minute *Gelidiella* are at hand from three dissimilar habitats. D. 22200 occurred on mangrove roots while D. 22227 occurred on rocks nearby in Academy Bay. D. 22430 was scraped from heavily surf-beaten rocks at Punta Suarez, Hood Island. All are less than 2 mm. high, compressed to flattened

and generally in accord with the Feldmann and Hamel understanding of this species known in several papers as *G. pannosa* (Bornet) Feldm. & Hamel. Perhaps more than one entity is involved here, but it seems best to assign them together to this still poorly-known but possibly widespread and variable tropical and subtropical plant.

Gelidiella machrisiana Daws. D. 22132, intertidal, Wreck Bay. This tetrasporangial material is more ample than the type from Costa Rica and is fertile. The plants are to 25 mm. tall. Tetrasporangia are borne in elongated sori occupying the ends of main axes and lateral pinnate branchlets. There is no sterile margin, and the sori from which tetrasporangia have been discharged show a cellular pattern of faintly decussate rows, although sporangia in position do not show any obvious geometrical arrangement. Transections show a central medullary area of thick-walled cells lacking the dense contents of the outer medulla and cortex, but no rhizines. Were it not for this, the plants might be mistaken for small *Celidium crinale*.

Peyssonelia mexicana Daws. Several fertile collections have been taken in intertidal and infratidal localities both at Academy Bay and Wreck Bay.

Peyssonelia rubra (Grev.) J. Ag. var. *rubra* Although numerous collections of *P. rubra* var. *orientalis* W. v. B. have been reported from Mexico and elsewhere along the eastern Pacific in recent years, that plant has not yet been found in the Galapagos. Instead, the present variant of this apparently dimorphic species is prevalent. It is characterized by multicellular rhizoids and generally somewhat thicker thallus than var. *orientalis*. D. 22117, Wreck Bay; D. 22206, 22271a, Academy Bay.

Cruoriella dubyi (Cr. & Cr.) Schm. On stones and shells, D. 22030, 22079, Academy Bay; D. 22139, Wreck Bay.

Hildenbrandia prototypus Nardo Numerous collections have been examined and all agree satisfactorily with this species. They are variable in thickness and size and seem to indicate conclusively that the name *Hildenbrandia galapagensis* applied to both Galapagos and Mexican plants by Setchell & Gardner (1937) has no distinctive basis for recognition. Accordingly, it is reduced herewith to synonymy.

Corallina vancouveriensis Yendo D. 22442, from a violently surfy shelf at Punta Suarez, Hood Island. The apparently higher respiratory oxygen requirement of these plants seems to be met by the violently surfy conditions in contrast to the quieter habitats of the next species which is known to have higher temperature tolerances.

Corallina pinnatifolia (Manza) Dawson D. 22034, 22125, Academy Bay. The Snodgrass and Heller specimen from Turtle Point, Albemarle Island, identified by Farlow with *Amphiroa orbigniana*, has been found in Herb. Farlow, reexamined and recognized as good fertile material of

Corallina pinnatifolia. It is clearly representative of an intertidal collection, while those specimens dredged from 15 fathoms in Elizabeth Bay by the same collectors and identified questionably by Farlow with *Corallina berterii* Mont., appear to be deep-water examples of the same species, in part approaching *C. pinnatifolia* var. *digitata* Daws.

Lemoine (1929) had equated the *Amphiroa orbigniana* specimens above with "*Arthrocardia tuberculosa* Web. van Bosse", but the original *Corallina tuberculosa* Postels & Ruprecht, from Sitka Island, Alaska, has never been adequately reevaluated and probably has nothing to do with the present case. Yendo (1902) identified material from Port Renfrew, British Columbia, with the Postels and Ruprecht plant, but Yendo's specimens, apparently representing a *Calliarthron* or *Bossiella* species as currently known, have not been reexamined in the light of more recent studies of articulated corallines. Furthermore, the type of *Corallina berterii* and related collections from Peru and Chile must be examined and compared before a satisfactory advance in the interpretation of these Pacific American *Corallina* species can be made.

Amphiroa zonata Yendo D. 22119, intertidal, Wreck Bay; D. 22335, ocean side of Tortuga Bay. These agree well with the species as it is known widely along Pacific Mexico.

Amphiroa crustiformis sp. nov.

Plate 2, figs. 2-5

Thalli primarily crustose, spreading to 8-10 cm., firmly adherent to the substrate, but the margins (to 1 cm.) free and lobed, 1 mm. thick or less, the lobes of unequal growth, anastomosing along the edges and sometimes temporarily leaving lacunae; erect thallus parts consisting of scattered, more or less erect, cylindrical protuberances developing on the surface 4-12 mm. back of the margins, becoming 4-7 mm. tall and about 1 mm. in diameter, crooked, often anastomosing irregularly where crowded, each with a single basal geniculum, rarely with a second; genicula often calcified over and obscure, sometimes evident by a basal constriction, but rarely fully free and flexible; tetrasporangial conceptacles borne both on the margins of the crustose thallus and on the erect branches, very low domoid, about 250 μ in diameter, in age becoming calcified over; sexual plants not seen.

Thalli primo gradu crustosi ad 8-10 cm. patentes, substrato firme adhaerentes, marginibus, autem, ad 1 cm. discretis lobatisque, 1 mm. vel minus crassitudine, lobis crescentia inaequalibus, secundum oras anastomosantibus, lacunas interdum temporaliter reliquentibus; partes thalli erectae e protuberantiis cylindricis sparsis plus minusve erectis constantes, his in superficie 4-12 mm. post margines crescentibus, 4-7 mm. alt., c. 1 mm. diam. factis, angulatis, qua in parte crebris saepe irregulariter anastomosantibus, unaquaque unicum geniculum basale habente; genicula per superficiem saepe calcifata et obscura, interdum per constrictionem basalem manifesta, raro, autem, omnino discreta flexibiliaque; con-

ceptacula tetrasporangialia et in marginibus thalli crustosi et in ramis erectis producta, humillimo-domoidea, c. 250 μ diam., adulta super superficiem calcifacta facta; plantae sexuales non visae.

TYPE: E. Y. Dawson 22118, February 6, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: On intertidal rocks at about -0.5 foot tide level, reef west of abandoned packing plant, Wreck Bay, San Cristobal Island, Galapagos.

This species is so extraordinary in its prominently crustose form with short, only once-segmented branches, that it cannot be confused with any other *Amphiroa*. It appears in nature or in the hand like a short-branched *Lithophyllum* species, especially since the conceptacles are borne both on the crust and the branches. However, slight pressure on a branch breaks it at the base and reveals the uncalcified genicular cushion.

