MARINE ALGAE OF WHIDBEY ISLAND, WASHINGTON

Ronald C. Phillips[1]

and

Robert L. Vadas[2]

The history of marine algal collections along the coast of Whidbey Island dates back to the work of N. L. Gardner, who made extensive collections on the island from 1897 to 1901. Except for small incidental collections, no major effort has been applied to the Whidbey Island marine flora since Gardner's work. The herbaria of the University of Washington and of the University of British Colombia were examined but contain few specimens from the island. Dr. Richard Norris, University of Washington, made several collections at West Beach during the summers, from 1949 to 1951. Other known algal collections from the Puget Sound region do not include material from Whidbey Island.

Work herein reported covers a four year period from 1962-1966. At three locations collections were made on a seasonal basis: Camp Casey Beach (immediately north of Admiralty Head), West Beach, and Deception Pass. A lesser amount of work was done at Bush Point. One collection each was made at Double Bluffs in Useless Bay and at East Point on the east side of the island. Observations, which were made as a part of a general Puget Sound survey for Zostera marina L. during 1962-1963, substantiate remarks to be made concerning distribution patterns and ecological conditions existing on the east side of Whidbey Island.[3]

Whidbey is the second largest island in the continental United States (approximately 40 miles long). It is oriented in an approximate north-south direction, and lies between 47 54'05" and 48 23'05" North Latitude. The approximate center of the island is at 122 33'05" West Longitude.

The island displays a variety of habitats, differing in both the degree of wave exposure and the type of substrate present. The west side, north of Admiralty Head receives the full force of the incoming tidal surges from the Straits of Juan de Fuca. As a result currents are swift, ranging from about nine knots at Deception Pass to approximately four and one-half knots at Admiralty Head. In addition, tide rips, large swirls, and a strong crashing surf are common along the northwest side of the island. Southward the velocity of the currents and the magnitude of hydroturmoil is reduced. South of Bush Point and along the east side of the island current velocities of three knots are common, but large waves and surges are not commonly encountered.

The beaches north of Admiralty Head are characterized by boulder fields which extend into the upper sublittoral zone. These boulders are a result of glacial deposit. The boulders are usually covered with copious amounts of algae. South of Admiralty Head the littoral and sublittoral zones are covered by a mantle of sand and mud with scattered rocks. At Bush Point, however, the upper littoral consists of boulders covered with algae, whereas the lower littoral and sub-littoral zones consist of sandy mud bottoms which are populated by dense beds of Zostera (below the Zostera, large boulders covered with

algae are abundant). The east side of Whidbey Island consists almost exculsively of sandy bottoms and displays an improverished flora.

The records established by Setchell and Gardner (1903) for Whidbey Island are included in the Systematic List, but will not be included in the keys. It is probable that Gardner's collections annotated simply, 'Whidbey Island', were made from West Beach. One of us (RCP) examined the collections of Gardner deposited in the herbarium of the University of California at Berkeley. The Phycotheca Boreali-Americana was also checked for Whidbey Island records. A few plants collected by Gardner were found there. Plants collected by Dr. R. E. Norris from 1949-1951 (listed by Scagel, 1957) or contained in the University of Washington or University of British Columbia herbaria are included.

Five species of algae were recently reported as occurring on Partridge Bank or at Smith Island, both west of Whidbey Island, by Norris and West (1966). These species will not be included in this treatment: Rhodophysema elegans, Besa papilliformis, Callithamnion endovagum, Platysiphonia clevelandii (already included in our work), and Myriogramme hollenbergii.

We would like to acknowledge the liberal help of several persons in providing assistance with algal determinations: Drs. Isabella Abbott, the late E. Y. Dawson aided several times, Dr. William Johansen was of invaluable help with corallines; Drs. John West, M. Neushul, R. F. Scagel, P. S. Dixon, and R. E. Norris also provided valuable assistance. Dr. Paul Silva was very helpful in providing the use of the herbarium at University of California, Berkeley.

We would also like to acknowledge the facilities and aid given by Seattle Pacific College. The liberal help generously offered by students at Seattle Pacific College was invaluable in amassing collections. We have checked Alaria and Laminaria identifications according to keys constructed by Dr. T. Widdowson and Dr. Louis Druehl, respectively, as used in their theses at the University of British Columbia.

No attempt was made to illustrate plants, inasmuch as the Provincial Museum of Victoria, B. C., is publishing a handbook on the more common plants of the Pacific Northwest area (Scagel, personal communication).

IDENTIFICATION KEYS

The artificial keys provided at the end of the list are intended only as an aid for student identification of local specimens and have no systematic value. They are intended to serve for recognition of a majority of well developed, mature specimens, but not for plants collected in winter. Some plants such as Odonthalia floccosa and Iridaea cordata were severely battered and torn from winter storms and appeared much different when compared with their typical summer morphologies.

Only plants collected by Dr. R. E. Norris (as listed in Scagel, 1957) or by us are included in the keys.

For critical determination on many species handsectioning with a razor blade and the use of a microscope is necessary. In most cases the genus may be recognized without microscopic characters.

COLLECTING LOCALITIES AND DATES

Unless otherwise stated the collections represent littoral collections at low tides. Such collections were made on extremely low minus tides. The sites are arranged from north to south on the west side of the Island, then northward on the east side of the Island.

Deception Pass: 11 June 1964, 8 August 1964, 20 November 1964, 28 June 1965, 22 June 1966.

West Beach: 1 August 1963, 8 August 1963 (SCUBA), 11 June 1964, 20 November 1964, 22 June 1966.

Ebey's Landing (immediately north of Camp Casey beach): 8 July 1963 (1 spot collection).

Camp Casey beach (immediately north of Admiralty Head): 20 March 1962, 27 October 1962 (SCUBA), 19 June 1963, 20 June 1963, 20 July 1963, 3 August 1963, 29-30 December 1963 (SCUBA), 26 March 1964 (SCUBA), 17 April 1964, 9 June 1964, 11 June 1964, 25 June 1964, 23 October 1964, 28 June 1965, 21 June 1966, 14 November 1966.

Keystone ferry jetty (immediately east of Camp Casey beach): 25 June 1963, (SCUBA).

Lagoon Point, Admiralty Bay (north of Bush Point, south of Camp Casey): 16 July 1963 (SCUBA).

Bush Point: 16 July 1963 (SCUBA), 5 October 1963 (SCUBA), 7 March 1964 (SCUBA), 4 April 1964 (SCUBA), 5 June 1964 (SCUBA), 22 July 1964 (SCUBA), 26 September 1964 (SCUBA).

Double Bluffs, Useless Bay: 23 July 1966 (SCUBA).

East Point (east side of island, near entrance to Holmes Harbor): 29 July 1966 (SCUBA).

Collections are deposited in the herbarium of Seattle Pacific College.

B I B L I O G R A P H Y

[1] Department of Botany, Seattle Pacific College, Seattle, Washington

[2] Department of Botany, University of Washington, Seattle, Washington 98105, present address Department of Botany and Plant Pathology, University of Maine, Orono, Maine 04473.

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SYSTEMATIC LIST

The classification system used here agrees with that used by Dawson (1961).

Seagrasses

1. *Phyllospadix scouleri* Hooker.

   On rocks. Flowers in early summer. Seeds in late summer and autumn. Seeds germinate in March of succeeding year. North of Admiralty Head. Perennial. Mid- to lower littoral; occasionally in upper sublittoral.

2. *Zostera marina* L.

   On muddy sand. South of Admiralty Head and on east side of island. Lower littoral and sublittoral. Flowers in late spring and early summer. Seeds in late summer and autumn. Seeds germinate in spring of succeeding year. Perennial.

Chlorophyta -- Green Algae

Volvocales

Chlorangiaceae

3. *Collinsiella tuberculata* S. & G.

   West Beach. (Gardner; stones, pebbles, shallow pool; Mid-littoral; exposed to heavy seas; 4 June 1901).

Ulotrichales

Monostromaceae

4. *Monostroma fuscum* P. & R.

   Deception Pass (Nov. 1964), Crockett Lake (Gardner; floating in slightly brackish water; 18 June 1901), Bush Point (July 1964). Sparse. On rocks. Littoral.

5. *Monostroma grevillei* (Thuret) Wittrock.

   Double Bluffs at Useless Bay. Summer 1966. Very sparse on rocks. Littoral. (Identification suggested by Dr. Maurice Dube, Western Washington State College, Bellingham).

6. Monostroma oxyspermum (Kutz.) Doty.

Whidbey Island (Gardner, 1899).

Ulvaceae

7. Enteromorpha compressa (L.) Grev.

Snaklum Point, Whidbey Island (just outside Penn Cove; Gardner).

8. Enteromorpha intestinalis (L.) Link.

Camp Casey beach (summer 1965), near Ebey's Landing (Gardner; salt water lake; growing on stones; 16 June 1901), Lake Crockett (Gardner; floating in outlet to lake; 18 June 1901), Useless Bay (Grant; June 1920). Littoral.

9. Enteromorpha linza (L.) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Keystone ferry jetty, Bush Point, Double Bluffs at Useless Bay, west shore of Whidbey Island (Gardner; on stones near low water mark; very abundant; 10 June 1901). Found at all seasons. Generally very numerous. On rocks mostly. Sometimes as epiphytes on Pterygophora. Littoral.

10. Enteromorpha prolifera (Mull.) J.Ag.

East Point. (Summer 1966), Coupeville (Gardner; drift; 5 July 1899). Plants up to two meters long. Sublittoral.

11. Ulva expansa (Setch.) S. & G.

Deception Pass, West Beach, Camp Casey beach, Bush Point. Found at all seasons. Littoral, occasionally sublittoral. On rocks.

12. Ulva lactuca L.

Deception Pass, West Beach, Camp Casey beach, Keystone ferry jetty, Bush Point, Double Bluffs at Useless Bay, East Point, Whidbey Island (Gardner; attached when small, floating when large). Spring and summer. On rocks. Littoral.

13. Ulva rigida C. Ag.

Deception Pass, Camp Casey beach, Useless Bay (Grant; August 1920, 1922). Autumn. On rocks. Littoral.

14. Percursaria percursa (C.Ag.) Rosenvinge.

West Beach (Gardner; salt pool; 3 June 1901).

Schizogoniales

Prasiolaceae

15. Prasiola meridionalis S. & G.

Penn Cove, Coupeville (Gardner; brackish water; moist ground and boards; March 1899).

Cladophorales

Cladophoraceae

16. Rhizoclonium implexum (Dillw.) Kutz.

West Beach (Gardner; salt pool; 3 June 1901).

17. Rhizoclonium riparium (Roth) Harvey.

Penn Cove (Gardner; on ground, covered by salt water at high tide; 8 June 1901, July 1901).

18. Urospora wormskjoldii (Mertens) Rosenvinge.

West Beach, Camp Casey beach, Whidbey Island (Gardner; June 1899). On rocks. Summer 1964. Littoral.

