Los Angeles County Museum

CONTRIBUTIONS IN SCIENCE

mber 27 January 19, 1959

MARINE ALGAE FROM THE 1958 CRUISE OF THE STELLA POLARIS IN THE GULF OF CALIFORNIA

By E. Yale Dawson

os Angeles County Museum • Exposition Park • Los Angeles 7, Calif.

CONTRIBUTIONS IN SCIENCE is a series of miscellaneous technical papers in the fields of Biology, Geology and Anthropology, published at irregular intervals by the Los Angeles County Museum. Issues are numbered separately and numbers run consecutively regardless of subject matter. Number 1 was issued January 23, 1957. The series is available to scientists and scientific institutions on an exchange basis. Copies may also be purchased at a nominal price.

MARINE ALGAE FROM THE 1958 CRUISE OF THE STELLA POLARIS TO THE GULF OF CALIFORNIA[1]

By E. YALE DAWSON[2]

Our recorded knowledge of the marine flora of the Gulf of California is based largely upon the paper of Setchell and Gardner (1924) and those of the writer (Dawson 1944, 1949b, 1953, 1954). Incidental accounts of a number of species have appeared in various papers by Hariot, Howe, and by Dawson. There have remained to date, however, many areas, especially in the southern Gulf of California, in which few or no collections have been made, and any description of the major components of the sublittoral flora at any localities in that region have been notably lacking. This has been due to the fact that virtually all collections prior to the present were made by dredge or by shore collecting at low tide where only exposed areas would be examined. Furthermore, most of these were made during late winter months when, in the southern Gulf, the flora is in poor development.

The collections reported upon here were made possible through the kindness and collaboration of Mr. and Mrs. John McNabb and Mr. and Mrs. Maurice A. Machris, who invited the writer, then Curator of Botany at the Los Angeles County Museum, to accompany them on a two-weeks cruise in April, 1958. Mr. McNabb directed the movements of the M/V Stella Polaris in accord with the best interests of the botanical studies, such that it was possible on almost every day of the cruise, from April 15 to 29, to anchor in a different and suitable locality from which we could engage in shallow water diving, with face plate and snorkle, to observe and collect the representatives of the flora. Inasmuch as the cruise moved regularly northward from La Paz to Isla San Pedro Nolasco off Guaymas, Sonora, it was possible to observe a geographic progression in the development of the flora from the impoverished algal region around Isla Espíritu Santo to the relatively richly vegetated region in the vicinity of Guaymas, Sonora.

The following brief field observations, accordingly, are arranged from south to north. In each case the inclusive collection numbers from the writer's series are given as a means of designating the collections cited elsewhere in the text. A bare listing of the various species obtained at each station is given as an aid to future comparative floristic work in the region.

The collections are deposited in the herbarium of the Los Angeles County Museum.

---

[1] Contribution from the Beaudette Foundation for Biological Research, Solvang, California. This study was aided in part by a National Science Foundation grant, G5848.

[2] Research Director, Beaudette Foundation, and Research Associate, Los Angeles County Museum.

GENERAL FIELD DATA

Lagoon between Isla Espíritu Santo and Isla Partida. April 16. Numbers 18969 to 18975.

The shallow inshore area in depths of 1 to 5 feet was completely dominated by large mats of *Caulerpa*. There was no *Sargassum* present, and no red algae of any significance were evident.

Caulerpa sertularioides, C. racemosa v. *turbinata, Halimeda discoidea, Enteromorpha compressa, Ernodesmis verticillata Hydrocoleum glutinosum.*

Entrance to west side of channel between Isla Espíritu Santo and Isla Partida. April 17. Numbers 18930 to 18948.

This area consists of rocks a few hundred feet off shore awash at mid-tide. The flora was completely different from that of the lagoon, but was in general exceedingly scant. There was scant and very short *Sargassum*, a fair growth of *Amphiroa*, some *Jania*, and a few dwarfish specimens of other species in cracks of the rocks. Almost no *Padina* occurred and indeed there was nothing of a conspicuous nature.

Hypnea nidulans, Codium sp. (prostrate), *Prionitis abbreviata* forms, *Ahnfeltia svensonii, Colpomenia sinuosa* v. *tuberculata, Gracilaria pachydermatica, Gelidium johnstonii, Corallina pinnatifolia* v. *digitata, Chlorodesmis hildebrandtii, Pocockiella variegata, Caulerpa sertularioides, C. racemosa* v. *turbinata, C. racemosa* v. *peltata, Heterosiphonia wurdemannii* v. *laxa, Falkenbergia* stage of *Asparagopsis taxiformis, Ceramium paniculatum, Taenioma perpusillum, Callithamnion paschale, Polysiphonia simplex, Spirulina subsalsa, Symploca hydnoides, Phormidium hormoides, Lyngbya aestuarii, L. majuscula.*

East side of Isla Partida. April 28. Numbers 18587 to 18598.

The flora here in depths of 1 to 4 feet was even more impoverished than on the west side. Only a few dwarfish plants of few species occurred, and there was nothing of a conspicuous nature present.

Codium sp. (prostrate), juvenile *Sargassum, Padina crispata?, Neomeris annulata, Centroceras clavulatum, Jania capillacea, Amphiroa annulata, Herposiphonia spinosa, Gracilaria pachydermatica?, Gelidiella hancockii, Falkenbergia* stage of *Asparagopsis taxiformis, Amphiroa dimorpha, Symploca hydnoides.*

Isla San Francisco. April 18. Numbers 18976 to 18988.

In depths of 2 to 7 feet on the southwest side of the island (on the north side of the anchorage inshore) a very poor flora appeared, consisting of only a few species with the exception of *Codium*, which occurred as the only conspicuous large plant. At a depth of 10 feet on the southwest side of the anchorage, collections by Mrs. Paquita Machris (numbers 18961 to 18963) indicated the dominance of *Asparagopsis, Galaxaura* and *Dictyota.*

Codium sp. (clumping), *Rhodymenia hancockii?*, *Jania longiarthra*, *Chnoospora implexa*, *Gelidiopsis tenuis*, *Polysiphonia mollis*, *Dasya* sp., *Cladophora utriculosa*, *Chlorodesmis hildebrandtii*, *Pocockiella variegata*, *Caulerpa racemosa* v. *peltata*, *Geppella decussata* sp. nov., *Sphacelaria furcigera*, *Peysonnelia rubra* v. *orientalis*.

Punta San Evaristo. April 19. Numbers 18949 to 18960.

Inshore on the southwest side in more or less protected places there was dominant *Sargassum* and *Chnoospora* on the bottom. On the south side near the entrance in a surfy area, *Liagora* was dominant on the bottom with some *Padina*, and more or less common *Colpomenia* and *Hydroclathrus* mixed in. The prostrate *Codium* formed large patches 1 to 3 feet in extent on the lower, under, or vertical surfaces of rather smooth rocks in depths of 1 to 3 feet. Young material of two species of *Sargassum* was noted together with some scrappy *Padina durvillaei*.

Liagora farinosa, *Laurencia obtusiuscula*, *Padina crispata?*, *Dictyota* sp., *Ulva lactuca*, *Codium* sp. (prostrate), *Sargassum sinicola*, *Colpomenia sinuosa* v. *tuberculata* (not collected), *Hydroclathrus clathratus*, *Chnoospora implexa*, *Padina caulescens?* *Lyngbya majuscula*, *Calothrix crustacea*, *Hydrocoleum glutinosum*.

Isla San Diego. April 19. Numbers 18913 to 18929.

Along the south end of the island near the prolonged reef, the bottom consisted of rich *Liagora* beds and fine big clumps of *Asparagopsis* on either side. Farther north along the inside shore, the cover was mainly of *Amphiroa* with some of the grass green *Laurencia obtusiuscula* close in. Observations were in depths of 1 to 6 feet.

Laurencia obtusiuscula, *Liagora farinosa*, *Codium* sp. *Asparagopsis taxiformis*, *Dictyota crenulata*, *Chondria* sp., *Amphiroa drouetii*, *Jania longiarthra*, *Chondria californica*, *Amphiroa annulata*, *Dictyota divaricata*, *Padina mexicana*, *Hypnea nidifica?*, *Liagora magniinvolucra*, *Sphacelaria tribuloides*, *Ectocarpus mitchellae*, *Pocockiella variegata*.

Bahía Agua Verde. April 20. Numbers 18877 to 18912.

Observations in depths of 1 to 6 feet along the inner margin of the lagoon on the south side of the bay showed an abundance of *Chnoospora*, *Hydroclathus*, *Rosenvingia* and *Laurencia*, and a general bottom cover of *Amphiroa*. A little way out, at the inner sea stack, *Amphiroa* was the general cover to depths of 1 to 6 feet, after which much *Padina* covered the bottom to 20 feet or more. *Halimeda* occurred in patches. *Dictyota* was present only as solitary individuals. *Sargassum* was spotty and mostly short, but some plants in 10 to 15 foot depths appeared to reach a height of 3 feet or more. There was no evidence of *Liagora* or *Asparagopsis*.

Sargassum horridum, *Chnoospora implexa*, *Gracilaria crispata*, *Padina caulescens*, *Hydroclathrus clathratus*, *Laurencia obtusiuscula*, *Rosenvingea intricata*, *Codium* sp. (clumping), *Codium* sp. (prostrate),

Amphiroa subcylindrica, Gracilaria pachydermatica, Gracilaria subsecundata, Amphiroa drouetii, Corallina pinnatifolia v. *digitata, Hypnea esperi, Colpomenia sinuosa, Jania longiarthra, Prionitis abbreviata, Bryopsis pennata, Laurencia papillosa* v. *pacifica, Herposiphonia tenella, Ceramium gracillimum* v. *byssoideum, Herposiphonia subdisticha, Halimeda discoidea, Rhodymenia hancockii, Ceramium sinicola* v. *interruptum, Dictyota divaricata, Ulva dactylifera?, Amphiroa dimorpha, Galaxaura arborea, Hypnea nidulans, Jania decussato-dichotoma, Gelidium johnstonii, Valoniopsis pachynema, Gelidium pusillum.*

El Solitario Rock, off Bahía Agua Verde. April 20. Numbers 18834 to 18876.

A rather varied and well developed flora occurred here, in depths of 2 to 5 feet, including a turf consisting of a number of small species of *Laurencia, Chondria, Ceramium* and *Amphiroa*, etc. *Gracilaria pachydermatica* occurred in cracks in the rocks, but the most conspicuous rock cover of larger plants consisted of *Asparagopsis*, and to a lesser extent, of *Sargassum.*

Saragassum sinicola, Derbesia hollenbergii, juvenile *Sargassum, Ceramium zacae, Gracilaria pachydermatica, Gelidium johnstonii, Chondria californica* with *Jantinella verrucaeformis, Polysiphonia concinna, Codium* sp. (clumping), *Laurencia obtusiuscula, Dictyota divaricata, Colpomenia sinuosa* v. *tuberculata, Laurencia obtusiuscula* v. *laxa?, Asparagopsis taxiformis, Amphiroa dimorpha, Amphiroa zonata, Prionitis abbreviata, Corallina pinnatifolia* v. *digitata, Laurencia papillosa* v. *pacifica, Grateloupia howei, Gracilaria* sp., *Hypnea nidifica, Hypnea johnstonii, Ectocarpus mitchellae, Chondria dasyphylla, Digenia simplex, Ceramium sinicola, Ceramium caudatum, Ceramium procumbens, Bryopsis muscosa, Centroceras clavulatum, Laurencia hancockii, Herposiphonia subdisticha, Galaxaura arborea, Laurencia sinicola, Dasya sinicola, Schizoseris pygmaea, Ceramium taylorii, Amphiroa annulata.*

Isla Monserrate. April 21. Numbers 18794 to 18822.

Collections were made along the northwest end of the island at a small rocky outcrop extending into the sand at depths of 4 to 5 feet. The general cover was of *Amphiroa* and epiphytic *Ceramium*. There was little *Codium, Asparagopsis* and *Digenia*, scant *Padina*, and no evidence of *Sargassum.*

Amphiroa subcylindrica, A. zonata, Codium sp. (clumping), *Halimeda discoidea, Asparagopsis taxiformis, Digenia simplex, Gracilaria pachydermatica, Polysiphonia mollis, Padina crispata?, Callithamnion paschale, Caulerpa racemosa* v. *turbinata, C. sertularioides, Chnoospora implexa, Ceramium gracillimum* v. *byssoideum, Dasya pedicellata?, Peysonnelia rubra* v. *orientalis, Ceramium fimbriatum, Dasya sinicola, Gracilaria crispata?, Chondria californica, Enteromorpha compressa,*

Lithophyllum trichotomum?, Jania longiarthra, Amphiroa annulata, Hypnea nidifica, Amphiroa drouetii, Champia parvula, Lyngbya majuscula.

Puerto Escondido. April 22. Numbers 18770 to 18793.

Collections were made along the outer cliffs at the entrance to Puerto Escondido opposite Isla Danzante and Isla Carmén in depths from 1 to 5 feet. *Sargassum* was conspicuous in some places, but the algae in general were rather sparse. *Gelidium* was frequent, and short plants of *Ceramium* and other small species formed a prominent turf. The corallines were notably scant. No *Asparagopsis, Liagora* or *Caulerpa* occurred. In depths of 20 feet or more, the bottom exhibited dominant *Padina durvillaei.*

Gracilaria pachydermatica, Sargassum macdougalii, Chnoospora implexa, Laurencia papillosa v. *pacifica, Dictyota divaricata?, Gelidium johnstonii, Gracilaria spinigera, Prionitis abbreviata* v., *Codium* sp. (prostrate), *Codium* sp. (erect), *Ceramium caudatum, Hypnea* sp., *Centroceras clavulatum, Polysiphonia mollis, Ceramium procumbens, Lophosiphonia scopulorum, Bryopsis muscosa, Amphiroa dimorpha, Amphiroa franciscana* f.?, *Jania decussato-dichotoma, Jania capillacea, Chaetomorpha bangioides, Gelidium pusillum.*

Puerto Escondido. April 22. Numbers 18751 to 18769.

