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A PRELIMINARY CHECK-LIST OF THE MARINE ALGAE OF THE MOSS LANDING JETTY:  
AN ANNOTATED FLORISTIC COMPILATION

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by

James B. Jensen and Sara J. Tanner

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## INTRODUCTION

This check-list represents a summary of floristic data collected over a period of nine months (September, 1971 - July, 1972) in connection with a study of the jetty at Moss Landing, California. This work has been termed preliminary, inasmuch as it was envisioned as a baseline for future studies; therefore, it provides a list of algal species present, along with notations, and does not represent a compilation of ecological data, although some notes are of an ecological nature. The purpose of this work, then, is to establish a basic flora upon which ecological analyses can be begun. This compilation is preliminary also because a flora is never complete; it is to be expected that new discoveries will be made, particularly of the smaller, physically less significant species; the authors have made several such additions during the last few weeks of the compilation.

Floristic differences were known in advance between the north and the south side of the jetty; this was to be expected, owing to the differences in salinity, wave force, exposure, etc., and the differing variations of the factors. These differences in floristic composition have been tabulated (see Table 1). No attempt has been made, in this study, to detect and measure or evaluate the various gradients of distribution (i.e., west to east into the harbor, or vertical intertidal zonation). However, such gradients were observed; analysis of the vertical zonation relative to the horizontal will likely show an interesting depression of zonation on the south side, for example.

The sources of information for this report include the following: (1) field work done specifically for this survey; (2) collections made by

students in two phycology classes at MLML during the period of the survey; (3) collections made by earlier classes; (4) the Moss Landing Marine Laboratories Herbarium. All voucher specimens have been accessioned to the MLML Herbarium, and a master set of such vouchers has been assembled into a single issue exsiccata, the specimen numbers of which correspond to the species numbers in the text. All collections are of the authors, except as noted in the text.

The notes provided for the various species are intended to supplement presently available information; they are therefore uniquely applied to the plants growing on the jetty. The plants of the jetty appeared and occurred as described in Smith (1944) excepting as noted in the text, these annotations being morphological or ecological information as added or amended by the information gathered for the jetty algae. In a similar manner, taxonomic and nomenclatural information has not been included, excepting where it is at variance or more recent than that given in the Monterey floras (Smith, 1944; Hollenberg and Abbott, 1966). The bibliography, then, includes only those references cited in the annotations and discussions.

In addition to the check-list, three features have been included in the present work. Table 1 provides a synopsis of the relative abundance and the location of all of the species detected. Table 2 presents two lists. One represents plants conspicuously, or unusually, absent from the jetty. These are species that, in the opinion of the authors, are commonly found and would generally be expected to occur at a location such as the jetty. List two is a compilation of species that the authors expect to be discovered growing on the jetty in the future. The third feature is a set of keys to all of the species detected thus far. It is to be noted that while these keys are

inclusive, they are not exclusive, that is, a species not included in the key may still be keyed (incorrectly). Therefore, new discoveries, and plants from other localities will not satisfactorily be determined using these keys.

In this report, the location commonly referred to as the "North Jetty" has been called "the jetty" (see map p. 35) in order to lessen confusion when referring to the north or the south side. The term "south jetty" has been retained for the "South Jetty", where only a few collections have been made, mainly of Egregia spp.

Several specific locations on the jetty have become defined both by their physical description and by their floristics. Several of these have been termed communities, a reference to their floristic composition. These are as follows (see also map, p. 35, and Table 1): (1) the water-sand-jetty community, which is comprised of rocks partially and completely buried by sand. Some floristic components of this community are Petalonia fascia, Gigartina volans, Gracilaria sjoestedtii, and Gymnogongrus spp. These populations occur where the waterline on the jetty meets the sandy beach at low tide; (2) the sand spit locality occurs along the slough side of the jetty toward the harbor (see map, arrow denotes seaward end of sand spit). Characteristic plants of this area include Cladophora microcladioides, C. ovoidea, Chaetomorpha aerea, Ulva costata, Gracilaria sjoestedtii (and its epiphytes Ceramium sp. and Polysiphonia sp.); (6) the harbor end of the jetty; and "SJ," the region on the south jetty characterized by the presence of a large population of Egregia spp.

A notable limitation upon this study is the length of time the survey covered; less than a year. Some information has been gathered regarding



seasonal variation, for example of morphology or of abundance. However, a clearer understanding of the jetty flora will be based upon a full annual perusal of each floristic element (species, populations, communities), and better yet, collection of data over a number of years. The latter would detect not only seasonal variation, but an important variation - the yearly variation. For example, this study covered a portion of a year that was a "good" year for Gigartina subgenus Mastocarpus species, both from the standpoint of morphological expression and development, and of the abundance of male plants, which were exceedingly abundant in locations where they were difficult to find in previous years.

## CHLOROPHYTA

### VOLVOCALES

#### Polyblepharidaceae

1. Dunaliella salina (Dunal) Teodoresco.

Not found on the jetty itself; probably occasional in the few tide pools of the jetty. Abundant at the harbor mouth as a planktonic bloom in early spring (March - April).

### ULOTRICHALES

#### Chaetophoraceae

2. Endophyton ramosum Gardner.

Very common as an endophyte in Rhodoglossum americanum. Filaments forming greenish patches dispersed throughout the blade of the host. North and south sides of the jetty.

#### Ulvaceae

##### Ulva

3. Ulva lobata (Kützinger) Setchell and Gardner.

Mature thalli frequently irregularly divided and lightly ruffled. Larger specimens exceeding 30 cm in length. North and south sides of the jetty; more abundant on the south side, where generally larger individuals occur.

4. Ulva angusta Setchell and Gardner.

Some thalli lanceolate, gradually tapering below; others becoming irregular with age. Cytological features are more

reliable for specific determination. Found on rocks buried in sand, south side of the jetty.

5. Ulva linza Linnaeus.

Plants occurring on tops of rounded boulders, mid-intertidal and on rocks buried in sand, low intertidal. Also occurring as an epiphyte on Zostera (drift, slough). Abundant on south side of the jetty, present on north side at the tip.

6 Ulva costata (Howe) Hollenberg.

Previously unreported north of Los Angeles County. Local thalli are more highly ruffled than described for this species by Hollenberg (1971), and approximate the degree of ruffling characteristic of U. taeniata, Setchell and Gardner, with which species this plant has probably been identified in the past. The lack of marginal dentation as seen in U. taeniata, and the characteristically smooth, flat, unruffled midrib region distinguishes U. costata from the latter. Growing on rocks deeply buried in sand, south side of the jetty. The usual fasciculate morphology of the thallus with many basal branching points is often not observed because the blades are collected without their basal portions.

Ulva expansa (Setchell) Setchell and Gardner has been reported from the slough (Leg: R.A. Essinger, MLML 0237), but has not been detected on the jetty.

7. Enteromorpha tubulosa Kützing.

Thalli relatively unbranched to highly branched. Specific determination in this genus, as in Ulva, are more reliable when based on cytological rather than morphological features. Occurring on both sides of the harbor end of the jetty.

Enteromorpha intestinalis (Linnaeus) Link has been reported from the slough (Leg: H. Salwasser, MLML 0658), but has not been detected on the jetty.

#### SCHIZOGONIALES

##### Prasiolaceae

8. Prasiola meridonalis Setchell and Gardner.

Thalli diminutive, to 2 mm high. Forming a dense greenish coating on the top and east-facing side of one rock in the middle of the tip of the jetty. No evidence of bird excrement, but possibly nutrient enriched from bait fish. Highly reproductive in June. The one population seen was present for only one month in the beginning of the summer, reappearing for a short duration in the later part of summer.

#### CLADOPHORALES

##### Cladophoraceae

9. Chaetomorpha aerea (Dillwyn) Kützing.

Thalli to 20 cm high. Not abundant; found attached to several small rocks partially buried in sand, on the south side of the jetty.

## Cladophora

10. Cladophora microcladioides Collins.

Plants found on rocks slightly buried in sand at base of south side of the jetty.

11. Cladophora ovoidea Kützing.

Found in association with the above species of Cladophora. Not common, seen only in May.

## CODIALES

### Bryopsidaceae

12. Bryopsis corticulans Setchell.

Common on sides of rocks, in crevices, and on rocks buried in sand. The abundance and vigor of these plants is uncommon. Found on the north and south sides of the jetty.

## PHAEOPHYTA

## ECTOCARPALES

### Ralfsiaceae

13. Ralfsia pacifica Hollenberg.

Plants present as coalescing crusts, upper surface smooth; covering tops and sides of rocks, mid-intertidal, in direct line of surf, north side of the jetty. Recent studies (Wynne, 1969) indicate the presence of crust-like stages morphologically similar to Ralfsia spp. in the life histories of certain Scytosiphonaceae. Since Scytosiphon and Petalonia are known from this locality, these

Ralfsia-like stages are to be expected. A tentative morphological distinction between the two is revealed in a view of vertical sections of the thallus: the marginal region of Ralfsia is formed of upsweeping (and sometimes downsweeping), curved ascending filaments; that of Ralfsia-like stages in the Scytosiphonaceae is formed of directly ascending straight filaments.

## CHORDARIALES

### Corynophloeaceae

14. Petrospongium rugosum (Okamura) Setchell and Gardner.

Plants present as individual crusts to 3.0 mm in diameter. Usually found in association with Nemalion when it is present. Plants usually tawny-brown in color rather than a darker "chestnut brown". Tops and sides of rocks at the +3.5 foot tidal level, north side of jetty, toward the tip.

## DICTYOSIPHONALES

### Punctariaceae

15. Petalonia fascia (Müller) Derbes and Solier.

Plants not detected before mid-June, appearing for the first time then; the species is most likely present throughout the year as crusts, the blade form being present from June (15a) through mid-winter (e.g. 15b). Apparently two separate populations are present on the jetty, one occurring on the north side of the jetty, one at the tip. The population at the tip is found on the sides of rocks at the +2.0 to +3.5 foot tidal level, and is comprised of

thalli that are narrowly lanceolate, and that produce but a few (1-4) blades (15a). The population located on the north side of the jetty occurs at the point where the waterline meets the jetty at the +3.5 foot tidal level. The plants occupy tops and sides of rocks between the +2.0 and the +3.5 foot tidal level, and exhibit thallus forms of two types: narrow lanceolate (15d, lower specimen), and wide lanceolate (15d, upper specimen). The plants of this population are more robust than those at the tip of the jetty, being generally larger and producing many more blades (10-20). The wider form is not found at the tip.

This species is separable from Phaeostrophion irregulare, which it superficially resembles, by means of two characters: Petalonia fascia lacks an extensive, perennial basal crust, and possesses a single parietal chloroplast per cortical cell, versus the extensive basal crust characteristic of Phaeostrophion irregulare, and its possession of several flattened chloroplasts per cortical cell. An additional distinction between the two is the usual occurrence of P. irregulare on exposed sand-surf swept rocks located lower in the intertidal; Petalonia fascia usually is found higher in the intertidal on rocks generally free of sand-surf action.

16. Phaeostrophion irregulare Setchell and Gardner.

Thallus composed of clusters of erect blades arising from an extensive basal crust. Blades generally cuneate below, widening evenly and rapidly above, often eroded at the tip. In comparison

to Petalonia fascia, the color of the blades has more of a "brown quality", and the blades exhibit a more crisp texture. Plants occurring on sand-surf swept rocks, 0.0 to +0.5 foot tidal level, tip of jetty, south side of jetty in the sandy regions, and on the north side of the jetty, below the Petalonia fascia population.