Archeolithothamnium pacificum (Dawson) comb. nov. *Sporolithon pacificum* Dawson 1960, p. 38. Both Madame Lemoine and J. Harland Johnson have pointed out that since *Archeolithothamnium* is widely recognized both as a recent and fossil genus, there is scant justification for recognizing the apparently equivalent *Sporolithon*. Specimens from the lower intertidal 1 mile east of the Darwin Station, D. 33218, are better developed than the type specimen from Isla Caño, Costa Rica.

Melobesia membranacea (Esper) Lamx. D. 21991a, on *Plocamium*, Hood Island; D. 22150, on *Plocamium*, D. 22045, on *Ochtodes* and *Laurencia*, Academy Bay. The material found on *Pterocladia* by Taylor and identified (1945) as *M. galapagensis* (Fosl.) Tayl. has been reexamined. It seems to be the same as mine and to agree satisfactorily with *M. membranacea*. I do not find any examples among the Galapagos collections with tetrasporangial conceptacles much exceeding 150 μ in diameter, and I am led to question the independent status of Foslíe's species and the accuracy of his description.

Melobesia marginata Setch. & Fosl. D. 22008, well-developed on *Laurencia*, Academy Bay.

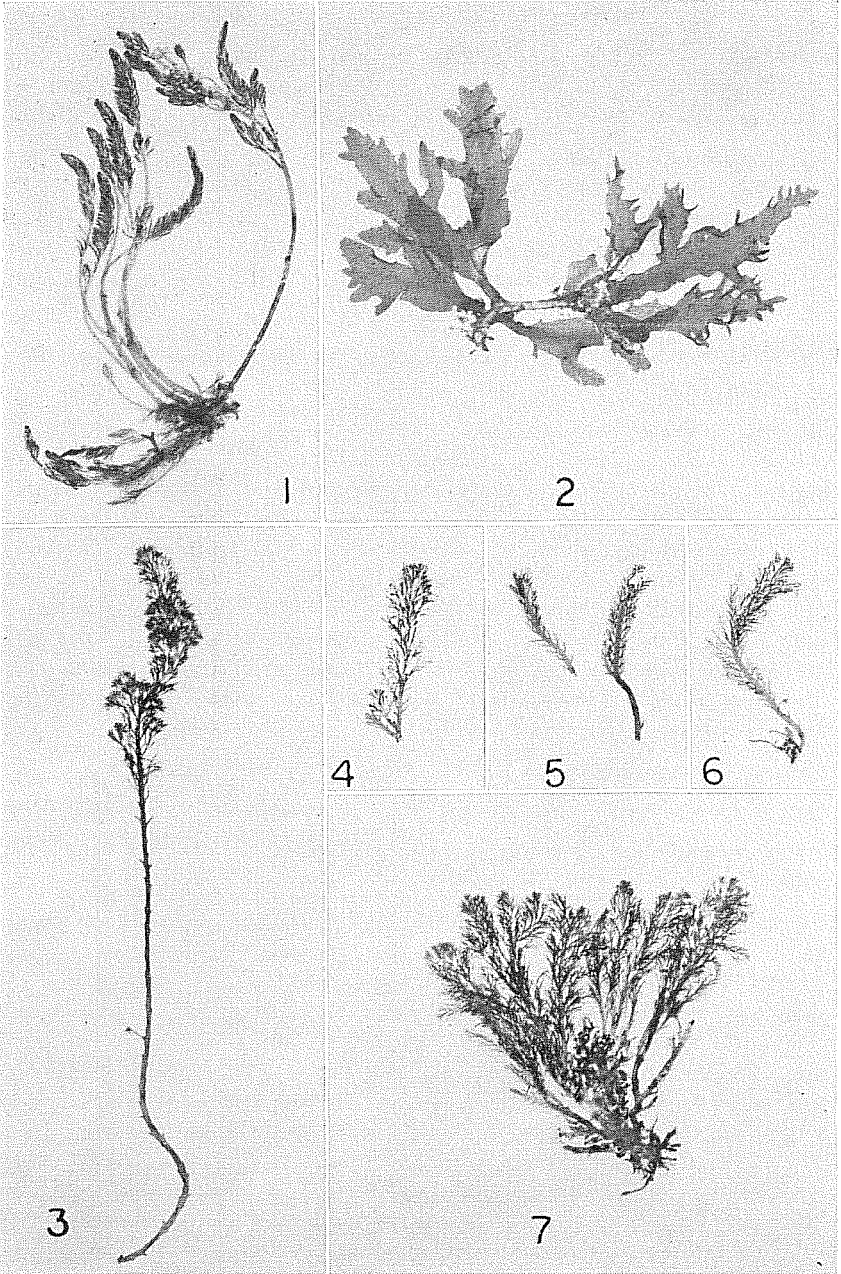
Dermatolithon canescens (Fosl.) Fosl. D. 22233, on *Glossophora*, Academy Bay.

Lithophyllum decipiens (Fosl.) Fosl. D. 22102, 22271b, Academy Bay.

PLATE 1



Fig. 1. *Bryopsis indica* var. *triseriata*. Habit of the type specimen, showing curved and apparently second pinnae that are actually distichously six-ranked, $\times 2$. Fig. 2. *Bartoniella equatoriana*. Part of the type material showing branching habit and faint but coarse midrib, $\times 2$. Fig. 3-7. *Pterosiphonia paucicorticata*. Portions of several different plants from the type locality to show variation in stature and branching. Fig. 3 shows the characteristic, multifarious, irregularly disposed branchlets of older parts. Fig. 5-6 show the distichous character of branches in mid-parts. Fig. 7 shows a part of a characteristic tufted plant. All $\times 2$.



Lithothamnium fragilissimum Fosl., in Weber van Bosse & Foslie D. 22081, lower intertidal, Wreck Bay.

Grateloupia versicolor (J. Ag.) J. Ag. D. 21998, 22277, Academy Bay; D. 22353, Tortuga Bay. The first of these is an exceptionally proliferous form with many short, spine-like branchlets.

Grateloupia howeii Setch. & Gard. Several collections of this species have been obtained both at Wreck Bay and Academy Bay and are found to agree with what Taylor (1945) misidentified as *Gigartina chauvinii*. It is one of the most conspicuous and coarse red algae of the lower intertidal zone, and because of the heavily papillate, flat blades looks entirely like a *Gigartina* species in the field.

Cryptonemia guaymasensis (Daws.) Daws. D. 22279, Academy Bay (a narrow form).