Collections were made from the protected outer bay outside of the port proper. Here *Sargassum* occurred more or less densely in depths of 6 to 8 feet. The other conspicuous large species were mainly *Caulerpa sertularioides, Padina durvillaei* and large plants of *Codium amplivesiculatum.* There were few corallinaceae. *Neomeris* was frequent and conspicuous on well-lighted stones at 4 to 6 foot depths.

Caulerpa sertularioides, Padina durvillaei, Codium amplivesiculatum, Sargassum sinicola, Hypnea nidifica, Hydroclathrus clathratus, Graciliaria ramisecunda, Nemacystus brandegeei, Gracilaria crispata, Rhizoclonium kochianum, Griffithsia tenuis, Amphiroa subcylindrica, Laurencia obtusiuscula, Ceramium fimbriatum, Polysiphonia mollis, Amphiroa zonata, Ceramium caudatum, Hormothamnion enteromorphoides, Lyngbya majuscula.

Puerto Escondido proper (inner harbor). April 22. Numbers 18823a to 18833.

Collections from a rather mucky bottom in depths of 1 to 4 feet showed a flora of rather few species dominated by *Enteromorpha clathrata, Polysiphonia and Lithophyllum ? trichotomum. Gelidiopsis tenuis* and *Caulerpa sertularioides* were frequent.

Hydroclathrus clathratus, Gelidiopsis tenuis, Caulerpa sertularioides, Enteromorpha clathrata, Polysiphonia mollis, Gracilariopsis sp., *Bryopsis muscosa?, Lithophyllum trichotomum?, Amphiroa taylorii.*

Puerto Ballandra, Isla Carmén. April 3. Numbers 18600 to 18626.

The inner part of the bay has a bottom cover mainly of *Polysiphonia* with scattered *Codium*, *Laurencia*, etc. at about + 0.5 feet. These are mixed with varying amounts of *Amphiroa*. Farther out, at the entrance to the bay, in depths of less than 6 feet on either side, *Amphiroa* and *Jania* are much stronger. Some *Halimeda* occurs and rather short *Sargassum* and *Hypnea*. *Gelidium johnstonii* becomes prominent in clefts and under overhanging rocks where the currents are strong.

Halimeda discoidea, *Bryopsis pennata*, *Colpomenia sinuosa*, *Laurencia obtusiuscula*, *Chnoospora implexa*, *Pterocladia pyramidale*?, *Potysiphonia mollis*, *Ceramium gracillimum* v. *byssoideum*, *Gracilaria textorii*, *Prionitis abbreviata*, *Ulva lactuca*?, *Amphiroa dimorpha*, *Amphiroa subcylindrica*, *Amphiroa zonata*, *Jania decussato-dichotoma*, *Jania longiarthra*, *Gelidium johnstonii*, *Sphacelaria hancockii*, *Laurencia papillosa* v. *pacifica*, *Griffithsia tenuis*, *Dictyota divaricata*, *Padina durvillaei*, *Laurencia hancockii*, *Herposiphonia secunda*, *Lithophyllum trichotomum*?, *Hydrocoleum comoides*.

Isla Cholla, off the north end of Isla Carmén. April 3. Numbers 18654 to 18695.

An amazing bottom of dominant *Halimeda*, *Codium* and *Sargassum* occurred here in depths of from 1 to 6 feet. The smaller turf-forming plants consisted largely of *Caulerpa* and *Ceramium*, and there were rather limited amounts of *Amphiroa*. Some good patches of luxuriant *Asparagopsis* occurred. The *Codium* grew in great, broad cushions, and *Halimeda* occupied whole acreages. In some places one could observe nothing but a spreading lawn of *Halimeda*. The *Sargassum* plants, where they occurred in reasonable abundance, were mostly short and apparently young.

At high levels of + 1.5 to 2.5 feet (numbers 18746 to 18749) a remarkable association of *Dermonema frappieri*, *Ahnfeltia svensonii*, *Laurencia hancockii* and *Hildenbrandia* occurred.

Sargassum horridum, *Asparagopsis taxiformis*, *Padina durvillaei*, *Derbesia hollenbergii*, *Rhodymenia californica*, *Gracilaria crispata*, *Gracilaria ramisecunda*, *Halimeda discoidea*, *Caulerpa vanbosseae*, *Corallina pinnatifolia* v. *digitata*, *Herposiphonia subdisticha*, *Polysiphonia mollis*, *Chondria californica*, *Griffithsia tenuis*, *Centroceras clavulatum*, *Dictyopteris repens*, *Herposiphonia secunda*, *Antithamnion breviramosus*, *Schizoseris pygmaea*, *Peysonnelia rubra* v. *orientalis*, *Codium* sp. (clumping), *Dasya* sp., *Amphiroa zonata*, *Amphiroa dimorpha*, *Laurencia obtusiuscula*, *Prionitis abbreviata*, *Ernodesmis verticillata*, *Dictyota* sp., *Hypnea nidulans*, *Gelidiopsis tenuis*, *Jania decussato-dichotoma*, *Laurencia papillosa* v. *pacifica*, *Lithophyllum trichotomum*?, *Laurencia sinicola*, *Chnoospora minima*, *Bryopsis muscosa*.

Punta Pulpito. April 23.

Although no collections were made, *Sargassum* was observed to occur

in heavy beds along the immediate shore, and large masses were breaking loose to float southward.

Isla Ildefonso. April 24. Numbers 18696 to 18730 (from depths of 1 to 5 feet); numbers 18731 to 18745 (from levels of + 1 foot or more).

This shore consists of solid, rough lava subject to heavy surf. *Porphyra* occurred to as much as 10 feet above mean low water level. No sand was present at all. The general bottom cover was of *Sargassum* with a heavy and dense mixture of many other things in good development, such as *Gracilaria*, *Botryocladia*, *Ulva*, *Dictyota*, *Dictyopteris*, much epiphytic *Ceramium*, *Polysiphonia*, *Chondria*, etc. Some *Asparagopsis* occurred and there was much *Codium* at levels of + 1 foot in shaded places along lava cliffs in estuarine breaks in the lava. Otherwise, the *Codium* occurred generally down to about -1 foot.

On exposed rocks at high levels in this locality (+ 1 foot or more), there was a good development of a flora adapted to desiccation. The surge, surf and spray are sufficiently continuous to keep this area wet except for relatively short times. Nevertheless, at the time of my collecting at low tide, the exposed material was severely dried. The *Porphyra* was practically crisp, as was much of the *Dermonema*, these being at the highest levels or at least exposed to the more severe drying.

Sargassum sinicola, *Polysiphonia johnstonii*, *Botryocladia uvarioides*, *Gracilaria spinigera*, *Caulerpa vanbosseae*, *Ulva lactuca?*, *Pachydictyon coriaceum*, *Centroceras clavulatum*, *Amphiroa dimorpha* v. *digitata* v. nov., *Amphiroa magdalenensis*, *Asparagopsis taxiformis*, *Dictyopteris zonarioides*, *Laurencia obtusiuscula* v. *laxa?*, *Laurencia papillosa* v. *pacifica*, *Hypnea cervicornis?*, *Gracilaria pachydermatica*, *Griffithsia tenuis*, *Dictyota divaricata*, *Herposiphonia subdisticha*, *Gracilaria textorii*, *Carpopeltis stella-polaris* sp. nov., *Jania tenella* v. *zacae?*, *Padina durvillaei*, *Cladophoropsis robusta*, *Grateloupia versicolor*, *Chondria californica*, *Branchioglossum woodii*, *Laurencia sinicola*, *Codium* sp. (clumping), *Codium* sp. (prostrate), *Ceramium procumbens*, *Ceramium taylorii*, *Ceramium sinicola*, *Dasya sinicola*.

High levels: *Codium* sp. (clumping), *Griffithsia tenuis*, *Ceramium taylorii*, *Pterocladia pyramidale*, *Chaetomorpha antennina*, *Porphyra hollenbergii*, *Dermonema frappieri*, *Polysiphonia simplex*, *Laurencia hancockii*, *Centroceras clavulatum*, *Gracilaria pachydermatica*, *Herposiphona tenella?*, *Prionitis* sp., *Chondria californica*.

Bahía Concepción, along the east shore between 5 and 8 miles from the entrance.

No collections were made here, but beds of *Sargassum* were observed in immediate inshore water in depths of 6 to 8 feet extending along much of this shore. The plants for the most part rose nearly to the surface, and large rafts were aggregating from detached plants, and drifting south.

Isla Tortuga. April 25. Numbers 18627 to 18653.

Collections were made along the shore of lava cobbles in depths of 0.5 to 5 feet. The bottom consisted of a mixed cover of *Codium*, *Caulerpa*, *Laurencia*, and *Amphiroa*. Some *Dictyopteris*, *Asparagopsis* and *Dictyota* occurred, but there was little *Sargassum* and *Padina*.

Codium sp. (clumping), *Padina durvillaei*, *Gracilaria pachydermatica*, *Sargassum sinicola*, *Caulerpa vanbosseae*, *Asparagopsis taxiformis*, *Galaxaura fastigiata*, *Gracilaria spinigera*, *Digenia simplex*, *Dictyota flabellata*, *Gelidiopsis variabilis*, *Bryopsis muscosa*, *Ulva lactuca*, *Polysiphonia concinna*, *Gloioderma conjuncta* comb. nov., *Laurencia obtusiuscula*, *Laurencia papillosa* v. *pacifica*, *Griffithsia tenuis*, *Centroceras clavulatum*, *Amphiroa magdalenensis*, *Chondria californica*, *Prionitis abbreviata* f., *Amphiroa dimorpha*, *Dictyota divaricata*, *Gigartina intermedia*, *Amphiroa zonata*, *Ceramium procumbens*.

Isla San Pedro Nolasco. April 25. Numbers 18545 to 18585.

At the single small landing place a remarkable algal community was encountered in a small invagination of the cliffs. Many small species, such as *Cladophoropsis*, *Rhodoglossum*, *Prionitis*, *Ceramium*, *Griffithsia*, *Dasya*, etc., occurred on the cliffs, some of which are deeply shaded. On the deep bottom grew a heavy *Padina* cover with great *Sargassum* plants standing up 20 feet or more and rising to the surface. Some fine, almost pure beds of *Spatoglossum* were found. In other places *Botryoglossum* was present in rich patches together with scattered *Grateloupia*. Closer inshore, although this is only a matter of a few yards because of the rather steeply inclined bottom, *Ulva* and *Centroceras* were conspicuous. This whole area is subject to constant surge of varying intensity.

Padina durvillaei, *Codium* sp. (clumping), *Sargassum brandegeei*, *Gracilaria textorii*, *Dictyopteris zonarioides*, *Gracilaria crispata*, *Dictyota flabellata*, *Grateloupia prolongata*, *Rhodoglossum hancockii*, *Dasya sinicola*, *Cladophoropsis robusta*, *Griffithsia tenuis*, *Prionitis abbreviata* v. *guaymasensis*, *Gigartina tepida*, *Hypnea esperi*?, *Gelidiopsis variabilis*, *Dictyota divaricata*, *Hypnea nidulans*, *Peysonnelia rubra* v. *orientalis*, *Derbesia hollenbergii*?, *Amphiroa subcylindrica*, *Schizoseris pygmaea*, *Callithamnion paschale*, *Ceramium sinicola*, *Ulva lactuca*, *Spatoglossum schroederi*?, *Botryocladia uvarioides*, *Gymnogongrus johnstonii*, *Sargassum sinicola*, *Laurencia obtusiuscula* v. *laxa*?, *Chondria decipiens*?, *Ceramium paniculatum*, *Hypnea johnstonii*, *Heteroderma gibbsii*?, *Antithamnion breviramosus*.

FLORISTIC LIST

CHLOROPHYTA

Enteromorpha clathrata (Roth) J. Ag. 18828; 18826

Not previously known in the Gulf of California, this species has been reported from Isla Clarión, Mexico, by Setchell and Gardner as *E.*

plumosa. Bliding (1944) has shown that *E. plumosa* Kütz. should be relegated to synonymy under *E. clathrata*.

Enteromorpha compressa (L.) Grev. 18816; 18972

Ulva lactuca L. 18571; 18639; 18954; 18610 This latter collection is a densely headed, doubtfully referred form producing more or less hemispherical tufts.

Ulva sp. 18701 This is probably a form of *U. angusta*, although it may possibly be a thin, deeply lobed variety of *U. lactuca*. Two specimens are present, one contradicting the other with regard to external form.

Ulva sp. cf. *U. dactylifera* Setch. & Gard. 18901 The cells are vertically elongated even near the margins, but distinctive characters of the blades are not evident.

Ernodesmis verticillata (Kütz) Børg. 18974; 18683

Cladophoropsis ? *robusta* Setch. & Gard. 18555; 18720 Fig. 3A

Examination and comparison of the present materials with the type of *Willeella mexicana* Dawson in connection with comments on *Willeella ordinata* Børg. and *W. mexicana* by Papenfuss and Egerod (1957:83) have led to the conclusion that the materials treated as *Willeella* from Mexico are more fully developed, amply branched examples of the plant named *Cladophoropsis robusta* Setchell and Gardner (1924, p. 714, pl. 13, fig. 16). The type of the latter was an immature plant in which the characteristic distichous branching of well-developed specimens had not yet come into evidence.

Despite the comments of Papenfuss and Egerod suggesting identity of *Willeella mexicana* and *W. ordinata* (although they had not seen material of the former) a further comparison of the present specimens with the illustrated account of *W. ordinata* by Børgesen (1930) points to a number of more clear-cut distinctions then were fully indicated earlier. Younger plants, and some older ones too, show little branching. The axes are rigid, erect and coarse with few septations. Mature material develops regular distichous branches which are at first markedly strict in position, standing parallel to and nearly touching the sides of the bearing axis. These branches almost invariably arise in pairs, and have consistently delayed septation somewhat suggestive of *Struvea*. In *Willeella ordinata* the branches are not strict, but usually spreading, are acute rather than blunt, and commonly arise in groups of 4 to 6 at a node. Irregular secondary branches often arise from lower parts of the primary axes, both in apparently younger plants with little or no distichous branching, as well as older ones with well-developed distichous branching. These arise by the cutting off of a lens-like cell which develops much as in *Valoniopsis pachynema*, a feature which, despite the distichous branching, suggests that our plant may be more nearly related to *Valoniopsis* than to *Willeella*. The septation in the formation of these irregular lower branches, and in some of the primary axial parts of the plants as well,

appear to be the result of segregative division. Such division is not found among the Anadyomenaceae to which *Willeella* is now generally recognized to belong (Papenfuss and Egerod, 1957:83).

