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MARINE ALGAE FROM THE 1969 CRUISE OF "MAKRELE" TO THE NORTHERN PART OF THE GULF OF CALIFORNIA

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ABSTRACT

This paper consists of an annotated list of more than 300 specimens of marine algae collected on 'Makrele' expedition. Seventy-seven species (8 Chlorophyta, 18 Phaeophyta, 51 Rhodophyta) are reported. Eight new records are noted. Lists of marine algae from each collecting station are given.

INTRODUCTION

The first paper on Gulf of California algae was based upon 5 marine and 2 freshwater species (Hariot, 1895). The first detailed list reported 27 marine species from La Paz and from San Felipe (Howe, 1911). The outcome of the California Academy of Sciences expedition to the Gulf of California in 1921 resulted in a description of over 100 species (Setchell and Gardner, 1924). The subsequent expeditions of the California Academy of Sciences resulted in descriptions and illustrations of 134 species from the Revillagigedo Islands (Setchell and Gardner, 1930) and numerous species from along the Pacific coast of Baja California (Setchell and Gardner, 1937).

The Allan Hancock expeditions of 1934 and 1939 yielded an extensive study on the marine algae from the Pacific coast of Baja California to the Galapagos Islands (Taylor, 1945).

From 1940 to 1966 more than 20 major collecting trips were made along both coasts of Baja California. E. Y. Dawson published important taxonomic and distributional studies on the algae from the Gulf of California (1944, 1959, 1966a, 1966b) and the Pacific coast of Mexico, referred to as "Pacific Mexico" (1945a, 1949, 1950a, 1950c, 1952a, 1953, 1954a, 1960a, 1961a, 1961b, 1962a, 1962b, 1963a, 1963b; Dawson and Beaudette, 1959; Dawson, Neushul and Wildman, 1960a, 1960b).

Dawson also published ecological observations of algae from the Gulf of

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California (1941), Pacific coast of Baja California (1945b, 1950b, 1951, 1952b), and reviewed ecology and distribution of marine algae from Baja California (1960b).

The present study is on the marine algae collected on "Makrele" cruises in the northern part of the Gulf of California during April and May 1969 (see map). This expedition was only possible through the generosity of Mr. Paul V. Ammen, owner of "Makrele", who made his ship available to Moss Landing Marine Laboratories of the California State Colleges of San Francisco, San José, Hayward, Sacramento and Fresno (located in Monterey Bay, California).

The author was one of 16 graduate students who participated in this unique and educational cruise of the "Makrele". I am deeply indebted to Mr. Ammen and to Dr. John P. Harville (cruise director) for this biological experience.

The author wishes to thank Miss G. Bockus, Mr. D. Lindquist and Mr. D. Wobber for making their collections available and to Teppy Dice for drawing the map. Special appreciation is due to Dr. Isabella A. Abbott of Hopkins Marine Station of Stanford University who has patiently guided the author in the present study.

"MAKRELE" STATIONS

Station 69-1. Bahia San Francisquito. April 16 and 18, 1969.
Lat. 28°26'22"N
Long. 112°53'47"W

Station 69-2. Bahia San Francisquito. April 17 and May 3, 1969.
Lat. 28°25'49" (±2")N
Long. 112°53'37" (±2")W

Station 69-3. Estero, Bahia de las Animas. April 19, 1969.
Lat. 28°48' (±2")N
Long. 113°20'50"W

Station 69-4. Puerto Refugio, Isla Angel de la Guarda. April 21 and 22, 1969, May 9, 1969.
Lat. 29°32'11" (±2")N
Long. 113°34'12" (±1")W

Station 69-5. Willard Bay, Bahía San Luis Gonzaga. April 24, 1969.
Lat. 29°48'40" (±10")N
Long. 114°23'00" (±10")W

Station 69-6. Norse Beach, Puerto Peñasco. April 5 and 25, 1969.

Station 69-7. Station Beach, Puerto Peñasco. April 5, 1969.

Station 69-8. Bocochibampo Bay, five miles north of Guaymas, Mexico. May 6, 1969.

Station 69-9. Bolinas Channel, two miles east of Bahia de los Angeles. April 30, 1969.

SYSTEMATIC LIST

CHLOROPHYTA

ULVACEAE

Entermorpha acanthophora Kuetzing

Setchell and Gardner, 1924, p. 715; Dawson, 1944, p. 203, pl. 16 fig. 43, pl. 38.

Growing in sand, at 4 to 8 ft. depth, near shore of Willard Bay, Bahia San Luis Gonzaga (JN-393). A very large specimen, over 30 cm. in length, was collected by G. Bockus, from 0 to 3 ft. depth, in the estero of Bahia de las Animas. (JN-383).

Entermorpha compressa (L.) Greville

Setchell and Gardner, 1924, p. 716. Dawson, 1944, p. 203; 1966b, p. 5.

Three small specimens, 1.5 to 3 cm. in length, at 15 ft. depth, Bahia San Francisquito (JN-260).

Ulva lactuca Linnaeus

Setchell and Gardner, 1920, p. 265; Setchell and Gardner, 1924, p. 717; Dawson, 1944, p. 202; Smith, 1944, p. 45, pl. 3, fig. 6-7; Dawson, 1959, p. 11.

One specimen at 15 ft. depth, Bahia San Francisquito (JN-259).

CLADOPHORACEAE

Chaetomorpha antennina (Bory) Kuetzing

Setchell and Gardner, 1920, p. 203; Setchell and Gardner, 1924, p. 713; Dawson, 1944, p. 207; Dawson, 1954a, p. 336, fig. 6L.

Attached to rock, from 0 to 6 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-394).

CODIACEAE

Codium amplivesiculatum Setchell et Gardner

Setchell and Gardner, 1924, p. 709, pl. 15, fig. 28-29, pl. 25; Dawson, 1944, p. 217; Dawson, 1959, p. 16.

Attached to rock, at 15 ft. depth, Bahia San Francisquito (JN-261).

Codium cuneatum Setchell et Gardner

Setchell and Gardner, 1924, p. 708, pl. 16, fig. 24-25, pl. 34; Dawson, 1944, p. 218.

Growing on rocks, at 20 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-330).

Codium macdougalii Dawson

Dawson, 1944, p. 218, pl. 53, fig. 1; Dawson, 1966, p. 55.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-262). Growing on rock, at 8 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-395).

Codium simulans Setchell et Gardner

Setchell and Gardner, 1924, p. 706, pl. 14, fig. 21-22, pl. 31; Dawson, 1944, p. 216.

Growing on rocks, intertidal, Norse Beach, Puerto Peñasco (JN-337, 346, 347). Attached to rocks, from 10 to 15 ft. depth, in *Padina* beds on shoreside of *Sargassum* beds Bahia San Francisquito (JN-226, 263).

PHAEOPHYTA
CUTLERIACEAE

Cutleria hancockii Dawson

Dawson, 1944, p. 226, pl. 54, fig. 1.

Growing on rocks, from 8 to 17 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-310, 316). Intertidal, on rocks, Station Beach, Puerto Peñasco (JN-354).

DICTYOTACEAE

Dictyopteris zonarioides Farlow

Setchell and Gardner, 1924, p. 728; Setchell and Gardner, 1925, p. 656, pl. 34, fig. 4, pl. 35, fig. 11, pl. 36, fig. 21, pl. 38, fig. 39, pl. 95; Dawson,

1944, p. 229 (as *Neurocarpus zonarioides*); Dawson, 1953, p. 114; Dawson, 1959, p. 18.

Growing on rocks with *Padina*, from 12 to 20 ft. depths, Puerto Refugio, Isla Angel de la Guarda (JN-311, 317). Intertidal, on rocks, Station Beach, Puerto Peñasco (JN-355).

Padina durvillaei Bory

Setchell and Gardner, 1924, p. 729; S. and G. 1925, p. 662, pl 93; Dawson, 1944, p. 230; Dawson, Acleto and Foldvik, 1964, p. 22, pl. 18, fig. a.