Carpopeltis clarionensis (Setch. & Gard.) Daws. D. 22266, 22370, Academy Bay; D. 22306, Villamil, Isabela Island. These specimens seem clearly to be the same as material recently reported from Masachapa, Nicaragua (Dawson 1962) and inadvertently cited as *?Polyopes clarionensis*. The plants have a distinct discoid or low-conical holdfast and differ in this respect from the otherwise similar *C. stella-polaris* of the Gulf of California. However, they lack the heavy, branched stipe of the Clarion Island type. Thus, since topotype material has not yet been obtained and since the only other recognition of this plant is from Hawaii where a larger form is reported (Dawson 1954), we still have not a fully satisfactory circumscription of this quite rare species.

Hypnea valentiae (Turn.) Mont. D. 22331, 22415, Tortuga Bay, inner lagoon.

Hypnea spinella (Ag.) Kütz. D. 22049, 22110, 22366, Academy Bay; D. 21982, Punta Suarez, Hood Island.

Gigartina lessonii Bory D. 21995, drift at Punta Suarez, Hood Island, December 1961 (Robert Bowman & party). The material reported by Farlow (1902) was from Elizabeth Bay and Iguana Cove, Albemarle Island, Feb. 1899, Snodgrass & Heller. The only Galapagos *Gigartina* specimen found in Herb. Farlow at the present time bears the label "Gigartina lessonii, Tagus Cove, Albemarle Island, Feb. 1899." Comparison with the specimen separated by Farlow as *Corallina berterii* shows that parts of each are on the two sheets, and that in all probability they came from the same dredge haul, namely, from 15 fathoms in Elizabeth Bay. Further comparison with *Gigartina tepida* Hollenberg from similar depths in the Gulf of California reveals such close correspondence that it seems justifiable here to refer the Albemarle (Isabela Island) specimen to *G. tepida*. The distinctions between this Pacific plant and the Atlantic *G. teedii* (Roth) Lamx. remain to be worked out more adequately.

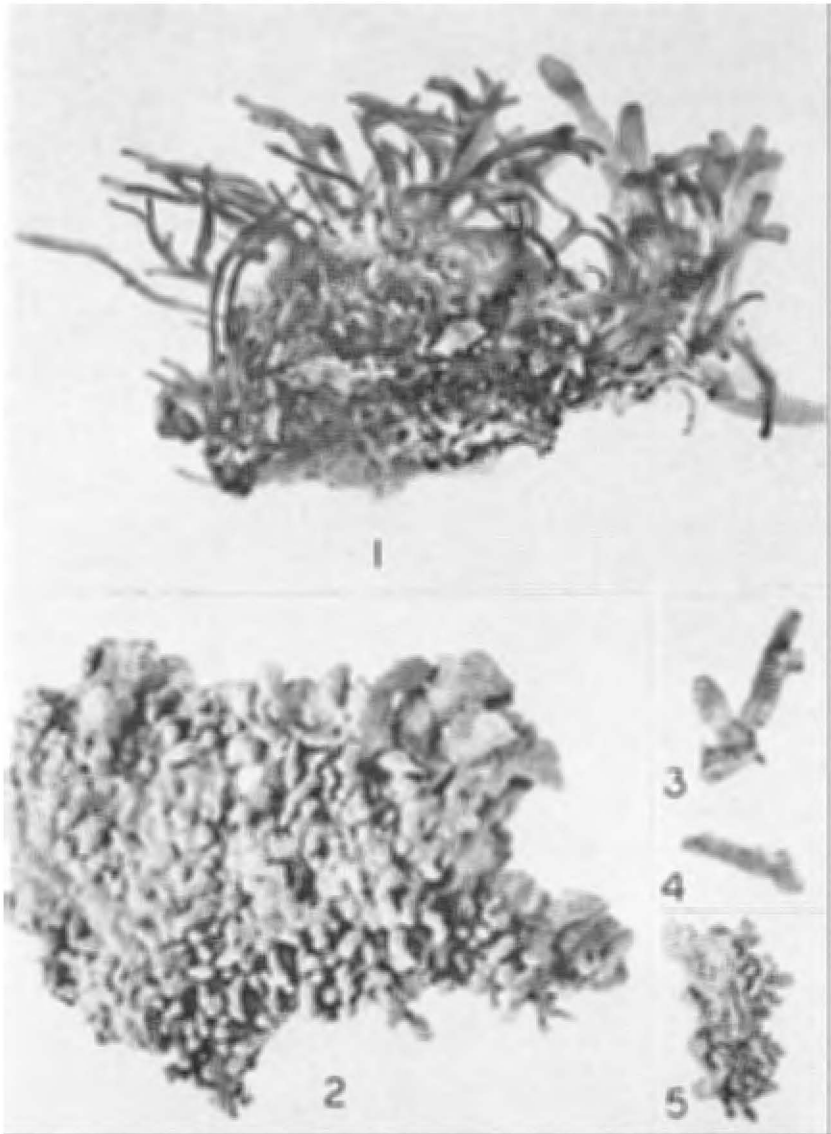


PLATE 2

Fig. 1. *Laurencia ligulata*. Habit of part of the type material, $\times 3$. Fig. 2-5. *Amphiroa crustaeformis*. Fig. 1. Habit of part of the type collection as seen from above, $\times 1.5$. Fig. 3. An erect branch showing a single intact geniculum, $\times 3$. Fig. 4. A detached erect branch showing its basal geniculum, $\times 3$. Fig. 5. Part of a crust seen in lateral view, $\times 1.5$.

Gelidiopsis intricatus (Ag.) Vickers D. 22009, 22021, Academy Bay; D. 22078, Wreck Bay; D. 22301, Villamil.

Gelidiopsis variabilis (Grev.) Schm. D. 22251, Academy Bay.

Champia parvula (Ag.) Harv. D. 22168, growing in a *Hypnea* mat, Punta Nuñez, Academy Bay.

Antithamnion breviramosus var. *simplex* Dawson D. 21984a, 21427a, 21454a, Punta Suarez, Hood Island, mostly in violently surfy areas; D. 22163a, Isla Cuamaño, Academy Bay. The Hood Island material is richly tetrasporangial and is the first reproductive material of this plant so far encountered. The sporangia are broadly ovoid and sessile, about 30 μ long at maturity, borne serially and adaxially on the second, third, fourth and sometimes fifth cells from the base of determinate laterals.

Griffithsia tenuis C. Ag. D. 22073, Wreck Bay; D. 22173, 22369, Academy Bay; D. 22300, Villamil; D. 22337, 22390, Tortuga Bay.