#### Scytosiphonaceae

##### Scytosiphon

17. Scytosiphon lomentaria (Lyngbye) J.G. Agardh forma lomentaria.

Mature thalli tubular and clearly constricted, younger individuals lacking this morphological character; these latter, if occurring alone, seemingly being referable to S. lomentaria forma complanatus Rosenvinge. Typically, forma lomentaria is characteristic of low-lying, sun-warmed, protected tide pools and forma complanatus is characteristic of similar, but higher pools (Wynne, 1969). The plants of the jetty occupy an intermediate position, and one that is not within a tide pool. Two populations occur on the north side of the jetty, one at the waterline-sand junction, one near the tip. Inasmuch as the range in morphology between the two entities generally correlates with their height in the intertidal, a collection of morphological intermediates is to be expected. Pure stands of forma complanatus have also been observed. Both formas of this species are known as summer annuals (Wynne, 1969). Although forma complanatus is morphologically similar to S. dotyi (see below), it is separable through the possession, at maturity, of unicellular paraphyses, which the latter lacks.



S. lomentaria forma complanatus is not present during the winter, but can overlap the presence of S. dotyi, which is best developed during the winter, but can occur during the summer period.

18. Scytosiphon dotyi Wynne.

Thalli tubular, unstricted, occupying extensive vertical rock faces exposed to surf in the upper intertidal, north side of the jetty, near the tip. Favoring relatively shaded locations. Generally a winter plant. Thalli lack the unicellular paraphyses characteristic of S. lomentaria formas. Final disposition of the identities of the various populations of Scytosiphon observed on the jetty must await a perusal of the plants while they occur over a year's time and determinations based upon anatomical features.

#### DESMARESTIALES

##### Desmarestiaceae

19. Desmarestia herbacea (Turner) Lamouroux.

Plants first appearing in March, scattered specimens occurring from April onward; at the tip of the jetty and in crevices protected from direct surf on the north side of the jetty.

#### LAMINARIALES

##### Alariaceae

##### Egregia

20. Egregia menziesii (Turner) Areschoug.

Plants occupying tops and sides of rocks in mid-intertidal,

at the tip and on the north side of the jetty. Many juvenile plants common beginning in April. A population most likely referable to this taxon is located on the seaward end of the south jetty.

21. Egregia laevigata Setchell subspecies laevigata.

Plants occupying tops of rocks in mid-intertidal, tip of the jetty. A population of this species is located on the harbor end of the south jetty. Thalli with intergrading characters (see below) occur between this and E. menziesii. The rachis and the vesicles and blades of plants assigned to this taxon are completely smooth. Specimens from Pebble Beach (MLML 0651, 0688, 0967, 0972, 0974, 0944) exhibit a similar morphology.

22. Egregia laevigata Setchell subspecies borealis (Setchell)

Silva.

Plants occupying a position between E. laevigata subsp. laevigata and E. menziesii on the south jetty, and on the north side of the jetty, near the tip. Rachis, vesicles, and blades beset with tubercles the number of which appears to intergrade between those of the two aforementioned taxa. Specimens with such intergrading characters have also been observed at Pebble Beach. This taxon is considered to represent a probable hybrid between E. laevigata subsp. laevigata and E. menziesii. Cultural work (in progress) involving crosses between the two postulated parents, both of local occurrence and with the Pebble Beach

populations, together with the more southern populations is needed to confirm the relationship of these three entities within Egregia.

## RHODOPHYTA

### BANGIALES

#### Bangiaceae

23. Smithora naiadum (Anderson) Hollenberg.

Not found on the jetty proper, but collected in drift from the slough. Epiphytic on Zostera.

#### Porphyra

24. Porphyra smithii Hollenberg and Abbott.

Epiphytic on Gigartina papillata. Fairly common on the north side of the jetty.

25. Porphyra perforata J.G. Agardh.

Thalli on the north side of the jetty occur higher in the intertidal (+5.0 feet), are smaller (about 5-10 cm), and greenish-gray in color. Thalli from the harbor end of the jetty occur lower (+2.0 feet), measure to 35 cm, and are of a rich brown-red color.

26. Porphyrella gardneri Smith and Hollenberg.

Plants growing as epiphytes on the apices of blades of Egregia spp., on the south jetty. One doubtful record exists for the jetty (Leg: J. Baxter, MLML 1075); the plants are epiphytic

on blades of Laminaria setchelli, a plant unknown at the jetty. The specimen was probably collected in the drift, and had originated some distance away.

#### NEMALIONALES

##### Acrochaetiaceae

27. Acrochaetium subimmersum (Setchell and Gardner) Papenfuss.

Endophytic, forming dark red patches in the host, Halymenia schizymerioides. Patches distributed over the blade of the host.

Common on the south side of the jetty.

##### Helminthocladiaceae

28. Nemalion lubricum Duby.

Rare, occurring as isolated individuals on the north side of the jetty, near the tip, becoming abundant where found in October. Plants have not been detected between December and July, but collections have been made in July, August (Leg: H. Salwasser, MML 0760), and November (Leg: J. Wellington, MML 1125), suggesting that this species is a late summer-winter plant. It most likely persists throughout the late winter to mid-summer period as a basal crust system, protonemal stage, or an Acrochaetium-like tetrasporophyte. Herein, this plant is re-identified by the name used in Smith's flora, pending more definite evidence in support of merging this species with the European N. elimthoides (Vellay) Batters.

29. Cumagloia andersonii (Farlow) Setchell and Gardner.

Rare, growing in same locations as Nemalion. North side of the jetty, becoming abundant where found in October in association with Nemalion.

#### CRYPTONEMIALES

##### Dumontiaceae

30. Pikea californica Harvey.

Rare, isolated individuals at the tip of the jetty, and on the north and south side, near the tip. In association with various delesseriaceous species at the 0.0 foot tidal level.

31. Farlowia mollis (Harvey and Bailey) Farlow and Setchell.

Rare, isolated individuals on the south side at the tip of the jetty. Occurs in protected locations. Plants seen were of the "mollis" form rather than the "crassa" form as described by Abbott (1962).

##### Corallinaceae

An intensive effort to collect and identify plants in this family, which belongs within the realm of the specialist, was not made. Those few plants which presented clear-cut characters were included in this check list, but most of the material remains unidentified at this time.

32. Corallina chilensis Decaisne.

Plants occurring below the 0.0 foot tidal level on rocks exposed to heavy surf. North side of the jetty.

33. Bossiella dichotoma (Manza) Silva.

A series of plants herein referred to this species was collected; certain characters were somewhat intermediate between this species and B. gardneri (Manza) Silva. This plant occurs in association with Corallina chilensis.

Cryptonemiaceae

34. Grateloupia doryphora (Montagne) Howe.

Plants in small tide pools at the +2.0 foot tidal level and on tops of rocks at the 0.0 foot tidal level. The former plants were a grass green color in nature (drying reddish) (34a); plants from the latter location (34b) were of a more normal coloration: deep brownish-red. Present on the south side of the jetty.

35. Cryptonemia ovalifolia Kylin.

Rare, found in a protected crevice on the side of one rock, at the +2.0 foot tidal level. North side of the jetty.

36. Halymenia schizymenioides Hollenberg and Abbott.

Thalli broadly lanceolate or deeply and irregularly divided, sometimes into falcate segments. Plants on protected sides of rocks, and on flat surfaces exposed to surf, at the 0.0 foot tidal level. North and south sides of the jetty, toward the tip; more common on the south side.

Prionitis

37. Prionitis lanceolata Harvey.

Thalli of essentially two forms: an outer coast form (37a) as illustrated in Smith's flora, and a form that is less branched

or proliferous, and with longer, more linear segments (37b). Plants found on tops of rocks, lower intertidal, north side of the jetty. Thalli often emit an odor of hypochlorite bleach.

38. Prionitis andersonii Eaton.

On sand covered rocks in protected areas, 0.0 to +2.0 foot tidal level. North side of the jetty.

39. Prionitis lyallii Harvey.

Rare, on rocks buried in sand in protected regions, +1.0 foot tidal level. North side of the jetty. Thalli, especially those found in small tide pools, often emit an odor of hypochlorite bleach.

Kallymeniaceae

Callophyllis

40. Callophyllis violacea J.G. Agardh.

Rare, at the 0.0 foot tidal level, growing in association with delesseriaceous species, exposed to mild surf action. South side of the jetty, toward the tip.

41. Callophyllis obtusifolia J.G. Agardh.

Plants found growing in association with the above species.

GIGARTINALES

Nemastomaceae

42. Schizymenia pacifica Kylin.

Thalli of an irregularly lanceolate or obovate form, variously and irregularly divided into shallow or deep segments, often

morphologically similar to Halymenia schizymenioides. On tops and vertical sides of rocks, 0.0 foot tidal level. North and south side (where it is more abundant) of the jetty.

#### Solieriaceae

43. Agardhiella tenera (J.G. Agardh) Schmitz.

Uncommon, growing on tops of rocks, 0.0 to +2.0 foot tidal level, in protected regions. Often in association with Gastroclonium coulteri (Harvey) Kylin. The plants observed were diminutive (less than 15 cm. high), and appeared stunted. North side of the jetty, toward the tip.

#### Gracilariaceae

44. Gracilaria sjoestedtii Kylin.

Plants growing on rocks which become deeply buried in sand, -1.0 to +1.0 foot tidal level. Uncommon on the north side of the jetty, common on the south side, where it extends into the slough and the harbor. Plants on the north side are free of the epiphytes commonly found on the plants on the slough side (viz. Polysiphonia, Ceramium, Ulva, Enteromorpha). This species is herein referred to the genus Gracilaria, in keeping with the merging of Gracilariopsis Dawson with Gracilaria Greville by Papenfuss (1967).



Phylloporaceae

Gymnogongrus

45. Gymnogongrus linearis (Turner) J.G. Agardh.

Plants growing on rocks partially or deeply buried in sand, or sometimes emergent from the sand. Limited to one area, but abundant at that location. North side of the jetty.

46. Gymnogongrus leptophyllus J.G. Agardh.

Plants growing in association with the above species of Gymnogongrus, but about 0.5 to 1.0 foot higher, on a protected rock surface about 0.5 foot above the sand. Limited to certain rocks, but common where found. North side of the jetty.

47. Gymnogongrus platyphyllus Gardner.

Rare, on rocks at mid-tidal level, south side of the jetty.

Gigartinaceae

Gigartina, subgenus Chondrodictyon.

48. Gigartina volans (C.A. Agardh) J.G. Agardh.

Thalli of variable form. Female plants that grow on rocks at least partly buried in sand are of the more typical form as illustrated by Smith (48a). Tetrasporic (and putative male) thalli foliose to regularly dichotomously divided, without marginal or proliferous bladelets (48b, 48c). Thalli growing on sides of rocks well above the sand become more regularly divided,

with more orders of branching. These latter thalli (48c) resemble Iridaea or other Gigartina species. North side of the jetty, in association with Gymnogongrus spp.

Gigartina, subgenus Chondracanthus.

49. Gigartina leptorhynchos J. G. Agardh forma leptorhynchos.

Plants on tops of rocks, +1.0 to +3.0 foot tidal level. A narrower form (49a) occurs in higher, more exposed locations; a wider, more luxuriant form (49b) occupies lower and more sheltered locations. G. leptorhynchos forma cylindrica Dawson, a terete form, was not detected. South side of the jetty, at the tip, and on the north side in the vicinity of the tip.