19. Urospora mirabillis Areschoug.

West Beach, Camp Casey beach, west shore of Whidbey Island (Gardner; July 1901). Summer. On rocks (on Codium at Camp Casey). Lower littoral.

20. Spongomorpha arcta (Dillw.) Kutz.

Deception Pass, Double Bluffs at Useless Bay. June 1966. On rocks. Upper littoral.

21. Spongomorpha coalita (Rupr.) Collins.

Decption Pass West Beach, Camp Casey beach, Useless Bay (Grant; July, August, September 1923), west coast of Whidbey Island (Gardner; June 1898, December 1900, 29 June 1901, July 1901). Summer and autumn. Plants displayed wear as autumn progressed. We did not find the species in winter. Littoral. On rocks.

22. Spongomorpha saxatilis (Rupr.) Collins.

Deception Pass, Bush Point, Useless Bay (Grant; August 1921). Spring and summer. Littoral. On rocks.

23. Spongomorpha spinescens Kutz.

West coast of Whidbey Island (Gardner).

Chlorococcales

Chlorococcaceae

24. Chlorochytrium inclusum Kjellman.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; 1899), Coupeville (Gardner; 5 March 1898). In Schizymenia; found once in Rhodoglossum latissimum (in Halymenia at Bush Point). Found at all seasons.

25. Codiolum petrocelidis Kuckuck.

Whidbey Island (Gardner).

Siphonales

Codiaceae

26. Codium fragile (Suringar) Hariot.

West Beach, Camp Casey beach, Whidbey Island (Gardner). Found at all seasons. Small plants in winter; best growth in summer. Lower littoral. On rocks. (One collection by Norris at West Beach). Gametangia in autumn.

27. Codium setchellii Gardner.

West Beach, Camp Casey beach, Whidbey Island (Gardner; sparse on rocks in upper sublittoral). Found at all seasons. Low littoral. On rocks.

Phaeophyta - Brown Algae

Ectocarpales

Ectocarpaceae

28. Ectocarpus acutus S & G. var. acutus.

Ft. Casey. (Gardner; epiphytic on Desmarestia intermedia; growing about two feet below mean low tide; 18 June 1901).

29. Ectocarpus cylindricus Saunders.

Camp Casey beach, west coast of Whidbey Island (Gardner; on back of chiton Catherina tunicata; 1 July 1901). Spring 1964. On Desmarestia intermedia.

30. Ectocarpus dimorphus Silva.

West Beach, west shore of Whidbey Island (Gardner; on Laminaria setchellii; 6 June 1901, 26 June 1901), west shore of Whidbey Island (Gardner; on back of limpet; 1 July 1901).

31. Ectocarpus granulosus (J.E. Smith) C.Ag.

Bush Point. Spring 1964. On worm tube. Sublittoral. Plurilocular organs present.

32. Ectocarpus terminalis Kutz.

Camp Casey beach, Bush Point. Autumn 1964. Epiphytic on Nereocystis or Zostera. Plurilocular organs present.

33. Streblonema pacificum Saunders.

West Beach, Camp Casey beach. Autumn. In Schizymenia pacifica. Plurilocular organs present.

Ralfsiaceae

34. Ralfsia pacifica Hollenberg.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner). Found at all seasons. Mid- and low littoral. Have never seen this on small pebbles; only on boulders or on reef.

Sphacelariales

Sphacelariaceae

35. Sphacelaria racemosa Grev.

West Beach (Norris; June 1951), Whidbey Island (Gardner).

Chordariales

Myrionemataceae

36. Myrionema strangulans Grev.

West coast of Whidbey Island (Gardner; on Nereocystis; August 1899).

Corynophlaeaceae

37. Leathesia difformis (L.) Areschoug.

Whidbey Island (Gardner).

Chordariaceae

38. Haplogloia andersonii (Farlow). Levring.

Whidbey Island (Gardner).

39. Heterochordaria abietina (Rupr.) S. & G.

West Beach, Whidbey Island (Gardner; June 1901). Summer 1964. Midlittoral. On rocks.

Desmarestiales

Desmarestiaceae

40. Desmarestia herbacea Lamx.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; 17 June 1901; floating). Spring and summer. Low littoral or sublittoral. On rocks.

41. Desmarestia intermedia P. & R.

Deception Pass, West Beach (Norris; August 1949), Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, west coast of Whidbey Island (Gardner; July 1901), Coupeville (Gardner; floating or on stones; 9 December 1897). Found at all seasons, but battered in winter. Most numerous in summer. Low littoral. On rocks.

42. Desmarestia media S. & G. var. tenuis S. & G.

West Beach, Camp Casey. Summer. Low littoral or sublittoral. On rocks.

43. Desmarestia munda S. & G.

West Beach, Bush Point. Spring, summer, autumn. Small plants in spring; extremely large in summer. Sublittoral.

Dictyosiphonales

Punctariaceae

44. Punctaria expansa S. & G.

Penn Cove (Gardner; floating or on algae).

45. Soranthera ulvoidea P. & R.

Whidbey Island (Gardner).

46. Myelophycus intestinale Saunders.

Whidbey Island (Gardner).

Scytosiphonaceae

47. Scytosiphon lomentaria (Lyngbye) J.Ag.

West Beach, Bush Point, Whidbey Island (Gardner). Spring. Mid-littoral. On rocks.

48. Petalonia debilis (C.Ag.) Derbes & Solier.

Deception Pass, West Beach, Camp Casey beach, Bush Point, East Point, Whidbey Island (Gardner). Spring, summer, and autumn. On Phyllospadix and Zostera leaves, on Nereocystis, on rocks.

49. Colpomenia sinuosa (Roth) Derbes & Solier.

Whidbey Island (Gardner).

Dictyosiphonaceae

50. Coilodesme californica (Rupr.) Kjellman.

Camp Casey beach, west coast of Whidbey Island (Gardner). Summer. On Cystoseira geminata.

Laminariales

Laminariaceae

51. Laminaria ephemera Setchell.

Deception Pass, Camp Casey beach. June 1963, June 1964. Sublittoral. On rocks. Present for only a short time.

52. Laminaria groenlandica Rosenvinge.

Deception Pass, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner). Summer and winter (mostly winter). Sublittoral. On rocks.

53. Laminaria saccharina (L.) Lamx.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay. Found at all seasons. Lower littoral and sublittoral. On rocks. With sori in summer, autumn, and winter. New plants can be found in all seasons.

54. Laminaria saccharina (L.) Lamx. f. linearis J.Ag.

West coast of Whidbey Island (Gardner; upper siblittoral; May to September 1901.)

55. Laminaria setchellii Silva.

West Beach, Camp Casey beach, Whidbey Island (T. Widdowson; July 1959), Whidbey Island (Gardner). Found at all seasons. Sublittoral. On rocks. In winter the leaves are battered back to the stipe.

56. Pleurophycus gardneri Setch. & Saunders.

Deception Pass, West Beach Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; June 1901). Spring, summer and autumn. Sublittoral. On rocks. New plants in spring. Look battered in autumn.

57. Cymathere triplicata (P. & R.) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner). Spring, summer, autumn. Sublittoral. On rocks. New plants in spring. Battered in autumn. Sori found in autumn.

58. Costaria costata (Turn.) Saunders.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Useless Bay (Grant; August 1924), west coast of Whidbey Island (Gardner; summer 1899). Spring, summer, autumn. New plants in spring. Low littoral and sublittoral. On rocks. Sori found in autumn.

59. Agarum fimbriatum Harv.

Deception Pass, Whidbey Island (Gardner; specimens with holdfasts). Summer 1965. Drift.

60. Hedophyllum sessile (C.Ag.) Setchell.

Deception Pass, Whidbey Island (Gardner). Summer and autumn. Probably perennial. Midlittoral and lower littoral. On rocks.

Lessoniaceae

61. Nereocystis luetkeana (Mert.) P. & R.

Deception Pass, West Beach, Camp Casey beach, Lagoon Point, Bush Point, Double Bluffs at Useless Bay, west coast of Whidbey Island(Gardner). Found at all seasons. New plants in spring. Sublittoral. On rocks. Sori present in summer, autumn, winter.

62. Macrocystis integrifolia Bory.

Whidbey Island (Gardner). Plant has good holdfast but is well battered; no blades present, only stubs up to 4½ cm. long.

Alariaceae

63. Pterygophora californica Rupr.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, west coast of Whidbey Island (Gardner; July 1908). Found at all seasons. Sublittoral. On rocks. Stipes become defoliated in winter. Sori in winter.

64. Alaria marginata P. & R.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; July 1908). Found at all seasons. Lower littoral. On rocks. Sori present at all seasons. Sporelings recolonize in April.

65. Alaria sp.

Deception Pass, West Beach, Bush Point. Summer. Sublittoral. On rocks.

66. Egregia menziesii (Turn.) Areschoug.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (University British Columbia herbarium; April 1958), west coast of Whidbey Island (Gardner). Found at all seasons. Lower littoral. On rocks.

Fucales

Fucaceae

67. Fucus distichus L.

Deception Pass, West Beach, Camp Casey beach (only collected as drift here; does not occur attached), Bush Point, Double Bluffs at Useless Bay, East Point, west coast of Whidbey Island (Gardner; June 1910). Summer and autumn. Midlittoral. On rocks.

Sargassaceae

68. Cystoseira geminata C. Ag.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; summer 1899). Found at all seasons. Lower littoral. On rocks. Plants heavily battered in winter and autumn; new growth in spring.

69. Sargassum muticum (Yendo) Fensholt.

Camp Casey beach (as drift), Double Bluffs at Useless Bay. Summer. Sublittoral. On rocks.

Rhodophyta -- Red Algae

Bangiophycidae

Goniotrichales

Goniotrichaceae

70. Goniotrichum cornu-cervi (Reinsch) Hauck.

West Beach(Norris; September 1949).

71. Goniotrichum elegans (Chauvin) Zanard.

West Beach. Summer 1966. Epiphyte.

Bangiales

Erythropeltidaceae

72. Smithora naiadum (Anderson) Hollenberg.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, East Point, Coupeville (Gardner; Penn Cove; June 1901). On Zostera and Phyllospadix leaves. New plants abundant in autumn.

73. Erythrotrichia kylinii Gardner.

Deception Pass, West Beach. Summer and autumn. Sublittoral. Epiphyte.

74. Erythrocladia subintegra Rosenvinge.

West Beach, Camp Casey beach. Summer and autumn. On Antithamnion subulatum, Codium fragile, and Janczewskia gardneri.

Bangiaceae

75. Bangia fuscopurpurea (Dillwyn) Lyngbye.

Camp Casey beach, Keystone ferry dock, Whidbey Island (Gardner). March 1962. Midlittoral. Drift at Camp Casey. On rocks.

76. Porphyra abyssicola Kjellman.

West coast of Whidbey Island (Gardner; on Zostera).

77. Porphyra amplissima (Kjellman) Setch. & Hus.

Useless Bay (Grant; August 1921), Coupeville (Gardner; upper sublittoral; 1899).