Spermothamnium phycophilum Tayl. This plant is represented by nineteen collections and appears to be one of the commonest epiphytes in the islands.

Spermothamnion snyderae Farl. D. 22036, 22225, saxicolous, Academy Bay.

Ceramium recticorticum Daws. D. 22272, Academy Bay. It is somewhat surprising to encounter this plant hitherto known only from the Sonora and Sinaloa coast of Mexico, but the well-developed material is convincing.

Ceramium fimbriatum Setch. & Gard. D. 22401, 22413b, inner east lagoon, Tortuga Bay.

Ceramium clarionense Setch. & Gard. D. 22056, 22263, Academy Bay; D. 21976, 22439a, Punta Suarez, Hood Island. The latter tetrasporangial collection also includes good tetrasporic material of *Ceramium templetonii* and provides good comparison of the distinctive, fertile, asexual characters of the two species in which the vegetative characters are somewhat similar.

Ceramium mazatlanense Daws. D. 22299, Villamil; D. 22447, Punta Suarez, Hood Island.

Ceramium horridum Setch. & Gard. Allan Hancock Foundation Station 167-34, Jan. 19, 1934, dredged in 15 fms., Post Office Bay. A fragmentary specimen of this collection was tentatively identified with *Centroceras bellum* because of the tendency for the cortical cells to be in rows (Dawson 1962). Additional material from that same dredge haul has now been found and examined in the Hancock Herbarium and shows the distinctive unicellular spines of *Ceramium horridum*.

Ceramium seriosporum sp. nov.

Plate 4, figs. 1-6

Thalli minute, epiphytic, about 1 mm. high, consisting of a prostrate or ascending filament attached by a few elongate, unicellular rhizoids at intervals of several segments and bearing several erect, subdichotomous axes; sterile filaments 20-30 μ in diameter, consisting of an axial cell row of cells slightly longer than broad corticated around their upper end by a double row of small, angular cells; apices blunt, little or not at all forcipate; tetrasporangia borne in nearly straight axial series of 3-6, one per segment, somewhat quadrate and a little broader than long, about 24 by 30 μ in dimensions; gonimoblast consisting of several successively developed long-clavate gonimolobes to 200 μ long; spermatangia not seen; branching of axes primarily dichotomous and subdistichous, but with occasional irregular lateral secondary branchlets.

Thalli minuti, epiphytici, c. 1 mm. alt. constantes e filamento prostrato ascendenteve, per rhizoidea pauca elongata unicellularia, intervallis aliquot segmentorum affixo, hoc filamento aliquot axes erectos subdichotomos ferente; filamenta sterilia 20-30 μ diam. constantia ex ordine axiali cellularum paululo longiorum quam latae, circum extremitatem earum superiorem per ordinem duplicem cellularum parvarum angularium corticatarum; apices obtusi vix aut haud forcipati; tetrasporangia in ordinibus axialibus fere rectis 3-6 producta; uno in omni segmento, aliquantulum quadrata, paululo latiora quam longa, c. 24 x 30 μ ; gonimoblastus constans ex aliquot gonimolobis longo-clavatis, ad 200 μ long. successive effectis; spermatangia non visa; ramificatio axium saepissime dichotoma et subdistichosa, ramulis lateralibus, autem, irregularibus secundariis interdum visis.

TYPE: E. Y. Dawson 22154, February 24, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: Epiphytic on crustose corallines with *Antithamnion veleroae*, intertidal on the seaward side of Isla Cuamaño, Academy Bay, Santa Cruz Island, Galapagos Archipelago.

This is an anomalous member of the genus *Ceramium* that may ultimately be segregated. Its narrow-clavate, spreading gonimolobes, axially seriate, quadrate sporangia and very small size are distinctive.

Ceramium prostratum sp. nov.

Plate 4, figs. 10-11

Thalli epiphytic, prostrate, to about 5 mm. in extent, consisting of branched, cylindrical axes attached ventrally at frequent intervals by groups of rhizoids with multicellular tips; axes 90-110 μ in diameter, completely corticated, the nodes not superficially evident, the cortical cells in irregular arrangement, radially elongate, angular and of irregular size, 5-16 μ in maximum diameter in surface view; axial cell row thick-walled, the lumina elliptical or more or less rectangular, 40-60 μ wide, 1.5-2 diameters long; branching primarily dichotomous and distichous but with irregular lateral proliferous branchlets; tips not forcipate;

spermatangial sori forming an enveloping sheath around terminal or subterminal portions of branches; other reproduction not seen.

Thalli epiphytici, prostrati, ad c. 5 mm. extensi, constantes ex axibus ramosis cylindricis per rhizoidea aggregata, cacuminibus multicellularibus praedita, crebro ventraliter affixis; axes 90-110 μ diam. omnino corticati, nodis in superficie non manifestis, cellulis corticalibus irregulariter dispositis, radialiter elongatis, angularibus, magnitudine irregularibus, 5-16 μ diam. max. a superficie visis; cellulae ordinis axialis membranas crassas habentes, luminibus ellipticis aut plus minusve rectangularibus, 40-60 μ lat., 1.5-2 plo longioribus quam lata; ramificatio primo gradu dichotoma distichosaque, ramulis proliferis, autem, lateralibus irregularibus praedita; cacumina non forcipata; sori spermatangiales vaginam involventem circum partes ramorum terminales subterminalesve efficientes; reproductio alia non visa.

TYPE: E. Y. Dawson 22224a, February 11, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: Epiphytic on *Gymnogongrus* with *Spermothamnion*, intertidal rocky shore in front of Darwin Laboratory, Academy Bay, Santa Cruz Island, Galapagos Archipelago.

This plant is most closely related in its complete cortication, obscure nodes and irregular arrangement of cortical cells to *Ceramium howellii* Setch. & Gard., but it differs in its smaller size and approximate branching.

An additional collection appears to belong here but is of different habit: D. 22307, growing in a *Lophosiphonia* turf on rocks of small islet in front of Villamil, Isabela Island, Feb. 9, 1962. Structurally it is like the type above, but it differs in habit from the epiphytic plant in that its growth in a dense turf provides for the branches to be partially erect in the turf rather than prostrate and distichous. The irregularly lateral, multifarious branching of these suberect parts is so prominent that dichotomies of the primary filaments are effectively obscured.