Large bed growing on rocks, shoreside of *Sargassum* bed, from 6 to 15 ft. depths, Bahia San Francisquito (JN-228, 258, 264). Intertidal on rocks, Norse Beach, Puerto Peñasco (JN-339, 363).

Dictyota flabellata (Collins) Setchell et Gardner

Dictyota hesperia Setchell et Gardner, 1924, p. 731, pl. 18, fig. 52-53; Dawson, 1944, p. 228. Dawson, 1950, p. 89.

Growing on rocks, at 7 ft. depth, off beach one mile north of Bahia de los Angeles (JN-379).

Ditcyota johnstonii Setchell et Gardner

Setchell and Gardner, 1924, p. 730, pl. 18, fig. 54-56, pl. 39; Setchell and Gardner, 1925, p. 653; Dawson, 1944, p. 228.

Growing on rocks, from 10 to 15 ft. depths, Bahia San Francisquito (JN-227, 246); at 20 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-331); intertidal, Norse Beach, Puerto Peñasco (JN-362).

CHORDARIACEAE

Haplogloia andersonii (Farlow) Levring Pl. 1

Levring, 1939, p. 50, pl: 5; Smith, 1944, p. 117, pl. 16, fig. 1-2; Dawson, 1961a, p. 392.

Growing on rocks at 15 ft. depth, Bahia San Francisquito (JN-265). This specimen represents a new record to the Gulf of California. Of widespread distribution from Alaska to Cabo Colnett, Baja California (Dawson 1961), but occurring infrequently.

SPERMATOCHNACEAE

Nemacystus brandegeei (Setchell et Gardner) Kylin

Meneghiniella brandegeei Setchell et Gardner, 1924, p. 5; Setchell and Gardner, 1925, p. 549, pl. 47, fig. 11, pl. 49, fig. 16. Kylin, 1940, p. 49; Dawson, 1944, p. 232; Dawson, 1959, p. 19, fig. 2.

Growing on rock, from 2 to 8 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-329). This specimen represents the fourth reported collection. Previously reported from La Paz, Puerto Escondido and Puerto Peñasco.

PUNTARIACEAE

Ishige foliacea Okamura

Dawson, 1944, p. 234, pl. 53, fig. 2; Dawson, 1966 a, p. 10.

Growing on rocks, at 15 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-328). This species is recorded only from the Japan Sea and the Gulf of California.

SCYTOSIPHONACEAE

Colpomenia bullosa (Saunders) Yamada

Scytosiphon bullosus Saunders, 1898, p. 163, pl. 31, fig. 1-7.

Colpomenia sinuosa f. *deformans* Setchell et Gardner, 1924, p. 726, pl. 19, fig. 61-62; Setchell and Gardner, 1925, p. 542. Discussion under *Colpomenia sinuosa* Dawson, 1944, p. 233. Hollenberg and Abbott, 1966, p. 632.

Growing on rocks among *Padina,* from 6 to 15 ft. depths, Bahia San Francisquito (JN-229, 267). Dominant species on rock reef, at 10 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-327).

Colpomenia sinuosa f. *expansa* Saunders

Saunders, 1898, p. 164, pl. 32, fig. 4-6; Setchell and Gardner, 1925, p. 540; Dawson, 1944, p. 232.

Growing on rocks, from 6 to 20 ft. depths, Bahia San Francisquito (JN-230, 243, 268)

Colpomenia sinuosa f. *tuberculata* (Saunders) Setchell et Gardner

Colpomenia tuberculata Saunders, 1898, p. 164, pl. 32, fig. 1-3; Howe, 1911, 495. Setchell and Gardner, 1924, p. 725.

Growing on rocks and occasionally as an epiphyte on *Hypnea,* at 15 ft.

depth, Bahia San Francisquito, (JN-266). Epiphyte on *Sargassum*, from 0 to 3 ft. depth, estero, Bahia de las Animas (JN-384).

SARGASSACEAE

Sargassum brandegeei Setchell et Gardner

Setchell and Gardner, 1924, p. 736, pl. 21, fig. 79: Dawson, 1944, p. 249, pl. 40, fig. 13-26; Setchell and Gardner, 1925, p. 718.

Attached to rocks, from 8 to 20 ft. depths, Bahia San Francisquito (JN-269), and at 15 ft. depth, rock reef, Puerto Refugio, Isla Angel de la Guarda (JN-326). Dawson (1966b) noted that this species is not clearly distinct from *S. herporhizum* and may represent only a variant.

Sargassum herporhizum Setchell et Gardner

Setchell and Gardner, 1924, p. 739, pl. 20, fig. 69-71; Dawson, 1944, p. 249, pl. 40, fig. 1-12; Setchell and Gardner, 1925, p. 718.

Northern gulf endemic. Intertidal, growing on rocks, Norse Beach, Puerto Peñasco (JN-350). Growing on rocks, at 10 ft. depth, Bahia San Francisquito (JN-271).

Sargassum johnstonii Setchell et Gardner f. *johnstonii*

Setchell and Gardner, 1924, p. 737, pl. 20, fig. 72, pl. 21, fig. 80; Dawson, 1944, p. 240, pl. 32 fig. 1-15, pl. 33, fig. 1-2 and 17-22.

Growing on rocks, from 12 to 15 ft. depth, Bahia San Francisquito (JN-270). Growing attached to sand covered rocks, at 8 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-396). Drifting in Bolinas Channel, two miles east of Bahia de los Angeles (JN-376). Beach one mile north of town, at 7 ft. depth, Bahia de los Angeles (JN-380).

Sargassum johnstonii f. *gracile* Setchell et Gardner

Setchell and Gardner, 1924, p. 738, pl. 21, fig. 76.

Growing on rocks, at 20 ft. depth, Bahia San Francisquito (JN-340, 349).

Sargassum lapazeanum Setchell et Gardner

Setchell and Gardner, 1924, p. 733, pl. 20, fig. 74; Dawson, 1944, p. 243, pl. 34, fig. 1-34; Setchell and Gardner, 1925, p. 718.

Growing on rocks, at 20 ft. depth, Bahia San Francisquito (JN-288).

Sargassum sinicola Setchell et Gardner

Setchell and Gardner, 1924, p. 736, pl. 20, fig. 73; Dawson, 1944, p. 247, pl. 35, fig. 10, jl. 38, fig. 5-11; Setchell and Gardner, 1925, p. 718.

Drifting in Bolinas Channel, two miles east of Bahia de los Angeles (JN-375). Attached to rock, at 10 ft. depth, Bahia Bocochibampo (JN-372).

Sargassum sp.

Several specimens were collected for which species determination has not been made. Bahia San Francisquito: JN-231, 232, 234, 256, 257. Puerto Refugio, Isla Angel de la Guarda; JN-308, 309. Norse Beach, Puerto Peñasco; JN-348, 351. Station Beach, Puerto Peñasco JN-357.

RHODOPHYTA
BANGIACEAE

Porphyra thuretii Setchell et Dawson apud Dawson

Setchell and Dawson, apud Dawson, 1944, p. 253; Smith, 1944, p. 171, pl. 40, fig. 2; Dawson, 1952, p. 12.

Growing on rocks and epiphytic on various algae from 8 to 15 ft. depths, Puerto Refugio, Isla Angel de la Guarda (JN-307, 325). Specimens were sterile and are referred to this species with doubt. Vegetative characters resemble *P. perforata*, which has not been reported from the Gulf. The packets of carpospores and antheridia must be counted to distinguish these two species.

ERYTHROPELTIDACEAE

Erythrotrichia carnea (Dillwyn) J. Agardh

Smith, 1944, p. 164, pl. 35, fig. 3-7.

Minute epiphyte on various algae. Reported here on *Gelidium johnstonii*, Bahia San Francisquito (JN-236).