The plants which correspond to *Cladophoropsis robusta* are often quite richly developed and provided with more or less frequent lower branchlets or lens-shaped incipient branchlets before the distichous branching of mature plants takes place. This is true of the type material and is now seen in number 18720 and in other earlier collections from Cabo Arco, near Guaymas, Sonora, in which densely tufted plants to 4 cm. tall bear only occasional, or scarcely any, paired branches. This feature, the apparent segregative division, and the distichous branching which is not characteristic of *Cladophoropsis*, suggest relationships apart from that genus and probably closer to *Valoniopsis*. More study of ample material is needed to clarify the position of this interesting plant, but it is manifestly clear that it is not identical with *Willeella ordinata*.

Taylor's number 34-588A from Isla Isabel, Nayarit, has been examined again and found to agree better with *Valoniopsis pachynema* than with *Cladophoropsis robusta*.

Valoniopsis pachynema (Mart.) Børg. 18907 This is characteristic material of this species (see Isaac 1957, fig. 6-7, pl. 28).

Rhizoclonium kochianum Kütz. 18760 This agrees with Hamel's concept (1930-32). He does not consider the differences of *R. kerneri* to be specific and treats that plant as a variant of *R. kochianum*. Taylor (1945:55) has reported a plant much like the present from Isla Clarión under the name *R. kerneri*.

Chaetomorpha antennina (Bory) Kütz. 18735

Chaetomorpha bangioides Daws. 18792 This is identical with the type from Isla Patos in the northern Gulf of California. It represents the second known occurrence of this distinctive species and a southward extension of range.

Chaetomorpha linum (Müller) Kütz. 18599

Cladophora albida (Huds.) Kütz. 18823b, on a parrot fish beak, Bahía Agua Verde, April 20.

Cladophora utriculosa Kütz. 18983 This agrees with the treatment by Hamel (1929). The species is reported as common in southern Japan, but has not heretofore been reported from Mexico.

Bryopsis pennata Lamx. 18601 Although there is some irregularity in the branching of this specimen to the extent of showing a tendency to be polystichous or secund, as in similar material studied by Egerod (1952) from Hawaii, most branch tips show a clearly distichous arrangement as in *B. pennata*. The material is reasonably well developed although the branching is largely confined to the branch tips. This recalls *B. pennatula* J. Agardh, described from southern Pacific Mexico and since reported by Taylor (1945) from White Friars Islands, Guerrero,

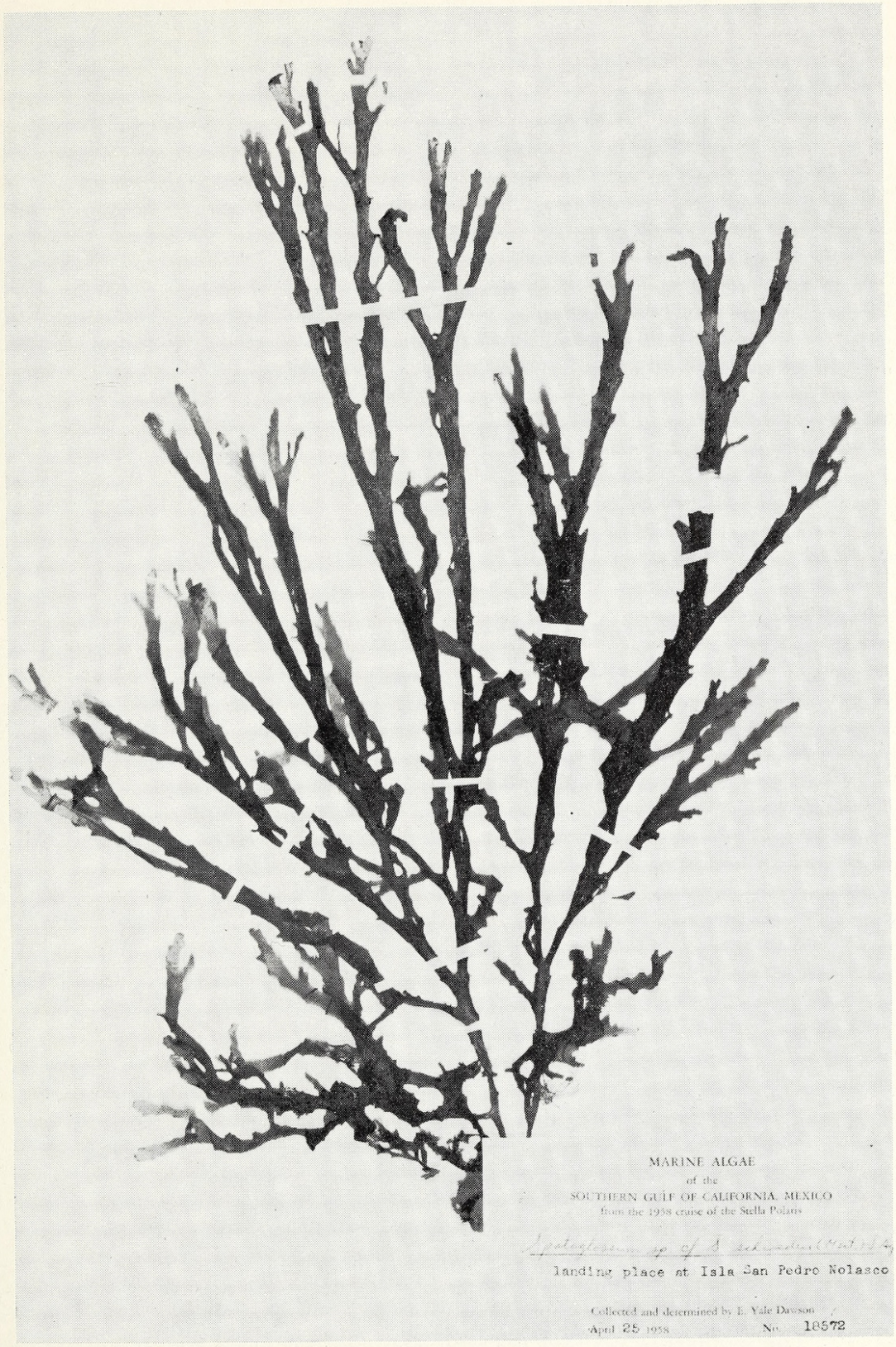


Fig. 1. *Spatoglossum* sp. cf. *S. schroederi*

Mexico, and from the Galapagos Archipelago. In the present material, the distichous branchlets are confined to the upper 2-3 mm. of the axes much as in Taylor's material, but are shorter and smaller, like *B. pennatula* figured by Kützing (1856, Tab. Phyc. vol. 6, pl. 76, fig. 2). Considering the dwarfish character of some other of the Liebmann specimens described by J. Agardh from San Agustin, Mexico, such as *Hypnea pannosa*, *Grateloupia versicolor*, etc., it seems probable that the type of *B. pennatula* may have come from a surfy, high habitat in which the production of the lateral branchlets was particularly disfavored by the environment. Such reduction of the lateral branchlets is observable in various *Bryopsis* species, and there does not appear to be any clear-cut distinction between Agardh's plant and *B. pennata* Lamx. as currently understood.

The plants called *B. plumosa* var. *pennata* (Lamx.) Børg by Dawson (1944:212) are probably luxuriantly developed, richly branched examples of this same species.

Bryopsis muscosa Lamx. 18638; 18694; 18788; 18866; 18830; 18894 Most of these are scrubby and ill-developed with very irregular multifarious branching, commonly in part secund. In some the laterals are mainly confined to branch tips and are not very abundant, or there may be many axes with almost no laterals.

Derbesia hollenbergii Taylor 18670 This material is abundantly fertile and the zoosporangia are consistently pyriform or turbinate. *D. hollenbergii* was described from the Galapagos Archipelago and was recently reported from South Africa. Our material has filaments 60-80 μ in diameter and sporangia to 130 μ in diameter, more like the South African material in size than either the type of *D. hollenbergii* or of *D. turbinata* Howe and Hoyt. 18657; 18682; 18835, scantily fertile, but with the turbinate sporangia.

Derbesia sp. 18580, sterile; 18567, sterile; 18582 These are all probably, but uncertainly, referable to *D. hollenbergii*.

Caulerpa racemosa var. *peltata* (Lamx.) Eubank 18986; 18944b

Caulerpa racemosa var. *turbinata* (J. Ag.) Eubank 18804; 18944a; 18970

Caulerpa sertularioides (Gmelin) Howe 18805; 18825; 18944; 18969; 18751, a new northward record in the Gulf of California.

Caulerpa vanbosseae Setch. & Gard. 18631; 18662; 18700

Chlorodesmis hildebrandtii A. Gepp & Ethel Gepp 18941; 18984 This material is short, but shows all the characters of this species, especially the internodal constrictions not present in *C. mexicana*. This is a new record for Pacific Mexico.

Geppella decussata sp. nov. Fig. 7 A

Thalli minuti, 2-3 mm. alt., monosiphoni, e parte superiore dichotome ramosa e stipite elongato, ex adhaesione basali prostrata oriente, constantes; stipes 1.0-1.5 mm. long., ca. 40 μ diam. maxime viridis, supra

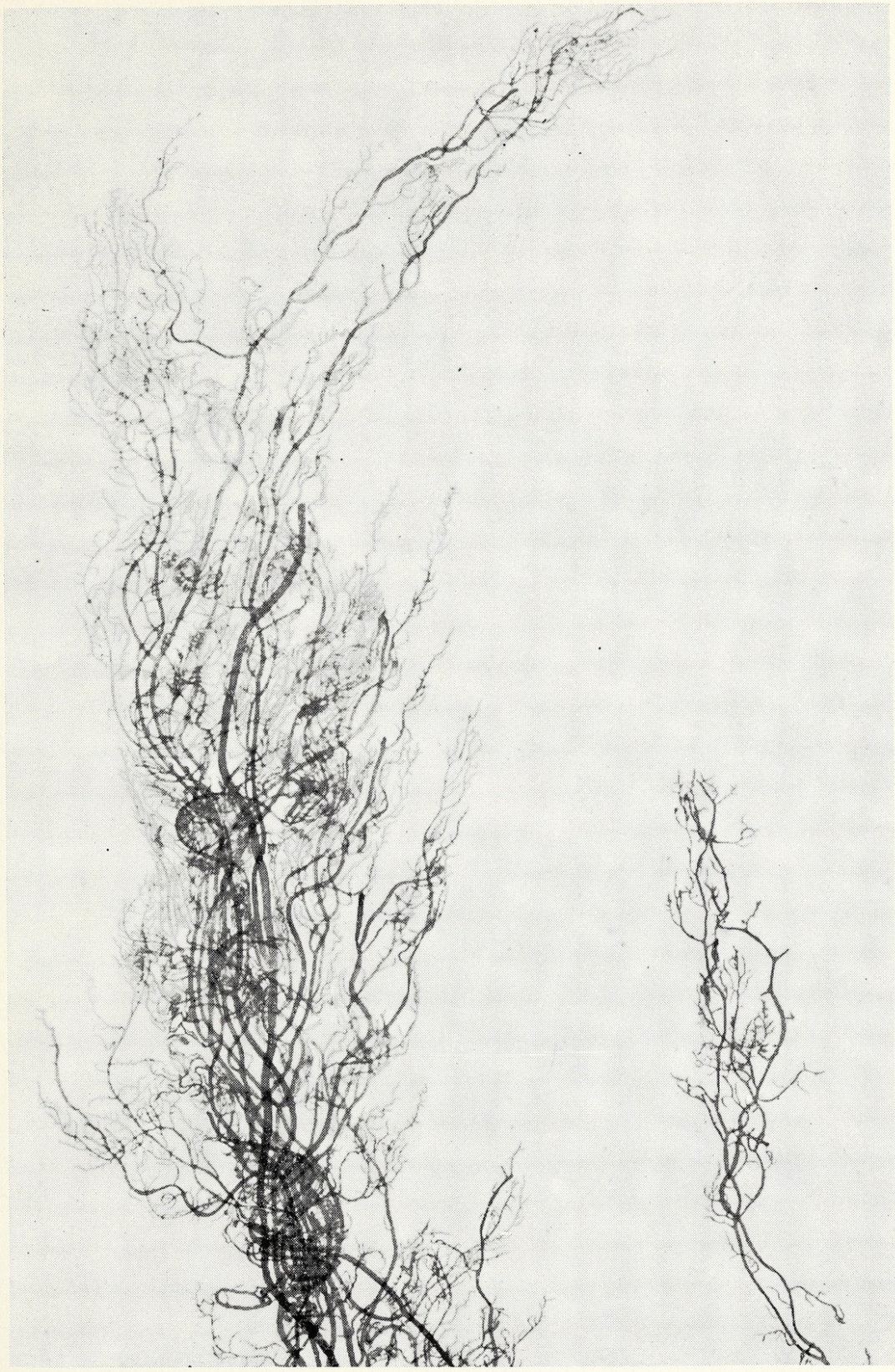


Fig. 2. *Nemacystus brandegeei*. Part of a large plant from Puerto Escondido (18758). Natural size.

dichotome decussate ramosus, primis furcis duabus vel tribus, intervallis 80-150 μ, deinde intervallis 250-400μ, ad dichotomias paululum constrictus, ad segmenta ultima ca. 25 μ diam. gradatim reductus; apices obtusi rotundatique; chromatophori longi, ellipticique, ca. 1.75-4.0 μ.

Thalli minute, 2-3 mm. tall, monosiphonous, consisting of a dichotomously branched upper part from an elongated stipe part arising from a prostrate basal attachment; stipe 1.0 to 1.5 mm. long, about 40 μ in diameter, densely green pigmented, dichotomously, decussately branched above, the first two or three forkings at intervals of 80-150 μ, then at intervals of 250-400 μ, very slightly constricted at the dichotomies, gradually reduced in diameter to the ultimate segments which are about 25 μ in diameter; apices blunt, rounded; chromatophores long elliptical, about 1.75-by 4.0 μ in dimensions.