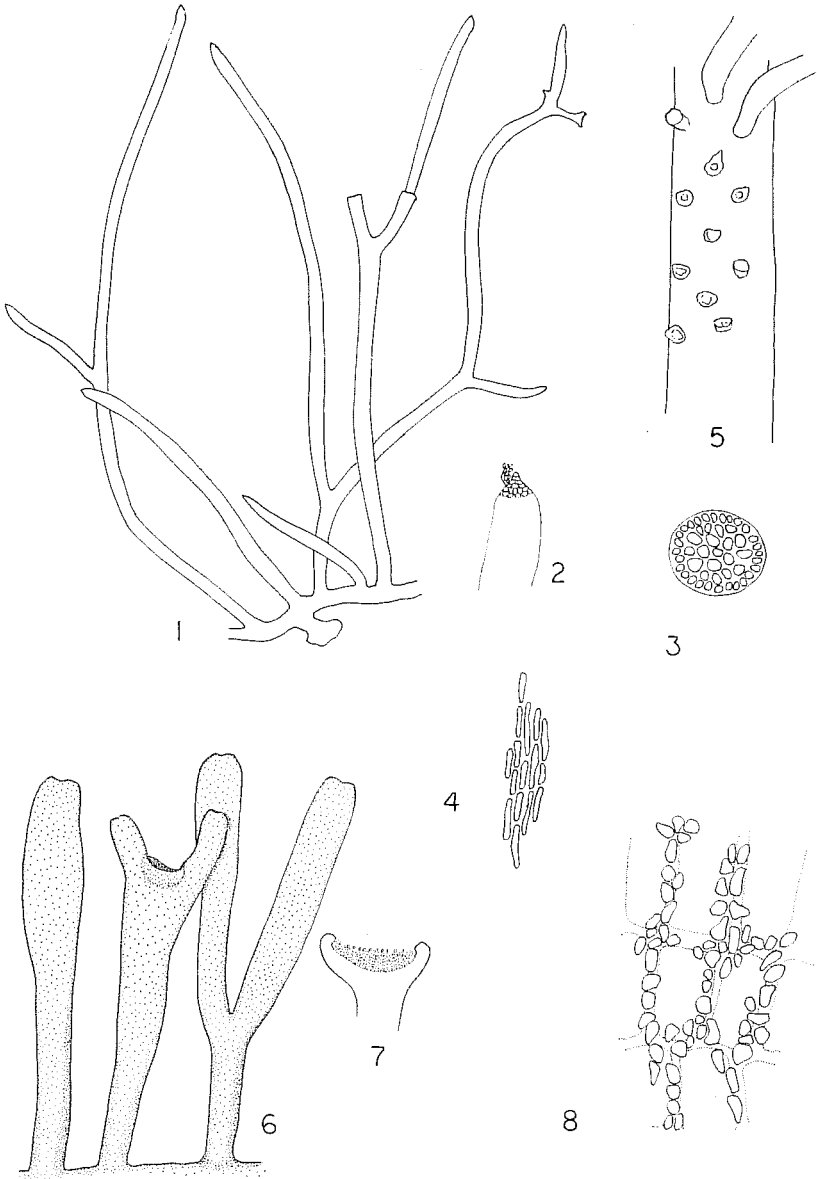
Cryptopleura crispa Kylin D. 22006, 22265, lower intertidal, Academy Bay; D. 22329, ocean side, Tortuga Bay; D. 22434, surfy shelf, Punta Suarez, Hood Island. Several of these plants are in well-developed tetrasporangial condition and show no evident distinction from the species as it is known in Mexico and California. They grow on various hosts such as *Laurencia*, *Cystophora*.

Cryptopleura imbricata Daws. D. 22262, lower intertidal, Academy Bay. This is a remarkable record for this rare species only recently described from Baja California (Dawson 1962).

PLATE 3



Fig. 1-4. *Alsidium pusillum*. Fig. 1. Branching habit of part of the type material, $\times 16$. Fig. 2. Apex of an axis showing apical cell and trichoblast, $\times 75$. Fig. 3. Transsection of an axis, $\times 75$. Fig. 4. Surface view of cortical cells, $\times 75$. Fig. 5. *Bryopsis indica* var. *triseriata*. Lateral view of an axis of the type material to show arrangement of the three rows of deciduous pinnae. Fig. 6-7. *Laurencia ligulata*, from the type collection. Fig. 6. Three erect axes, one having a sper-



matangial cup, $\times 5$. Fig. 7. A spermatangial cup in vertical section, $\times 10$. Fig. 8. *Pterosiphonia paucicorticata*. Part of an axis of the type material seen in surface view showing the development of the incomplete cortex confined, essentially, to the surface area over the inside lateral walls of the pericentral cells.

Taenioma perpusillum (J. Ag.) J. Ag. D. 22082, on *Lithophyllum* at Wreck Bay, San Cristobal Island.

Bartoniella ? *equatoriana* sp. nov.