CHAETANGICEAE

Scinaia johnstoniae Setchell

Setchell, 1914, p. 97, pl. 11, fig. 14-15; Setchell and Gardner, 1924, p. 742; Dawson, 1944, p. 257; Dawson, 1953, p. 44, pl. 3, fig. 12, pl. 21, fig. 1.

Two specimens collected, at 8 ft. and 20 ft. depths, growing on rocks, Bahia San Francisquito (JN-235, 289).

Scinaia latifrons Howe

Howe, 1911, p. 500; Setchell and Gardner, 1924, p. 742; Dawson, 1944, p. 258; Dawson, 1953, p. 46, pl. 4 fig. 1.

Growing on rocks among *Padina* from 10 to 17 ft. depths, Puerto Refugio, Isla Angel de la Guarda (JN-318, 321).

Pseudogloiophloea confusa (Setchell) Levring in Svedelius

Gloiophloea confusa Setchell, 1914, p. 118, pl. 14, fig. 44-47; Dawson, 1953, p. 48, pl. 4, fig. 2. Svedelius, 1956, p. 13; Hollenberg and Abbott, 1966, p. 655.

Growing on rocks with *Padina*, *Gelidium* and *Scinaia johnstoniae*, from 8 to 15 ft. depths, Bahia San Francisquito (JN-254, 255, 272). Growing on rocks just below *Padina* beds, from 15 to 17 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-302, 332).

GELIDIACEAE

Gelidium decompositum Setchell et Gardner

Setchell and Gardner, 1924, p. 743, pl. 71; Dawson, 1944, p. 260; Dawson, 1952, p. 67.

Growing on rocks, from 6 to 10 ft. depth, Bahia San Francisquito (JN-244, 245, 250). Dawson (1953) points out that in section the thallus seems to be that of *Gelidium*, though this alga resembles *Pterocladia pyramidale* in gross aspect. This species is known only from Bahia San Francisquito, Isla Partida and Isla Raza and may prove (when found fertile) to be a *Pterocladia*.

Gelidium johnstonii Setchell et Gardner

Setchell and Gardner, 1924, p. 742, pl. 46, fig. a, pl. 72, pl. 73; Dawson, 1944, p. 260; Dawson, 1952, p. 73.

Growing on rocks, at 12 ft. depth, Bahia San Francisquito(type locality) (JN-236). Growing on rocks, from 8 to 17 ft. depths, with many epiphytes, Puerto Refugio, Isla Angel de la Guarda (JN-294, 319). Intertidal, on rocks, Norse Beach, Puerto Peñasco (JN-365).

Gelidium pusillum (Stackhouse) Le Jolis

Dawson, 1944, p. 258, pl. 42, fig. 1-6; Taylor, 1945, p. 152; Dawson, 1952, p. 62.

Several specimens, 2.5 to 3 cm. in length, growing on rocks, intertidal, Station Beach, Puerto Peñasco (JN-358).

DUMONTIACEAE

Acrosymphyton caribeaum (J. Agardh) Sjoestedt Pl. 2

Taylor, 1960, p. 366.

Growing on rock, at 10 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-304). This specimen represents a new record for the Gulf of California. Taylor (1960) reports it from Bermuda, Florida and Saba Bank.

CRYPTONEMIACEAE

Grateloupia violacea (Setchell et Gardner) Dawson

Schizymenia violacea Setchell and Gardner, 1924, p. 786, pl. 25, fig. 37-38. *Schizymenia johnstonii* Setchell and Gardner, 1924, p. 786, pl. 88; Dawson, 1944, p. 287. Dawson, 1961, p. 200, pl. 8.

Growing on rocks, at 15 ft. depth, Bahia San Francisquito (JN-274).

Prionitis abbreviata Setchell et Gardner

Setchell and Gardner, 1924, p. 785, pl. 25, fig. 39, pl. 50b; Dawson, 1944 Setchell and Gardner, 1924, p. 785, pl. 25, fig. 39, pl. 50b; Dawson, 1944, p. 283; Dawson, 1954, como *Zanardinula abbreviata* pág. 279, pl. 19, fig. 64, pl. 20, fig. 65-66.

Intertidal, growing on rocks, Norse Beach and Station Beach, Puerto Peñasco (JN-359, 366).

KALLYMENIACEAE

Pugetia mexicana Dawson

Dawson, 1966, p. 62, fig. 6G-H.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-237). This specimen represents the second reported collection.

Callophyllis violacea J. Agardh Pl. 3

Dawson, 1954, p. 301, pl. 5, fig. 42-43, pl. 44, fig. 92; Abbot and Norris, 1965, p. 74, pl. 4, fig. 2, pl. 5, fig. 1-2, pl. 6, fig. 1-2.

Growing on sand covered rocks, at 10 ft. depth, Bahia Bocochibampo, five miles north of Guaymas, Sonora (JN-369). This provides the first record of this species in the Gulf of California; previously reported from Isla Asuncion, Baja California (Dawson 1961).

NEMASTOMACEAE

Schizymenia pacifica (Kylin) Kylin

Dawson, 1961, p. 199, pl. 3, fig. 7, pl. 7; Abbott, 1967, p. 162 fig. 1-3.

Growing on rock, from 0 to 3 ft. depth, estero, Bahia de las Animas (JN-285). Growing on sand covered rock, at 6 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-397).

SPHAEROCOCCACEAE

Taylorophycus laxa (Taylor) Dawson Pl. 4

Dawson, 1961, p. 224, pl. 27. *Leptocladia laxa* Taylor, 1945, p. 163, pl. 38, fig. 1; Dawson, 1952, p. 89, pl. 6, fig. 7.

Growing on rocks, at 10 ft. depth, Bahia San Francisquito (JN-279, 1042); from 10 to 15 ft. depths, Puerto Refugio, Isla de la Guarda (JN-303, 315, and 549).

This poorly known species was previously reported from Magdalena Bay, where only sterile or cystocarpic specimens were collected. The tetrasporangia in the Gulf of California specimens (JN-315, 511, 1402) are borne in specialized lateral branches.

SOLIERIACEAE

Eucheuma uncinatum Setchell et Gardner

Setchell and Gardner, 1924, p. 748, pl. 67, pl. 68; Dawson, 1944, p. 288; Dawson, 1961, p. 230, pl. 32.

This alga, of great economic value, is reported by Dawson (1961) to be found throughout the northern Gulf of California. It was collected at various "Makrele" stations.

Growing on rocks, among and above *Padina* beds, common at 6 to 20 ft. depths, Bahia San Francisquito (JN-238, 276). Crowing on sand covered rocks, sparse at 0 to 3 ft. depths, estero, Bahia de las Animas (JN-386). Randomly distributed, from 8 to 20 ft. depths, Puerto Refugio, Isla Angel de la Guarda (JN-302, 333). Growing on sand bottom, at 10 ft. depth, Bahia Bocochibampo, five miles north of Guaymas. (JN-373).

Sarcodiotheca dichotoma (Howe) Dawson

Anatheca dichotoma Howe, 1911, p. 502, pl. 29. Dawson, 1944, p. 290; Dawson, 1961, p. 226, pl. 28, pl. 31, fig. 4.

Growing on sand covered rock, at 10 ft. depth, Bahia Bocochibampo, five miles north of Guaymas. (JN-370).

HYPNEACEAE

Hypnea cervicornis J. Agardh

Dawson, 1961, pl. 34, fig. 3-4, pl. 35, fig. 3.

Epiphytic on *Sargassum* and growing on rocks, intertidal, Norse Beach, Puerto Peñasco (JN-342).

Hypnea johnstonii Setchell et Gardner

Setchell and Gardner, 1924, p. 758, pl. 23, fig. 19-21; Dawson, 1944, p. 292; Dawson, 1961, p. 236.

Epiphytic on *Sargassum camouii*, Norse Beach, Puerto Peñasco (JN-367).

Hypnea pannosa J. Agardh

Setchell and Gardner, 1924, p. 758; Dawson, 1944, p. 291; Taylor, 1945, p. 227, pl. 71; Dawson, 1961, p. 236, pl. 35, fig. 4-5.