78. Porphyra lanceolata (Setch. & Hus) Smith & Hollenberg.

Camp Casey beach. Spring 1964. In littoral tide pools.

79. Porphyra miniata f. cuneiformis Setch. & Hus.

Deception Pass, Camp Casey Beach, Bush Point, Coupeville at Penn Cove (Gardner; June 1899), west coast of Whidbey Island

(Gardner; floating; June 1899). Summer and autumn. Littoral; mainly sublittoral. On rocks.

80. Porphyra nereocystis Anderson.

Bush Point, Coupeville at Penn Cove (Gardner; June 1901), west coast of Whidbey Island (Gardner; plants up to ½ meter long; May 1899). Autumn 1963. On Nereocystis.

81. Porphyra perforata J.Ag.

Deception Pass, West Beach, Camp Casey beach, Keystone ferry jetty, Bush Point, Double Bluffs at Useless Bay, East Point, Whidbey Island (Gardner). Spring, summer, autumn. Upper littoral. On rocks. Cystocarpic and spermatangial in summer and autumn.

82. Porphyra variegata (Kjellman) Hus.

Deception Pass, West Beach, west coast of Whidbey Island (Gardner; low tide line; July 1901). Summer. Sublittoral. On rocks.

83. Conchocelis rosea Batters.

Whidbey Island. In empty shells. Reported by Jao (1937). In other geographic locations both Porphyra and Bangia demonstrate a Conchocelis stage in their life histories.

Florideophycidae

Nemalionales

Acrochaetiaceae

84. Acrochaetium pacificum Kylin.

Camp Casey beach. June 1963. On Codium fragile. With monospores.

85. Acrochaetium porphyrae (Drew) Smith.

Camp Casey beach. November 1966. In Porphyra perforata.

86. Acrochaetium rhizoideum (Drew) Jao.

Camp Casey beach. Spring and summer. On Codium fragile. Monospores in summer.

87. Acrochaetium subimmersum (S. & G.) Papenfuss.

West Beach (Norris; August 1949), west coast of Whidbey Island (Gardner; in Grateloupia schizophylla; July 1901). In Prionitis lyallii.

88. Rhodochorton purpureum (Lightfoot) Rosenvinge.

Whidbey Island (Gardner).

89. Rhodochorton tenue Kylin.

West Beach (Norris; August 1949).

Chaetangiaceae

90. Whidbeyella cartilaginea S. & G.

West coast of Whidbey Island (Gardner; floating or cast ashore; July 1901).

Bonnemaisoniaceae

91. Bonnemaisonia nootkana (Esper) Silva.

Deception Pass, West Beach, Camp Casey beach, west coast of Whidbey Island (Gardner; May to August 1901). Summer. Low littoral. Tetrasporic and cystocarpic in summer.

Cryptonemiales

Dumontiaceae

92. Cryptosiphonia woodii J.Ag.

West Beach, Whidbey Island (Gardner). Summer. Sublittoral. On rocks.

93. Pikea pinnata Setchell.

Camp Casey beach. Spring 1962. Drift.

94. Farlowia mollis (Harv. & Bailey) Farlow and Setchell.

Deception Pass, West Beach, Camp Casey beach, west coast of Whidbey Island (Gardner; 10 June 1901). Summer and autumn. Low littoral. On rocks. Battered in autumn.

95. Dilsea californica (J.Ag.) Kuntze.

West Beach, Whidbey Island (Gardner; 10 June 1901). Early summer 1964. Low littoral. On rocks.

96. Weeksia fryeana Setchell.

West Beach (Norris; August 1950), Bush Point. Spring, summer, autumn. Sublittoral. On rocks.

97. Constantinea simplex Setchell.

West Beach, Camp Casey beach, Bush Point. Found at all seasons. Low littoral. Mainly sublittoral. On rocks.

98. Constantinea subulifera Setchell.

West Beach, Bush Point, west coast of Whidbey Island (Gardner; tetrasporic; 1898-1901). Summer, autumn (probably present at all seasons). Low littoral and sublittoral. On rocks. Tetrasporic in summer and autumn.

Gloiosiphoniaceae

99. Gloiosiphonia verticillaris Farlow.

West Beach (Norris; August 1950), Whidbey Island (Gardner).

Endocladiaceae

100. Endocladia muricata (P. & R.) J.Ag.

Deception Pass, West Beach, west coast of Whidbey Island (Gardner; July 1901). Summer. Upper littoral. On rock.

101. Gloiopeltis furcata (P. & R.) J.Ag.

Whidbey Island (Gardner).

Squamariaceae

102. Rhodophysema georgii Batters.

Deception Pass, Camp Casey beach, East Point. Summer. On leaves of Zostera and Phyllospadix.

Hildenbrandiaceae

103. Hildenbrandia prototypus Nardo

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, West Beach (Gardner; covering large patches on rocks at and below low tide; 4 June 1901). Present at all seasons. Upper and midlittoral. On rock. Tetrasporic in winter.

Corallinaceae

104. Melobesia marginata Setch. & Foslie.

Whidbey Island (Gardner).

105. Melobesia mediocris (Foslie) Setch. & Mason.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner). Present at all seasons. On Phyllospadix and Zostera leaves.

106. Lithothamnion pacificum Foslie.

West coast of Whidbey Island (Gardner; July 1908).

107. Lithothamnion phymatodeum Foslie.

West coast of Whidbey Island (Gardner; forming crusts on rocks; upper sublittoral; 7 July 1901).

108. Polyporolithon conchatum (Setch.& Foslie) Mason.

Whidbey Island (Gardner).

109. Polyporolithon parcum (Setch. & Foslie) Mason.

West Beach, Camp Casey beach. Present at all seasons. On Calliarthron tuberculosa. Spermatangial, cystocarpic, and tetrasporic in spring.

110. Dermatolithon dispar (Foslie) Foslie.

West coast of Whidbey Island (Gardner; cast up; June 1901; July 1908).

111. Lithophyllum decipiens (Foslie) Foslie.

Camp Casey beach. Present at all seasons. Littoral. Covering rocks. Tetrasporic in winter and spring.

112. Lithophyllum neofarlowii Setch. & Mason.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; on Acmaea; upper sublittoral; June 1901). Present at all seasons. Sublittoral. On rocks. Tetrasporic in autumn.

113. Lithophyllum whidbeyense Foslie.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner; June 1901). Present at all seasons. On Acmaea. Tetrasporic in autumn.

114. Corallina officinalis L. var. chilensis (Harv.) Kutz.

West Beach, Camp Casey beach, Whidbey Island (Gardner). Present at all seasons. Low littoral and sublittoral. On rock. Tetrasporic in autumn.

115. Corallina vancouveriensis Yendo.

Deception Pass, West Beach, Camp Casey beach, Bush Point (as drift). Present at all seasons. Low littoral and sublittoral. On rocks.

116. Serraticardia macmillani (Yendo) Silva.

Camp Casey beach. Present at all seasons. Sublittoral. On rocks. Tetrasporic in winter and spring; spermatangial in winter.

117. Pachyarthron cretaceum (P. & R.) Manza.

Camp Casey beach. Summer 1963. Low littoral. On rocks.

118. Bossiella corymbifera (Manza) Silva.

Whidbey Island (Gardner).

119. Bossiella dichotoma (Manza) Silva.

Camp Casey beach. Present at all seasons. Sublittoral. On rock. Tetrasporic in autumn.

120. Bossiella frondescens (P. & R.) Dawson.

West Beach, Camp Casey beach. Present at all seasons. Sublittoral. On rock. Tetrasporic in autumn and winter.

121. Calliarthron schmittii Manza

Camp Casey beach. Winter 1963. Sublittoral. On rock.

122. Calliarthron tuberculosa (P. & R.) Dawson.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner). Present at all seasons. Sublittoral. On rock. Tetrasporic and spermatangial in winter.

Cryptonemiaceae

123. Grateloupia pinnata (P. & R.) Setch.

Deception Pass, Camp Casey beach. Summer and winter. Low littoral. On rock.

124. Grateloupia schizophylla Kutz.

West Beach (Norris; August 1949), west coast of Whidbey Island (Gardner; drift; July 1901).

125. Cryptonemia borealis Kylin.

West Beach (Norris; September 1949), Bush Point. Spring and summer. Sublittoral. On rock.

126. Aeodes gardneri Kylin.

West Beach (Norris; September 1949), Useless Bay (Grant; June 1920), west coast of Whidbey Island (Gardner; drift; June to September 1901). Cystocarpic and tetrasporic in summer.

127. Halymenia californica Smith and Hollenberg.

Deception Pass, West Beach (Norris; September 1949), Camp Casey beach, Bush Point. Spring, summer, autumn. Sublittoral. On rock. Cystocarpic in autumn.

128. Halymenia sp.

Bush Point. July 1964. Sublittoral. (Probably a new species; specimen sterile; Dr. Isabella Abbott, personal communication).

129. Prionitis lyallii Harv.

Deception Pass, West Beach, Camp Casey beach, Double Bluffs at Useless Bay, west coast of Whidbey Island (Gardner), Penn Cove (Gardner). Present at all seasons (least abundant in winter). Littoral. On rock. Cystocarpic and tetrasporic in autumn.

Kallymeniaceae

130. Kallymenia oblongifructa Setchell.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; drift, July 1910; also drift on Pleurophycus and Pterygophora, 1897). Spring, summer, autumn (new plants in spring). Sublittoral. On rock. Tetrasporic in spring.

131. Callophyllis crenulata Setchell.

Deception Pass, West Beach, Camp Casey beach, west coast of Whidbey Island (Gardner; 8 June 1901). Present at all seasons. Lower littoral and sublittoral. On rock; on Pterygophora stipes in winter. Cystocarpic in spring, summer, and autumn.

132. Callophyllis edentata Kylin.

Deception Pass, West Beach, Camp Casey beach, Bush Point. Present at all seasons. Low littoral and sublittoral. On rock; on Pterygophora stipes in winter; may be on Laminaria setchellii stipes. Cystocarpic in summer and autumn.

133. Callophyllis firma (Kylin) Norris.

West Beach (Norris; August 1950).

134. Callophyllis flabellulata Harv.

Deception Pass West Beach, Camp Casey beach, Whidbey Island (University British Columbia herbarium; April 1958), Whidbey Island (Gardner). Present at all seasons; least abundant in winter. Lower littoral.

135. Callophyllis heanophylla Setchell.

Deception Pass, West Beach. Summer. Low littoral. On rocks.

136. Callophyllis violacea J.Ag.

Whidbey Island (Gardner; drift).

137. Callocolax globulosis Dawson.

Bush Point. Autumn 1963. On Callophyllis flabellulata.

138. Euthora fruticulosa (Rupr.) J.Ag.

West Beach (Norris; June 1951), west coast of Whidbey Island (Gardner; 9 December 1897).