TYPE: Dawson 18987, with *Sphacelaria* scraped from rocks on the southwest side of Isla San Francisco, April 18, 1958. (LAM)

In reporting on the marine algae of the southern Marshall Islands the writer (Dawson 1956:39, fig. 27) recorded and illustrated a small green alga from Arno Atoll as *Geppella mortensenii* Børgesen. That plant, now deposited in the Bishop Museum, Honolulu, showed a somewhat decussate, non-flabellate branching and also lacked the annular attachments between branches characteristic of Børgesen's Mauritius specimens of *G. mortensenii*. Its size, general structure and appearance were such that it was referred in the absence of other comparative material to the Indian Ocean species. Now we find a plant in the southern Gulf of California which is quite clearly the same as the Arno Atoll specimens, although more laxly branched above, but more clearly distinct from the Indian Ocean plant in its lax, decussate, non-flabellate branching as well as in the lack of attachment discs. Accordingly, the Mexican plant is described as a second representative of this curious codiaceous genus and the Marshall Islands material referred to it.

Codium spp. A number of collections of this interesting genus were made and submitted to Dr. P. C. Silva for determination. He, however, indicated that the problems with Mexican codiums are so numerous and difficult that he prefers to treat them only monographically as a large geographic unit. This he proposes to do in the near future. Accordingly, the material from the present collections will be cited only with brief discussion.

With the exception of collections at Puerto Escondido of large plants identical in habit and utricle characters with *Codium amplivesiculatum* Setch. & Gard. (18753), the *Codium* collections consisted of two distinctive types. One of these, represented by 18587, 18725, 18779, 18911, 18932, 18956 is a thin, prostrate species which was observed at nearly all of the southern localities visited to as far north as Puerto Escondido. In some localities it formed extensive patches to a meter broad, while in

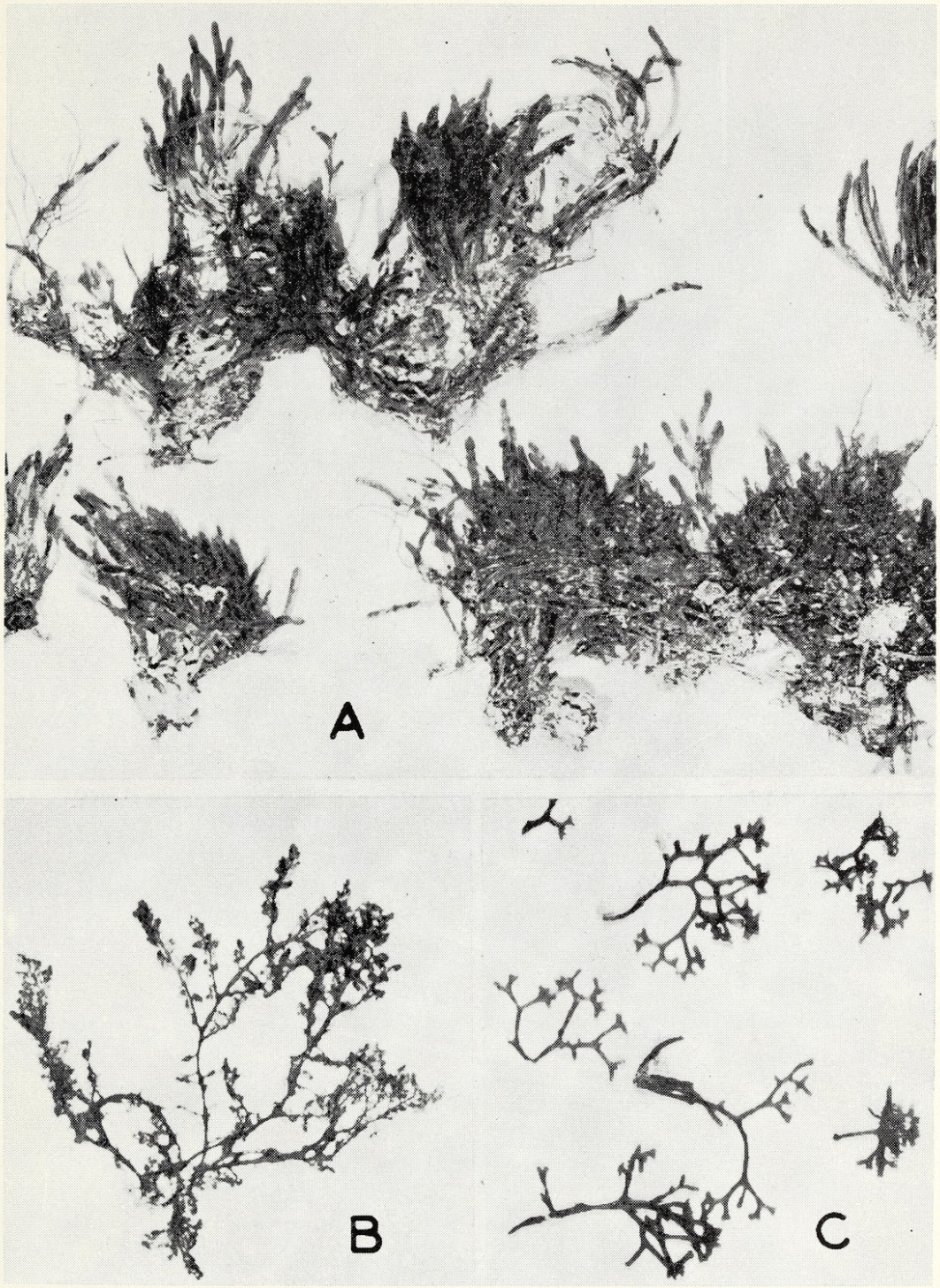


Fig. 3. A. *Cladophoropsis robusta.* Part of a collection from Isla San Pedro Nolasco (18555) showing the congested habit and lack of well-developed distichous branches throughout most of the clumps. B. *Dasya sinicola.* A specimen from Isla San Pedro Nolasco. C. *Ahnfeltia svensonii.* Dwarfish material from Isla Cholla, off Isla Carmén (18747). All natural size.

others the plants were only a few cm. across. This suggests the plant reported by Taylor (1945) as *Codium setchellii* Gard., prox. from Panama, but clearly has nothing to do with that California species.

The other group of collections represented by 18546, 18627, 18675, 18727, 18731, 18784, 18796, 18843, 18884, 18915, 18965, 18976, is of a more or less densely clumping form mostly 5-10 cm. high, seemingly of the *Codium simulans* Setch. & Gard. complex. These were found at nearly every locality from Isla San Francisco to Isla San Pedro Nolasco. They sometimes, as at Isla Cholla, occurred as dominant members of the bottom community between low water level and depths of 6 to 10 feet. At Isla Ildefonso, dense, spongy fringes of these plants occurred in shaded places to above the + 1 foot tide level.

Neomeris annulata Dickie 18590

Halimeda discoidea Dec'ne 18600; 18661; 18797; 18898; 18971

PHAEOPHYTA

Ectocarpus sp. aff. *E. mitchellae* Harv. 18859; 18928

Sphacelaria furcigera Kütz. 18823, on a parrot fish beak, Bahía Agua Verde, April 20.

Sphacelaria hancockii Daws. 18617, with abundant propagulae

Sphacelaria tribuloides Menegh. 18927, a new record in the Gulf of California. A few propagulae of *S. furcigera* are also present.

Pachydictyon coriaceum (Holmes) Okam. 18702, a narrow, slight form

Dictyota crenulata J. Ag. 18917 This is a new extension northward into the Gulf of California.

Dictyota dichotoma (Huds.) Lams. 18586, covered with abundant, deciduous, vegetative propagulae; 18964, a narrow form.

Dictyota divaricata Lamx. 18561; 18620; 18650; 18713; 18845; 18923; 18900; 18963; 18967; 18775, referred with doubt

Dictyota flabellata (Collins) Setch. & Gard. 18551; 18636

Dictyota sp. 18685 This is apparently distinct from any known Pacific Mexican species, but the affinities with exotic species are not clear.

Dictyopteris repens (Okam.) Børg. 18671 This material is characteristic of the species as known from several other tropical Pacific areas and represents a new record for Pacific Mexico.

Dictyopteris zonarioides Farlow 18549; 18707

Padina caulescens Thivy 18880 has the branched, stupose stipe, the light calcification and regular, closely spaced hair lines of this species, which has not heretofore been reported as far north as the Gulf of California. Number 18960 is similar, but is referred with some doubt.

Padina sp. cf. *P. crispata* Thivy 18951 is the best developed of three examples and shows general agreement with this species from the Tres Marías Islands and from Costa Rica. The blades are two-

layered in outer parts and six-layered below. 18802, not well developed; 18598, poorly developed.

Padina durvillaei Bory 18545; 18621, poor and young; 18628; 18656; 18718 seems to show very slight calcification in some places; 18752; 18842

Padina mexicana Daws. 18924 This is the third locality for this species known hitherto from La Paz and from Isla Tiburón.

Spatoglossum sp. aff. *S. schroederi* (Mert.) J. Ag. 18572 (Fig. 1) The presence of marginal teeth and protuberances, as well as the relatively narrow blades, places this plant nearest to *S. schroederi*. A similar collection in size and branching, but with less regularly or conspicuously toothed or modified margins, is Dawson 9987 (AHFH) from near Punta Malarrimo, Bahía Vizcaino, Baja California. *S. schroederi* is reported from Chile. Specimens from Hawaii have been seen and noted that agree superficially with specimens of *S. schroederi* from the West Indies.

Pocockiella variegata (Lamx.) Papenf. 18942; 18929; 18985 These represent new records for the Gulf of California.

Nemacystus brandegeei (Setch. & Gard.) Kylin 18758 (Fig. 2) This is large, luxuriant material, lax, long, skein-like and entangled, observed to reach a meter or more in length.

Colpomenia sinuosa (Roth) Derbès & Solier 18861; 18891

Colpomenia sinuosa var. *tuberculata* (Saund.) Setch. & Gard. 18846; 18935

Hydroclathrus clathratus (C. Ag.) Howe 18756; 18823a; 18881; 18958

Rosenvingea intricata (J. Ag.) Børg. 18883

Chnoospora implexa Hering, ex J. Ag. 18604; 18773; 18806; dwarfish; 18878; 18959; 18979; 18692

Sargassum brandegeei Setch. & Gard. 18547

Sargassum horridum Setch. & Gard. 18654, immature material, but spiny and with muricate branches. The holdfast is a small, irregular discoid or conical attachment 6-8 mm. in diameter. 18877

Sargassum macdougalii Daws. 18771, somewhat immature, but the lower "leaves" and holdfast in agreement with this species.

Sargassum sinicola Setch. & Gard. 18575; 18630; 18696; 18754; 18834; 18957

Sargassum sp. 18588, juvenile specimens resembling *S. patens* Ag.; 18966

RHODOPHYTA

Porphyra hollenbergii Daws. 18736, carposporic plants only

Dermonema frappieri (Mont. & Millard.) Børg. 18737; 18746 These represent new records from the Gulf of California.

Galaxaura arborea Kjellm. 18870; 18903

Galaxaura veprecula Kjellm. 18962, richly developed material

Galaxaura fastigiata Dec'ne 18633

Liagora farinosa Lamx. 18914; 18949 This species has not been reported from the Gulf of California.

Liagora magniinvolucra Daws. 18926 A single male and a mature cystocarpic plant are present, the latter more slender and less mucilaginous than the former, but otherwise like it. This is a new record for the Gulf north of Cabo Pulmo.

Asparagopsis taxiformis (Delile) Collins & Hervey 18655; 18632; 18706; 18798; 18848; 18916; 18961; 18597, *Falkenbergia* generation; 18945, *Falkenbergia* generation

Gelidium johnstonii Setch. & Gard. 18616; 18776; 18839; 18938, slender and dwarfish but tetrasporic; 18906

Gelidium pusillum (Stackh.) Le Jolis forms 18793, tetrasporangial; 18912

Pterocladia pyramidale (Gard.) Daws. 18605; 18734 These are almost unquestionably the *Gelidium decompositum* of Setchell and Gardner which has not been found in fertile condition. The known occurrence now of *Pterocladia pyramidale* at several tropical and near tropical localities such as Alijos Rocks, Isla Clarión, Galapagos Archipalego, etc., also suggests strongly the identity of this species with the Gulf of California plants known as *Gelidium decompositum.*

Gelidiella hancockii Daws. 18596 This agrees with the type in size and habit but is more strict. The erect axes are almost all simple and attenuate whereas most specimens to date have shown some irregularity of branching and less strict erect parts.

Gelidiopsis tenuis Setch. & Gard. 18687; 18824; 18980

Gelidiopsis variabilis (Grev.) Schmitz 18560 These have compressed branches and axes and occasional opposite branches that were at first misleading; 18637

Hildenbrandia prototypus Nardo 18749

Peysonnelia rubra var. *orientalis* Weber v. Bosse 18674; 18810; 18988

Lithophyllum ? trichotomum (Heydr.) Lemoine? 18626; 18690; 18817; 18832

cf. *Heteroderma gibbsii* (Fosl. & Setch.) Foslie 18584

Corallina pinnatifolia var. digitata Daws. 18663; 18852; 18889; 18939

Amphiroa annulata Lemoine 18591, in a turf of *Jania capillacea* and *Centroceras clavulatum;* 18593; 18876, near var. *pinnata* Daws., mixed with dwarfish *A. zonata;* 18922; 18598; 18611; 18649, an atypical, narrow, proliferous form with upper segments very much and consistently unlike the lower; 18678

Amphiroa dimorpha Lemoine 18789; 18849; 18902

Amphiroa dimorpha var. **digitiforme** var. nov. Fig. 4

Forma speciei similis, segmentis inferioribus latis, autem, irregulariter lobatis atque digitate divisis, segmentis superioribus ad segmenta ultima subcylindrica 400 μ diam. successive reductis.

Like the species but the lower, broad segments irregularly lobed and digitately divided, and the upper segments successively reduced to ultimate ones, in part subcylindrical and only 400 μ in diameter.