Gigartina, subgenus Cheilogigartina.

50. Gigartina corymbifera (Kützinger) J.G. Agardh.

Rare; a somewhat flaccid, highly proliferous specimen is herein referred to this species. The orbicular (but eroded) blade, together with the linear-cuneate, concave-convex basal region devoid of papillae is characteristic of this species. Exposed to surf, 0.0 foot tidal level, north side of the jetty.

51. Gigartina californica J.G. Agardh.

Thalli diminutive and stunted early in the season, later some normal thalli occurring along with stunted ones. The single collection presented herein is worthy of remark due to its superficial resemblance to G. papillata. It is distinguished from the latter through its red color (developed from a brownish-red upon

drying), and the marginal serrulations. This species morphologically intergrades with G. harveyana, particularly toward the north (e.g., Pigeon Point, Bodega Head). Plants growing on rocks at the 0.0 foot tidal level, south side of the jetty.

52. Gigartina harveyana (Kützting) Setchell and Gardner.

Thalli narrowly lanceolate and simple (52a) to broadly foliar and much branched or proliferous (52b). The latter form approaches G. boryi Setchell and Gardner. These two species morphologically intergrade at certain localities on the Monterey Peninsula (e.g., Asilomar point). Dawson (1961) has merged G. boryi with G. harveyana on the basis of their similarities and because grazed and proliferous, but undoubted specimens of G. harveyana resemble the type of G. boryi. Extending these observations to the local flora would substantiate combining these two species. Isolated individuals occurring at the 0.0 foot tidal level, 2/3 the distance to the tip of the north side of the jetty.

Gigartina, subgenus Mastocarpus.

Many of the species described within this subgenus probably represent environmental modifications of certain morphological features. These species then represent nothing more than "formas", form species, or the "microspecies" of Setchell and Gardner (1933). A more final disposition of the taxonomy of this subgenus is dependent upon a monographic treatment (in preparation) that includes the study of each taxon throughout its range, and at many collecting stations. Meanwhile, by adhering narrowly to the concept associated

with the type specimen of each "species", and by limiting to tentative the assignment of specimens approaching, to some degree, the characters of that species, a floristic treatment can be compiled for a specific region. Many specimens, then are only provisionally assigned to taxa of this polymorphic complex.

53. Gigartina agardhii Setchell and Gardner.

Thalli usually narrow and wiry, male plants and some female plants wider; swollen margin strongly developed, branches usually strongly canaliculate, branching regularly dichotomous. Proliferations, when they are present, are diminutive repetitions of the branches (e.g. regularly dichotomous). Cystocarps occupying papillae that are globose or drawn out into a pinnule. Occurring on tops and sides of rocks, +3.0 foot tidal level and above, north side of the jetty and at the tip.

54. Gigartina papillata (C.A. Agardh) J.G. Agardh.

Thalli usually wide; well developed specimens thick, thereby obscuring the swollen margin. Branching usually limited to one or several fairly regular dichotomous divisions. Male thalli tending to be more broadly expanded and somewhat translucent (thereby approximating G. cristata, in part). One specimen presented here (54a) is simple and non-proliferous, and is similar to the type. The second specimen (54b) represents a less divided, more foliar expression, with proliferations superimposed upon an essentially undivided blade (which form is assignable to G. papillata var.

subsimpler Setchell). Common on both sides of the jetty; the form represented by 54b is characteristic of the harbor end of the jetty.

55. Gigartina cristata (Setchell) Setchell and Gardner.

Thalli more or less translucent, blades regularly divided into relatively wide, linear segments, two to five orders of branching. Apices cristate (resembling a cock's comb) owing to several orders of short-segmented branches, this combination of branches broadly rounded in gross outline. Submarginal region sometimes regularly producing cuneate, proliferous bladelets; swollen margin usually prominent. The specimen presented here (particularly the upper individual) is close in appearance to the type. Plants growing on rocks near the shore on the north side of the jetty. Specimens provisionally referable to this taxon are scattered as isolated individuals or small populations over much of the jetty.

56. Gigartina dichotoma Gardner.

Thalli proportionately long and narrow, branches wide and usually linear, swollen margin present, inconspicuous (to well developed in male plants). Branching usually limited to several dichotomies, which are characteristically limited to the lower third of the thallus, hence the sub-ultimate or ultimate segments are elongate. Ultimate segments tend to be somewhat sharply pointed. Papillae more distant than in the other species, usually in randomly scattered patches. Some forms with papillae that are elongated into ligulate pinnules (56b). The collections represented by 56a are similar to the type, while the morphology

represented by 56**b** is mentioned in the discussion of the original description of this species (Gardner, 1927, p. 333). A form commonly found in certain populations (particularly on rocks near the shore on the north side of the jetty) is represented by 56**c**: an undivided blade. These plants are particularly well developed in size, and superficially resemble G. californica and G. harveyana, being separable from those taxa by the lack of marginal serrulations and the red-brown color. Male thalli (56**d**), on the other hand, resemble thalli of Iridaea because of the lack of obvious papillae; the swollen margin, however serves to distinguish these from the latter genus. Common at the above location, scattered individuals and populations occur over much of the jetty.

57. Gigartina jardinii J.G. Agardh.

Thalli narrow to wide, usually with branches measuring 0.5-1.5 cm wide; if narrow, cartilaginous. Branching pattern basically dichotomous, but not regularly dichotomous due to modifications ranging from sub-dichotomous through sub-pinnate and palmate, to irregular. Swollen margin thicker, more canaliculate (upturned), and with a more pronounced nude region than is characteristic for the other species of this complex. Apices of terminal segments acutely pointed, bifurcate to quadrifurcate. The type (Setchell and Gardner, 1933, pl. 65) represents a narrower form; Smith (1944, pl. 69, Fig. 1) provides a figure of a relatively wide form (as G. cristata). The thalli of this species possess characters that are intermediate, individually, between several other species

of this complex; the total morphology appears to be a blend of that of G. agardhii with that of G. papillata. Narrow forms are separable from the former by their cartilaginous rather than wiry texture, and by their sub-dichotomous to irregular branching pattern, rather than regularly dichotomous. Wider forms are separable from G. papillata by more numerous branchings together with the acute apices. Forms resembling G. dichotoma are separable by the possession of more numerous branchings with segments that are shorter and less linear than in that species. North side of the jetty, on rocks at the +1.0 foot tidal level. Abundant where found, but not widely distributed. (The coastal distribution of this species appears spotty; it has been repeatedly collected from Stillwater Cove, Asilomar Point, and Pigeon Point, as well as more northern locations.)

58. Rhodoglossum americanum Kylin.

Plants represented by two populations: one occupying the rocks above the Gymnogongrus spp. and Gigartina volans population on the north side of the jetty, one characteristic of the sandy area on the south side. Thalli from the south side (58b) usually occur as simple, individual blades that are thicker, coarser, and longer than those from the north side. These latter plants (58a) are generally in groups, proliferous from the holdfast or the stipes; later in the growing season plants proliferous from the margins of the blades were collected (58c).

Iridaea

59. Iridaea lineare (Setchell and Gardner) Kylin.

Thalli with simple (59a) to several times branched (59b) stipes. The characteristics of this species, namely the long, narrowly cuneate stipe, and the narrow, linear-lanceolate blade that is spirally twisted, are exhibited by mature thalli. Juvenile (59a, center plant) or stunted thalli approximate the morphology of I. splendens. Common on sides of surf-swept rocks, 0.0 foot tidal level, north side of the jetty.

60. Iridaea splendens (Setchell and Gardner) Papenfuss.

Thalli with undivided blades, apically divided blades, or several blades from a branched stipe. The latter two forms appear more frequently at this locality than is usual. Older, vigorous thalli (60b) becoming thick and somewhat leathery in texture. Abundant on outer half of the north side of the jetty, -1.0 to +2.0 foot tidal level.

61. Iridaea flaccida (Setchell and Gardner) Silva.

First detected in July, becoming common on both sides of the jetty.

62. Iridaea coriacea (Setchell and Gardner) Scagel.

A number of clearly referable specimens were observed at this locality. Fresh thalli exhibit the leathery texture, the greenish-brown color, and the thick blade (with completely submerged cystocarps, in female thalli) that is characteristic of



this species. Many specimens are intermediate between these and the characters of both I. splendens and I. flaccida. Common on tops and sides of rocks, -1.0 to +1.0 foot tidal level, north and south sides of the jetty.

63. Iridaea heterocarpa Postels and Ruprecht.

Exceptional variation in form was observed for thalli of this species. The morphology ranged from simple obovate blades or irregularly divided blades to regularly dichotomously branched thalli which exhibited broad to very narrow (0.5-0.7 mm) segments. Male thalli tend to be broader, in general, than female thalli. Female thalli exhibit the characteristic large, variously sized cystocarps. Present on tops of rocks, +1.0 foot tidal level, north side of the jetty.

## RHODYMENIALES

### Champiaceae

64. Gastroclonium coulteri (Harvey) Kylin.

Scattered groups of individuals on tops of rocks, 0.0 to +2.0 foot tidal level, north side and tip of the jetty where heavy surf occurs.

## CERAMIALES

### Ceramiaceae

#### Platythamnion

65. Platythamnion pectinatum Kylin.

A single specimen (Leg: R.A. Essinger, MML 0311) was collected from the -1.5 foot tidal level, from a rock exposed to waves.

66. Platythamnion villosum Kylin.

Plants occurring on protected sides of rocks, lower intertidal, south side of the jetty.

67. Callithamnion pikeanum Harvey.

Isolated individuals on slanted tops of rocks at the +1.0 foot tidal level, south side of the jetty. Whereas this species is uncommon, the thalli are of relatively large size.

68. Pleonosporum dasyoides (J.G. Agardh) DeToni.

Plants growing on sides of rocks in association with Polyneura, -1.0 to 0.0 foot tidal level, south side of the jetty. The occurrence of this species on rock substrate is unusual; its usual host, Ptilota densa, has not yet been seen on the jetty. One collection (Leg: Judy E. Hansen, MML 0130) occurred as an epiphyte on Prionitis lanceolata.

69. Griffithsia pacifica Kylin (prox.).

Morphologically, our material somewhat resembles G. pacifica, and final taxonomic disposition awaits completion of studies of fertile material. Scattered individuals on tops of rocks somewhat

protected from surf, at the +1.0 foot tidal level, south side of the jetty. The plant is also relatively abundant in certain subtidal stations in the slough.

70. Ceramium eatonianum (Farlow) DeToni.

Thalli diminutive in size (usually 1.0 cm high, but up to 2.0 cm), of a dark reddish color. Plants occur as dense tufts (each tuft being an equal mixture of this and Polysiphonia hendryi var. gardneri) in association with Balanus, +2.5 foot tidal level and above, south side of the jetty. Abundant where the barnacle occurs.

71. Ceramium sp. nov. ined.

Plants epiphytic on Gracilaria sjoestedtii. Thalli to 3.0 cm high, incompletely corticated, bright red in color. Abundant between March and May, persisting into June. Occurring on the population of the host located on the sandy area of the south side of the jetty. This species is morphologically similar to C. gardneri Kylin and C. californicum J.G. Agardh, to which taxa it is probably related. Formal description of this taxon awaits further study of the reproductive morphology.