Gigartinales

Cruoriaceae

139. Petrocelidis middendorffii (Rupr.) Kjell.

Whidbey Island (Gardner).

Nemastomaceae

140. Schizymenia pacifica (Kylin) Kylin.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; 1901), west coast of Whidbey Island (Gardner; cast ashore at Ebey's Landing; July 1910). Present at all seasons; least abundant in winter. Low littoral. On rocks. Cystocarpic in summer, autumn, winter; spermatangial in summer; tetrasporic in autumn.

Solieriaceae

141. Turnerella mertensiana (P. & R.) Schmitz.

Camp Casey beach. Summer 1966. Low littoral. On rock. Cystocarpic in summer.

142. Turnerella sp.

Bush Point. Autumn 1963. Sublittoral. On rock.

143. Agardhiella tenera (J.Ag.) Schmitz.

West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; tetrasporic and cystocarpic; 1897). Summer and autumn. Sublittoral. On rocks. Cystocarpic in summer and autumn.

144. Opuntiella californica (Farlow) Kylin.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; drift). Present at all seasons. Mostly sublittoral. On rock. Cystocarpic in winter.

145. Sarcodiotheca furcata (S. & G.) Kylin.

Deception Pass, West Beach, Bush Point, west coast of Whidbey Island (Gardner; cast ashore; abundant June to September, some all year long; 8 June 1901). Summer and autumn. Sublittoral. On rock. Cystocarpic in summer.

Plocamiaceae

146. Plocamium coccineum var. pacificum (Kylin) Dawson.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Low littoral and sublittoral. On rock. Tetrasporic in autumn.

147. Plocamiocolax pulvinata Setchell.

West Beach, Camp Casey beach. Summer and autumn. On Plocamium.

Gracilariaceae

148. Gracilaria verrucosa (Hudson) Papenfuss.

Double Bluffs at Useless Bay, East Point, Whidbey Island (Gardner). Summer. Sublittoral. On rock.

Phyllophoraceae

149. Ahnfeltia concinna J.Ag.

Deception Pass, West Beach, Camp Casey beach, west coast of Whidbey Island (Gardner; cast up; June 1901). Spring, summer, autumn. Midlittoral. On rock.

150. Ahnfeltia plicata (Hudson) Fries.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner). Present at all seasons. Upper littoral; lower littoral in winter. On rocks.

151. Gymnogongrus platyphyllus Gardner.

Bush Point. September 1964. Sublittoral. On rock. Cystocarpic in autumn.

152. Stenogramme interrupta (C.Ag.) Mont.

Bush Point. September 1964. Sublittoral. On rocks. Cystocarpic in autumn.

Gigartinaceae

153. Gigartina corymbifera (Kutz.) J.Ag.

Bush Point, Whidbey Island (Gardner). October 1963. Sublittoral. On rock.

154. Gigartina exasperata Harv. & Bailey.

West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; some drift; 20 June 1901). Present at all seasons. Low littoral and sublittoral. On rocks. Cystocarpic in summer.

155. Gigartina papillata (C.Ag.) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Upper littoral. On rocks. Cystocarpic in summer, autumn, and winter.

156. Rhodoglossum latissimum J.Ag.

Deception Pass, West Beach, Camp Casey beach. Found at all seasons. Low littoral and sublittoral. On rocks. Tetrasporic in all seasons.

157. Iridaea cordata (Turn.) Bory.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, Whidbey Island (University British Columbia herbarium; April 1958), west coast of Whidbey Island (Gardner; drift; May 1910). Present at all seasons; battered in winter; new sporelings in spring. Littoral. On rock. Cystocarpic in all seasons; tetrasporic in summer, autumn, and winter.

158. Iridaea heterocarpa P. & R.

Just north of Camp Casey, Camp Casey beach, Double Bluffs at Useless Bay, Whidbey Island (Gardner; cystocarpic; 9 December 1897). Present at all seasons. Littoral. On rocks. Cystocarpic in summer and autumn; tetrasporic in autumn and winter.

159. Iridaea whidbeyana (S. & G.) Scagel.

West Beach (Norris; August 1950), Whidbey Island (Gardner; spermatangial and cystocarpic; 9 December 1897), west coast of Whidbey Island (Gardner; spermatangial and cystocarpic; 1908).

Rhodymeniales

Rhodymeniaceae

160. Fauchea fryeana Setchell

Bush Point. October 1963. Whidbey Island (Gardner; drift; sterile and cystocarpic; 7 June 1901). Sublittoral. On rock. Tetrasporic.

161. Fauchea laciniata J.Ag.

Camp Casey beach (March 1964), Bush Point (October 1963). Low littoral and sublittoral. On rocks. Tetrasporic in March.

162. Fryeella gardneri (Setchell) Kylin.

West Beach, (Norris; September 1949; August 1950), West Beach (Scagel; August 1955), Bush Point, west coast of Whidbey Island (Gardner; drift; May to June 1901). Summer and autumn. Sublittoral. On rock. Cystocarpic in summer; tetrasporic in summer and autumn.

163. Halosaccion glandiforme (Gmelin) Ruprecht.

Deception Pass, Camp Casey beach (drift), Whidbey Island (Gardner). Summer. Midlittoral. On rock.

164. Rhodymenia palmata (L.) Grev.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, west coast of Whidbey Island (Gardner; summer 1900). Spring, summer, autumn. New plants in spring; plants battered in autumn. Littoral. On rock. Spermatangial in summer, tetrasporic in summer and autumn.

165. Rhodymenia pertusa (P. & R.) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Keystone ferry jetty, Bush Point, west coast of Whidbey Island (Gardner). Spring, summer, autumn. Low littoral and sublittoral. On rock, occasionally on Pterygophora stipes. Cystocarpic in summer.

Ceramiales

Ceramiaceae

166. Antithamnion defectum Kylin.

West Beach, Camp Casey beach. Spring. On Codium fragile and Callophyllis crenulata.

167. Antithamnion gardneri DeToni.

Deception Pass, Camp Casey beach. Present at all seasons. Lower littoral. Epiphyte. Cystocarpic in autumn; spermatangial in winter; tetrasporic in summer, autumn, and winter.

168. Antithamnion glanduliferum Kylin.

West Beach (Norris; August 1949).

169. Antithamnion nigricans Gardner.

Deception Pass Camp Casey beach, Bush Point. Present at all seasons. On rock and epiphyte on kelp stipes. Cystocarpic in spring; tetrasporic in summer.

170. Antithamnion occidentale Kylin.

Useless Bay (Grant; June 1923), Ft. Casey (Gardner; floating; 19 June 1901); Hancock's Point (Gardner; floating; tetrasporic; 25 June 1901).

171. Antithamnion pacificum (Harv.) Kylin.

West Beach (Norris; August 1949; June 1951), Camp Casey beach, (winter, 1963) west coast of Whidbey Island (Gardner).

172. Antithamnion pygmaeum Gardner.

West Beach. August 1963. On Nereocystis.

173. Antithamnion shimamuranum Nagai.

Deception Pass, Ebey's Landing. Summer. Low littoral. On rock. (To our knowledge this is the first collection of this species in the eastern Pacific. Identification confirmed by Dr. J. A. West and the late Dr. E. Y. Dawson). Tetrasporic in summer.

174. Antithamnion subulatum Harv.

Deception Pass, West Beach (Norris; September 1949; June 1951; August 1950), Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner). Spring, summer, autumn. Sublittoral. On rock and as an epiphyte. Tetrasporic in spring, summer, and autumn.

175. Platythamnion reversum (S. & G.) Kylin

West Beach (Norris; September 1949; June 1951), Keystone ferry jetty, Bush Point, west coast of Whidbey Island (Gardner; drift; June 1901). Spring and summer. Sublittoral. On rock. Tetrasporic in spring.

176. Platythamnion villosum Kylin

West Beach (Gardner; floating; 4 June 1901).

177. Ceramium californicum J.Ag.

West Beach (Norris; September 1949), Camp Casey beach, Whidbey Island (Gardner; tetrasporic and cystocarpic; June 1901). Summer 1963. On Agardhiella.

178. Ceramium codicola J.Ag.

West Beach (Norris; September 1949).

179. Ceramium pacificum (Collins) Kylin.

Camp Casey beach, Whidbey Island (Gardner). Winter 1963. Low littoral. On rock.

180. Microcladia borealis Ruprecht

West Beach, Camp Casey beach, Whidbey Island (Gardner). Spring, summer, autumn. Most abundant in summer. Low littoral. On rock. Cystocarpic in spring.

181. Microcladia coulteri Harv.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay, Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Epiphyte in littoral. Cystocarpic in summer and autumn.

182. Ptilota filicina (Farlow) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Gardner; 9 December 1897). Summer. Low littoral. On rock.

183. Callithamnion biseriatum Kylin

West Beach (Norris; September 1949).

184. Callithamnion laxum S. & G.

Whidbey Island (Gardner).

185. Callithamnion lejolisea Farlow.

Camp Casey beach, Autumn 1966, winter 1963, spring 1964. In joints of Calliarthron tuberculosa. Sublittoral. Tetrasporic in winter and spring. Sterile in autumn.

186. Callithamnion pikeanum Harv.

Deception Pass, Whidbey Island (Gardner). Summer. Midlittoral. On rock. Cystocarpic in summer.

187. Callithamnion polyspermum

West shore of Whidbey Island (Gardner; on Kallymenia; June 1901).

188. Pleonosporium vancouverianum (J.Ag.) J.Ag.

West Beach (Norris; August 1950), Bush Point. September 1964. Sublittoral epiphyte. Polysporangia in autumn.

Delesseriaceae

189. Membranoptera platyphylla (S. & G.) Kylin.

West Beach (Norris; August 1949), Camp Casey beach. Autumn, winter, spring. Sublittoral. Epiphte on Pterygophora and Alaria holdfasts. Cystocarpic and spermatangial in spring.

190. Membranoptera tenuis Kylin.

West Beach. Summer. Sublittoral. On rock. Cystocarpic in spring.

191. Delesseria decipiens J.Ag.

Deception Pass, West Beach, Camp Casey beach, Keystone ferry jetty, Whidbey Island (Gardner; extremely large luxuriant plants; 10 June 1901). Present at all seasons; least abundant in winter. Low littoral and sublittoral. On rock. Cystocarpic and tetrasporic in spring.

192. Platysiphonia clevelandii(Farlow) Papenfuss.

West Beach (Norris; August 1949; June 1951).

193. Polyneura latissima (Harv.) Kylin.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner). Present at all seasons. Low littoral and sublittoral. On rock. Cystocarpic in autumn; tetrasporic in spring, summer, and autumn.

194. Polycoryne gardneri Setchell.

West Beach (Norris; August 1949), Bush Point. October 1963. Sublittoral. On Polyneura.

195. Myriogramme sp.

West Beach, Camp Casey beach. Winter, spring. Lower littoral.

196. Nitophyllum mirabile Kylin.

West Beach, Camp Casey beach. Spring. Sublittoral. On rock. Cystocarpic in spring.