Growing on rocks, at 4 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-398).

Hypnea valentiae (Turner) Montagne

Dawson, 1961, p. 238, pl. 37.

Growing on rocks, at 8 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-300).

GRACILARIACEAE

Gracilaria sjoestedtii Kylin

Smith, 1944, p. 267, pl. 63, fig. 4. *Gracilariopsis sjoestedtii* Dawson, 1961, pl. 10, fig. 14, pl. 11, fig. 10, pl. 23. Papenfuss, 1967, p. 98.

Growing on sand covered rocks with *Enteromorpha acanthophora*, at 4 to 8 ft. depths, Willard Bay, Bahia San Luis Gonzaga (JN-401). In sand, from 0 to 3 ft. depth, estero, Bahia de las Animas (JN-387).

Gracilaria subsecundata Setchell et Gardner

Setchell and Gardner, 1924, p. 755, pl. 23, fig. 26, 27, pl. 59; Dawson, 1944, p. 40; Dawson, 1961, p. 209, pl. 10, fig. 10, pl. 11, fig. 1 and 6, pl. 12, fig. 3-4, pl. 17.

Growing on rocks, at 8 ft. depth. Willard Bay, Bahia San Luis Gonzaga (JN-399); at 15 ft. depth Bahia San Francisquito (JN-278); at 7 ft. depth, off beach one mile north of Bahia de los Angeles (JN-381); at 10 ft. depth, Bahia Bocochibampo, 5 miles north of Guaymas (JN-371).

Gracilaria textorii (Suringar) J. Agardh var. *textorii*

Gracilaria vivesii Howe, 1911, p. 503, pl. 30, pl. 33 *Gracilaria johnstonii* Setchell et Gardner, 1924, p. 752, pl. 22, fig. 11-14, pl. 60.

Gracilaria sinicola Setchell et Gardner, 1924, p. 752, pl. 62.

Gracilaria vivipara Setchell et Gardner, 1924, p. 750, pl. 24. fig. 28-29, pl. 63. Dawson, 1961, pl. 10, fig. 8, pl. 11, fig. 2, pl. 12 fig. 13-14, pl. 18.

Growing on rocks, among *Padina* beds, at 10 ft. depth, Bahia San Francisquito (JN-239); from 8 to 20 ft. depths, Puerto Refugio, Isla Angel de la Guarda (JN-312, 334).

Gracilaria verrucosa (Hudson) Papenfuss

Dawson, 1944, p. 296 (interpreted as *Gracilaria compressa*). Dawson, 1961, p. 214, pl. 20.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-277).

PHYLLOPHORACEAE

Gymnogongrus johnstonii (Setchell et Gardner) Dawson

Callophyllis johnstonii Setchell aetd Gardner, 1924, p. 746, pl. 51. fig. A-B. Dawson, 1944, p. 301, pl. 71, fig. 2 (interpreted as *Gymnogongrus divaricatus*). Dawson, 1961, p. 250, pl. 43.

Growing on sand covered rock, at 12 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-299).

GIGARTINACEAE

Gigartina johnstonii Dawson

Dawson, 1944, p. 302; Dawson, 1961, p. 269, pl. 57.

Growing in sand, from 0 to 3 ft. depth, estero, Bahia de las Animas (JN-388).

Gigartina macdougalii Dawson

Dawson, 1944, p. 303; Dawson, 1961, p. 271, pl. 58, fig. 2.

Growing on rocks, from 6 to 10 ft. depths, Bahia San Francisquito (JN-247, 252, 253); from 0 to 3 ft. depths, estero, Bahia de las Animas (JN-389).

Gigartina papillata (C. Agardh) J. Agardh

Dawson, 1961, p. 272, pl. 60.

Growing on rocks, at 15 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-324). This is the first report of this species in the Gulf of California. Previously known from Pacific coast of Baja California (Dawson 1961).

Gigartina pectinata Dawson

Dawson, 1944, p. 302, pl. 64, fig. 1; Dawson, p. 273, pl. 61, fig. 1.

Growing on rocks, from 0 to 3 ft. depths, estero. Bahia de las Animas (JN-390); at 7 ft. depth, beach one mile north of Bahia de los Angeles (JN-382); at 17 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-320, 335); at 7 ft. depth, Willard Bay, Bahia San Luis Gonzaga (JN-400).

Gigartina tepida Hollenberg

Hollenberg, 1945, p. 449, fig. 5; Dawson, 1961, pl. 58, fig. 1.

Growing on rock, at 15 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-292, 301).

RHODYMENIACEAE

Gloioderma conjuncta (Setchell et Gardner) Dawson

Estebania conjuncta Setchell et Gardner, 1924, p. 738, pl. 25, fig. 35-36, pl. 85, pl. 86; Dawson, 1944, p. 281. Dawson, 1963, p. 442, pl. 79.

Epiphytic on various algae, at 12 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-297, 313).

Botryocladia pyriformis (Boergesen) Kylin Pl. 5

Taylor, 1960, p. 483, pl. 64, fig. 2.

Growing on rock, from 8 to 12 ft. depths, (JN-298); epiphytic on gorgongian, at 30 ft. depth, (JN-403), Puerto Refugio, Isla Angel de la Guarda. New to the Gulf of California; Taylor (1960) previously lists distribution as Bermuda, Florida, Jamaica, Virgin Isls., Netherlands Antilles and Brazil.

CHAMPIACEAE

Champia parvula (C. Agardh) Harvey

Setchell and Gardner, 1930, p. 153; Dawson, 1944, p. 310; Dawson, 1963, p. 468, pl. 93.

Intertidal, on rocks, Norse Beach, Puerto Peñasco (JN-343).

Lomentaria catenata Harvey

Carallopsis excavata Setchell et Gardner, 1924, p. 756, pl. 23, fig. 24-25, pl. 44b, pl. 48. Dawson, 1944, p. 308, pl. 74, fig. 1; Dawson, 1963, p. 465, pl. 92, fig. 1-10.

Growing on rock at 10 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-314).

CERAMIACEAE

Ceramium pacificum (Collins) Kylin Pl. 6

Dawson, 1950b, p. 120, pl. 4, fig. 30; Dawson, 1962, p. 61, pl. 23, fig. 3, pl. 24, fig. 1.

Growing on rocks at 15 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-322). This represents a new record for the Gulf of California; previously reported from Punta Maria, Baja California (Dawson 1961).

Griffithsia multiramosa Setchell et Gardner

Setchell and Gardner, 1937, p. 87, pl. 4, fig. 10a-10c; Dawson, 1944, p. 315; Dawson, 1962, p. 71, pl. 32.

Growing among *Ulva* at 15 ft. depth, Bahia San Francisquito (JN-280).

DELESSERIACEAE

Hypoglossum attenuatum var. *abyssicolum* (Taylor) Dawson

Dawson, 1962, p. 77, pl. 34, fig. 3.

Epiphytic on *Eucheuma*, Bahia San Francisquito (JN-275).

Nienburgia andersoniana (J. G. Agardh) Kylin Pl. 7

Smith, 1944, p. 345, pl. 90; Taylor, 1945, p. 280; Dawson, 1962, p. 86, pl. 41, pl. 42, fig. 1.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-251). New to the Gulf of California; previously known from Oregon and Santa Cruz, California, to Isla Magdalena, Baja California (Dawson 1961).

DASYACEAE

Dasya sinicola (Setchell et Gardner) Dawson var. *sinicola*
Dawson, 1959, p. 32, fig. 3B; Dawson, 1963a, p. 408, pl. 128, fig. 4, pl. 158, fig. 3.

Growing on rock at 15 ft. depth, Bahia San Francisquito (JN-281, 282, 290); from 0 to 3 ft. depths, estero, Bahia de las Animas (JN-391); at 17 ft. depth, Puerto Refugio, Isla Angel de la Guarda (JN-336); intertidal, Station Beach, Puerto Peñasco (JN-360).