TYPE: Dawson 18684, at a depth of about 5 feet, Isla Cholla, off Isla Carmén, April 23, 1958. (LAM)

ADDITIONAL MATERIAL: Dawson 18704, Isla Ildefonso, April 24, 1958.

The fact that this stikingly atypical form has appeared several times (specimens approaching the present ones have been examined in the Hancock Foundation, Los Angeles) has indicated that a distinct entity of at least varietal rank should be recognized. At best the varied forms of *Amphiroa dimorpha*, as, indeed, other species of this difficult genus, cannot easily be described in precise terms. The figures best show the range of variation in lower segment size and form that may be found in this taxon.

Amphiroa drouetti Daws. 18821, genicular calcification not as complete as in some examples; 18888 This is very tall material, to 6 cm, but in good agreement with the original material in diameter, forking, calcification of genicular regions, etc. The lower genicula on this large material show clearly, but the upper show little except by cracks in the calcification. 18908, luxuriant, rather strongly compressed below and larger in diameter than some; 18919

Amphiroa magdalenensis Daws. 18646; 18705 These extend the range northward into the Gulf of California.

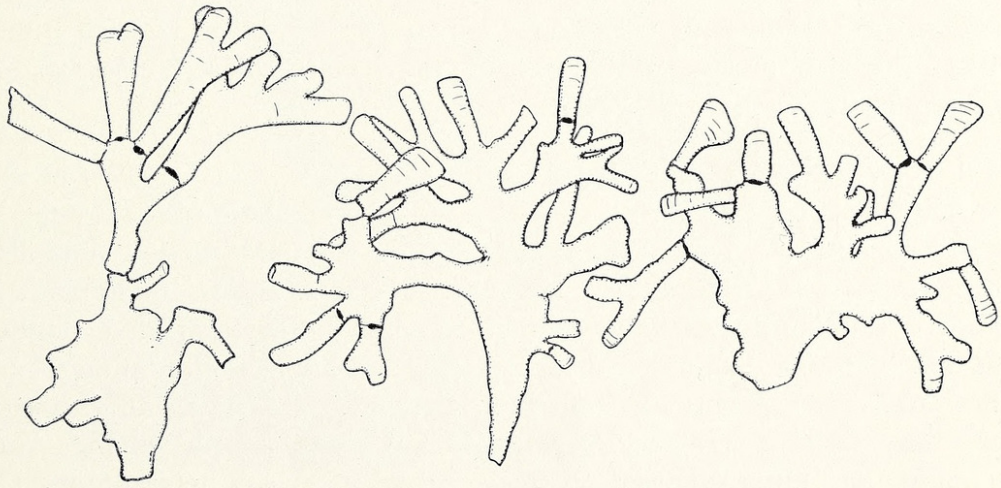


Fig. 4. *Amphiroa dimorpha* var. *digitiforme* var. nov. Three examples of broad, digitate segments from lower, inner portions of a clump of the type collection, × 3.

Amphiroa subcylindrica Daws. 18612; 18763; 18794; 18885

Amphiroa taylorii Daws 18833 This collection is in good agreement with this species, but is more regularly dichotomously branched than the type and not so crooked. The two-tiered genicula, the diameter of the cylindrical branches and the constricted genicula are distinctive. The species has not previously been reported in the Gulf of California proper.

Amphiroa zonata Yendo 18613; 18652; 18677, 18768; 18795, large material 8 cm. tall; 18850, an atypical form

Amphiroa sp. (cf. forms of *A. franciscana* Taylor) 18790 This is difficult to assign. Some lower segments are quite broad, but many are as narrow as 200 μ or less.

Jania capillacea Harv. 18591a, with *Centroceras clavulatum* and *Amphiroa annulata*

Jania decussato-dichotoma (Yendo) Yendo 18614; 18688; 18791, with *Jania capillacea;* 18905, richly developed and typical

Jania longiarthra Daws. 18615; 18818, with *Amphiroa annulata;* 18892, rather slender, decussate and somewhat divaricate, but in otherwise satisfactory agreement; 18909; 18920; 18978, luxuriant material nearly 3 cm. tall.

Jania tenella Kütz. 18729, in a *Hypnea-Laurencia-Jania* turf mixture

Jania tenella aff. var. *zacae* Daws. 18717

Grateloupia howei Setch. & Gard. 18854 This collection shows a variegation in some parts suggestive of that in *G. versicolor.* This is a new southern record, but depauperate material of this species is known from Mazatlán.

Grateloupia prolongata J. Ag. 18552

Grateloupia versicolor (J. Ag.) J. Ag. 18721 This is a dichotomously branched, abundantly tetrasporic collection without pinnae or proliferations of any kind. It extends the species range northward into the Gulf of California.

Carpopeltis stella-polaris sp. nov. Fig. 9 B

Thalli erecti, 3-4 cm. alt., e fasce axium dichotomorum e systemate parvo rhizomatum subteretium ramosorum stolones breves nonnullos ferentium oriente constantes; laminae erectae ramosae quaternae vel quinae e caudicibus brevibus (2 mm. alt.) super systema rhizomaticum interdum orientes, laminae a basi anguste cuneatae, uno in plano intervallis 5-11 mm. dichotome ramosae, angustae planaeque, 0.5-1.5 mm. latae, ca. 150 μ crassae, segmentis terminalibus plerumque quasi attenuatis aut obtuso-lanceolatis, non expansis; sori tetrasporangiales indefiniti, elongati, in partibus laminarum terminalibus plerumque per dichotomiam ultimam extensi, quasi totas laminas utroque in latere nisi margines occupantes; tetrasporangia ca. 32 μ long., cruciata, in cortice

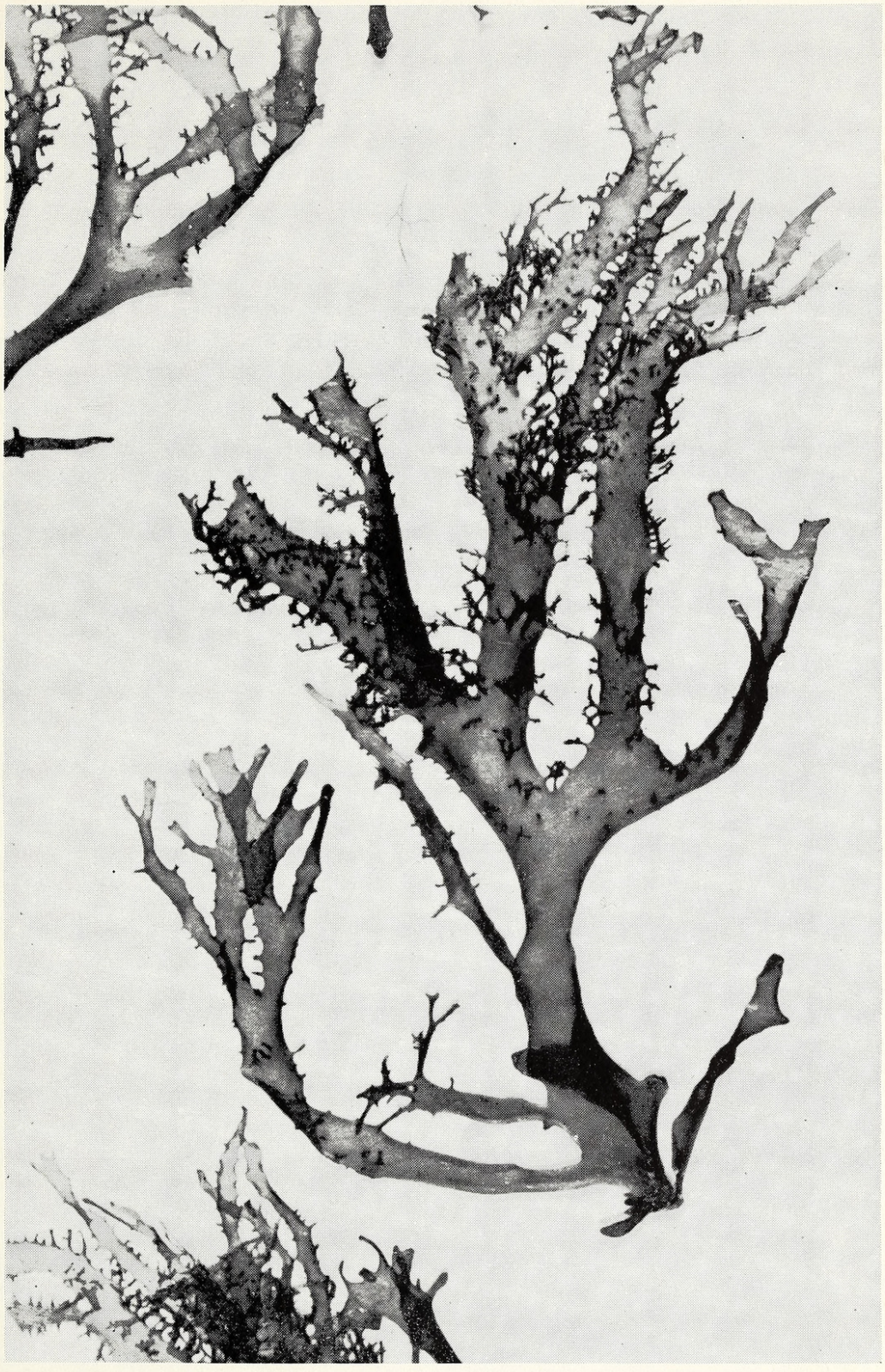


Fig. 5. *Gracilaria spinigera.* A specimen from Isla Ildefonso (18699). Natural size.

ca. 40 μ crass. propter nematheciam mutato producta; reproductio sexualis non visa.

Thalli erect, 3-4 cm. tall, dull red in color, consisting of a group of dichotomous axes arising from a small system of subterete, branched rhizomes bearing some short stolons; erect branched blades sometimes arising in groups of 4-5 from short (2 mm. tall) stumps above the rhizome system, narrowly cuneate from the base, dichotomously branched in one plane at intervals of 5-11 mm., narrow, flat, 1.0-1.5 mm. wide, about 150 μ thick, the terminal segments usually somewhat attenuated or blunt-lanceolate, not expanded; transection of sterile mid-parts showing a medulla of moderately densely packed filamentous cells essentially longitudinally arranged, mostly 3-4 μ in diameter, a subcortex of about 2 layers of smaller, more or less rectangular cells somewhat anticlinally elongated, about 5-6 μ long, 3.5-5 μ wide; tetrasporangial sori indefinite, elongated, in terminal blade parts, usually running back through the last dichotomy, occupying essentially the whole of both sides of the blades except the margins; tetrasporangia about 32 μ long, cruciate, borne in a nemathecially modified cortex about 40 μ thick in which the sterile cortex and subcortex of 4-5 layers of cells is somewhat augmented to about 6, but anticlinal elongation and further division of the outer layers reducing the lateral diameters of the ultimate layers to about 2.5 μ; sexual reproduction not seen.

TYPE: Dawson 18716, at a depth of about 5 feet, Isla Ildefonso, Gulf of California. (LAM)

This species closely resembles *Rhodymenia californica* or *R. attenuata* in form, but is quickly separated by observation of the filamentous structure. The nemathecial tetrasporangia together with the filamentous structure and flat, dichotomous branches seem clearly to place the plant in the genus *Carpopeltis* as understood by Kylin, 1956[3]. Two other species are reported in the northeastern Pacific. *Carpopeltis bushiae* (Farl.) Kylin is a broader, thicker species with proportionally short upper segments, and branching from a definite cylindrical stipe. Its range is from southern California to Punta Abreojos, Baja California. *Carpopeltis clarionensis* (Setch. & Gard.) comb. nov. *(Polyopes clarionensis* Setchell & Gardner 1937, p. 91, pl. 4, fig. 9, pl. 6, fig. 17, pl. 23, fig. 45) is a species with subdichtomous ligulate blades from a rigid, cylindrical branched lower portion. It is reported from Isla Clarión and from Oahu, Hawaii. Our present species is distinct from both of these in stipe and branching characters, although seemingly nearest *C. bushiae* and

[3] Kylin (1956) has limited his recognition of *Polyopes* to the single Australian species *P. constrictus* (Turn.) J. Ag. He has transferred *Polyopes bushiae* Farl. and *P. sinicola* Setch. & Gard. to *Carpopeltis*. The latter plant has been shown by the writer (1954) to have nothing to do with *Polyopes*, but to represent a specimen of *Ishige foliacea*.

possibly derived from it. Some resemblances are seen to the Japanese species *Carpopeltis affinis* (Harv.) Okam., but there appear to be ample differences in habit and habitat.

Prionitis abbreviata Setch. & Gard. 18609; 18933, an extremely reduced, almost branchless form from near the margin of its range; 18936, the same, but with branches. Other variations of this species not well assignable to var. *guaymasensis* are 18648, 18681, 18851, 18893.

Prionitis abbreviata var. *guaymasensis* (Daws.) comb. nov. (*Prionitis guaymasensis* Dawson 1944, p. 283, pl. 60, fig. 1-2) 18557 represents an atypical form of this plant with decompound, attenuate, acute branches. 18778 is a narrow form not quite equivalent to this variety.

Hypnea sp. cf. *H. cervicornis* J. Ag. 18710

Hypnea esperi Bory 18890, typical material adhering loosely to sand and gravel, and identical with specimens collected by the writer in Viét Nam. 18559 is possibly a rather large form of this species.

Hypnea johnstonii Setch. & Gard. 18581; 18858

Hypnea nidulans Setch. 18562, 18566 and 18930 are sufficiently coarse, loosely branched and reddish in color to be placed with certainty under this widely distributed tropical species. Numbers 18686, 18904 and 18925 are similar, but for the most part somewhat smaller, and have led to a further comparison of the type specimens of *Hypnea nidulans* Setch. and *H. pannosa* J. Ag. with various collections of caespitose hypneas in the tropical Pacific. This seems to bring out the following point: The type of *Hypnea pannosa* seems to be depauperate material taken from high rock pockets in which the plants were fertile but somewhat dwarfishly developed. These are most nearly like material from a similar high surfy habitat collected by Taylor on Islas Secas, Panama, and recognized by him as this species. Taylor also placed under *H. pannosa* several coarser, better developed plants which correspond with plants more generally known as *H. nidulans* Setch.