197. Hymenena flabelligera (J.Ag.) Kylin.

Deception Pass, West Beach, Camp Casey beach, west coast of Whidbey Island (Gardner). Present at all seasons. Low littoral and sublittoral. On rock and occasionally on Pterygophora stipes. Cystocarpic in summer, autumn, and winter; tetrasporic in summer and autumn.

198. Hymenena setchellii Gardner.

West Beach (Norris; September 1949), Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; drift; August 1908). Autumn, winter, spring. Sublittoral. On Pterygophora stipes. Cystocarpic in spring; tetrasporic in winter and spring.

199. Cryptopleura violacea (J.Ag.) Kylin.

Bush Point. October 1963. Sublittoral. On rock.

200. Botryoglossum ruprechtiana (J.Ag.) DeToni.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Low littoral and sublittoral. On rocks. Cystocarpic in summer, autumn, and winter; tetrasporic in all seasons.

201. Gonimophyllum skottsbergii Setchell.

Deception Pass, West Beach, Camp Casey beach, Bush Point. Present at all seasons. On Botryoglossum ruprechtiana and Hymenena. Cystocarpic in winter; tetrasporic in winter.

Dasyaceae

202. Rhodoptilum plumosum (Harv. & Bailey) Kylin.

West Beach, Camp Casey beach, Keystone ferry jetty, Bush Point, west coast of Whidbey Island (Gardner; May to September 1901). Present at all seasons. Low littoral and sublittoral. On rock. Tetrasporic in summer.

203. Heterosiphonia densiuscula Kylin.

West Beach (Norris; June 1951).

Rhodomelaceae

204. Polysiphonia hendryi Gardner.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Double Bluffs at Useless Bay. Spring, summer, autumn. Mid- and low littoral. On rock. Cystocarpic in spring, summer, and autumn; tetrasporic in spring, summer and autumn.

205. Polysiphonia pacifica var. distans Hollenberg.

Whidbey Island (Gardner).

206. Polysiphonia pacifica var. pacifica. Hollenberg.

West Beach (Norris; September 1949), Camp Casey beach. Lower littoral. Autumn 1964.

207. Polysiphonia pacifica var.disticha Hollenberg.

West Beach (Norris; June 1951).

208. Polysiphonia paniculata Mont.

West coast of Whidbey Island (Gardner; August 1899), Camp Casey beach. Lower littoral. Autumn 1966. Tetrasporic.

209. Polysiphonia urceolata (Dillwyn) Grev.

Deception Pass, Camp Casey beach, Whidbey Island (Gardner;floating; 7 June 1901). Spring, summer, autumn. Littoral. On rock. Cystocarpic and tetrasporic in spring.

210. Lophosiphonia reptabunda (Suhr) Kylin.

West Beach (on Nereocystis and Pterygophora stipes), Camp Casey beach (on Codium fragile). Summer. Low littoral and sublittoral.

211. Pterosiphonia arctica S. & G.

Whidbey Island(Gardner; 31 May 1901, July 1901).

212. Pterosiphonia bipinnata (P. & R.) Falk.

Deception Pass, West Beach, Camp Casey beach, Whidbey Island (Grant; June 1920; also by Gardner). Summer and autumn. Lower littoral. On rock. Cystocarpic in summer; tetrasporic in summer and autumn.

213. Pterosiphonia dendroidea (Mont.) Falk.

West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; floating; July 1901). Present at all seasons. Sublittoral. On rock; occasionally on Pterygophora stipes. Tetrasporic in summer.

214. Pterosiphonia gracilis Kylin.

West Beach (Norris; June 1951), Camp Casey beach, Bush Point. Spring, summer, autumn, Low littoral and sublittoral. On rocks. occasionally epiphytic. Tetrasporic in spring.

215. Pterochondria woodii (Harv.) Hollenberg.

Deception Pass, West Beach (also collected there by Dr. R. F. Scagel; 13 August 1955), Camp Casey beach, Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Sublittoral. On Pterygophora stipes. Tetrasporic in winter.

216. Herposiphonia grandis Kylin.

West Beach. Summer. Low littoral. On rock. Tetrasporic in summer.

217. Herposiphonia subdisticha Okamura.

Camp Casey beach. Summer, autumn. On Bossiella dichotoma.

218. Laurencia spectabilis P. & R.

Deception Pass, West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; mean low tide; 18 June 1901).Present at all seasons. Low littoral and sublittoral. On rock. Cystocarpic in summer and autumn; spermatangial in spring.

219. Janczewskia gardneri S. & G.

West Beach, Camp Casey beach, Bush Point, Whidbey Island (Gardner; mean low tide; 18 June 1901). Present at all seasons. On Laurencia spectabilis.

220. Rhodomela larix (Turner) C.Ag.

Deception Pass, West Beach, Camp Casey beach, Double Bluffs at Useless Bay, Whidbey Island (Gardner; 9 December 1897). Present at all seasons. Upper littoral. On rock.

221. Odonthalia floccosa (Esper) Falk.

Deception Pass, West Beach, Camp Casey Beach, Bush Point, Double Bluffs at Useless Bay, west coast of Whidbey Island (Gardner; July 1898, 3 July 1901). Present at all seasons; battered in winter. Littoral and sublittoral. On rock. Cystocarpic in spring summer and autumn. Tetrasporic in summer and autumn. Often in areas exposed to turbulent water, branches will tend to clump; this was noticed on the type specimen of O. floccosa f. comosa from Whidbey Island, and has been seen in the field on plants from the outer coast and along the Strait of Juan de Fuca.

222. Odonthalia kamtschatica (Rupr.) J.Ag.

Deception Pass, West Beach, Camp Casey beach, Bush Point. Present at all seasons; battered in winter; new plants in spring. Lower littoral. On rock. Cystocarpic in summer and autumn.

223. Odonthalia lyallii (Harv.) J.Ag.

Camp Casey beach, west coast of Whidbey Island (Gardner; June 1901). Summer. Littoral. On rock. Cystocarpic and tetrasporic in summer.

224. Odonthalia washingtoniensis Kylin.

Deception Pass, West Beach, Camp Casey beach, Bush Point, west coast of Whidbey Island (Gardner; at all seasons). Present at all seasons; battered plants in winter; new plants in spring. Littoral and sublittoral. On rock. Cystocarpic in spring and summer; tetrasporic in summer and winter.

Chrysophyta

Vaucheriales

Phyllosiphoniaceae

225. Ostreobium queckettii Born. & Flah.

Whidbey Island. In empty shells. Reported by Jao (1937).

The following species are listed by Scagel (195) as occurring on Whidbey Island. We cannot find them among Gardner's collections or those of others:

Haplogloia kuckuckii Kylin (probably collected by Kylin.)

Farlowia compressa J.Ag.

Platythamnion pectinatum Kylin.

Callithamnion acutum Kylin.

Cryptonemia borealis Kylin.

ARTICIFIAL KEYS TO THE MARINE ALGAE OF WHIDBEY ISLAND, WASHINGTON

1. Key to the Seagrasses.

   1. Leaves 4-12 mm. wide, with 5-7 nerves; rhizomes with elongated internodes; inflorescence a compound stalk with several spadices per stalk; spadices bisexual; habitat muddy sand..*Zostera marina*.

   1. Leaves no more than 3 mm. wide, with 3 nerves; rhizomes with exceedingly compacted internodes; inflorescence short with one spadix per stalk; habitat rocks..... *Phyllospadix scouleri*.

2. Key to the Chlorophyta - Green Algae

   1. Thallus consisting of a single microscopic cell (endophyte in *Schizymenia pacifica*)..... *Chlorochytrium inclusum*.

   1. Thallus macroscopic; consisting of more than one cell or coenocytic..2.

      2. Thallus coenocytic ..... 3.

      2. Thallus composed of definitive cells ..... 4.

   3. Thallus erect, dichotomously branched..... *Codium fragile*.

   3. Thallus a prostrate, spongy mass..... *Codium setchellii*.

      4. Thallus a branched or unbranched uniseriate filament..5.

      4. Thallus consisting of more than one row of cells.....9.

   5. Filaments branched ..... 6.

   5. Filaments unbranched ..... 8.

      6. Recurved spine-like branches present.*Spongomorpha coalita*.

      6. Recurved spine-like branches absent..... 7.

   7. Most terminal branches rounded to clavate at the tip; filaments of main axes above 60-100 microns in diameter.. *Spongomorpha arcta*.

7. Terminal branches other than the main growing axes with acute tips; filaments in main axes 80-100 microns in diameter..... Spongomorpha saxatilis.

8. Rhizoids extramatrical; zoosporangia not over 100 microns in maximum diameter, only slightly swollen ..Urospora mirabilis.

8. Rhizoids intramatrical; zoosporangia over 175 microns in diameter, oblong cylindrical.....Urospora wormskjoldii.

9. Thallus membranous and flat, at least at maturity, solid at the base.....10.

9. Thallus hollow, tubular, at least at the base, the upper parts sometimes expanded..... 14.

10. Thallus 2 cells thick ..... 11.

10. Thallus 1 cell thick ..... 13.

11. Cells square or nearly so in cross-section..... Ulva lactuca.

11. Cells elongate in cross-section .....12.

12. Thallus large with deeply ruffled margins...Ulva expansa.

12. Thallus small, margins not particularly ruffled; thallus broad, often split..... Ulva rigida.

13. Thallus darkening on drying, or following contact with heated object; cells square in cross section..... Monstroma fuscum.

13. Thallus not darkening on drying; cells rectangular in cross-section .....Monstroma grevillei

14. Thallus flat and distromatic, but tubular at the base and occasionally along the margins.....Enteromorpha linza.

14. Thallus tubular throughout.....15.

15. Cells in regular, longitudinal rows throughout.....

Enteromorpha intestinalis.

15. Cells not in regular rows in most of the thallus .....

Enteromorpha prolifera.

3. Key to the Phaeophyta - Brown Algae.

1. Thallus crustose on rock surfaces ..... Ralfsia pacifica.

1. Thallus not crustose.....2.

2. Thallus consisting of uniseriate vegetative filaments..3.

2. Thallus not filamentous.....7.

3. Thallus wholly or almost wholly endophytic in Schizymenia pacifica.

.....Streblonema pacificum.

3. Thallus not endophytic..... 4.

4. Chromatophores disc-shaped..... 5.

4. Chromatophores band-shaped..... 6.

5. Fronds less than 1 cm. high..... Ectocarpus cylindricus.

5. Fronds 1 cm. or more high..... Ectocarpus granulosus.

6. Fronds less than 1 cm. high..... Ectocarpus terminalis.

6. Fronds more than 1 cm. high..... Ectocarpus dimorphus.

7. Thallus cylindrical or only slightly flattened throughout..8.

7. Thallus not cylindrical throughout (definitely flattened)..11.

8. Branch tips with a conspicuous apical cell.....

Sphacelaria racemosa.