72. Centroceras clavulatum (C.A. Agardh) Montagne.

Plants covering tops of rocks, mid-intertidal, south side of the jetty.

Microcladia

73. Microcladia borealis Ruprecht.

Plants on tops and sides of rocks exposed to surf, +1.0 foot tidal level, middle to the tip of the jetty, on the north side.

74. Microcladia coulteri Harvey.

Plants epiphytic on various Florideophycideae, abundant on certain thalli of the host species, absent from others, a feature probably dependent upon the age and condition of the host, as well as its position in the intertidal. Widely distributed on the jetty.

Delesseriaceae

75. Polyneura latissima (Harvey) Kylin.

Plants on sides and tops of rocks exposed to surf, -1.0 foot tidal level, toward the tip of the jetty on both the north and the south side, more abundant on the latter; forming a band below the other Rhodophyta, at times continuous from the sand spit to the tip of the jetty on the south side.

76. Nienburgia andersoniana (J. G. Agardh) Kylin.

Plants present from about April onward, becoming abundant in June. Older thalli characteristically heavily encrusted with bryozoan colonies. Occupying the sides of rocks and in crevices, protected from direct surf, 0.0 foot tidal level, south side of the jetty toward the tip. This species usually occurs as scattered or isolated individuals; the jetty populations, therefore are relatively abundant.

Cryptopleura

77. Cryptopleura lobulifera (J.G.Agardh) Kylin.

Plants abundant on the south side of the jetty in association with C. violacea, Neinburgia, and Polyneura, with which species it forms the "delesseriaceous belt".

78. Cryptopleura violacea (J.G. Agardh) Kylin.

Plants occurring as above.

Rhodomelaceae

Polysiphonia

79. Polysiphonia paniculata Montagne.

Thalli of relatively large size (15 cm). Plants occurring on tops and sides of exposed rocks, +1.0 to +2.0 foot tidal level. Abundant on the south side, less abundant on the north side of the jetty, but absent toward the tip.

80. Polysiphonia hendryi var gardneri (Kylin) Hollenberg.

Plants occurring in association with Ceramium eatonianum, and distributed as in that species (see above). The thallus is usually a khaki green color.

81. Polysiphonia sp.

Plants epiphytic on Gracilaria sjoestedtii, abundant as the populations of Ceramium on this host began to disappear. Plants occurring on the south side population of the host. This apparently new species of Polysiphonia has four pericentral cells, and resembles, in this respect and in its morphology, P. pacifica Hollenberg. It differs from the latter in having rhizoidal cortication in the lower portion, a feature, however, shared with P. hancockii Dawson, which also has four pericentral cells. The local species differs from the latter in lacking scar cells. Further, P. hancockii, according to present knowledge, has an extremely limited range, being known only from the tip of Baja California.

82. Pterosiphonia dendroidea (Montagne) Falkenberg.

Plants occurring as two populations on the south side of the jetty. The first and earlier population is distributed on the shaded and protected sides of rocks in the mid-intertidal. The later-appearing population occupies the tops and sides of more exposed, lower (-1.5 to 0.0 foot tidal level) rocks. The two populations slightly overlapped in time, and because of this, appeared to represent two distinct entities on account of their different ages. This apparent difference was accentuated by the diminutive stature of the early population.

LEGEND TO MAP

- (1) water-sand-jetty community
- (2) sand spit locality
- (6) east (harbor) end of jetty
- J the jetty
- SJ the south jetty, arrow indicates location  
of population of Egregia spp.

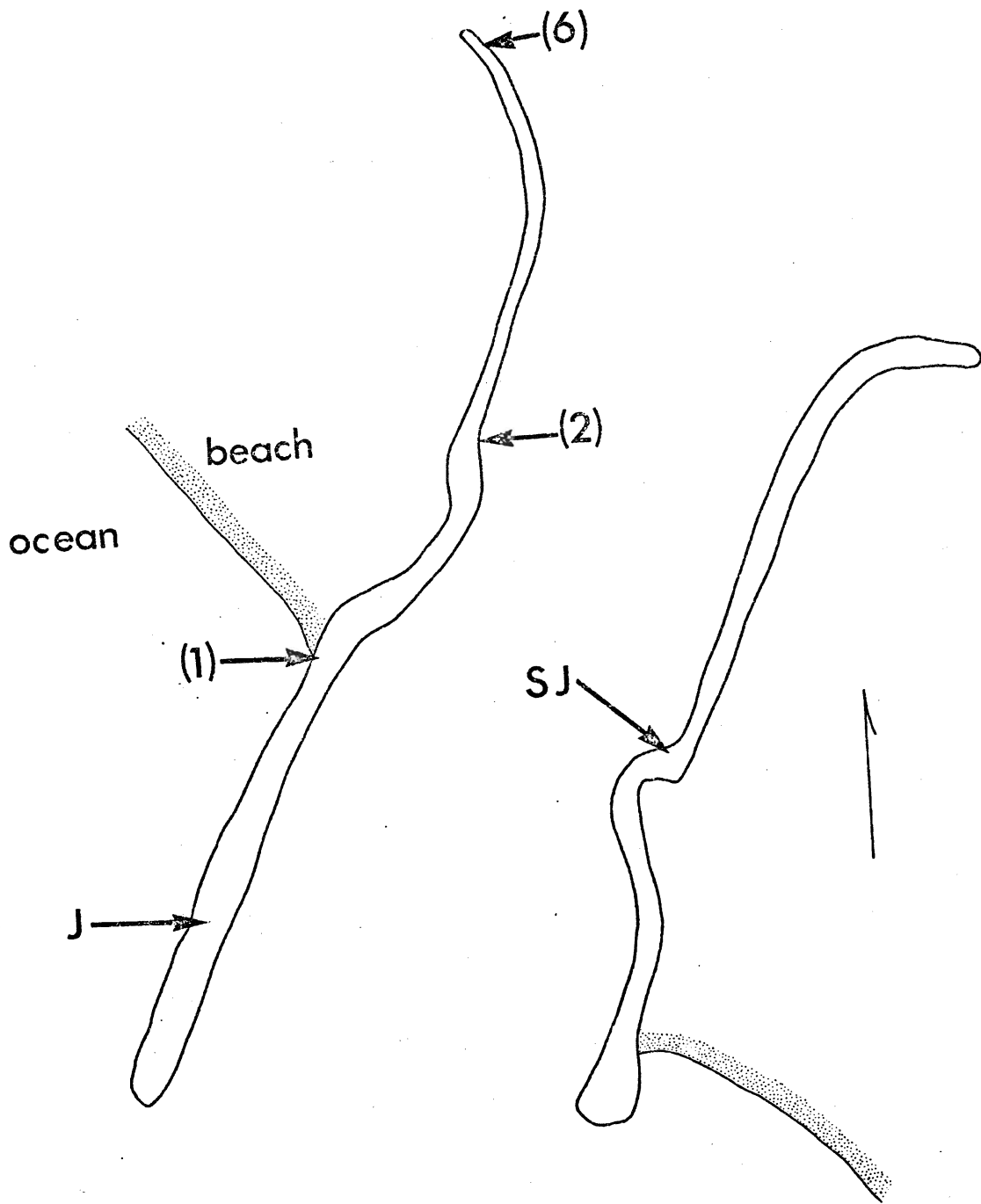




TABLE 1: SPECIES CHECK-LIST WITH OCCURRENCE AND RELATIVE ABUNDANCE<sup>1</sup>

PLANT		NORTH SIDE	SOUTH SIDE	NOTES
1.	<i>Dunaliella salina</i>			planktonic only
2.	<i>Endophyton ramosum</i>	++ (1) <sup>2</sup>	++	limited to distribution of host
3.	<i>Ulva lobata</i>	+	++ (2)	south, more robust thalli
4.	<i>Ulva angusta</i>	-	+	(2)
5.	<i>Ulva linza</i>	++ (3)	+++ (2)	
6.	<i>Ulva costata</i>	-	++ (2)	
7.	<i>Enteromorpha tubulosa</i>	++ (6)	++ (2,6)	
8.	<i>Prasiola meridionalis</i>			limited to the top of the jetty.
9.	<i>Chaetomorpha aerea</i>	-	+	(2)
10.	<i>Cladophora microcladioides</i>	-	+	(2)

<sup>1</sup>Abundance in relation to the usual, expected occurrence:

- = not present
- + = rare (less than usual)
- ++ = present (about as is usual)
- +++ = abundant (more profuse than usual)

Annotated distributions (see introduction for explanations):

- (1): Water-sand-jetty community
- (2): Sand spit locality
- (3): and located at the tip
- (4): located only at the tip
- (5): located only near the tip
- (6): east (harbor) end of jetty

PLANT	NORTH SIDE	SOUTH SIDE	NOTES
11. Cladophora ovoidea	-	+ (2)	
12. Bryopsis corticulans	++	+++	
13. Ralfsia pacifica	++	-	
14. Petrospongium rugosum	++ (5)	-	
15. Petalonia fascia	++ (1,3)	-	
16. Phaeostrophion irregulare	++ (1,3)	++ (2)	
17. Scytosiphon lomentaria	+ (1,5)	-	
18. Scytosiphon dotyi	+ (5)	-	
19. Desmarestia herbacea	++ (3)	-	
20. Egregia menziesii	++ (3)	-	also, south jetty population
21. Egregia laevigata subsp. laevigata	+ (4)	-	also, south jetty population
22. Egregia laevigata subsp. borealis	+ (4)	-	also, south jetty population
23. Smithora naiadum			drift, epiphyte on <u>Zostera</u>
24. Porphyra smithii	+++	-	limited to distribution of host
25. Porphyra perforata	++	++ (6)	(6), robust thalli
26. Porphyrella gardneri			south jetty only
27. Acrochaetium subimmersum	-	++ (3)	limited to distribution of host
28. Nematium lubricum	+ (5)	-	
29. Cumagloia andersonii	++ (5)	-	
30. Pikea californica	+ (3,5)	+ (3,5)	
31. Farlowia mollis	-	+ (4)	
32. Corallina chilensis	++	-	
33. Bossiella dichotoma	++	-	
34. Grateloupia doryphora	-	++	
35. Cryptonemia ovalifolia	+	-	protected rock crevices
36. Halymenia schizymenioides	++ (5)	++ (5)	more common on the south side
37. Prionitis lanceolata	++	-	

PLANT	NORTH SIDE	SOUTH SIDE	NOTES
38. <i>Prionitis andersonii</i>	++	-	
39. <i>Prionitis lyallii</i>	+	-	
40. <i>Callophyllis violacea</i>	-	+ (5)	
41. <i>Callophyllis obtusifolia</i>	-	+ (5)	
42. <i>Schizymenia pacifica</i>	++	++	more abundant on the south side
43. <i>Agardhiella tenera</i>	+ (5)	-	
44. <i>Gracilaria sjoestedtii</i>	+ (1)	+++ (2)	extends into harbor and up the slough
45. <i>Gymnogongrus linearis</i>	+++ (1)	-	
46. <i>Gymnogongrus leptophyllus</i>	+++ (1)	-	
47. <i>Gymnogongrus platyphyllus</i>	-	+	
48. <i>Gigartina volans</i>	++ (1)		
49. <i>Gigartina leptorhynchus</i>	++ (5)	++ (3)	upper and lower forms
50. <i>Gigartina corymbifera</i>	+	-	
51. <i>Gigartina californica</i>	-	+	diminutive thalli
52. <i>Gigartina harveyana</i>	+	-	
53. <i>Gigartina agardhii</i>	++	-	
54. <i>Gigartina papillata</i>	+++	+++	
55. <i>Gigartina cristata</i>	++ (1)		
	(++)	(++)	(scattered individuals)
56. <i>Gigartina dichotoma</i>	++ (1)		
	(++)	(++)	(scattered individuals)
57. <i>Gigartina jardinii</i>	++		
58. <i>Rhodoglossum americanum</i>	++ (1)	++ (2)	
59. <i>Iridaea lineare</i>	++	-	
60. <i>Iridaea splendens</i>	+++	-	
61. <i>Iridaea flaccida</i>	++	++	
62. <i>Iridaea coriacea</i>	++	++	
63. <i>Iridaea heterocarpa</i>	++	-	
64. <i>Gastroclonium coulteri</i>	+ (3,5)	-	