Plate 1, fig. 2; Plate 4, figs. 7-9

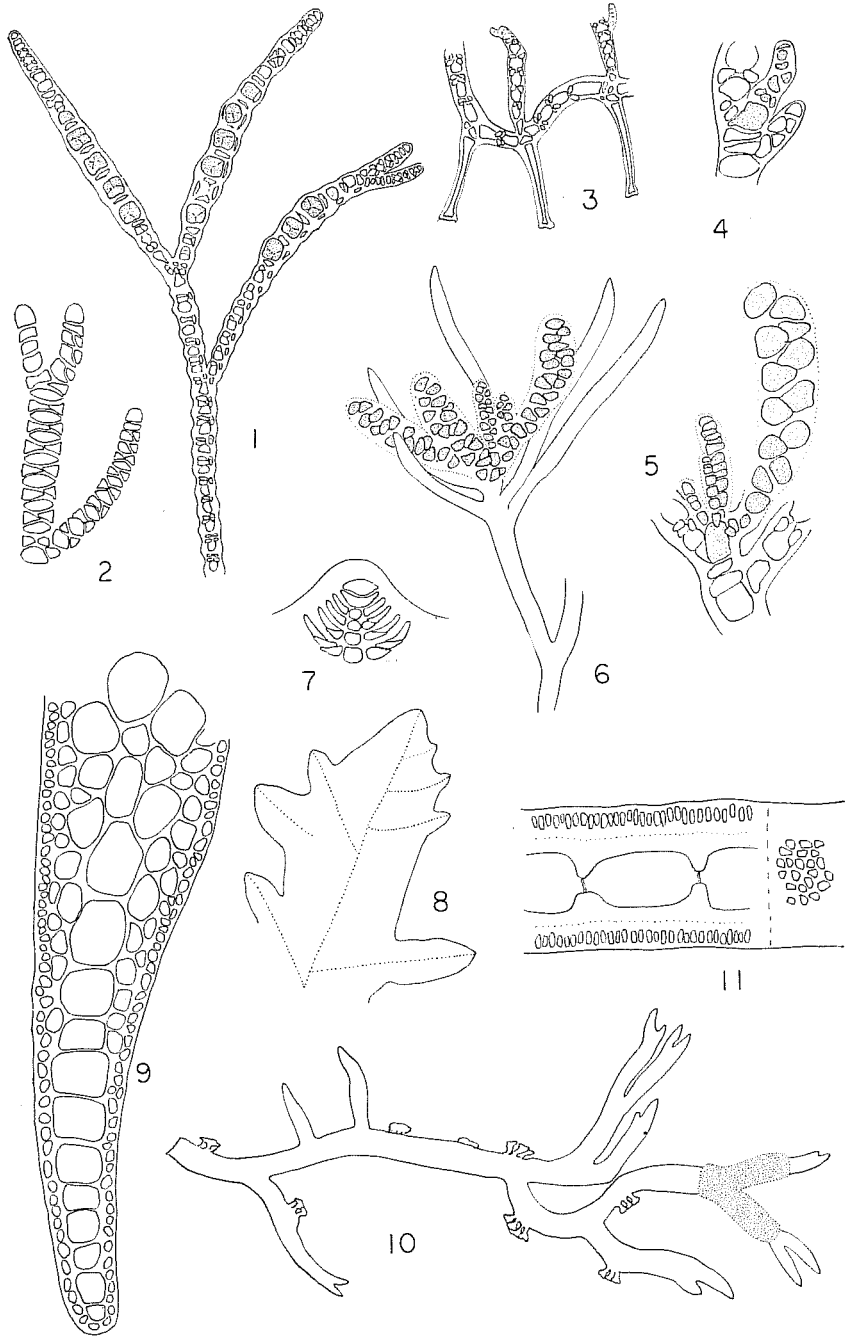
Thalli to 2.5 cm. tall, consisting of several erect, stipitate, branched blades from a fleshy, discoid holdfast; blades from a branched cylindrical stipe about 0.75 mm. in diameter and 3-4 mm. long, merging into a faint percurrent midrib with branch ribs at each branch or lobe of the blade; blades polystromatic throughout, 2.0-2.5 mm. broad, branched or lobed from the margin, non-proliferous from the blade surface; mature blades about 100 μ thick in marginal parts, to 300 μ thick or more at the midrib, the margin consisting of a layer of small pigmented surface cells about 10 μ in diameter and a medulla of large, rotund, colorless cells 50-70 μ in diameter, these in a single layer along the margins and augmented toward the midrib by additional rotund cells of somewhat smaller size, the midrib, thus, consisting of a central axial filament surrounded by a fleshy tissue of large, isodiametrical cells; apices with a single prominent apical cell, the primary axial cell row apparently without intercalary divisions, but early undergoing tangential divisions to produce the polystromatic midrib; reproduction not seen.

Thalli ad 2.5 cm. alt. constantes ex aliquot laminis erectis stipitatis ramosis ex haptero discoideo succulento orientibus; laminae e stipite cylindrico ramoso c. 7.5 mm. diam. 3-4 mm. long expansae, stipite in costam inconspicua percurrentem, ad unumquemque laminae ramum ramulum costae efficientem mergente; laminae omnino polystromaticae, 2.0-2.5 mm. lat., e margine ramosae aut lobatae, e superficie non-proliferae; laminae maturae c. 100 μ crass. in partibus marginalibus, ad 300 μ crass. vel plus ad costam, margine constante e strato cellularum parvarum coloratarum superficialium c. 10 μ diam., et e medulla cellularum maguarum rotundarum sine colore 50-70 μ diam., his cellulis in strato singulo secundum marginales dispositis, et versus costam per cellulas rotundas additicias paululo minores auctis, costa, ita, e filamento centrali axiali per telam succulentam cellularum magnarum isodiametricalium circumdato constante; apices unam cellulam apicalem perspicua habentes, cellulis ordinis primarii axialis ut videtur sine divisionibus intercalaribus, mox, autem, ad costam polystromaticam efficiendam, divisiones tangenciales subeuntibus; reproductio non visa.

PLATE 4



Fig. 1-6. *Ceramium seriosporum* from the type collection. Fig. 1. Upper portion of a tetrasporic axis, $\times 102$. Fig. 2. Detail of cell divisions of upper portion of a sterile axis, $\times 275$. Fig. 3. Part of a prostrate filament showing unicellular rhizoids and erect axes, $\times 136$. Fig. 4-6. Several stages in development of long-clavate gonimolobes, $\times 205$. Fig. 7-9. *Bartoniella equatoriana* from the type collection. Fig. 7. Apex to show cell divisions. Fig. 8. Upper portion of a blade to show marginal branching and position of midrib and its branches. Fig. 9. Trans-section of a blade showing six pericentral cells at the midrib. Fig. 10-11. *Ceramium prostratum*. Fig. 10. Habit of part of the prostrate spermatangial type, $\times 28$. Fig. 11. (left) Median optical view of an axis; (right) superficial view, $\times 170$.



TYPE: E. Y. Dawson 22370a, February 26, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: On intertidal rocks with *Gelidium pusillum* var. *pacificum* near the Darwin Laboratory, Academy Bay, Santa Cruz Island, Galapagos Archipelago.

This small plant, as a member of the Hypoglossum group according to Kylin, best agrees with *Bartoniella* in its polystromatic thallus, presence of a midrib and marginal branching, but differs markedly in its small size and in other characters from the two austral species of this genus heretofore known.

Pterosiphonia paucicorticata sp. nov.

Plate 1, figs. 3-7; Plate 3, fig. 8

Thalli densely tufted, about 2 cm. high (old fertile axes to 4 cm.), growing on rocks and barnacles in heavy surf, consisting of prostrate parts attached ventrally by multicellular rhizoids and giving rise to erect, axes that are cylindrical and 250-400 μ in diameter at the base, tending to be compressed and distichously branched in mid-parts, and multifariously branched above, or multifarious throughout; the ultimate branchlets again cylindrical, about 40-60 μ in diameter, somewhat recurved and subacute; main axes lightly and incompletely corticated by short-celled appressed filaments from the pericentral cells; pericentral cells mostly 8-9, of about the same diameter as the central axial filament, about 130 μ long in mature parts; lateral determinate branchlets 0.8-1.5 mm. long, with 8-12 alternate, ultimate branchlets, these distichous in mid-parts, irregularly disposed above; tetrasporangia seriate, 5-6 in ultimate determinate branchlets, about 60 μ in diam.; other reproduction not seen.