8. Branch tips without a conspicuous apical cell.....9.

9. Branching opposite..... Desmarestia media var. tenuis.

9. Branching alternate..... 10.

10. Branching dense with very short branches..... Heterochordaria abietina.

10. Branching not dense, with longer branches ..... Desmarestia intermedia.

11. Entire thallus, except holdfast, dichotomously branched throughout Fucus distichus.

11. Entire thallus, if branched, not with branching dichotomous throughout ..... 12.

12. Thallus with a single sessile or stipitate blade .... 13.

12. Thallus with many leaf or ribbon-like blades .....27.

13. Holdfast with evident root-like haptera ..... 14.

13. Holdfast disc-shaped (haptera may be present in Desmarestia).21.

14. Haptera borne at base of blade; stipe usually indistinct.. Hedophyllum sessile.

14. Haptera radial about base of stipe .....15.

15. Blade with a percurrent midrib or ribs..... 16.

15. Blade without midrib or ribs ..... 19.

16. Blade with 5 percurrent ribs.....Costaria costata.

16. Blade with 1 percurrent midrib..... 17.

17. With sporphylls between holdfast and blade... Alaria marginata.

17. Without sporophylls.....18.

18. Blade densely bullate and midrib narrow; blade perforate.. Agarum fimbriatum.

18. Blade smooth, slightly wrinkled near midrib; midrib broad.. *Pleurophycus gardneri*.

19. Stipe erect, supporting lamina; stipe terete, tapering noticeably.. *Laminaria setchellii*.

19. Stipe not erect, not supporting lamina, not terete..... 20.

20. Base of lamina cuneate to acute; blade bullate in two rows along longitudinal axis..... *Laminaria saccharina*.

20. Base of lamina cordate to cuneate; entire blade bullate.. *Laminaria groenlandica*.

21. Blade with a stipe over 5 cm. long..... 22.

21. Blade, if stipitate, with stipe usually less than 1 cm. long..23.

22. Blade with 3 percurrent series of conspicuous folds..... *Cymathere triplicata*.

22. Blade without folds..... *Laminaria ephemera*.

23. Blade a sac ..... 24.

23. Blade flat..... 25.

24. Length of blade more than 20 times breadth..... *Scytosiphon lomentaria*.

24. Length of blade less than 8 times breadth ..... *Coilodesme californica*.

25. Blade without conspicuous veins..... *Petalonia debilis*.

25. Blade with conspicuous veins.....26.

26. Axes about 1 cm. wide; branches very abundant, 3-5 orders.. *Desmarestia herbacea*.

26. Axes to 1 dm. wide; not many branches, 2(occasionally 3) orders..... Desmarestia munda.

27. Blades not borne laterally along an erect axis ..... Nereocystis leutkeana.

27. With leaf or ribbon-like blades borne laterally along an erect axis..... 28.

28. Blades not borne radially about the axis..... 29.

28. Blades radially arranged about the axis.....30.

29. Blades short, densely crowded, and frequently replaced by a pneumatocyst.....Egregia menziesii.

29. Blades long, not densely crowded, no pneumatocysts ..... Pterygophora californica.

30. Blades ribless; branches terminating in single or paired apiculate pneumatocysts.....Cystoseira geminata.

30. Blades with midribs; branches terminating in single pneumatocysts which are not apiculate...Sargassum muticum.

4. Key to the Rhodophyta - Red Algae.

1. Thallus calcareous.....2.

1. Thallus not calcareous .....14.

2. Thallus wholly crustose.....3.

2. Thallus with erect jointed branches.....7.

3. Roof of sporangial conceptacles perforated by few to many pores..4.

3. Roof of sporangial conceptacles perforated by a single pore...5.

4. Plants on Calliarthron tuberculosa...Polyporolithon parcum.

4. Plants on Zostera and Phyllospadix leaves ..... Melobesia mediocris.

5. Thallus without branches, papillae, or other pronounced excrescences..... Lithophyllum decipiens.

5. Thallus with pronounced excrescences.....6.

6. Protuberances regular; thallus pink; on molluscs or stones .. Lithophyllum whidbeyense.

6. Protuberances irregular, anastomosing; thallus purple; on stones or on tide pool floors or sides of rocky outcroppings.....Lithophyllum neofarlowii.

7. Conceptacles restricted to terminal intergenicula of erect branches..... 8.

7. Conceptacles not restricted to terminal intergenicula of erect branches .....9.

8. Branches from main axes verticillate..... Corallina vancouveriensis.

8.. Branches from main axes normally strictly distichous pinnate.....Corallina officinalis var. chilensis.

9. Intergenicula with well differentiated wings.....10.

9. Intergenicula not expanded wings.....13.

10. Conceptacles restricted to flattened faces of intergenicula..11.

10. Conceptacles both on flattened faces and on lateral margins of intergenicula ..... 12.

11. Branching pinnate; intergenicula angular...Bossiella frondescens.

11. Branching in part pinnate, ultimately dichotomous; wings rather broad..... Bossiella dichotoma.

12. Plants more or less prostrate; intergenicula dorsiventral.. Calliarthron schmittii.

12. Plants essentially erect; upper intergenicula commonly subcylindrical..... ...Calliarthron tuberculosa.

13. Fertile intergenicula cylindrical or only slightly compressed.. Pachyarthron cretaceum.

13. Fertile intergeniucla markedly compressed..Serraticardia macmillani.

14. Thallus parasitic on other algae.....15.

14. Thallus not parasitic, although sometimes epiphytic..19.

15. Parasitic on Botryoglossum..... Gonimophyllum skottsbergii.

15. Not on Botryoglossum.....16.

16. Parasitic on Plocamium ..... Plocamiocolax pulvinata.

16. Not on Plocamium .....17.

17. Parasitic on Polyneura..... Polycoryne gardneri.

17. Not on Polyneura..... 18.

18. Parasitic on Laurencia.....Janczewskia gardneri.

18. Not on Laurencia, but on Callophyllis flabellulata..... Callocolax globulosis.

19. Thallus crustaceous ..... 20.

19. Thallus not crustaceous ..... 22.

20. Thallus spreading extensively on rocks and shells..... Hildenbrandia prototypus.

20. Thallus epiphytic or eipzoic ..... 21.

21. Thallus forming small (up to 0.5 mm.) dark-red spherical papillae on leaf margins of Phyllospadix..Rhodophysema georgii.

21. Thallus microscopic, epiphytic or epizoic, composed of radially branched filaments.....Erythrocladia subintegra.

22. Thallus a simple or branched monosiphonous filament, sometimes developing a cortex in the mature parts...23.

22. Thallus more than one cell broad, frequently organized into a complex multicellular body.....45.

23. Thallus unbranched.....24

23. Thallus branched.....25.

24. Thallus microscopic .....Erythrotrichia kylinii.

24. Thallus macroscopic ..... Bangia fuscopurpurea

25. Thallus with cells not touching each other but separated by thick walls and with a thick gelatinous sheath..... 26.

25. Thallus with cells touching each other and with protoplasmic continuity between adjacent cells..... 27.

26. Cells usually in a single row; filaments 12-30 microns thick..... Goniotrichum elegans.

26. Cells irregularly arranged, in the broader parts 5-8 cells in the cross- section, in the young parts a single row of cells; older filaments 30-60 microns thick..... Goniotrichum cornu-cervi.

27. Cells of major axes with opposite branches .....28.

27. Cells of major axes not with opposite branches.....37.

28. Each verticil with all branchlets the same length....29.

28. Each verticil with 2 long and 2 short branchlets.....
Platythamnion reversum.

29. Primary determinate branches essentially in opposite pairs..30.

29. Primary determinate branches in whorls of 3 or 4.....35.

30. Some opposite pairs of determinate branchlets with one member commonly suppressed.....Antithamnion gardneri.

30. Determinate branchlets mostly in regular opposite pairs, rarely with suppression of one member of a pair.....31.

31. Determinate branches compound, that is with secondary branchlets on one or both sides..... 32.

31. Determinate branches mainly simple, seldom with secondary branchlets on one or both sides.....34.

32. Gland cells absent..... Antithamnion shimamuranum.

32. Gland cells present..... 33.

33. Terminal cells of ultimate branchlets pointed.....
Antithamnion pygmaeum.

33. Terminal cells of ultimate branchlets rounded.....
Antithamnion defectum.

34. Terminal cells of branchlets blunt.Antithamnion pacificum

34. Terminal cells of branchlets acute .....
Antithamnion glanduliferum.

35. Gland cells absent.....Antithamnion nigricans.

35. Gland cells present..... 36.

36. Terminal cells of lateral branchlets acute.....
Antithamnion sublutatum.

36. Terminal cells of lateral branchlets blunt .....
Antithamnion occidentale.

37. Thallus with regular alternate branching..... 38.

37. Thallus with branching predominantly unilateral, subdichotomous, or irregular..... 41

38. Sporangia with more than 4 spores .....
Pleonosporium vancouverianum.

38. Sporangia with 4 tetraspores.....39.

39. Endophytic on articulated corallines...Callithamnion lejolisea.

39. Not endophytic..... 40.

40. Thalli prominently corticated.....Callithamnion pikeanum.

40. Thalli not corticated Callithamnion biseriatum.

41. Each cell containing a few to many discoid chromatophores...
Rhodochorton tenue.

41. Cells not with discoid chromatophores.....42.

42. In Prionitis..... Acrochaetium subimmersum.

42. Not in Prionitis.....43.

43. In Porphyra perforata..... Acrochaetium porphyrae.

43. Not in Porphyra ..... 44.

44. Cells of thallus 4.5-5.5 microns wide; monosporangia 5.5-6.5 microns wide and 8-10 microns long.....
Acrochaetium pacificum.

44. Cells of thallus 16-20 microns wide; monosporangia 16-25 microns wide and 22-35 microns long...Acrochaetium rhizoideum.

45. Thallus, when mature, with cells arranged in conspicuous and regular polysiphonous series (sometimes obsecured in older parts by a cortex.).....46.

45. Thallus, when mature, not with cells in conspicuous polysiphonous series..... 59.

46. Branches cylindrical and arising along several radii..47.

46. Branches more or less flattened and all lying in one plane..52.

47. Thallus with prominent prostrate, rhizome-like branches bearing erect branches..... Lophosiphonia reptabunda.

47. Thallus branches wholly or partially erect..... 48.

48. Thallus branches with 4 pericentral cells.....49.

48. Thallus branches with more than 4 pericentral cells..51.

49. Ultimate branch tips sharply pointed.... Polysiphonia urceolata.

49. Ultimate branch tips rounded with hemispherical cell at tip..50.

50. Ultimate branchlets more or less determinate ..... Polysiphonia pacificia var.disticha.

50. Ultimate branches indeterminate..... Polysiphonia pacifica var. pacifica.

51. Branch or scar cell or trichoblast on every segment..... Polysiphonia paniculata.

51. Branch or scar cell or trichoblast not on every segment..... Polysiphonia hendryi.

52. Marginal cells half as long as pericentral cells present in the segments of the flattened branches..... Platysiphonia clevelandii.