PLANT	NORTH SIDE	SOUTH SIDE	NOTES
65. <i>Platythamnion pectinatum</i>			rare; single specimen seen
66. <i>Platythamnion villosum</i>	-	+	
67. <i>Callithamnion pikeanum</i>	-	+	
68. <i>Pleonosporium dasyoides</i>	-	+	rock substrate
69. <i>Griffithsia pacifica</i>	-	+	extends into the harbor
70. <i>Ceramium eatonianum</i>	-	+++	associated with barnacles
71. <i>Ceramium</i> sp.	-	+++ (2)	limited to distribution of host
72. <i>Centroceras clavulatum</i>	-	++	
73. <i>Microcladia borealis</i>	++	-	
74. <i>Microcladia coulteri</i>	++	++	
75. <i>Polyneura latissima</i>	++ (5)	++ (5)	more abundant on the south side
76. <i>Nienburgia andersoniana</i>	-	+++	
77. <i>Cryptopleura lobulifera</i>	-	+++	
78. <i>Cryptopleura violacea</i>	-	+++	
79. <i>Polysiphonia paniculata</i>	++	+++	absent near tip
80. <i>Polysiphonia hendryi</i> var. <i>gardneri</i>	-	+++	associated with barnacles
81. <i>Polysiphonia</i> sp.	-	+++ (2)	limited to distribution of host
82. <i>Pterosiphonia dendroidea</i>	-	++	

TABLE 2

A. Some commonly found species conspicuously absent from the jetty.	B. Species not yet found but expected to occur on the jetty
Enteromorpha intestinalis Cladophora trichotoma Spongomorpha coalita Heterochordaria abietina Laminaria setchellii Costaria costata Dictyoneurum californicum Postelsia palmaeformis Alaria marginata Fucus gardneri Pelvetia fastigiata Gelidium robustum Endocladia muricata Plocamium pacificum Ahnfeldtia plicata Erythrophyllum delesserioides Rhodymenia pacifica Hymenena flabelligera Botryoglossum farlowianum Rhodomela larix Laurencia spectabilis	Ulothrix implexa Blidingia minima Enteromorpha intestinalis Urospora penicilliformis Ectocarpus spp. Myronema spp. Rhodochorton purpurem Gelidium robustum Petrocelis franciscana Gardneriella tuberifera Gracilariophila oryzoides Rhodymenia spp. Antithamnion spp. Callithamnion spp. Spermothamnion snyderae Rhodomelaceae

KEY TO THE SPECIES

CHLOROPHYTA: Thallus grass-green

1. Thallus unicellular.....2.
1. Thallus multicellular.....3.
  2. Thallus an ovoid, uninucleate, biflagellate, planktonic cell.....Dunaliella salina.
  2. Thallus a branched filamentous, non-septate coenocytic cell; attached.....Bryopsis corticulans.
3. Thallus a branched or unbranched, uniseriate filament.....4.
3. Thallus not as above, a hollow tube or an expanded blade.....8.
  4. Thallus an endophytic branched filament..... Endophyton ramosum.
  4. Thallus not as above; if a branched filament, free living.....5.
5. Thallus an unbranched filament.....Chaetomorpha aerea.
5. Thallus a branched filament.....6.
  6. Thallus non-septate; branching distinctly pinnate.....Bryopsis corticulans.
  6. Thallus septate; branching a combination of bifurcate and unilateral.....7.
7. Upper branches acutely pointed, arcuate away from the branch bearing them, pectinate; cells at base of branchlets 80-100  $\mu$ m broad, branchlet cells linear.....Cladophora microcladioides.
7. Upper branchlets not as above; apices rounded, branchlets linear, unilateral on upper side of branch bearing them, but not altogether pectinate (closely placed); cells at base of branchlets 60  $\mu$ m broad, branchlet cells barrel shaped.....Cladophora ovoidea.
  8. Thallus a hollow tube throughout, whose wall is one cell thick.....9.
  8. Thallus not as above; an expanded sheet, if not wholly, at least in the upper portion.....10.

9. Thallus with cuboidal cells in more or less linear rows in surface view; chloroplasts lining the outer wall.....Enteromorpha tubulosa.
9. Thallus with irregularly shaped, angular cells not in linear rows; chloroplasts (in surface view) lining the lateral wall.....Enteromorpha intestinalis.
  10. Thallus less than 4 mm high at maturity; monostromatic, cells with stellate chloroplasts; found in splash zone, top of jetty.....Prasiola meridionalis.
  10. Thallus more than 20 mm high at maturity; diastromatic, cells with cup-shaped or lamellate chloroplasts; found in intertidal or upper zone, sides of jetty.....11.
11. Thallus a distromatic blade above, a hollow tube below.....Ulva linza.
11. Thallus not as above; distromatic throughout.....12.
  12. Thallus a group of basally branched lanceolate blades possessing a highly ruffled margin and a plane and costate (thickened central region) mid-region.....Ulva costata.
  12. Thallus not as above; a single blade, which may be lobed or irregularly divided; margins plane or lightly ruffled; mid-region of blades not costate.....13.
13. Cells of thallus cuboidal in cross section; chloroplasts restricted to lining the outer face of the cell.....Ulva angusta.
13. Cells of thallus sub-cuboidal to rectangular in cross section; chloroplasts occupying the outer one-third of the cell.....Ulva lobata.

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PHAEOPHYTA: Thallus brown, dark brown, or brownish-green

1. Thallus crustose.....2.
1. Thallus not as above; with erect portions.....4.

2. Crust loosely adherent to rock (easily peeled away); highly and irregularly convoluted; light tawny-brown in color; filaments, in vertical section view, branched.....Petrospongium rugosum.
2. Thallus not as above; tightly adherent to rock; slightly and concentrically convoluted; blackish-brown in color; filaments, in vertical section view, unbranched.....3.
3. Crust with upsweeping, curved ascending filaments in vertical section view.....Ralfsia pacifica.
3. Crust with directly ascending filaments in vertical section view.....crust-stage of Scytosiphon spp. and Petalonia.
  4. Thallus a hollow tube.....5.
  4. Thallus not as above.....7.
5. Thallus with colorless, unicellular paraphyses.....6.
5. Thallus without colorless, unicellular paraphyses.....Scytosiphon dotyi.
  6. Thallus constricted at intervals.....Scytosiphon lomentaria forma lomentaria.
  6. Thallus not constricted at intervals.....Scytosiphon lomentaria forma complanatus.
7. Thallus consisting of a hapteroid holdfast from which arises an elongate rachis clothed with pinnate blades.....8.
7. Thallus not as above.....10.
  8. Rachis and blades with tubercules.....9.
  8. Rachis and blades without tubercules.....Egregia laevigata subsp. laevigata.
9. Rachis densely clothed with tubercules, appearing felt-like.....Egregia menziesii.
9. Rachis clothed with sub-distant tubercules, warty but not felt-like.....Egregia laevigata subsp. borealis.



- 10. Blade repeatedly (and pinnately) branched, branches with an obscure midrib; terminating in a trichothallic filament.....Desmarestia herbacea.
- 10. Blade single, clustered, or divided but without a midrib; not terminating in a trichothallic filament.....11.
- 11. Surface cells with one parietal chloroplast; holdfast system annual, not an extensive crust.....Petalonia fascia.
- 11. Surface cells with several flattened chloroplasts; holdfast system perennial, an extensive crust.....Phaeostrophion irregulare.

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RHODOPHYTA: Thallus dark green brown, brown-red to bright pink

- 1. Thallus calcareous, hard and stony, and jointed.....2.
- 1. Thallus not calcareous, not stony and jointed.....3.
  - 2. Main branches sub-cylindrical, percurrent, pinnately bearing laterals.....Corallina chilensis.
  - 2. All branches flattened, upper segments winged, with repeatedly bifurcate or irregular branching.....Bossiella dichotoma.
- 3. Thallus polysiphonous.....4.
- 3. Thallus not polysiphonous, but uniseriate or aggregate.....7.
  - 4. Branching pinnate; color red.....Pterosiphonia dendroidea.
  - 4. Branching radial; color blackish-brown or khaki green.....5.
- 5. Pericentral cells 4; epiphytic on Gracilaria.....Polysiphonia sp.
- 5. Pericentral cells 12-14; not epiphytic on Gracilaria.....6.

- 24. Apex of blade broadly rounded; stipe gradually widening into a blade, the base of which is concave-convex.....Gigartina corymbifera.
- 24. Apex of blade pointed; stipe abruptly widening into a blade, the base of which is plane.....Gigartina californica.
- 25. Margin of blade with obovate proliferations; papillae scattered.....Gigartina volans.
- 25. Margin of blade nude; papillae dense or scattered.....26.
- 26. Blade narrow-lanceolate, apex acute; papillae distantly scattered or in scattered patches.....Gigartina dichotoma.
- 26. Blade not as above; wide and with a rounded apex; papillae densely placed.....Gigartina papillata.
- 27. Stipe (or lower portion of blade) once or twice bifurcate, giving rise to undivided or once divided blades with obovate proliferous bladelets on the margins.....Gigartina volans.
- 27. Thallus not with above combination of characters.....28.
- 28. Thallus profusely and irregularly divided or branched many times; soft and bushy; papillae proliferous blade-like on the blade surface; color purple-brown.....Gigartina leptorhynchus.
- 29. Blade irregularly divided several times; with marginal serrations; texture somewhat soft; color bright to dark red.....Gigartina harveyana.
- 29. Thallus not as above; once or repeatedly bifurcate (if irregularly branched, thallus wiry-cartilaginous); margins nude; texture firm; color brown to brown-red to dark red-black.....30.
- 30. Thallus narrow, 2-5 mm wide; segments wiry to wiry-cartilaginous.....31.
- 30. Thallus wider than above; segments blade-like texture firm but neither wiry nor cartilaginous.....32.