Thalli conferte fructiculosi, c. 2 cm. alt., in saxis *Cirripediisque* in fluctu gravi, constantes e partibus prostratis per rhizoidea multicellularia ventraliter affixis, et axes erectos cylindricos ad basim 250-400 μ diam., mediis in partibus compressos et distichose ramosos, supra multifarie ramosos efficientibus; ramuli ultimi rursus cylindrici, c. 40-60 μ diam., aliquantulum recurvati atque subacuti; axes principales per filamenta appressa, cellularum brevium, e cellulis pericentralibus orientium modice imperfecteque corticati; cellulae pericentrales plerumque 8-9, diametro filamento axiali centrali satis similes, in partibus maturis c. 130 μ long, ramuli determinati laterales 0.8-1.5 mm. long., 8-12 ramellos ultimos alternatos, media in parte distichosos, supra irregulariter dispositis habentes; tetrasporangia in ordinibus axialibus, 5-6 in ramuli ultimi, c. 60 μ diam.

TYPE: E. Y. Dawson 22423, March 1, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: Violently surfy seaward shelf near the blow hole at Punta Suarez, Hood Island, Galapagos Archipelago.

ADDITIONAL MATERIAL: D. 22432, 22449, 22456, all from the same general locality as the type.

The light and incomplete cortication of this plant together with its habit and branching characters mark it distinctly from other Pacific species. It occurred as one of the dominant plants in its specialized habitat

and may be found more widely when such dangerously uninviting localities can be explored.

Heterosiphonia wurdemannii var. *laxa* Børg. D. 22391a, 22398, 22413a, Tortuga Bay.

Herposiphonia subdisticha Okam. D. 22233a, epiphytic on *Glossophora*, Academy Bay.

Herposiphonia tenella (Ag.) Nägeli D. 21905, Barrington Island; D. 21980, 21988, 22430, 22438, 22455, Punta Suarez, Hood Island; D. 22248, Academy Bay.

Herposiphonia secunda (Ag.) Ambronn D. 22023, 22181, Academy Bay; D. 22074, Wreck Bay.

Lophosiphonia villum (J. Ag.) Setch. & Gard. D. 22156, 22243, Academy Bay; D. 22309, 22312, Villamil; D. 22396, Tortuga Bay; D. 22454, 22458, Punta Suarez, Hood Island.

Bostrychia tenuis f. *simpliciuscula* Post D. 22406d, on mangroves bordering Tortuga Bay (det. E. Post).

Polysiphonia howei Holl. D. 22101, brackish tidal pool under mangroves, Academy Bay.

Polysiphonia bifurcata Holl.³ Plate 5, fig. 1-2 D. 22237, Academy Bay at depth of 8 meters; D. 22418, Tortuga Bay; D. 22451, 21983, Punta Suarez, Hood Island. These plants are assigned to this species with some hesitation, but there seems to be no better disposition at present. They are shorter than the type of the species, which was collected from deeper water (36-55 meters), and all have seven pericentral cells.

A careful reexamination of the type of *P. bifurcata* has revealed that there are six (rather than five) pericentral cells in the Hood Island collection, but only 5 in Taylor's Costa Rica specimen cited with the type (460a-35). Sexual plants were not available to the writer when the species was described and have not been seen previously.

All the new collections are fertile. D. 21983 has all three phases; D. 22237 has both male and tetrasporic plants; D. 22451 has male plants; D. 22418 is tetrasporic. The cytocarps are ovoid and measure up to 280 μ in diameter. The ostiolar cells are not particularly enlarged. The spermatangial structures are sessile and without any vegetative branching of the trichoblast primordia from which they arise. They occur mostly one per segment in alternating positions on either side of the adaxial row of pericentral cells and mature on the adaxial, concave side of the terminal branches. This seems to be a condition not found in other species of *Polysiphonia*.

³This and the following species of *Polysiphonia* have been identified and annotated by Dr. G. J. Hollenberg.

The tetrasporangia arise in a straight series and the seeming spiral arrangement at maturity is secondary.

Finally it should be noted that no trichoblasts have been described previously for *P. bifurcata*. In the newly collected material trichoblasts are found only occasionally on cystocarpic plants and less frequently still on tetrasporic plants. None were found on male plants. The branch tips are not as prominently forcipate as in the previously described specimens of this species.

Three collections from Scammon Lagoon, Pacific Baja California, Mexico, previously identified with *P. bifurcata* (Hollenberg 1961), have five pericentral cells and differ from the type also in having much-attenuate branches toward the bifurcate apices. These may prove to represent an independent species.

Polysiphonia decussata Holl. D. 22425, Punta Suarez, Hood Island. The branching of these is less distichous than described for the type, and trichoblasts and scar-cells are less regular in position.

Polysiphonia flaccidissima Holl. D. 22075, 22133, Wreck Bay; D. 22275, 22280, 22364, Academy Bay; D. 22324, 22411, Tortuga Bay.

Polysiphonia simplex Holl. D. 22011, 22054, 22315, Academy Bay; D. 22345, 22398, Tortuga Bay.

Alsidium pusillum sp. nov.

Plate 3, figs. 1-4

Thalli 6-10 mm. tall, cylindrical, about 100-160 μ in diameter, consisting of semi-prostrate parts attached by frequent ventral multicellular discs and giving rise dorsally to erect or ascending free axes; free axes infrequently branched, tending to taper slightly in upper parts but the apices short-conical, the apical cell prominent; trichoblasts infrequent and short; transection showing a central axial filament and five pericentral cells all about the same diameter (25-28 μ); cortex of two layers of cells, the inner of about the same size and empty appearance as the pericentral cells, the outer narrow-elongated and pigmented; reproduction not seen.

Thalli 6-10 mm. alt., cylindrici, c. 100-160 μ diam., constantes e partibus semi-prostratis per discos frequentes ventrales multicellulares affixis, et axes discretos erectos ascendentesve dorsaliter efficientibus; axes discreti raro ramosi, in partibus superioribus saepius paululum attenuati, apicibus, autem, brevi-conicis, cellula apicali perspicue; trichoblasti rari brevesque; transectio filamentum centrale axiale atque 5 cellulas pericentrales, diametro omnis quasi eadem (25-28 μ) praebens; cortex constans e duobus stratis cellularum, cellulis strati interioris eadem magnitudine aspectuque vacuo cellulis pericentralibus quasi similibus, cellulis strati exterioris angustis elongatis et coloratis; reproductio non visa.

TYPE: E. Y. Dawson 22018, February 12, 1962, in Herbarium of the Allan Hancock Foundation.