52. Marginal cells not present or, if present, the same length as the other cells in the segment.....53.

53. Thallus with branches arising distichously along each side of the major axes and terminating in monsiphonous filaments.... Heterosiphonia densiuscula.

53. Thallus with polysiphonous branches throughout.....54.

54. Thallus with a branch sequence of three simple branches between successive compound branches.....55.

54. Thallus not with distribution of three simple branches between successive compound branches..... 56.

55. Thallus erect, 4-6 cm. high, with lower compound branches up to 4 cm. long ..... Herposiphonia grandis.

55. Thallus prostrate, up to 4 cm. high, with lower compound branches up to 7 mm. long ..... Herposiphonia subdisticha.

56. Thallus without percurrent axes.... Pterochondria woodii.

56. Thallus with percurrent axes .....57.

57. Branches markedly compressed..... Pterosiphonia dendroidea.

57. Branches terete or only slightly compressed.....58.

58. Thallus 6-12 cm. high; articulations in the main branches 4-8 times as long as broad..... Pterosiphonia bipinnata.

58. Thallus 2-4 cm. high; articulations in the main branches about as long as broad..... Pterosiphonia gracilis.

59. Thallus with main axes cylindrical (sometimes slightly flattened) .....60.

59. Thallus markedly flattened to blade-like.....80.

60. Thallus unbranched; a hollow sac..... Halosaccion glandiforme.

60. Thallus branched; not a hollow sac.....61.

61. Thallus with main axes bearing transverse whorls of branchlets.. Gloiosiphonia verticillaris.

61. Thallus not with whorls of branchlets..... 62.

62. Thallus more or less dichotomously branched.....63.

62. Thallus not dichotomously branched.....67.

63. Thallus wiry in texture; medulla of narrow parallel longitudinal filaments ..... 64.

63. Thallus not wiry in texture; no medulla of narrow parallel longitudinal filaments.....65.

64. Branches less than 0.5 mm. wide..... Ahnfeltia plicata.

64. Branches 0.5-1.0 mm. wide.....Ahnfeltia concinna.

65. Thallus with cortication only at the nodes..... Ceramium californicum.

65. Thallus with internodes completely corticated throughout..66.

66. Plants with penetrating, bulb-tipped, rhizoids ..... Ceramium codicola.

66. Plants not with penetrating, bulb-tipped, rhizoids.... Ceramium pacificum.

67. Thallus with a few major axes, sometimes giving rise to numerous short branches..... 68.

67. Thallus more or less profusely branched.....70.

68. Thallus with percurrent axis; medulla of very large cells.. Gracilaria verrucosa.

68. Thallus not with percurrent axis; medulla not with large cells only ..... 69.

69. Thallus somewhat flattened; medulla with mostly large, roundish cells mixed with some slender bracched filaments..... Euthora fruticulosa.

69. Thallus not flattened; medulla filamentous with a consipcuous axial filament.....Cryptosiphonia woodii.

70. Thallus with major axes bearing numerous short branchlets all about the same length.....71.

70. Thallus with major axes bearing progressively shorter branches .....76.

71. Short lateral branches distichous .....72.

71. Short lateral branches not distichous.....75.

72. Branchlets terminating in monosiphonous filaments..... Rhodoptilum plumosum.

72. Branchlets not terminating in monosiphonous filaments..73.

73. Two branches of a pair alike; medulla with a conspicuous axil filament surrounded by intertwined rhizoidal filaments..... Pikea pinnata.

73. Two branches of a pair unlike; medulla not with conspicuous axial filament and rhizoidal filaments ..... 74.

74. Branches markedly flattened..... Ptilota filicina.

74. Branches not flattened.....Bonnemaisonia nootkana.

75. Apices of short branches blunt..... Rhodomela larix.

75. Apices of short branches acutely pointed..Odonthalia floccosa.

76 Branching of smaller branches pectinate.....77.

76. Branching of small branches not pectinate .....79.

77. Branching pattern of 3-4 smaller branches on one side of axis, alternating with 3-4 branches on other side, and so on..... Plocamium coccineum var. pacificum.

77. Branching pattern not as above .....78.

78. Plants epiphytic.....Microcladia coulteri.

78. Plants not epiphytic.....Microcladia borealis.

79. All major axes covered with dense spine-like branchlets.... Endocladia muricata.

79. All major axes smooth ..... Agardhiella tenera.

80. Epiphytic on Zostera and Phyllospadix leaves..... Smithora naiadum.

80. Not epiphytic on Zostera and Phyllospadix.....81.

81. With veins or midrib ..... 82.

81. Without veins or midrib..... 91.

82. With veins but no midrib.....83.

82. With midrib; veins present or absent .....84.

83. Veins at base of blade only.....Weeksia fryeana.

83. Veins over all of blade.....Polyneura latissima.

84. With percurrent midrib..... 85.

84. Without percurrent midrib ..... 87.

85. Thallus with all branches arising from the midrib .....
Delesseria decipiens.

85. Thallus not with all branches arising from the midrib.....86.

86. Frond 3-6 cm. high; branches 2-10 mm. wide; midrib macroscopic; side nerves microscopic..... Membranoptera platyphylla.

86. Frond 2-3 cm. high; branches 0.5-1 mm. broad; midrib microscopic; no side nerves..... Membranoptera tenuis.

87. Margins of thallus with semicircular proliferations.....
Botryoglossum ruprechtiana.

87. Margins of thallus without semicircular proliferations....88.

88. Tetrasporangia located in stichidium-like branches.....
Odonthalia kamtschatica.

88. Tetrasporangia not in stichidia, but in sori on thallus..89.

89. Tetrasporangia sori only along the margins of the branches...
Cryptopleura violacea.

89. Tetrasporangial sori scattered over thallus.....90.

90. Linear sori; mostly found on rocks..Hymenena flabelligera.

90. Oval sori; on Pterygophora stipes....Hymenena setchellii.

91. Thalli with perfoliate blades..... 92.

91. Thalli not with perfoliate blades..... 93.

92. Blades separated by moderately long internodes.....
Constantinea subulifera.

92. Blades not separated by internodes...Constantinea simplex.

93. Thalli with gland cells in the cortex.....94.

93. Thalli not with gland cells in the cortex.....96.

94. Thallus thick and cartilaginous; primary blade proliferating off rounded stipitate blades.....Opuntiella californica.

94. Thallus thin to membranous..... 95.

95. Thallus gelatinous to the touch; cystocarps immersed near the surface ..... Schizymenia pacifica.

95. Thallus membranous; cystocarps deeply embedded in medulla....
Turnerella mertensiana.

96. Thallus with a medulla of obvious filaments.....97.

96. Thallus not with a medulla of obvious filaments.....113.

97. Thallus usually iridescent.....98.

97. Thallus not iridescent.....100.

98. Thallus of medium size, 5-25 cm. high...Iridaea heterocarpa.

98. Thallus large, 25 cm. to over 1 meter long..... 99.

99. Thalli for the most part broader than long...Iridaea whidbeyana.

99. Thalli at least longer than broad, or longer; base cordate...
Iridaea cordata.

100. Surface of thallus with numerous, stout, papillate outgrowths..101.

100. Surface of thallus not with papillate outgrowths.....103.

101. Papillae often corymbose; blade often very large and unbranched.. Gigartina corymbifera.

101. Papillae not corymbose; blade mostly branched.....102.

102. Thallus up to 10 cm. high, dissected in some cases; margins mostly entire.....Gigartina papillata.

102. Thallus 20-40 cm. high, ovate to lanceolate; margins mostly toothed.....Gigartina exasperata.

103. Medulla with a single axial filament surrounded by numerous rhizoidal filaments..... Farlowia mollis.

103. Medulla not with a single axial filament.....104.

104. Thallus gelatinous; medulla with conspicuous stellate cells..105.

104. Thallus not gelatinous; medulla not with conspicuous stellate cells.....107.

105. Thallus large, expanded, blade-like, unbranched ..... Kallymenia oblongifructa.

105. Thallus smaller, simple, but usually branched .....106.

106. Thallus 20-60 cm. long, 20-40 mm. wide, simple or with a few proliferations..... Grateloupia schizophylla.

106. Thallus 7-10 cm. long, 7-10 mm. wide, pinnately branched... Grateloupia pinnata.

107. Medulla with filaments extending perpendicularly from cortex to cortex ..... Halymenia californica.

107. Medulla not with filaments oriented perpendicularly.....108.

108. Cortex two cells thick.....*Cryptonemia borealis*.

108. Cortex thicker.....107.

109. Thallus texture somewhat rubbery; purplish.....
Rhodoglossum latissimum.

109. Thallus texture not rubbery; not purplish.....110.

110. Plants bladelike, not divided.....111.

110. Plants flattened but not bladelike, divided.....112.

111. Blades tending to split into somewhat falcate or curved asymmetrical parts..... *Dilsea californica*.

111. Blades undivided or at most a little laciniate..*Aeodes gardneri*.

112. Thallus dichotomously branched; usually bright red and subtidal ..... *Sarcodiotheca furcata*.

112. Thallus with more or less extensive branching, frequently with numerous marginal distichously arranged pinnate branchlets; brownish black in color; intertidal or in tide pools..... *Prionitis lyallii*.

113. Vegetative thalli throughout only one or two cells thick..114.

113. Vegetative plants thicker, at least in some parts.....119.

114. Thallus one cell thick..... 115.

114. Thallus two cells thick.....117.

115. Plants epiphytic on *Nereocystis*..... *Porphyra nereocystis*.

115. Plants not epiphytic on *Nereocystis*.....116.

116. Cells with two stellate chromatophores..*Porphyra lanceolata*.

116. Cells with one stellate chromatophore...*Porphyra perforata*.

117. Gelatinous matrix of blade stratified..... Porphyra variegata.

117. Gelatinous matrix of blade homogeneous.....118.

118. Carposporangia and spermatangia intermixed along margin of thallus.....Porphyra amplissima.

118. Carposporangia and spermatangia in separate areas which alternate along margin of thallus..... Porphyra miniata var. cuneiformis.

119. Basal portion of thallus a cylindrical rhizome.....120.

119. Basal portion of thallus not a cylindrical rhizome..... 121.

120. Thallus perforated when mature..... Rhodymenia pertusa.

120. Thallus not perforated when mature.....Rhodymenia palmata.

121. Branching pinnate; branch tips ending in a small depression containing a single apical cell..... Laurencia spectabilis.