- 6. Thallus diminutive (to 2.5 cm high), habit tufted; occurring on barnacles; color khaki green.....Polysiphonia hendryi var. gardneri.
- 6. Thallus larger (to 20 cm high), habit lax; occurring on rocks; color blackish-brown.....Polysiphonia paniculata.
- 7. Thallus anatomically a uniseriate filament, at least in the upper portions, may become completely or incompletely corticated below or at the nodes.....8.
- 7. Thallus not as above; not anatomically a uniseriate filament.....16.
  - 8. Thallus completely uncorticated.....9.
  - 8. Thallus corticated below or at the nodes.....12.
- 9. Branching with whorled branches at each node, main branches with opposite pairs dimorphic.....10.
- 9. Branching not as above; not whorled but irregular (endophytic thallus) or bifurcate (free-living thallus).....11.
  - 10. Ultimate branches two upper, one lower per node..... Platythamnion villosum.
  - 10. Ultimate branches two upper, no lower per node.....Platythamnion pectinatum.
- 11. Thallus endophytic, forming red patches in the host (Halymenia schizymenioides.....Acrochaetium subimmersum.
- 11. Thallus not as above; free-living, erect, growing on rock.....Griffithsia pacifica.
  - 12. Thallus completely corticated below, uncorticated and uniseriate above.....13.
  - 12. Thallus with nodal cortication.....14.
- 13. Sporangia with tetraspores; thallus dark purple-brown in color; habit dense and somewhat spongy.....Callithamnion pikeanum.
- 13. Sporangia with polyspores; thallus bright red in color; habit lax and filamentous.....Pleonosporium dasyoides.
  - 14. Cortication obviously limited to nodes in mature portions of branches; thallus epiphytic on Gracilaria.....Ceramium sp.
  - 14. Cortication not as above; becoming corticated throughout in mature portion of branches; thallus not epiphytic but on rock.....15.

15. Thallus at maturity diminutive (up to 3 cm high), occurring on barnacles; cortication not in regular longitudinal rows, nodal spines lacking.....Ceramium eatonianum.
15. Thallus not as above; at maturity 8-10 cm high, occurring on rock; cortication in regular longitudinal rows, nodal spines present.....Centroceras clavulatum.
16. Thallus strongly flattened or an expanded sheet; blade-like, entire, divided, or even branched.....17.
16. Thallus cylindrical or a flattened cylinder, not blade-like.....63.
17. Thallus a membranous expanded sheet, one (cuboidal) cell in thickness.....18.
17. Thallus not as above; more than one cell in thickness.....21.
18. Thallus epiphytic on Zostera.....Smithora naiadum.
18. Thallus not epiphytic on Zostera.....19.
19. Thallus epiphytic on Egregia.....Porphyrella gardneri.
19. Thallus not epiphytic on Egregia.....20.
20. Thallus usually on rock; cells with one centrally located chloroplast.....Porphyra perforata.
20. Thallus epiphytic on Gigartina cells with two widely separated chloroplasts, one at each end.....Porphyra smithii.
21. Surface of thallus with many globose or finger-like papillate outgrowths.....22.
21. Surface not as above.....37.
22. Blade undivided.....23.
22. Blade divided.....27.
23. Margin of blade serrated; thallus bright to dark red.....24.
23. Margin of blade not serrated, but smooth and swollen, or with obovate proliferations; thallus dark red to black.....25.

31. Branching regularly bifurcate (with superimposed proliferations sometimes obscuring the branching).....Gigartina agardhii.
31. Branching sub-bifurcate to irregular.....Gigartina jardinii.
32. Apices acutely pointed.....33.
32. Apices broadly rounded or cristate to blunt-lanceolate.....34.
33. Thallus regularly bifurcate with wide (1.5-3.0 cm) long-linear segments.....Gigartina dichotoma.
33. Branching sub-bifurcate to irregular, with narrow (less than 1.0 cm) short-irregular segments.....Gigartina jardinii.
34. Thallus translucent, brown in color.....35.
34. Thallus not as above.....36.
35. Apex of segments cristate (crested like a cock's comb); fertile specimens with rounded papillae.....Gigartina cristata.
35. Apex not cristate but lanceolate to broadly rounded; fertile specimens smooth and without papillae, or with ligulate outgrowths on the blade surface.....Gigartina subgenus Mastocarpus, male thalli.
36. Thalli with long-linear segments, apices blunt lanceolate; papillae distantly scattered or in scattered patches.....Gigartina dichotoma.
36. Thalli not with above combination of characters; segments short and not linear, but cuneate, apices blunt to rounded; papillae densely placed.....Gigartina papillata.
37. Blades regularly divided into segments, repeatedly bifurcate or flabellate or pinnate.....38.
37. Blades entire or with several irregular divisions.....52.
38. Thallus brown to brownish-red, translucent; margin markedly thickened..... Gigartina subgenus Mastocarpus, male thalli.
38. Thallus not with above combination of characters.....39.

39. Thallus profusely and irregularly branched; soft and bushy; many blade-like proliferations on the margins and surfaces of the segments; color purple-brown.....Gigartina leptorhynchos.
39. Thallus not with above combination of characters.....40.
40. Thallus highly dissected, with many irregularly pinnate, ribbon-like branches.....Farlowia mollis.
40. Thallus not as above.....41.
41. Thallus pinnately branched; segments strap-shaped or foliaceous.....42.
41. Thallus not as above; repeatedly bifurcate or flabellate.....44.
42. Thallus red to reddish in color.....Prionitis andersonii.
42. Thallus red-brown to greenish-brown.....43.
43. Segments strap-shaped (ultimate segments may be foliaceous to lanceolate); texture stiff and firm, not slippery to the touch.....Prionitis lanceolata.
43. Segments linear-lanceolate to foliaceous; texture soft and slippery to the touch.....Prionitis lyallii.
44. Thallus regularly bifurcate; texture firm-cartilaginous or wiry.....45.
44. Thallus not as above; regularly flabellate, the segments thin-membranous or at least expanded and blade-like.....47.
45. Thallus with segments less than 2 mm wide; texture wiry.....Gymnogongrus leptophyllus.
45. Thallus with segments 4 mm or wider; texture firm to cartilaginous.....46.
46. Margins of segments markedly thickened; thalli translucent; texture firm but not cartilaginous.....Gigartina subgenus Mastocarpus, male thalli.
46. Margins of segments thinner than mid-region; thalli not translucent; texture cartilaginous.....Gymnogongrus platyphyllus.

47. Thallus with a percurrent midrib and a toothed margin.....Nienburgia andersoniana.
47. Midrib, if present, not percurrent; margin entire.....48.
48. Thallus with a network of veins obvious to the naked eye.....49.
48. Thallus without veins.....51.
49. Veins large, coarse and emergent from the thallus surface; midrib absent.....Polyneura latissima.
49. Veins fine, not emergent, but within the tissue of the thallus; midrib present in lower half of the thallus.....50.
50. Thallus reddish-purple in color; segments elongate; texture membranous and flaccid; tetrasporangial sori linear when in blade (rounded when in marginal proliferations).....Cryptopleura violacea.
50. Thallus reddish-brown in color; segments short; texture crisp; tetrasporangial sori lunate in blade (and in marginal proliferations).....Cryptopleura lobulifera.
51. Apices acutely pointed; cystocarps rarely over 1.5 mm in diameter in lower portions of thallus.....Callophyllis obtusifolia.
51. Apices blunt and broadly rounded; cystocarps up to 3.0 mm in diameter in lower portions of thallus.....Callophyllis violacea.
52. Thallus bright red in color; texture thin and flaccid.....53.
52. Thallus not as above; texture firm to rubbery.....54.
53. Thallus to 4 cm high; obovate; rare.....Cryptonemia ovalifolia.
53. Thallus higher, over 10 cm high; lanceolate; common on rocks where it occurs.....Rhodoglossum americanum.
54. Thallus with a markedly thickened margin.....Gigartina dichotoma, male thalli.
54. Thallus margin not thickened.....55.

55. Thallus linear-lanceolate; main blade typically irregularly lacerate, and thereby producing several lateral segments; texture extremely slippery; of a rich brown (on rocks) or a deep green (in tide pools) color.....Grateloupia doryphora.
55. Thallus not with above combination of characters.....56.
56. Thallus not iridescent when submerged; texture firm and sometimes slippery, surface appearing granular or as a tanned leather; color rich brown or dull red; blades typically irregularly lacerate.....57.
56. Thallus not with above combination of characters; iridescent when submerged; texture rubbery and stretchable, surface homogenous; color various but not as above.....58.
57. Transection revealing gland cells, with refractive contents, in cortex; medullary filaments interwoven and longitudinally arranged; color red to dull red.....Schizymenia pacifica.
57. Gland cells lacking; medulla with numerous filaments traversing the medulla from cortex to cortex (at least obliquely); color reddish-brown to rich brown.....Halymenia schizymenioides.
58. Tetrasporangial sori located in cortex or at juncture of cortex and medulla.....Gigartina volans, tetrasporophyte.
58. Tetrasporangial sori located in medulla.....59.
59. Cystocarps of various sizes, large (to 3 mm in diameter); blade typically deeply and irregularly incised into segments.....Iridaea heterocarpa.
59. Cystocarps of uniform size, smaller (to 1.5 mm in diameter); blade typically single, or regularly divided once or twice.....60.
60. Blades narrow, linear-lanceolate typically spiralled and with ruffled margins; stipe conspicuous, to 5 cm long.....Iridaea lineare.
60. Blades cordate, typically plane or nearly so; stipe to 2 cm long.....61.



61. Blades leathery in texture, thick (to 1.5 mm);  
cystocarps totally imbedded in tissue  
of female thalli.....Iridaea coriacea.
61. Blades not leathery in texture, thinner  
(to 0.75 mm); cystocarps emergent, protruding  
from tissue of female thalli.....62.
62. Blade greenish, at least partially,  
    especially after drying.....Iridaea flaccida.
62. Blade rich purple.....Iridaea splendens.
63. Ultimate branchlets regularly  
constricted, hollow but with  
septae.....Gastroclonium coulteri.
63. Thallus not as above.....64.
64. Thallus regularly dichotomously branched.....65.
64. Thallus unbranched, or radially, pinnately  
    (or pectinately), or irregularly branched.....69.
65. Thallus with numerous papillate or  
ligulate outgrowths.....Gigartina agardhii.
65. Thallus without such outgrowths.....66.
66. Thallus fine and delicate, a corticated  
    filament.....67.
66. Thallus wiry or cartilaginous, and  
    aggregate of interwoven filaments.....68.
67. Thallus at maturity diminutive (to 3.0 cm high);  
occurring on barnacles; cortication not  
in regular longitudinal rows, nodal  
spines lacking.....Ceramium eatonianum.
67. Thallus not as above; at maturity  
8-10 cm high; occurring on rocks;  
cortication in regular longitudinal  
rows, nodal spines present.....Centroceras clavulatum.
68. Thallus to 3 cm high; strongly  
    flattened; wiry.....Gymnogongrus leptophyllus.
68. Thallus 15-20 cm high;  
    terete to slightly flattened;  
    cartilaginous.....Gymnogongrus linearis.
69. Thallus radially branched.....70.
69. Thallus branched in one plane.....73.
70. Texture of thallus soft and gelatinous,  
    velvety.....71.
70. Texture of thallus firm.....72.

71. All branches about the same size, few  
in number.....Nemalion lubricum.
71. Several main branches which bear  
many smaller branches.....Cumagloia andersonii.
72. Plant bushy, branches all of  
a similar length, spindle shaped,  
constricted at the base;  
commonly growing on rocks free  
of sand.....Agardhiella tenera.
72. Plant elongate and stringy;  
branches of irregular length,  
without a basal constriction;  
commonly growing on rocks  
buried in sand.....Gracilaria sjoestedtii.
73. Thallus pectinately branched, branches  
secund; color purple.....Microcladia borealis.
73. Branches of thallus not as above, but  
pinnate; color red to deep red.....74.
74. Thallus growing as an  
epiphyte.....Microcladia coulteri.
74. Thallus growing on rock.....Pikea californica.