The writer in 1944 (p. 291) compared *H. pannosa* and *H. nidulans* on the basis of type fragments of the former in the herbarium of the University of California. Subsequently, examination of the type material in Herb. Agardh has revealed somewhat more of the characteristics of this collection and shows that the small, caespitose material of Dawson's number 722 referred to *H. pannosa* in 1944 may not be this plant, but perhaps a still more delicate species with saddle-shaped nemathecia. The habit, although somewhat more lax, is very much the same, and it looks simply like a smaller edition of *H. pannosa*.

Hypnea nidifica auct. 18755; 18819; 18857 These correspond with the species interpreted as *Hypnea nidifica* J. Ag. in the Gulf of California (Dawson 1944), but the identity of Agardh's species from Hawaii is confused because the type collection consists of a mixture

of two species, one saxicolous and one epiphytic, which have been recognized as distinct when observed in nature in Hawaii.

Gracilaria crispata Setch. & Gard. 18550; 18659; 18759, an extremely attenuated bay form?; 18814, probably young, dwarfish; 18879, richly developed

Gracilaria pachydermatica Setch. & Gard. 18629; 18711; 18741; 18772, antheridial; 18770; 18800; 18838; 18886; 18937, a dwarfed form; 18595, doubtful

Gracilaria ramisecunda Daws. 18660; 18757, sterile

Gracilaria spinigera Daws. 18634; 18699 (Fig. 4); 18777

Gracilaria subsecundata Setch. & Gard. 18887

Gracilaria textorii (Suring.) J. Ag. 18548 The discovery of male plants of *G. textorii* in Japan has enabled Ohmi (1955) to make critical comparisons with the writer's material of *G. vivesii* Howe from the Gulf of California with the result that the writer's suspicions of the identity of the two (Dawson 1949a) have been substantiated. This is small, narrow, apparently immature material. 18608, poorly developed

Gracilaria sp. 18715, probably a very narrow, young form of *G. textorii*; 18829, sterile

Gymnogongrus johnstonii (Setch. & Gard.) Daws. 18574, cystocarpic material identical with the type illustration; 18583 (Fig. 6 A)

Ahnfeltia svensonii Taylor 18747 (Fig. 3 C) This material is very small for the species, but a comparison with a wide range of large and dwarfish examples from the Galapagos Archipelago shows that our material is essentially indistinguishable from some of the smaller topotype examples of *A. svensonii* from Charles Island, Galapagos. The distinctly compressed segments and approximate branches are characteristic; 18934, juvenile material with the flattening of axes scarcely yet apparent.

Rhodoglossum hancockii Daws. 18553

Gigartina intermedia Suring. 18651 These plants are so remarkably like Suringar's species that this identification seems almost unquestionably correct despite the fact that the species has not heretofore been reported from the eastern Pacific. It is well known in Japan, Amoy, China, and was recently reported from Viêt Nam.

Gigartina tepida Hollenb. 18558

Gloioderma conjuncta (Setch. & Gard.) comb. nov. (*Estebania conjuncta* Setchell & Gardner 1924, p. 783, pl. 25, fig. 35, 36, pl. 85, 86) 18641

Setchell and Gardner provisionally placed their genus *Estebania* in the Grateloupiaceae because of "general structure, the absence of an apical cell and the cruciate tetraspores." Their description of the "general structure" consisted largely of an account of the "center of the fronds packed with fine, densely intertwined, much branched filaments, sur-

rounded on all sides by 1-2 layers of large ovoid cells merging outwardly into smaller cells."

An examination of the development of these branched filaments in the medulla, between and even within the large, vacuolate medullary cells, has shown that they occur as the result of secondary growth and intrusion in older thallus parts. Young areas of the thallus have only the large medullary cells without such filaments. This structure is characteris-

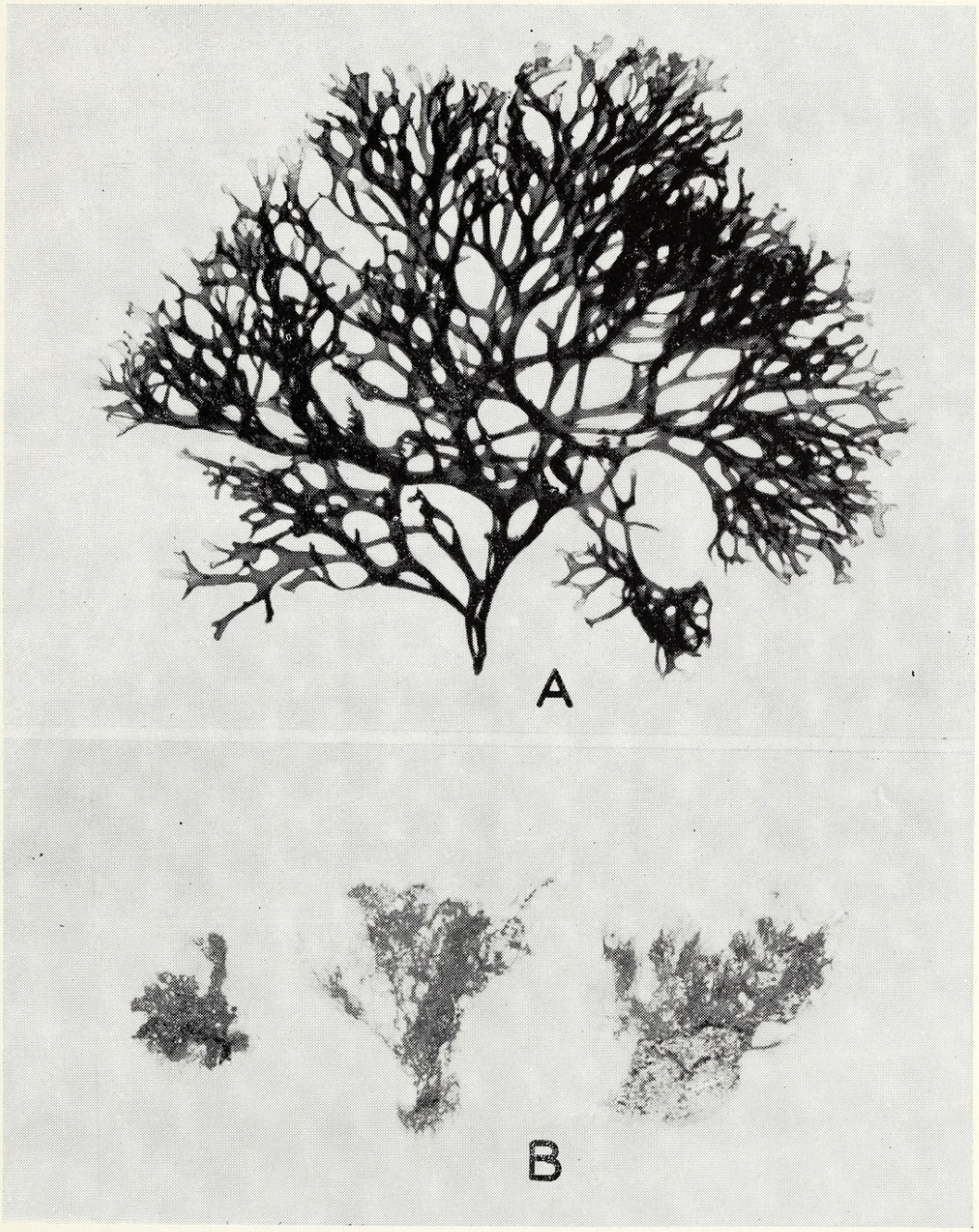


Fig. 6. A. *Gymnogongrus johnstonii.* A specimen from Isla San Pedro Nolasco (18574). Natural size. B. *Callithamnion paschale.* Mature, fertile material from Isla Monserrate (18803). Natural size.

tic of *Gloioderma*, and the account and illustrations of Sparling (1957), when compared with our present material of *Estebania*, conclusively call for union of the latter with *Gloioderma*, despite the fact that frequent collection of this species in abundance at a number of northern Gulf of California stations has failed to reveal any sexually reproductive plants.

Rhodymenia californica Kylin 18658 The size, thin segments and especially the non-nemathecial manner of the tetrasporangia production seem to substantiate this determination which represents a new Gulf of California record.

Rhodymenia hancockii Daws. 18899 (Fig. 9 A) This ample material permits expansion of the description drawn from the fragmentary type specimen. The holdfast, heretofore not known, is discoid and without stolons. The stipe is prominent and the blades over 400 μ thick. The narrower blades of the present material probably reflect the shallower habitat. The type came from about 40 meters depth. Specimens under 18977 also have branched stipes and discoid holdfasts without stolons, but are referred here with some doubt.

Botryocladia uvarioides Daws. 18573; 18698 (Fig. 8) The gland cells are 11-12 μ in diameter and arranged as described.

Champia parvula (Ag.) Harv. 18821a, small, epiphytic examples

Callithamnion paschale Børgesen (Fig. 6 B) Examination of Børgesen's (1924) well-illustrated account of this plant in the light of three new collections of the species described some years ago as *C. veleroae* Dawson (1944:312) has revealed such similarity, not only in vegetative characters, but in all the reproductive phases, that it is considered necessary to reduce the name of the Gulf of California plant and to recognize a wide distribution for *C. paschale* in both the southern and northern hemispheres in the Pacific. It was heretofore presumed to be an endemic at remote Easter Island. All reproductive phases are present in number 18803, antheridial in 18948b, and tetrasporangial in 18569, in which there is some tendency to irregular rather than strictly dichotomous branching.

Antithamnion breviramosus Daws. 18585, growing on *Cladophoropsis robusta;* 18672a These collections are essentially identical with the southern California type and represent new records for Pacific Mexico. A variant of this species was recently reported by the writer from Eniwetok Atoll, Marshall Islands.

Antithamnion mcnabbii sp. nov. Fig. 7 C

Thallis minuti, abunde ramosi dense aggregati, ad 8 mm. alt. penicillos molles rubros in corallinis brevibus articulatis in saxorum superficie formantes, ex axibus intricatis ramosis monosiphonis ecorticatis, infra ca. 25 μ diam., rhizoidea plerumque simplicia multicellularia multa ferentibus constant; cellulae axiales infra ca. 150 μ long., supra 100 μ,

et ad cacumina gradatim reductae; ramuli secondarii indeterminati frequentes 3-4 segmentis inter se distantes, multifarii, plerumque sine ramis tertiariis indeterminatis; ramuli ultimi determinati terni verticillati, breves, ca. 100 μ long, digitate 2-, 3-, interdum 4-furcati, cellulis in extremitatibus ad 10 μ vel minus long., atque 6-7 μ lat. magnitudine successive reductis; cellula terminalis obtusa, subacuta, aut pilum sine colore ferens; glandicellulae absentes; reproductio non visa.

Thalli minute, abundantly branched and densely aggregated, to 8 mm. tall, forming soft, red tufts on short articulated corallines on rock surfaces, consisting of interwoven branched monosiphonous, ecorticate axes about 25 μ in diameter below, bearing numerous, generally simple multicellular rhizoids, each arising from the basal cell of a determinate lateral branch; axial cells about 150 μ long below, 100 μ above and gradually reduced to the tips; secondary indeterminate branches frequent, 3-4 segments apart, multifarious, usually without tertiary indeterminate branches; ultimate determinate branchlets whorled in groups of three, short, about 100 μ long, with two, three, or sometimes four forks in a digitate manner, the first two usually of a single cell each and the last sometimes of a single cell, sometimes of two, the cells successively reduced in size to 10 μ or less long and 6-7 μ wide at the ends, the end cell blunt, subacute, or bearing a colorless hair; gland cells absent; reproduction not seen.

TYPE: Dawson 18855, scraped from rock surfaces with other minute algae from depths of about 3 feet, El Solitario rock, Bahía Agua Verde, Baja California del Sur, April 20, 1958. (LAM)

In size and superficial characters this tiny species suggests *A. breviramosus* Dawson, a species also newly recorded in the Gulf of California. The dense aggregation of axes matted together with rhizoids the absence of gland cells and the short-segmented, digitate determinate laterals are, however, amply distinctive.

Branchioglossum woodii (J. Ag.) Kylin 18723 This is a new record for the southern Gulf of California.

Schizoseris pygmaea Daws. 18673; 18873; 18568 Despite an abundance of this plant on thin sponges at depths of 3 to 6 feet on vertical walls at the landing place on Isla San Pedro Nolasco, no fertile material has appeared. Accordingly, it is not possible to make an adequate comparison with the *Myriogramme subdichotoma* Segawa (1941) from Izu, Japan, a plant that shows great resemblance to, and may be identical with, ours. Segawa has pointed out the affinity of his plant with *Schizoseris*, even to its close resemblance to the larger *Schizoseris dichotoma* (Hook. & Harv.) Kylin (1929) from New Zealand. He also indicates a likeness of his plant with Børgesen's *Myriogramme bombayensis*. Since fertile material is lacking our specimens cannot fully be compared with any of these, but in habit and size the similarity to Segawa's species is most striking.