121. Branching not pinnate; branch tips not ending in a small depression ..... 122.

122. Thallus one cell thick at the margin.....123.

122. Thallus more than one cell thick at the margin.....124.

123. Carposporangia in chains..... Myriogramme sp.

123. Carposporangia not in chains.....Nitophyllum mirabile.

124. Thallus with an axial filament surrounded by four pericentral cells which become heavily corticated .....125.

124. Thallus not of this type of construction.....126.

125. Branches flat throughout (upper bra ches may be only compressed).. Odonthalia lyallii.

125. Branches not flat throughout (flat above, only compressed below) ..... Odonthalia washingtoniensis.

126. Medulla of large cells only ..... 127.

126. Medulla of large and small cells mixed .....130.

127. Branching more or less dichotomous; upper dichotomies much narrower than lower ones..... 128.

127. Branching more or less dichotomous; all dichotomies about the same width.....129.

128. Cystocarps marginal..... Fauchea fryeana.

128. Cystocarps scattered over surface of thallus.Fauchea laciniata.

129. Plants distinctly red; segments 8-12 mm. wide ..... Stenogramme interrupta.

129. Plants dull colored; segments 4-6 mm. wide ..... Gymnogongrus platyphyllus.

130. Gland cells in medulla; filaments mixed into cells in medulla Fryeella gardneri.

130. No gland cells in medulla; no filaments in medulla....131.

131. Mature thalli up to one dm. long, thin, usually a light rose-red color..... 132.

131. Mature thalli usually longer than 1 dm., cartilaginous, usually dark wine-red or reddish purple.....134.

132. Thallus unbranched..... Callophyllis firma.

132. Thallus branched.....133.

133. Terminal branches usually narrow, often pinnate, usually sharply pointed..... Callophyllis flabellulata.

133. Terminal branches usually broad and rounded.....

Callophyllis heanophylla.

134. Margins strongly crispate..... *Callophyllis crenulata*.

134. Margins not crispate..... *Gallophyllis edentata*.

GLOSSARY OF SELECTED TERMS USED IN ALGAL KEYS

1. Apiculate - terminating in a sharp point.
2. Blade - flattened, leaf-like.
3. Bullate - having a blistered appearance.
4. Carposporangium - reproductive cell of the generation attached to the female plant. Produces the carpospores.
5. Cartilaginous - tough, hard, elastic.
6. Chromatophore - pigment containing body.
7. Coenocytic - a multinucleate condition usually without cross-walls.
8. Conceptacles - fertile cavities opening to thallus surface.
9. Cordate - heart-shaped.
10. Corymbose - branched.
11. Crustose - in a thin layer flattened against the substrate.
12. Cuneate - wedge-shaped.
13. Cystocarp - mature female repoductive structure in red algae resulting from sexual reproduction.
14. Distichous - arranged in two ranks.
15. Extramatrical - outside the sheath.
16. Falcate - sickle-shaped.
17. Haptera - root-like portions of a holdfast.
18. Intergenicula - calcified segment between the joints of a jointed coralline alga.
19. Intramatrical - inside the sheath.
20. Monosporangium - reproductive structure with a single asexual spore.

21. Monosiphonous - single series of cells.
22. Orbicular - circular outline.
23. Pectinate - branches restricted to one side of an axis and set close together like the teeth of a comb.
24. Percurrent - running the entire length.
25. Perfoliate - passing through the blade.
26. Pericentral - surrounding a central monosiphonous axis.
27. Pinnate - branches on each side of a common axis.
28. Pneumatocyst - bladder.
29. Polysiphonous - having tiers of parallel, vertically elongated cells.
30. Polysporangium - reproductive structure with many asexual spores (polyspores).
31. Rhizoid - a filamentous attachment organ.
32. Rhizoidal - in the form of a rhizoid.
33. Sorus - a group of reproductive structures.
34. Spermatangia - male reproductive organ of the red algae.
35. Stipitate - with a stipe.
36. Terete - cylindrical.
37. Tetrasporangium - reproductive structure containing four asexual spores (tetraspores).
38. Trichoblast - a simple or branched, usually colorless, filament.
39. Verticillate - whorls of branches.

ALGAE FOUND AT COLLECTION SITES

Numbers correspond to species in the Systematic List. This list contains only those species found by R. E. Norris (as reported in Scagel, 1957) or by us.

Deception Pass

1 4,9 11-13,20-22,24,34,40,41,48,51-53,56-61,63-68,72,73,79,81,82,91,94, 100, 102. 103, 105, 112, 113, 115, 122, 123, 127, 129-132, 134, 135, 140, 144-146, 149, 150, 155-157, 163-165, 167, 173, 174, 181, 182, 186, 191, 193, 197, 200. 201, 204, 209, 212, 215, 218, 220-222,224.

West Beach

1, 9, 11, 12, 18, 19, 21, 24, 26, 27, 30, 33-35, 39-43, 47, 48, 53, 55-58, 61, 63-68, 70-74, 81, 82, 87, 89, 91, 92, 94-100, 103, 105, 109, 112-115, 120, 122, 124 - 127, 129-135, 138, 140, 143-147, 149, 150, 154 - 157, 159, 162, 164-166, 168, 171, 172, 174, 175, 177, 178, 180-183, 188-198, 200-204, 206, 207, 210, 212-216, 218-222, 224.

Ebey's Landing

1, 158 173.

Camp Casey beach

1,8, 9, 11-13, 18, 19, 21, 24, 26, 27, 29, 32-34, 40-42, 48, 50-53, 55-58, 61, 63, 64, 66-69, 72, 74, 75, 78, 79, 81, 84-86, 91, 93, 94, 97, 102, 103, 105, 109, 111-117, 119-123, 127, 129-132, 134, 140, 141, 144, 146, 147, 149, 150, 154-158, 161, 163-167, 169, 171, 174, 177, 179-182, 185, 189, 191, 193, 195-198, 200-202, 204, 206, 208-210, 212-215, 217-224.

Keystone ferry jetty

9, 12, 75, 81, 165, 175, 191, 202.

Lagoon Point

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Bush Point

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Useless Bay at Double Bluffs

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East Point

2, 10, 12, 48, 67, 72, 81, 102, 148.

Penn Cove

2.

INDEX TO SPECIES

ADDENDUM

The following species have been added since the manuscript went to press:

Botryoglossum farlowianum, (J.Ag.) DeToni.
Camp Casey beach. Found throughout the year. Lower littoral. Cystocarpic in winter.

Halymenia gardneri (Kylin) Hollenberg and Abbott.
Collected by J. M. Grant, June 1920. Probably Useless Bay.

Rhodymenia sp.
West Beach. Drift. Collected by R. L. Vadas.

Schizymenia epiphytica (Setchell & Lawson) Smith & Hollenberg.
West Beach. Sublittoral. Collected by R. L. Vadas.

LITERATURE USEFUL FOR THE WHIDBEY ISLAND AREA

This list is not an exhaustive coverage, but lists only those few works which would be most helpful.

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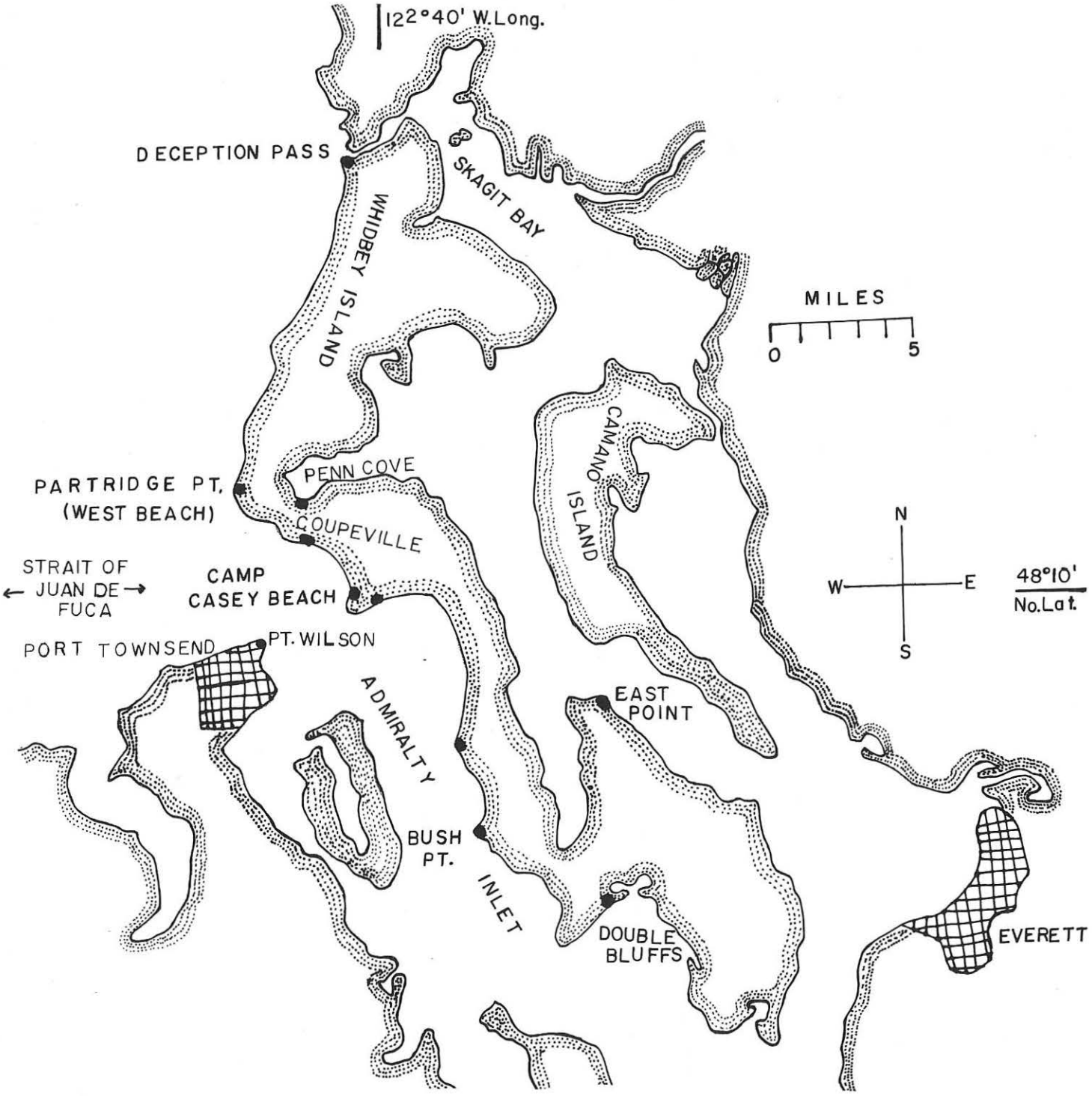
122°40' W.Long.
DECEPTION PASS
SKAGIT BAY
WHIDBEY ISLAND
MILES
0
5
CAMANO ISLAND
PENN COVE
PARTRIDGE PT.
(WEST BEACH)
COUPEVILLE
N
W
E
S
48°10'
No.Lat.
STRAIT OF
← JUAN DE →
FUCA
CAMP
CASEY BEACH
PORT TOWNSEND
PT. WILSON
ADMIRALTY
EAST
POINT
BUSH
PT.
INLET
DOUBLE
BLUFFS
EVERETT