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EXPLANATION OF PLATES

Plate 1

- Fig. 1. Ulva linza. No. 5.  $X\frac{1}{2}$ .  
Fig. 2. Ulva costata. No. 6.  $X\frac{1}{2}$ .  
Fig. 3. Petalonia fascia. Two plants showing narrow lanceolate form below, and wide lanceolate form above. No. 15d.  $X\frac{1}{2}$ .  
Fig. 4. Phaeostrophion irregulare. No. 16.  $X\frac{1}{2}$ .

Plate 2

- Fig. 1. Halimena schizymenioides. No. 36a.  $X\frac{1}{2}$ .  
Fig. 2. Gigartina volans. Tetrasporophytes. No. 48c.  $X\frac{1}{2}$ .  
Fig. 3. Gigartina californica. Diminutive plants. No. 51.  $X\frac{1}{2}$ .  
Fig. 4. Gigartina harveyana. No. 52b.  $X\frac{1}{2}$ .

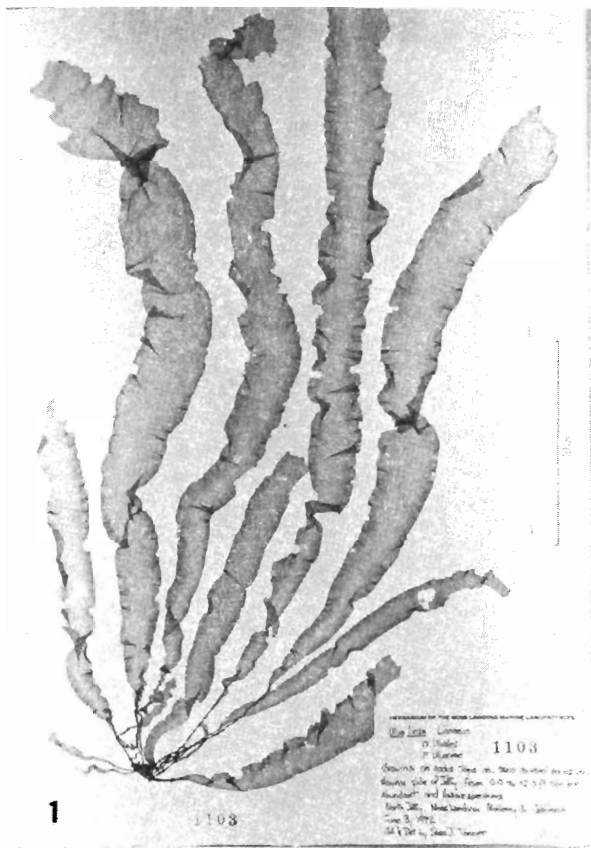
Plate 3

- Fig. 1. Gigartina papillata. No. 54b.  $X\frac{1}{2}$ .  
Fig. 2. Gigartina cristata. No. 55.  $X\frac{1}{2}$ .  
Fig. 3. Gigartina dichotoma. Papillae elongated into ligulate pinnules. No. 56b.  $X\frac{1}{2}$ .  
Fig. 4. Gigartina dichotoma. Male plants. No. 56d.  $X\frac{1}{2}$ .

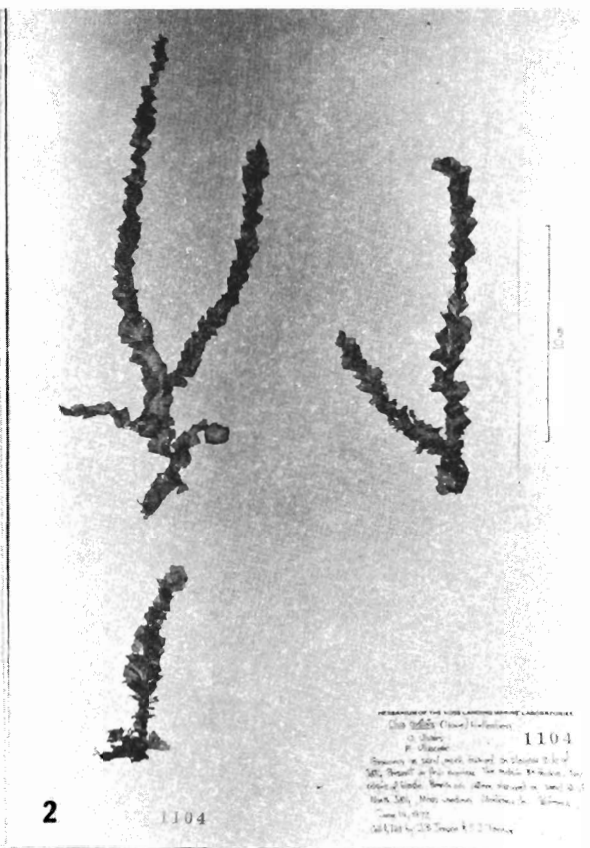
Plate 4

- Fig. 1. Gigartina jardinii. No. 57.  $X\frac{1}{2}$ .  
Fig. 2. Rhodoglossum americanum. Marginal proliferations abundant. No. 58c.  $X\frac{1}{2}$ .  
Fig. 3. Ceramium sp. Epiphytic on Gracilaria sjoestedtii. No. 71.  $X\frac{1}{2}$ .  
Fig. 4. Nienburgia andersoniana. Encrusted with bryozoans. No. 76b.  $X\frac{1}{2}$ .

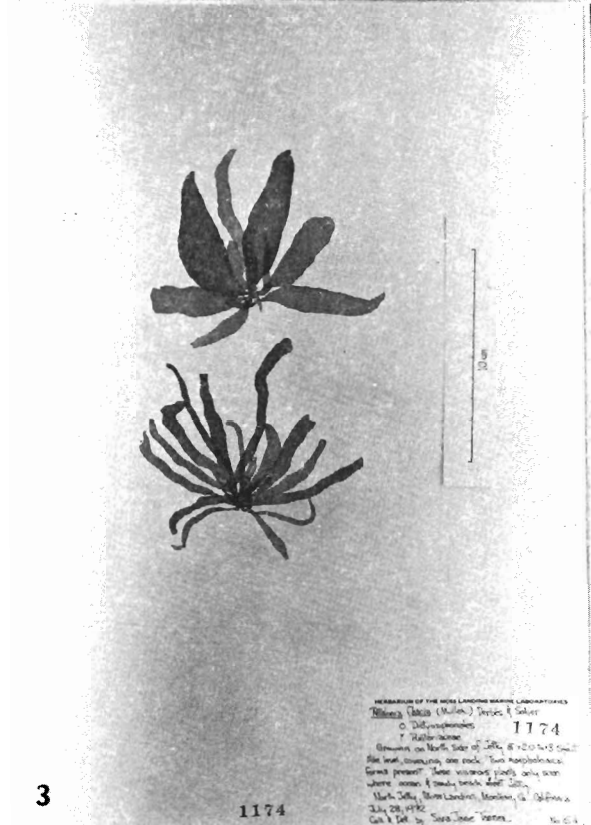




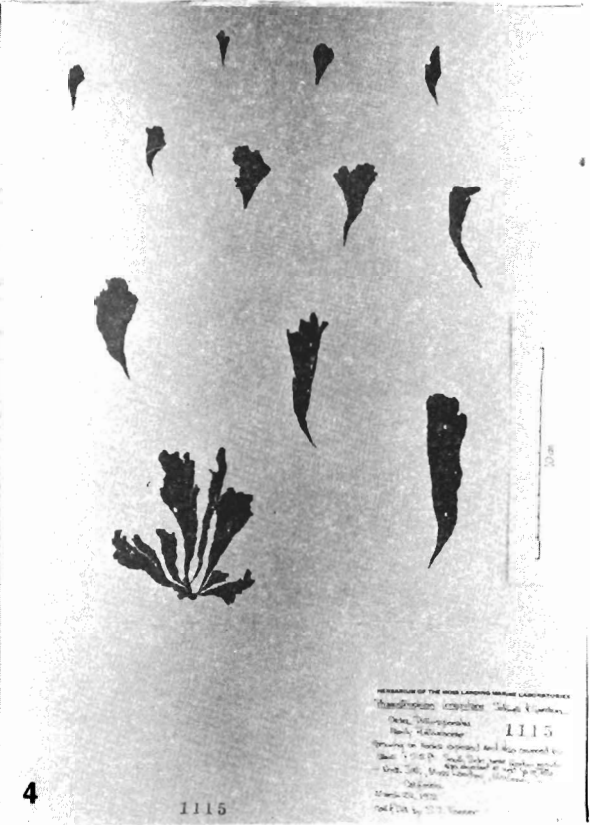
HERBARIUM OF THE WOOD LINDSAY MARINE LABORATORIES  
*Ulva* *Linzaea*  
 1103  
 Collected on rocks near the shore of the island of  
 St. Helena, from 0.0 to 12.0 ft. from the  
 surface, and from specimens  
 from the Marine Laboratory, St. Helena,  
 June 3, 1912.  
 Collected by S. S. Taylor



HERBARIUM OF THE WOOD LINDSAY MARINE LABORATORIES  
*Ulva* *Linzaea*  
 1104  
 Collected on rocks near the shore of the island of  
 St. Helena, from 0.0 to 12.0 ft. from the  
 surface, and from specimens  
 from the Marine Laboratory, St. Helena,  
 June 3, 1912.  
 Collected by S. S. Taylor