RHODOMELACEAE

Digenia simplex (Wulfen) C. A. Agardh
Setchell and Gardner, 1924, p. 769; Dawson, 1944, p. 326; Taylor, 1945, p. 297; Dawson, 1963, p. 419, pl. 140, fig. 5, pl. 159, fig. 1.
Intertidal, on rocks, Station Beach, Puerto Peñasco (JN-361).

Polysiphonia johnstonii Setchell et Gardner
Setchell and Gardner 1924, p. 767; Dawson, 1944, p. 329; Hollenberg, 1961, p. 357, pl. 2, fig. 4-5.
Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-287).

Pterosiphonia dendroidea (Montagne) Falkenberg
Dawson, 1944, p. 335; Dawson, Neushul and Wildman, 1960, p. 76, pl. 41, fig. 3-4; Dawson, 1963, p. 26, pl. 157, fig. 2.
Growing on rock, at 6 ft. depth, Bahia San Francisquito (JN-241).

Herposiphonia plumula (J. Ag.) Hollenberg
Hollenberg, (in press). *Herposiphonia subdisticha*, Dawson, 1944, p. 334, pl. 49, fig. 2; Dawson 1959, p. 32; Dawson 1963, p. 433, pl. 141, fig. 4-5.
Growing on rock, at 8 ft. depth, Bahia San Francisquito, (JN-240).

Laurencia johnstonii Setchell et Gardner
Setchell and Gardner, 1924, p. 764, pl. 52a, 53. Dawson, 1944, p. 328; 1959, p. 36; 1963, p. 453, pl. 156 fig. 1-2.
Growing on sand covered rock, at 3 ft. depth, estero, Bahia de las Animas (JN-392). Intertidal, Norse Beach, Puerto Peñasco, growing on rocks and epiphytic on Sargassum (JN-344, 352, 368).

Laurencia papillosa var. *pacifica* Setchell et Gardner
Setchell and Gardner, 1924, p. 765, pl. 23, fig. 18, pl. 24, fig. 34, pl.

43-b, pl. 54; Dawson, 1944, p. 327; Dawson, 1959, p. 36; Dawson, 1963, p. 460, pl. 166, fig. 3.

Intertidal on rocks Norse Beach, Puerto Peñasco; (JN-345, 353).

Laurencia paniculata (C. A. Agardh) J. G. Agardh

Setchell and Gardner, 1924, p. 762; Dawson, 1944, p. 326, Dawson, 1963, p. 459, pl. 145, fig. 5, pl. 155, fig. 1-2.

Growing on rock, at 12 ft. depth, Puerto Refugio, Angel de la Guarda (JN-296, 249).

Laurencia pacifica Kylin

Dawson 1963, pl. 151, fig. 1, pl. 152, pl. 153, fig. 2.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-284).

Laurencia estebaniana Setchell et Gardner

Setchell and Gardner 1924, p. 763, pl. 24, fig. 34, pl. 45a; Dawson, 1963, p. 451, pl. 146, fig. 2.

Growing on rock, at 15 ft. depth, Bahia San Francisquito (JN-283).

MARINE ALGAE FROM "MAKRELE" STATIONS

1. Bahia San Francisquito
   Entermorpha compressa
   Ulva lactuca
   Codium amplivesiculatum
   C. macdougalii
   C. simulans
   Padina durvillaei
   Haplogloia andersonii (new record)
   Colpomenia bullosa
   Colpomenia sinuosa f. expansa
   C. sinuosa f. tuberculata
   Sargassum brandegeei
   S. herporhizum
   S. johnstonii f. johnstonii
   S. lapazeanum
   Erythrotrichia carnea
   Scinaia johnstoniae
   Gelidium decompositum
   G. johnstonii

Grateloupia violacea
Pugetia mexicana
Taylorophycus laxa (new record)
Eucheuma uncinatum
Gracilaria subsecundata
G. textorii var. textorii
G. verrucosa
Gigartina macdougalii
Griffithsia multiramosa
Hypoglossum attenuatum var. abyssicolum
Nienburgia andersoniana (new record)
Dasya sinicola var. sinicola
Polysiphonia johnstonii
Pterosiphonia dendroidea
Herposiphonia plumula
Laurencia pacifica
L. estebaniana

2. Bahia de Las Animas
Entermorpha acanthophora
Colpomenia sinuosa f. tuberculata
Schizymenia pacifica
Eucheuma uncinatum
Gracilaria sjoestedtii
Gigartina johnstonii
G. macdougalii
Dasya sinicola var. sinicola
Laurencia johnstonii

3. Bahia de Los Angeles
Dictyota flabellata
Sargassum johnstonii f. johnstonii
S. sinicola
Gracilaria subsecundata
Gigartina pectinata

4. Puerto Refugio, Isla Angel de la Guarda
Codium cuneatum
Cutleria hancockii

Dictyopteris zonarioides
Dictyota johnstonii
Nemacystus brandegeei
Ishige foliacea
Colpomenia bullosa
Sargassum brandegeei
Porphyra thuretti
Scinaia latifrons
Pseudogloiophloea confusa
Gelidium johnstonii
Acrosymphyton caribaeum (new record)
Taylorophycus laxa (new record)
Eucheuma unicinatum
Hypnea valentiae
Gracilaria textorii var. textorii
Gymnogongrus johnstonii
Gigartina papillata (new record)
G. pectinata
G. tepida
Gloioderma conjuncta
Botryocladia pyriformis (new record)
Lomentaria catenata
Ceramium pacificum (new record)
Dasya sinicola var. sinicola
Laurencia paniculata

5. Willard Bay, Bahia San Luis Gonzaga
Entermorpha acanthophora
Chaetomorpha antennina
Codium macdougalii
Sargassum johnstonii f. johnstonii
Schizymenia pacifica
Hypnea pannosa
Gracilaria sjoestedii
G. subsecundata
Gigartina pectinata

6. Norse Beach, Puerto Peñasco
Codium simulans

Padina durvillaei
Dictyota johnstonii
Sargassum camouii
S. herporhizum
S. johnstonii f. gracile
Gelidium johnstonii
Prionitis abbreviata
Hypnea cervicornis
H. johnstonii
Champia parvula
Laurencia johnstonii
L. papillosa var. pacifica

7. Station Beach, Puerto Peñasco
Cutleria hancockii
Dictyopteris zonarioides
Sargassum camouii
Gelidium pusillum
Prionitis abbreviata
Dasya sinicola var. sinicola
Digenia simplex

8. Bahia Bocochibampo, Guaymas
Sargassum sinicola
Callophyllis violacea (new record)
Eucheuma uncinatum
Sarcodiotheca dichotoma