Taenioma purpusillum (J. Ag.) J. Ag. 18948a

Centroceras clavulatum (Ag.) Mont. 18645; 18669; 18703 18740; 18782; 18786; 18867; 18875

Ceramium caudatum Setch. & Gard. 18769 is rather slender but fertile, tetrasporangial material on *Codium;* 18780, large, well-developed tetrasporangial material essentially identical with the type. Close relationship to the larger, coarser *C. ornatum* Setch. & Gard. from Isla Guadalupe is shown by the arrangement and the form of the peculiarly stalked tetrads within the tetrasporangia (Compare Setchell & Gardner 1924, pl. 27, fig. 55 and Dawson 1950, pl. 2, fig. 10); 18864, tetrasporangial

Ceramium fimbriatum Setch. & Gard. 18765; 18811

Ceramium gracillimum var. byssoideum (Harv.) G. Mazoyer 18607, sterile material on *Amphiroa;* 18807, sterile, but well developed vegetatively; 18897

Ceramium paniculatum Okam. 18578; 18579 is the same, but is a more slender form. It has many branches showing few or no spines, but others with many; 18948

Ceramium procumbens Setch. & Gard. 18653 This collection is unusual in that the opposite branching is in part suppressed in favor of alternate or irregular branching, and the tetrasporangial branches are asymmetrically curved with the sporangia immersed in the convex side. Male plants are also present and their fertile axes are more symmetrical. 18726, luxuriant fertile material of all stages; 18728 has prominent opposite branching, but the fertile axes are partly asymmetrical as noted above. It is mixed with *C. taylorii* and *C. sinicola.* 18785, on *Gelidium;* 18865

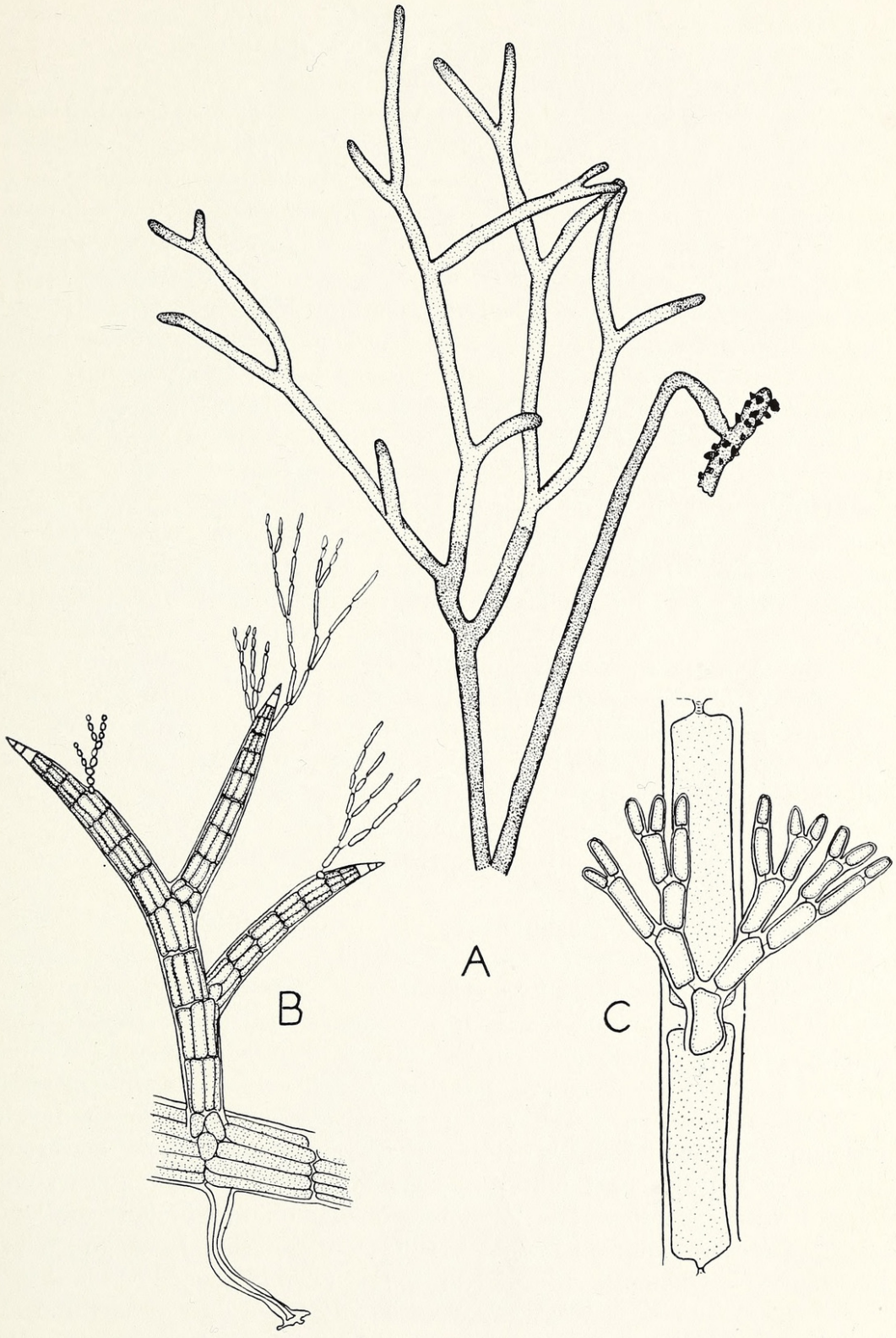
Ceramium sinicola Setch. & Gard. 18570; 18863

Ceramium sinicola var. *interrupta* (Setch. & Gard.) Daws. 18910, on *Codium*

Ceramium taylorii Daws. 18733, some growing on *Chaetomorpha* and some on rocks; 18874

Ceramium zacae Setch. & Gard. 18837 This tetrasporangial material, epiphytic on *Gelidium,* represents a new record for the Gulf of California.

Fig. 7. A. *Geppella decussata* sp. nov. Habit of a plant from the type collection showing an erect, dichotomous, decussate axis from a prostrate portion with adherent sand grains, × 64. *B. Herposiphonia spinosa* sp. nov. Portion of a prostrate axis from the type collection, showing a rhizoid and a spinose, determinate branchlet with trichoblasts, × 87.5. C. *Antithamnion mcnabbii* sp. nov. Portion of a mature axis from the type collection, showing one of three whorled, lateral, determinate branches at a node 700 μ from its tip, × 305.


A
B
C

Griffithsia tenuis C. Ag. 18556; 18619; 18644; 18667; 18712; 18732; 18762

Dasya sp. cf. *D. pedicellata* (Ag.) Ag. 18809, possibly just a reduced example with thick axes up to 500 μ in diam. below, but slender, branched pseudolaterals 12 μ thick in outer parts.

Dasya sinicola (Setch. & Gard.) comb. nov. (*Heterosiphonia sinicola* Setchell & Gardner 1924, p. 770, pl. 28, fig. 59, 60, pl. 47b) 18812; 18730; 18554 (Fig. 3 B) This material has been compared with portions of the type material and found to be identical. The structure of the plant is that of a 5 pericentral celled *Dasya* rather than a *Heterosiphonia*. The pseudolaterals are monosiphonous throughout rather than polysiphonous below. Secondary indeterminate polysiphonous lateral branches do not arise from the pseudolaterals as in *Heterosiphonia* and are not at first corticated. These uncorticated lateral branches may have led Setchell and Gardner to their disposition of the plant.

Setchell and Gardner have given good illustrations of the anatomical features of the axis, showing the pericentral cells and cortical cells of mature axes in detail. The cortication is delayed however to the extent that the immediate apices clearly show the pericentral cells which are early corticated by slender rhizoidal cells. The material under 18730 is excellent for observing the pseudolaterals and secondary branch origins. Number 18872 seems to be a dense, short, compact form superficially different in appearance from the type, but structurally the same.

Heterosiphonia wurdemanii var. *laxa* Børg. 18944c, small amount; a new record for the Gulf of California

Digenia simplex (Wulfen) Ag. 18635; 18799; 18862

Polysiphonia concinna Hollenberg[4] 18640; 18841

Polysiphonia johnstonii Setch. & Gard. 18697

Polysiphonia mollis Hook. & Harv. 18606; 18665; 18767; 18783; 18801; 18827; 18981

Polysiphonia simplex Hollenberg 18738; 18946

Herposiphonia secunda (Ag.) Ambronn 18625; 18672

Herposiphonia subdisticha Okam. 18664, very luxuriantly developed; 18714, excellent material on *Amphiroa;* 18869; 18897a. This species may now be considered to be well known in the Gulf of California, and it has been possible to compare the present collections with material of *Herposiphonia parva* Hollenberg recently described from California (Hollenberg 1943: 575, fig. 8-9). There appear to be no consistent differences between the plants from southern and northern areas along Pacific North America. The habit of growing on articulated corallines is characteristic and is identical with that of the Japanese plants illustrated by Okamura (1915, Icones III, pl. 146, fig. 11-18). These

[4] The determinations of these four species of *Polysiphonia* are provided by Dr. George J. Hollenberg of the University of Redlands, California.

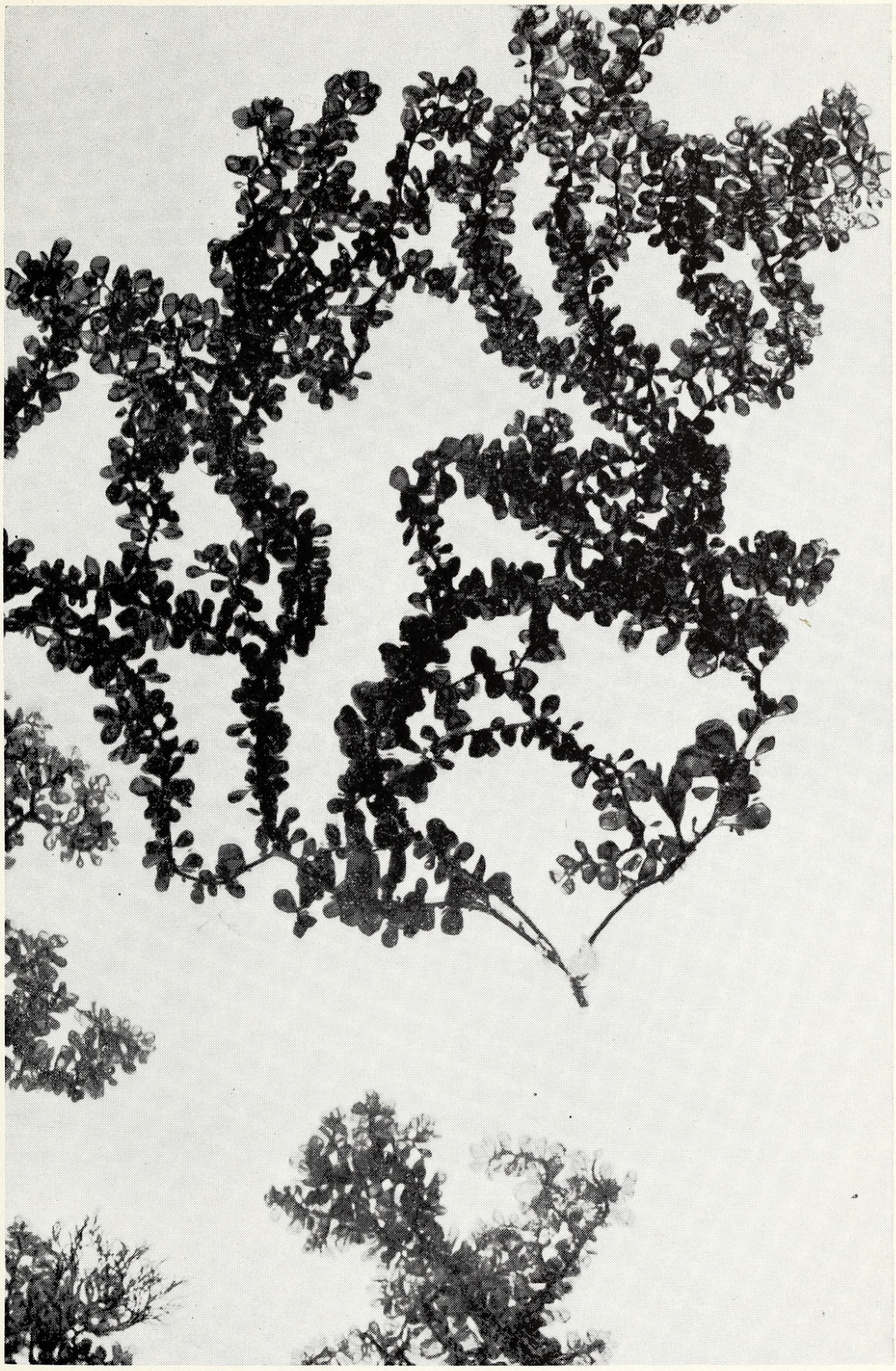


Fig. 8. *Botryocladia uvarioides.* A specimen from Isla Ildefonso (18698). Natural size.

considerations call for the reduction of *H. parva* under *H. subdisticha.*

Herposiphonia tenella (Ag.) Ambronn 18896; 18742, growing on a limpet shell is a very densely branched, short-segmented example referable here with some doubt. The confined habitat may account for the peculiarities.

Herposiphonia spinosa sp. nov. Fig. 7 B

Thalli minuti, apud algas alias repentes, ex axe principali prostrato polysiphono ad 18 μ long. vel plura, 130-160 μ diam., per rhizoidea unicellularia e superficie ventrali affixo, constantes, uno rhizoideo ex extremitate anteriore cellulae pericentralis in fere omni segmento, nisi prope cacumina axis, oriente, rhizoidea per membranam convexam a cellula pericentrali absciso; cellulae pericentrales 10-12 in axibus maturis, 6-8 in ramis determinatis; segmenta matura ca. 200 μ long.; apices ascendentes et, ut solet in genere,, circinati videri solent; rami indeterminati ad omne quartum segmentum regulariter obvenientes, per 3 ramos determinatos disiuncti; rami determinati saepissime erecti, e dimidio dorsali axis prostrati orientes, longitudine usque 1 mm., infra ca. 80 μ diam. semel vel plerumque bis furcati, ramis rigidis, divaricatis atque paululum recurvatis, ad apicem acutum, e serie plerumque 3 cellularum sine colore constantem, attenuatis, omnibus ramis in segmento quarto vel quinto post cacumen spiniforme trichoblastam ramosam conspicuam non praemature deciduam ferentibus; reproductio non visa.

Thalli minute, creeping among other algae, consisting of a prostrate polysiphonous main axis to 18 mm. long or more, 130-160 μ in diameter attached by unicellular rhizoids from the ventral surface, one of these arising from the forward end of a pericentral cell on virtually every segment except near the axis tips, the rhizoid cut off from its pericentral cell by a convex wall; pericentral cells 10-12 in mature axes, 6-8 in determinate branches; mature segments about 200 μ long; apices ascending and tending to appear circinate as generally in the genus; indeterminate branches occurring regularly at every 4th segment, separated by three determinate branches; determinate branches tending to be erect, arising from the dorsal half of the prostrate axis, reaching a length of about 1 mm., about 80 μ in diameter below, once or usually twice forked, the branches rigid, divaricate and slightly recurved, tapered to a sharp point consisting of a series of usually 3 colorless cells, each branch bearing on the 4th or 5th segment back from its spine-like tip a conspicuous branched trichoblast which is not deciduous; reproduction not seen.