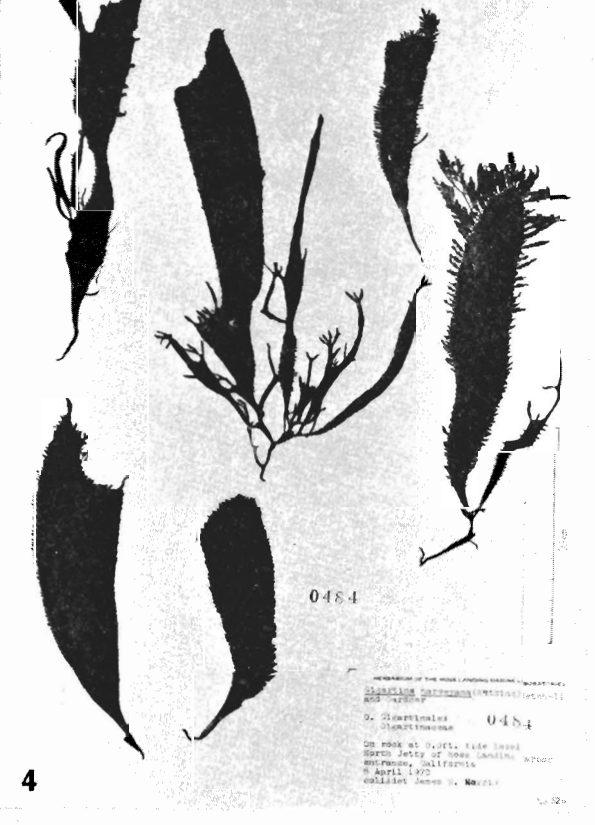
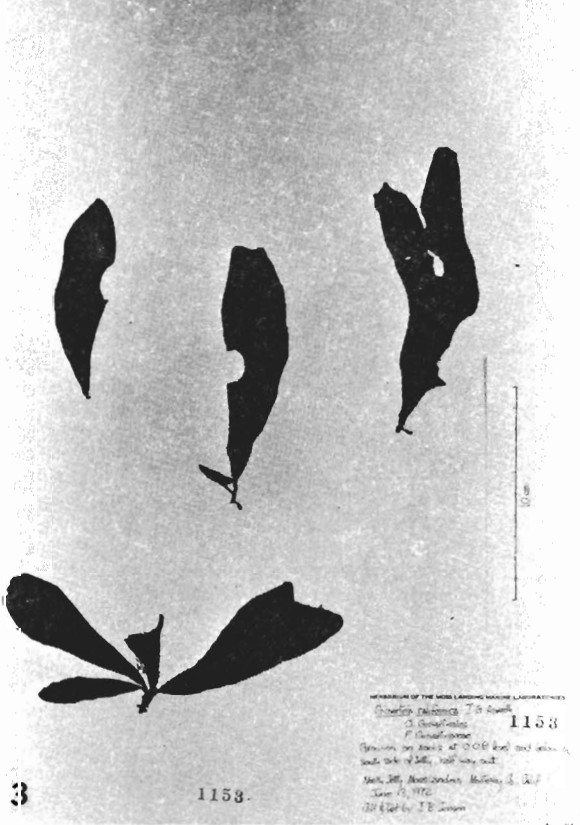
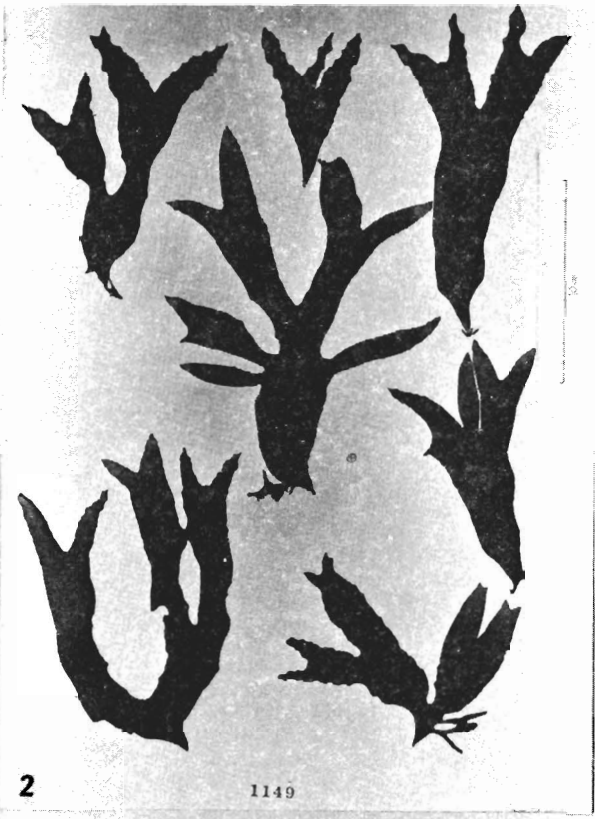
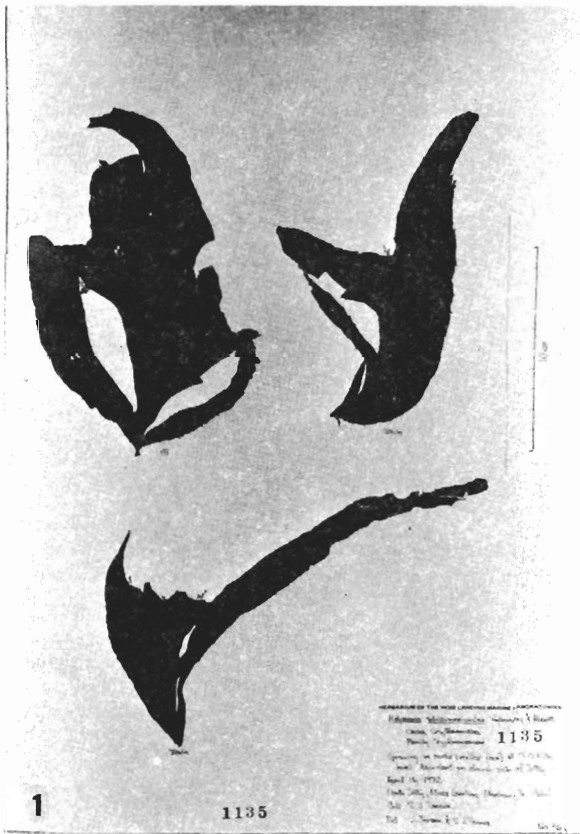


HERBARIUM OF THE WOOD LINDSAY MARINE LABORATORIES  
*Ulva* *Linzaea*  
 1174  
 Collected on rocks near the shore of the island of  
 St. Helena, from 0.0 to 12.0 ft. from the  
 surface, and from specimens  
 from the Marine Laboratory, St. Helena,  
 June 3, 1912.  
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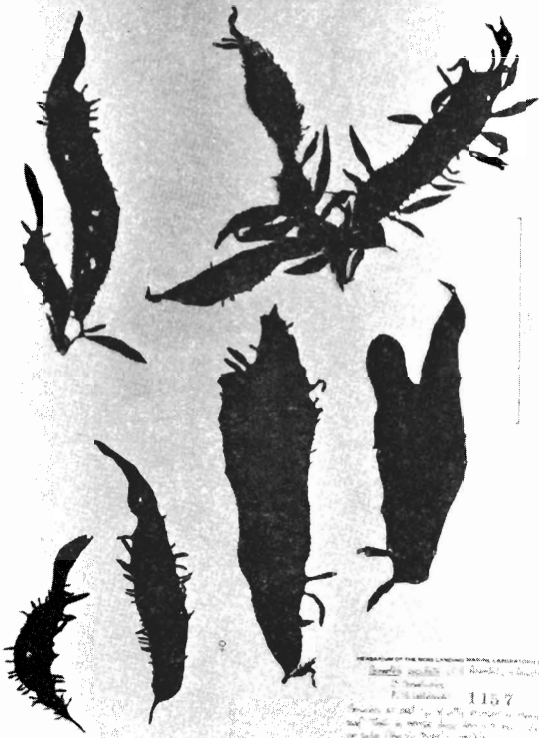
HERBARIUM OF THE WOOD LINDSAY MARINE LABORATORIES  
*Ulva* *Linzaea*  
 1115  
 Collected on rocks near the shore of the island of  
 St. Helena, from 0.0 to 12.0 ft. from the  
 surface, and from specimens  
 from the Marine Laboratory, St. Helena,  
 June 3, 1912.  
 Collected by S. S. Taylor







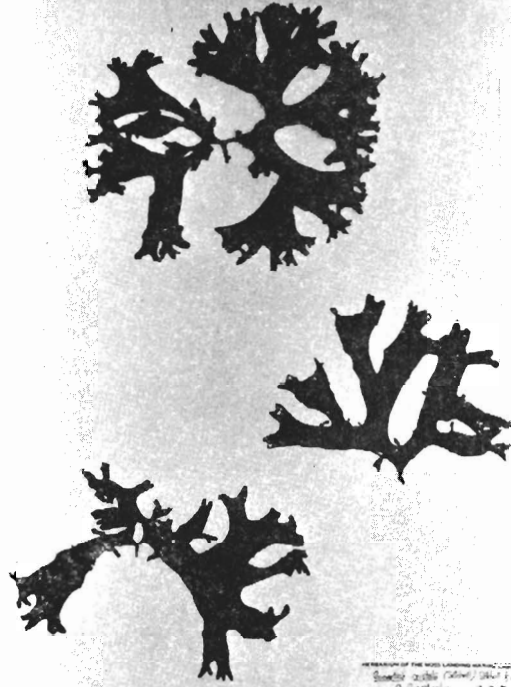




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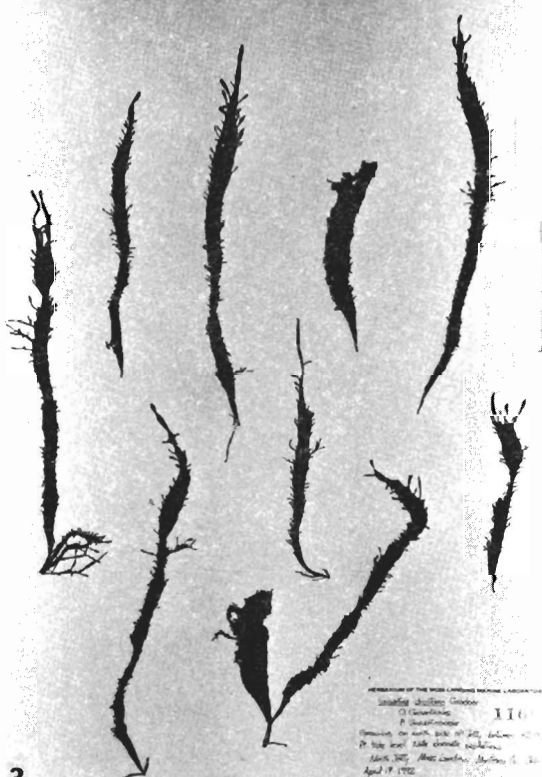
PREPARATION OF THE TYPE SPECIES OF THE GENUS *Stenactis*  
*Stenactis aculeata* (L.) Benth. & Hook.  
 P. 18. Plate 1157  
 Specimens on which this plate is based are deposited in the Herbarium of the University of Cambridge, England.  
 Marked with the number 1157.  
 April 19, 1912.  
 G. H. S. G. Jones.



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1158

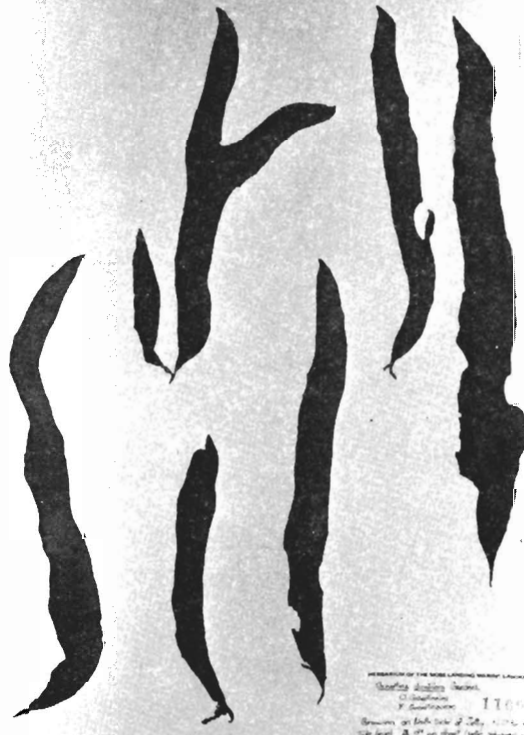
PREPARATION OF THE TYPE SPECIES OF THE GENUS *Stenactis*  
*Stenactis aculeata* (L.) Benth. & Hook.  
 P. 18. Plate 1158  
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3

1160

PREPARATION OF THE TYPE SPECIES OF THE GENUS *Stenactis*  
*Stenactis aculeata* (L.) Benth. & Hook.  
 P. 18. Plate 1160  
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 G. H. S. G. Jones.



4

1162

PREPARATION OF THE TYPE SPECIES OF THE GENUS *Stenactis*  
*Stenactis aculeata* (L.) Benth. & Hook.  
 P. 18. Plate 1162  
 Specimens on which this plate is based are deposited in the Herbarium of the University of Cambridge, England.  
 Marked with the number 1162.  
 April 19, 1912.  
 G. H. S. G. Jones.