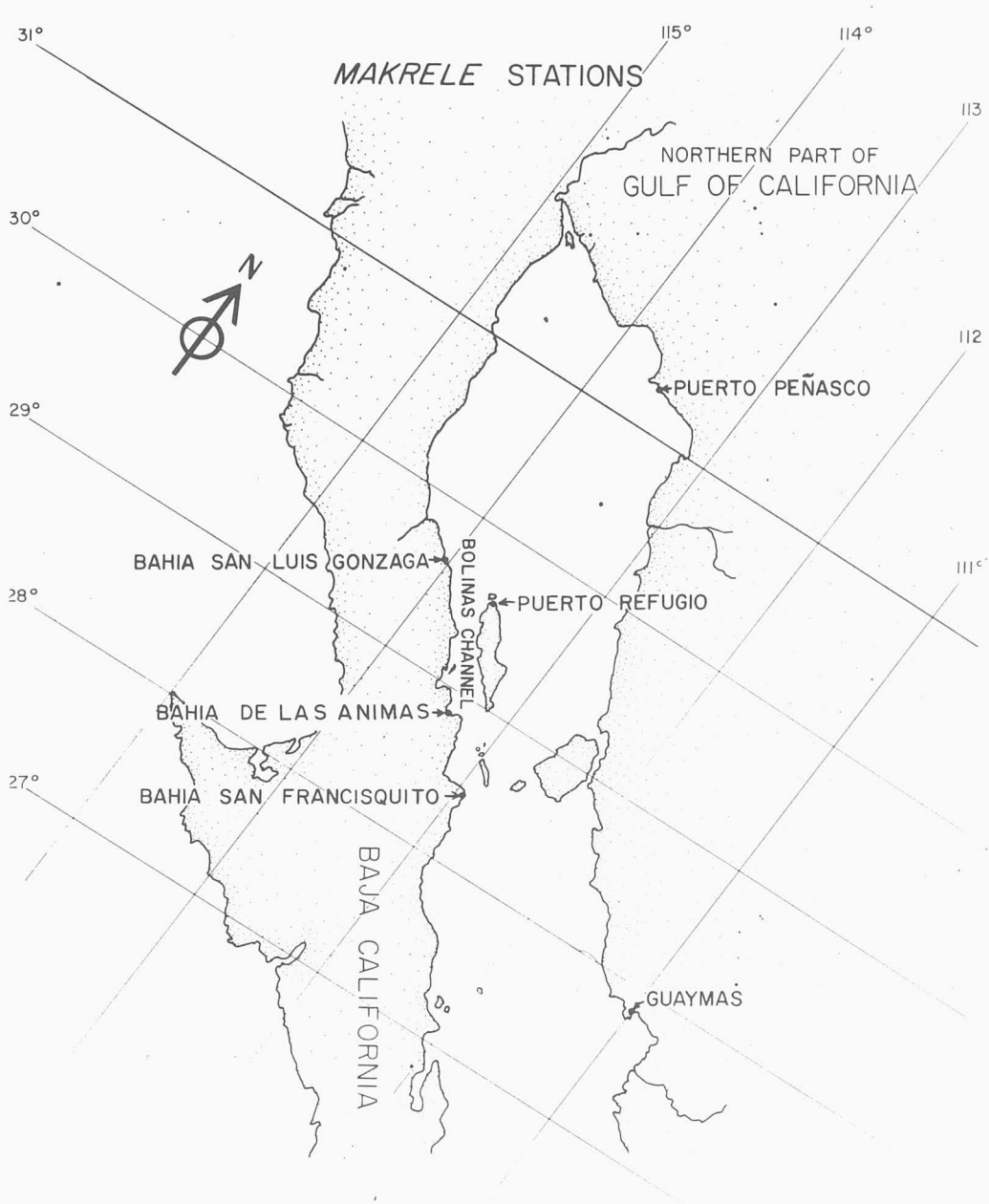
All "Makarele" marine algal collections are deposited in the following herbaria: new records and duplicate collections, Allan Hancock Foundation of University of Southern California; the first set, Moos Landing Marine Laboratories; and a few residual collections, Gilbert M. Smith Herbarium of Hopkins Marine Station of Stanford University.

REFERENCES

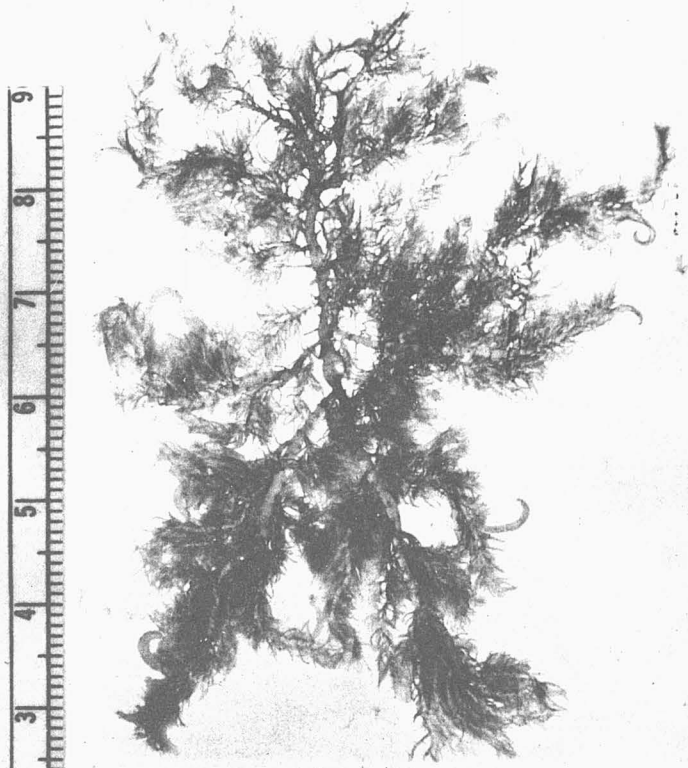
Abbott, I. A. 1967. Studies in the foliose red algae of the Pacific coast. II. *Schizymenia*. Bull. So. Calif. Acad. Sci. 66(3): 161-174.
—— and R.E. Norris. 1965. Studies on *Callophyllis* from the Pacific coast of North America. Nova Hedwigia 10(1/2): 67-84.
Dawson, E.Y. 1941. Field observations on the algae of the Gulf of California. A. Hancock Pac. Exped. 3(7): 115-119.
——. 1944. The marine algae of the Gulf of California. A. Hancock Pac. Exped. 3(10).

——. 1945a. Some new and unreported sublittoral algae from Cerdos Island, Mexico. Bull. So. Calif. Acad. Sci. 43: 102-112.
——. 1945b. Marine algae associated with upwelling along the coast of Baja California, Mexico. Ibid. 44(2): 57-71.
——. 1949. Resultados preliminares de un reconocimiento de las algas marinas de la costa pacífica de México. Rev. Soc. Mex. Hist. Natur., 9: 215-255.
——. 1950a. Notes on some Pacific Mexican Dictyotaceae. Bull. Torrey Bot. Club 77(2): 83-93.
——. 1950b. A note on the vegetation of new coastal upwelling area of Baja California. J. Mar. Res. 9: 65-68.
——. 1950c. A review of *Ceramium* along the Pacific coast of North America with special references to its Mexican representatives. Farlowia 4: 113-138.
——. 1951. A further study of upwelling and associated vegetation along Pacific Baja California, Mexico, J. Mar. Res. 10: 39-58.
——. 1952a. Marine red algae of Pacific Mexico. Part 1. Bangiales to Corallinaceae, Subf. Corallinoiodeae. A. Hancock Pac. Exped. 17(1): 1-238.
——. 1952b. Circulation withing Bahia Vizcaino, Baja California, and its effects on the marine vegetation. Amer. Jour. Bot. 39: 425-432.
——. 1953. A summary of recent marine algal investigations along Pacific Mexico with synopsis of the literature synonymy, and distributions of the recorded species. Rev. Soc. Mex. Hist. Natur. 13: 97-197.
——. 1954a. Marine red algae of Pacific Mexico. Part 2. Cryptonemiales (cont.). A. Hancock Pac. Exped. 17(2): 240-396.
——.1954b. Marine plants in the vicinity of Nha Trang, Viet Nam. Pac. Sci. 8(4): 372-481.
——. 1956. How to know the seaweeds. Wm Brown Co., Dubuque, Iowa. 197 pp.
——. 1959. Marine algae from the 1958 cruise of the Stella Polaris in the Gulf of California. Los Angeles Co. Museum Contr. Sci. 27: 1-39.
——. 1960a. Marine red algae of Pacific Mexico. Part 3. Cryptonemiales, Corallinaceae Subf. Melobesioideae. Pac. Naturalist 2(1): 1-125.
——. 1960b. A review of the ecology, distribution, and affinities of the benthic flora. Systematic Zool. 9(3 and 4): 93-100.
——. 1961a. Marine red algae of Pacific Mexico. Part 4. Gigartinales. Pac. Naturalist 2(5): 189-343.
——. 1961b. A guide to the literature and distributions of Pacific benthic algae from Alaska to the Galapagos Islands Pac. Sci. 15(3): 370-461.
——. 1962a. Marine red algae of Pacific Mexico. Part 7. Ceramiales: Ceraminaceae, Delesseriaceae. A. Hancock Pac. Expend. 26(1): 1-206.
——. 1962b. Benthic marine exloration of Bahia de San Quintin, Baja California, 1960-1961. Marine and marsh vegetation. Pac. Naturalist 3(7): 275-280.
——. 1963a. Marine red algae of Pacific Mexico. Part 6. Rhodymeniales. Nova Hedwigia 5: 437-476.
——. 1963b. Marine red algae of Pacific Mexico. Part 8. Ceramiales: Dasyaceae, Rhodomelaceae. Nova Hedwegia 6: 401-481.
——. 1966a. New records of marine algae from the Gulf of California. Ariz. Acad. Sci. 4(2): 55-66.
——. 1966b. Marine algae in the vicinity of Puerto Peñasco Sonora, Mexico. Gulf of California Field Guide Series, No. 1. Univ of Ariz. Pub. 57 pp.
—— and P.T. Beaudette. 1959. Field notes from the 1959 eastern Pacific cruise of the Stella Polaris. Pac. Naturalist 1(13): 1-24.
——, M. Neushal and R.D. Wildman. 1960a. Seaweeds associated with kelp beds along Southern California and northwestern Mexico. Ibid., 1(14): 1-81.
——, M. Neushal and R.D. Wildman. 1960b. New records of sublittoral marine plants from Pacific Baja California. Ibid., 1(19): 1-30.
——, C. Acleto and N. Foldvik. 1964. The seaweeds of Peru. Nova Hedwigia Beihefte 13: 1-111.