TYPE: Dawson 18594, scraped from a rock surface at a depth of about two feet below mean low water, east side of Isla Partida, Baja California del Sur, April 28, 1958. (LAM)

The remarkably sharply pointed, branched, rigid, determinate branches are so distinctive that this species can hardly be confused with any other *Herposiphonia*. This may be a rare plant, for although several

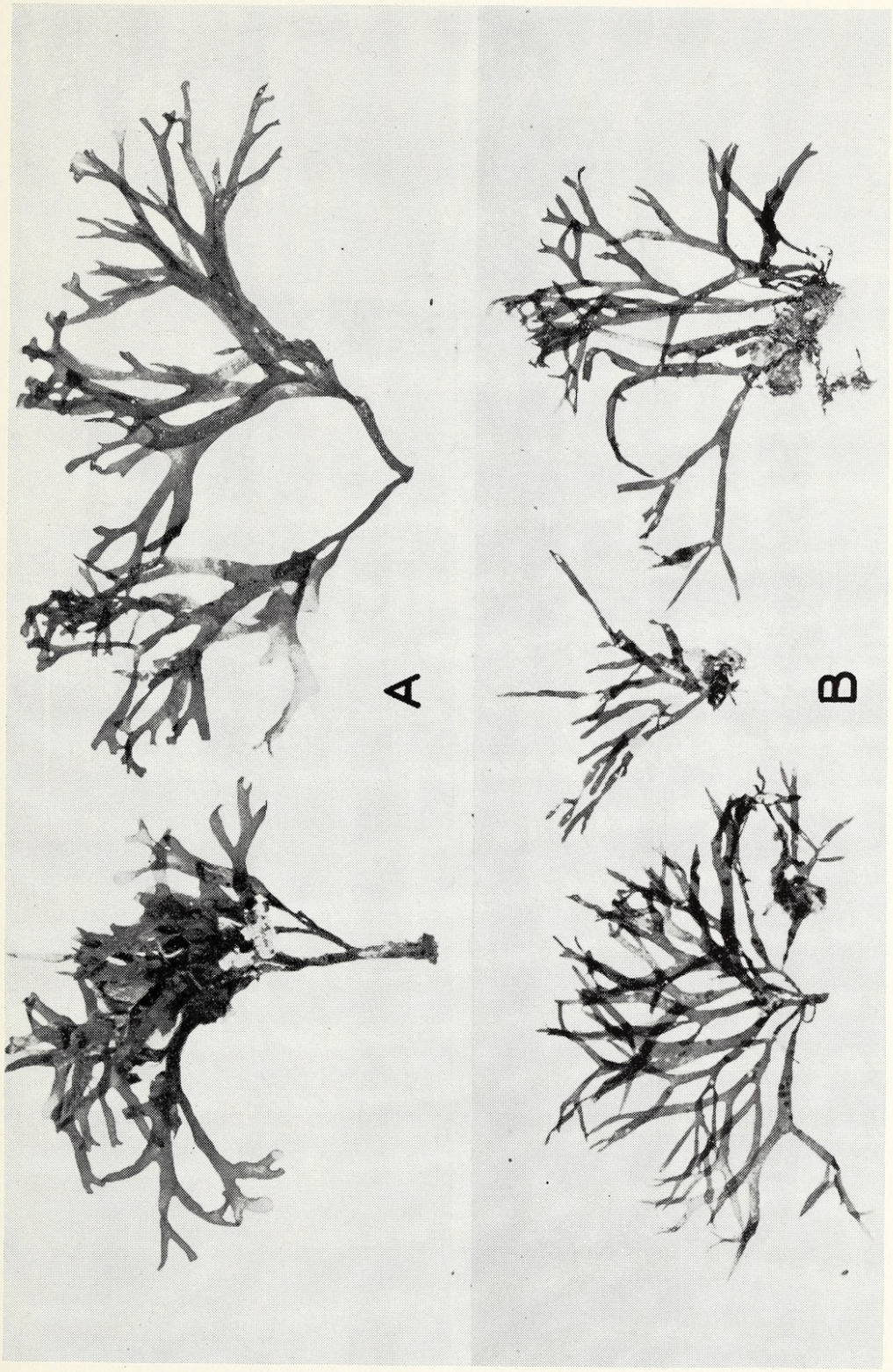


Fig. 9 A. *Rhodymenia hancockii*. Two specimens from Bahía Agua Verde (1889). Natural size.
B. *Carpopeltis stella-polaris* sp. nov. Three plants from the type collection from Isla Ildefonso. Natural size.

other species of *Herposiphonia* have been collected repeatedly in the Gulf of California, this one has appeared only in the present instance.

Lophosiphonia scopulorum (Harv.) Womersl. 18787, well developed

Laurencia hancockii Daws. 18868, topotypic; 18739, a little coarser than the type (350-400 μ thick) but in good agreement; 18748, richly developed; 18624, richly developed on a sponge. This latter material is shorter (5-7 mm. tall) than the type and has branches and axes slightly smaller in diameter (mostly 240-275 μ diam.). It seems clearly to be the same, however, as the Bahía Agua Verde material from intertidal rock pockets. The sublittoral habitat of the present material probably explains the variations observed, inasmuch as the species is apparently characteristically an inhabitant of surfy, intertidal areas.

The old and little known *Laurencia decumbens* Kützing (1863:16; 1865, Tab. Phyc. vol. 15, pl. 51) from New Caledonia is to be considered close to this species so far as form, habit and size are concerned, but Kützing's indicated magnifications are clearly incorrect and the description is fragmentary.

Laurencia obtusiuscula Setch. & Gard. Two series of rather delicately and abundantly branched laurenciae are at hand. Of these, the plants with shorter determinate branches are in best agreement with typical *L. obtusiuscula:* 18679, 18642, 18693, 18844, 18764, 18882, 18603, 18913, 18950. These were collected at levels which range from slightly below mean low water to somewhat above. Their most conspicuous feature in nature is the bright green color which, as observed by a swimmer at medium or high tide periods, makes the bottom appear like a waving green meadow. An inshore zone of this green *Laurencia* occurred at practically every station from Punta San Evaristo north to Isla Tortuga.

A similar plant, but reddish in color is represented by three collections, 18708, 18847 and 18576. These resemble the illustration of *Laurencia obtusiuscula* var. *laxa* Setch. & Gard. and are referred here with some question.

It appears unlikely that specific differences exist between plants described as *L. obtusiuscula* and *L. johnstonii.* Number 18844, for instance, is apparently equivalent to *L. johnstonii.* Setch. & Gard., but is not at all clearly distinct specifically from *L. obtusiuscula.* Numbers 18603 and 18913 show gradations also in density of branches and in color.

Laurencia papillosa var. *pacifica* Setch. & Gard. A series of seven specimens is at hand of plants which agree with the Setchell and Gardner illustration of this Gulf of California variety of the widely distributed species: 18689, 18643, 18709, 18774, 18853, 18895, 18618

Laurencia sinicola Setch. & Gard. 18691; 18724; 18871

Chondria californica (Collins) Kylin 18921; 18666; 18668; 18722, tetrasporic; 18745, tetrasporic; 18815; 18840; 18647, bearing richly developed *Jantinella.* Kylin doubted the distinctness of *Chondria*

acrorhizophora and its parasite, *Jantinella sinicola*. Although Dawson (1944) recognized both, the present collections seem to negate the existence of two distinct species. Some specimens show acrogenous rhizoids and no strongly hooked branches, while others show a tendency for both. The habit of all is essentially as in the Pacific Coast forms of *Chondria californica*. Number 18840, with its tendency to curved tips and presence of rhizoids, suggests that *Chondria clarionensis* Setch. & Gard. may also belong here.

Chondria dasyphylla (Woodw.) C. Ag. 18860

Chondria sp. aff. *C. decipiens* Kylin 18577 This sterile material is suggestive of a dwarfish *C. decipiens*. No liquid preserved specimens were prepared, and the plant needs study on the basis of more complete and fertile collections. A comparison with southern California material shows remarkable similarity in form and structure, even to details of cortical cell form, the 5 pericentral cells, and the cell proportions in the medulla. The present collection is compressed, however, instead of subcylindrical.

Chondria sp. 18918 This plant is difficult to place. It is of the Coelochondria group, having rhizoidal attachments and a habit similar to *Chondria polyrhiza* Collins & Hervey and *C. hapteroclada* Tseng, perhaps nearest the latter. Its pericentral cells, however, show the curved lines described for *C. curvilineata* Collins & Hervey.

Jantinella verrucaeformis (Setch. & McFadden) Kylin 18647a, on *Chondria californica*

CYANOPHYTA[5]

Symploca hydnoides Kütz. 18592; 18940a, with *Spirulina subsalsa*

Hydrocoleum glutinosum (Ag.) Gom. 18592a, with *Symploca hydnoides*; 18973; 18975, on *Halimeda*; 18955, with *Calothrix crustacea* on *Liagora*

Hydrocoleum comoides (Harv.) Gom. 18622

Lyngbya majuscula (Dillw.) Harv. 18761; 18813; 18952

Lynbya aestuarii (Mert.) Liebm. 18947

Hormothamnion enteromorphoides Grun. 18766

Spirulina subsalsa Oerst. 18940, with *Symploca hydnoides*

Phormidium hormoides Setch. & Gard. 18943, on a sponge

Calothrix crustacea Thur. 18955a, with *Hydrocoleum glutinosum* on *Liagora*

[5] The determinations of Cyanophyta are contributed by Dr. Francis Drouet of New Mexico Highlands University, Las Vegas, New Mexico.

LITERATURE CITED

Bliding, C.

1944. Zur Systematik der schwedischen Enteromorphen. Bot. Notiser 1944:331-356.

Børgesen, F.

1924. Marine algae from Easter Island, In C. Skottsberg, the Natural History of Juan Fernandez and Easter Island 2(9):247-309. Almqvist & Wiksells, Uppsala.

1930. Some Indian green and brown algae, especially from the shores of the Presidency of Bombay. Indian Bot. Soc., Jour. 9: 151-174.

Dawson, E. Y.

1944. The marine algae of the Gulf of California. A. Hancock Pac. Exped. 3(10):189-454, 47 pls.

1949a. Studies of northeast Pacific Gracilariaceae. A. Hancock Found. Occ. Papers (9): 1-105, 25 pls.

1949b. Resultados preliminares de un reconocimiento de las algas marinas de la costa Pacífica de México. Rev. Soc. Hist. Nat. 9:215-255, 1 map.

1950. A review of *Ceramium* along the Pacific Coast of North America with special reference to its Mexican representatives. Farlowia 4(1): 113-138, 4 pls.

1953. Marine Red Algae of Pacific Mexico, Part 1, Bangiales-Corallinaceae subf. Corallinoideae. A. Hancock Pac. Exped. 17(1): 1-240, 33 pls.

1954. Marine Red Algae of Pacific Mexico, Part 2, Cryptonemiales (cont.). Ibid. 17(2): 241-297, 44 pls.

1956. Some marine algae of the southern Marshall Islands. Pac. Sci. 10(1): 25-66, 66 figs.

Egerod, Lois

1952. An analysis of the siphonous Chlorophycophyta with special reference to the Siphonocladales, Siphonales, and Dasycladales of Hawaii. Calif. Univ., Pubs., Bot. 25(5): 325-545, 14 pls.

Hamel, G.

1929. Quelques *Cladophora* des côtes Françaises (suite). Rev. Algol. 4:43-76.

1930-32. Chlorophyceae des côtes Françaises. Ibid. 5:1-54, 383-430; 6:9-73.

Hollenberg, G. J.

1943. New marine algae from southern California. II. Amer. Jour. Bot. 30(8): 571-579.

Isaac, W. E.

1957. Some marine algae from Xai-Xai. Jour. So. African Bot. 23 (3): 75-102, 16 figs., 6 pls.

Kützing, F. T.
1845-71. Tabulae Phycologicae . . . Vols. 1-19 + index. 1900 pls. W. Köhne, Nordhausen.
1863. Diagnoses und Bemerkungen zu drei und siebenzig neuen Algenspecies, pp. 1-19, In Dr. Burghardt, Zu der öffentlichen Pruffung sämmtlicher Klassen der Realschule zu Nordhausen . . . Carl Kirchner, Nordhausen.
Kylin, H.
1929. Die Delesseriaceen Neu-Seelands. Lunds Univ. Årsskr. N.F. Avd. 2, 25(2): 1-15, 12 pls.
1956. Die Gattungen der Rhodophyceen. xv + 673 pp., 458 figs. Gleerups, Lund.
Ohmi, H.
1955. Contributions to the knowledge of Gracilariaceae from Japan. I. Critical notes on the structure of *Gracilaria textorii* (Suringar) J. Ag. Hokkaido Univ., Bull. Fac. Fish. 5(4): 320-331, 6 pls.
Okamura, K.
1907-1942. Icones of Japanese Algae. 7 vol., 345 pls. Published by the author, Tokyo.
Papenfuss, G. F. and Lois Egerod
1957. Notes on South African marine Chlorophyceae. Phytomorphyology 7(1): 82-93.
Segawa, S.
1941. New or noteworthy algae from Izu, I. Hokkaido Imp. Univ., Fac. Sci., Sci. Papers Inst. Alg. Res. 2(2): 251-271, 13 figs., 4 pls.
Setchell, W. A. and N. L. Gardner
1924. The marine algae. Expedition of the California Academy of Sciences to the Gulf of California in 1921. Calif. Acad. Sci., Proc. iv, 12: 695-949, 77 pls.
1937. A preliminary report on the algae. The Templeton Crocker Expedition of the California Academy of Sciences. Ibid. 22(2): 65-98, 1 fig., 23 pls.
Sparling, Shirley
1957. The structure and reproduction of some members of the Rhodymeniaceae. Calif. Univ., Pubs., Bot. 29(3): 319-396, pls. 48-59, 15 text figs.
Taylor, W. R.
1945. Pacific marine algae of the Allan Hancock Expeditions to the Galapagos Islands. A. Hancock Pac. Exped. 12: i-iv, 1-528, 3 figs., 100 pls.