TYPE LOCALITY: Growing in a low algal turf of *Herposiphonia*, *Jania*, *Hypnea*, etc., intertidal, Academy Bay, Santa Cruz Island, Galapagos Archipelago.

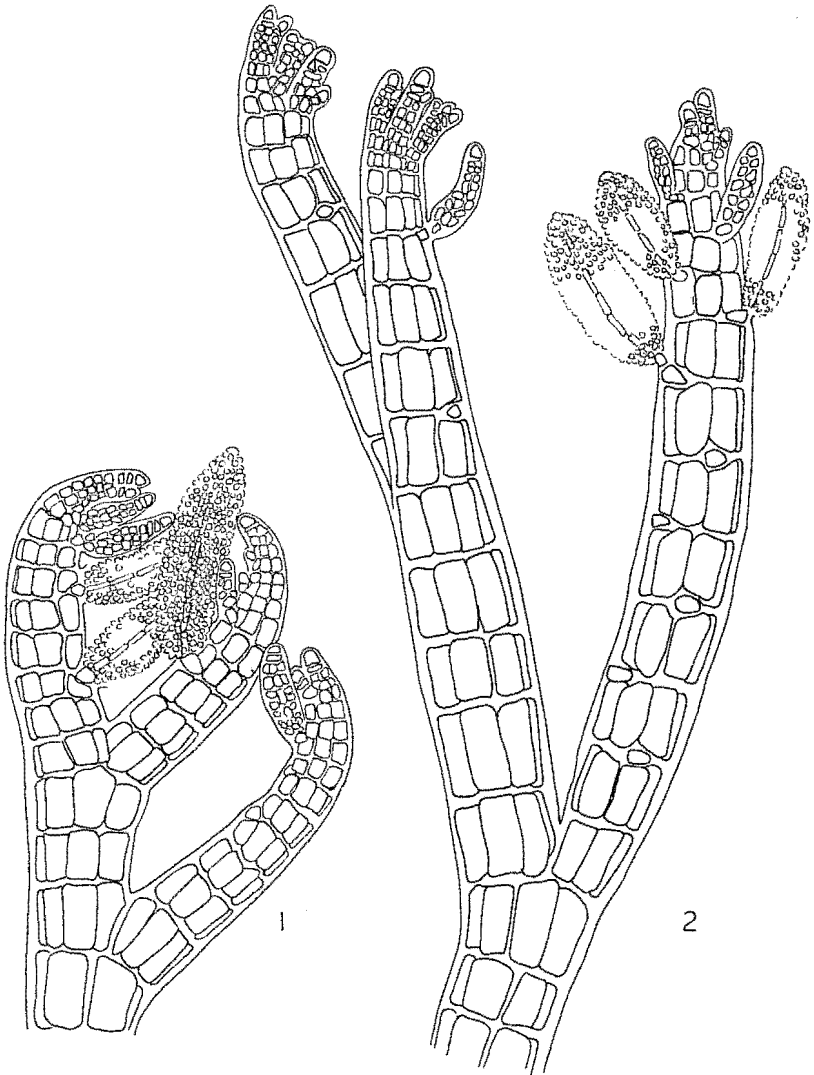


PLATE 5

Fig. 1-2. *Polysiphonia bifurcata* from Punta Suarez, Hood Island, D. 21983. Fig. 1. Second spermatangial branchlets arising on the adaxial side of the more-or-less forcipate terminal parts of branches, $\times 177$. Fig. 2. Portion of a terminal part of a plant showing on the right an adaxial view of a branch bearing two staggered rows of spermatangial branchlets, $\times 177$.

This species shows much in common with the European *A. helminthochorton* from which it differs by its much smaller size, its five rather than seven to eight pericentral cells and its infrequent trichoblasts. The only other species of *Alsidium* reported from the Pacific is *A. pacificum* Dawson (1959) from Palmyra Island. It has about seven pericentral cells and markedly enlarged central axial cells in older parts, although it is of similar size and habit.

Chondria californica (Collins) Kylin D. 22056a, Academy Bay; D. 22336, Tortuga Bay.

Laurencia sinicola Setch. & Gard. D. 22435, Punta Suarez, Hood Island.

***Laurencia ligulata* sp. nov.**

Plate 2, fig. 1; Plate 3, figs. 6-7

Thalli colonial, consisting of many compressed, subsimple erect axes 9-12 mm. high from a crustose, adherent basal tissue; erect parts cylindrical below, 600-700 μ in diameter, ligulate above, 1.0-1.2 mm. wide and about 0.4 mm. thick, mostly simple in vegetative development, sometimes once or twice forked, occasionally with a lateral branch in the plane of the flattening, terminally somewhat indented to the apical pit; trichoblasts not evident; surface cells not papillate, small, mostly 12-14 μ in maximum diameter; medullary cells 40-50 μ in diameter, without lenticular thickenings; spermatangia borne in an open cup terminating a ligulate branch and usually with a short, flat, branch-extension on either side; spermatangiophores about 200 μ long, slender, covered with spermatangia except the bulbous terminal cell, crowded in the cup perpendicularly to its bottom and sides; other reproduction not seen.

Thalli coloniales constantes ex axibus erectis multis compressis subsimplicibus, 9-12 mm. alt., e tela basali adhaerente crustosa orientibus; partes erectae infra cylindricae, 600-700 μ diam., supra ligulae 1.0-1.2 mm. lat., c. 0.4 mm. crass., in crescentia vegetativa magna ex parte simplices, interum semel vel bis furcatae, interdum ramum lateralem in complanatione praebentes, terminaliter ad foveam apicalem satis indentatae; trichoblasti non manifesti; cellulae superficiei non papillatae, parvae, magna ex parte 12-14 μ diam. max.; cellulae medullariae 40-50 μ dian., sine incrassationibus lenticularibus; spermatangia in poculo aperto ramum ligulatum terminante, extensionem rami brevem planam utroque in latere plerumque habente, producta; spermatangiophores c. 200 μ long. tenues, cum spermatangiis, cellulis terminalibus bulbosis exceptis, tecti, ad partes poculi inferiores lateralesque perpendiculariter crebre dispositi; reproductio alia non visa.

TYPE: E. Y. Dawson 22267, March 8, 1962, in Herb. Allan Hancock Foundation.

TYPE LOCALITY: On a coral rock in the lower littoral, 1 mile east of the Darwin Laboratory, Santa Cruz Island, Galapagos Archipelago.

This is one of the most distinctive of Pacific laurenciae. Its subsimple, colonial, ligulate blades and peculiar spermatangial cups distinguish it without question.

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