Hariot, M.P. 1895. Algues du Golfe de Californie recueillies par M. Diguet. Jour. de Botanique 9: 167-170.
Hollenberg, G.J. New marine algae from Southern California. III. Amer. Jour. Bot. 32(8): 447-51. figs. 1-9.
——. 1961. The genus *Polysiphonia*. Part 5, in E.Y. Dawson's Marine red algae of Pacific Mexico. Pac. Naturalist 2(6): 346-375.
——. (in press). Phycological notes *IV*. New marine algae from California.
—— and I.A. Abbott. 1966. Suplement to Smith's Marine algae of the Monterey Peninsula. Stanford Univ. Press. 130 pp.
Howe, M.A. 1911. Phycological studies V. Some marine algae of Lower California, Mexico. Torr. Bot. Club 38(11): 489-514.
Kylin, H. 1940. Die Phaeophyceenordnug Chordariales. Lunds Univ. Arsskr., N.F. 36(9): 1-67.
Levring T. 1939. Uber die Phaeophyceengattungen *Myrioglia* Kuch. und *Haplogloia* nov. gen. Bot. Notiser 1939: 40-52.
Papenfuss, G.F. 1967. Notes on Algal Nomenclature — V. Various Chlorophyceae and Rhodophyceae. Phykos 5(1-2): 95-105.
Sauders, D. 1898. Phycological Memoirs. Proc., Calif. Acad. Sci., 3rd Ser., Bot. 1: 147-168.
Setchell, W.A. 1914. The *Scinaia* assemblage. Univ. Calif. Pub. Bot. 6: 79-152.
——. 1937. The Templeton Crocker expedition of the California Academic of Science 1932 No. 34. Report on the Sargassums. Proc. Calif. Acad. Sci. 22(5): 127-158.
—— and N.L. Gardner 1919-1920, 1925 (reprint 1967). The marine algae of the Pacific Coast of North America. Nova Hedwigia, Bibliotheca Phycologica, 1. Part 1 and II; 1-382. Part III: 383-898.
——. 1924. New marine algae from the Gulf of California. Proc. Calif. Acad. Sci. 12(29): 695-949.
——. 1924a. Phycological contributions. VII. Univ. Calif. Pub. Bot. 13(1): 1-13.
——. 1930. Marine algae of the Revillagigedo Islands Expeditions in 1925. Proc. Calif. Acad. Sci. 19(11): 109-215.
——. 1937. The Templeton Crocker Expedition of the California Academic of Science, 1932. No. 31. A preliminary report on the algae. Proc. Calif. Acad. Sci. 22(2): 65-98.
Smith G.M. 1944. Marine algae of the Monterey Peninsula. Stanford Univ. Press 622 pp.
Svedelius, N. 1956. Are the haplobiontic Florideae to be considered reduced types? Bot. Tidsskr. 50: 1-24.
Taylor, W.R. 1945. Pacific marine algae of the Allan Hancock expeditions to the Galapagos Islands. A. Hancock Pac. Exped. 12: 1-528.
——. 1960. Marine algae of the eastern tropical and subtropical coast of the Americas. Ann Arbor, Univ. Michigan Press. 870 pp.


MAKRELE STATIONS
NORTHERN PART OF
GULF OF CALIFORNIA
31°
30°
29°
28°
27°
115°
114°
113
112
111°
N
PUERTO PEÑASCO
BAHIA SAN LUIS GONZAGA
BOLINAS CHANNEL
PUERTO REFUGIO
BAHIA DE LAS ANIMAS
BAHIA SAN FRANCISQUITO
BAJA CALIFORNIA
GUAYMAS

Pl.-1. Haplogloia andersonii.

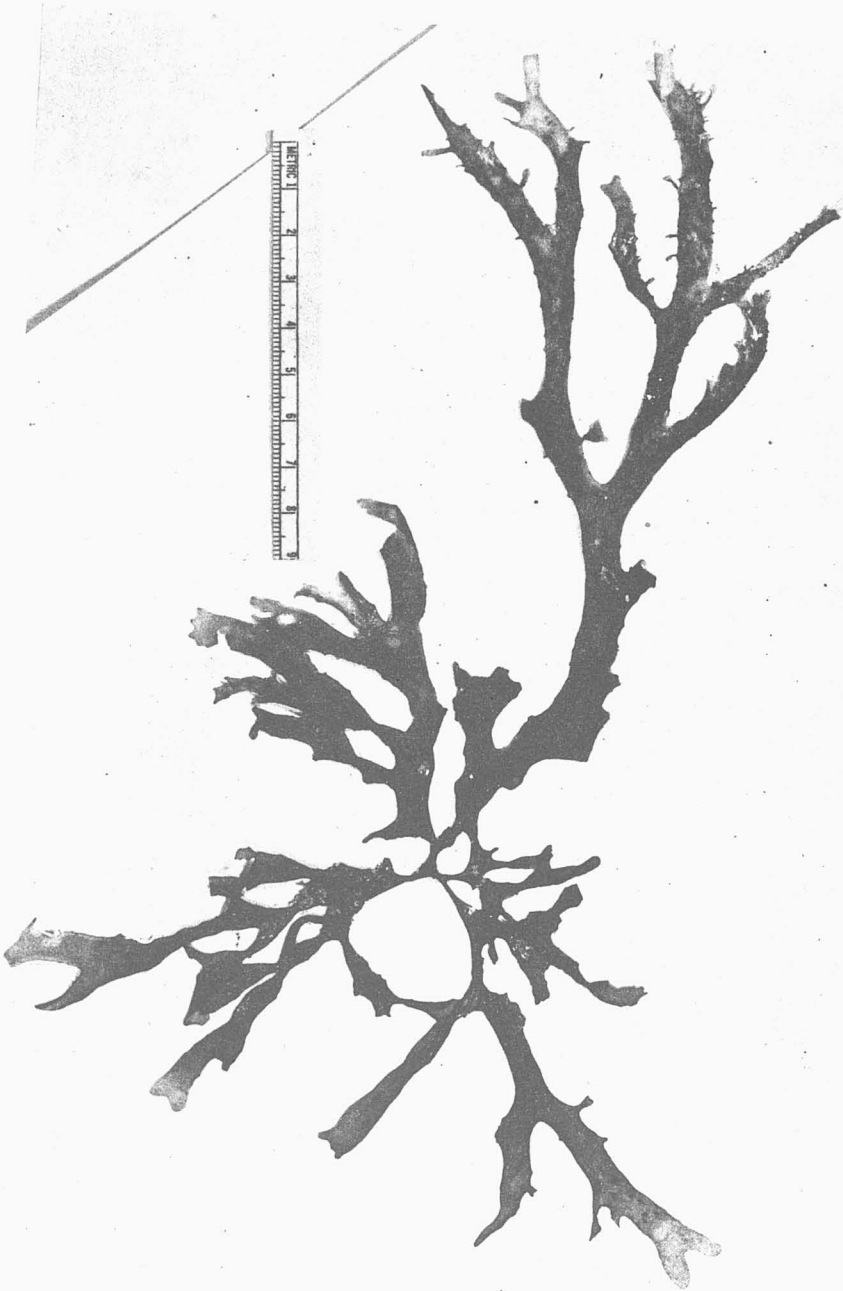


Acrosymphyton caribaeum (J. Ag.) Sjoest

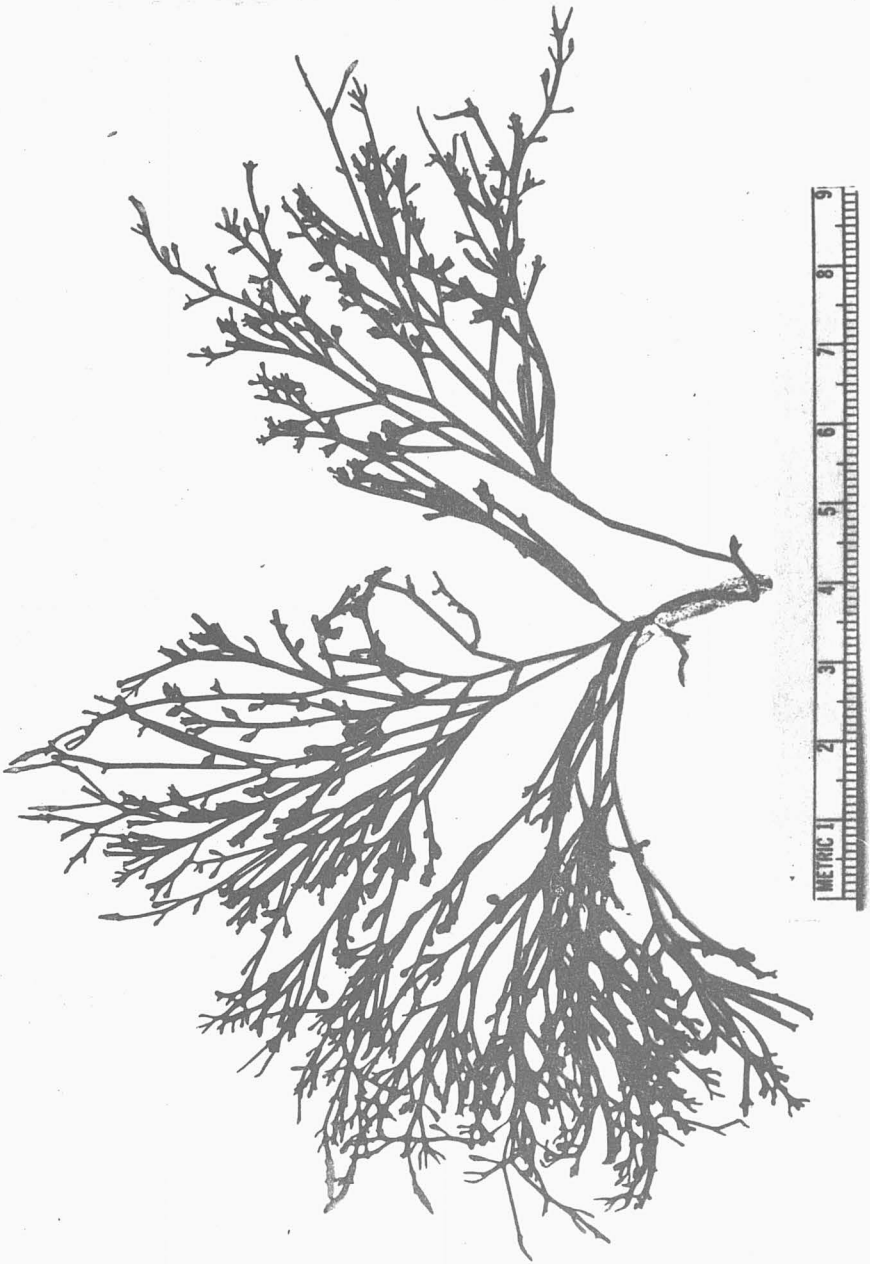
16. V. 1969

DETERMINED BY ISABELLA A. ABBOTT

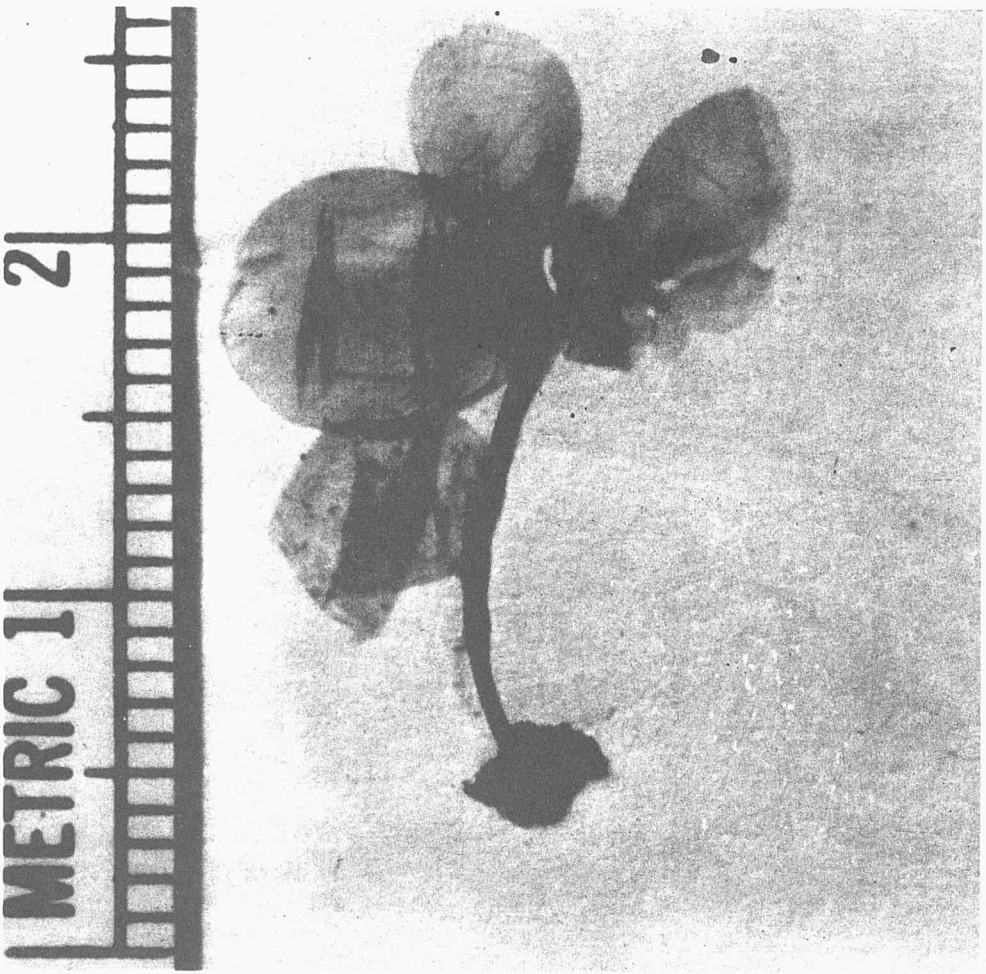
Pl.-2. Acrosymphyton caribaeum.



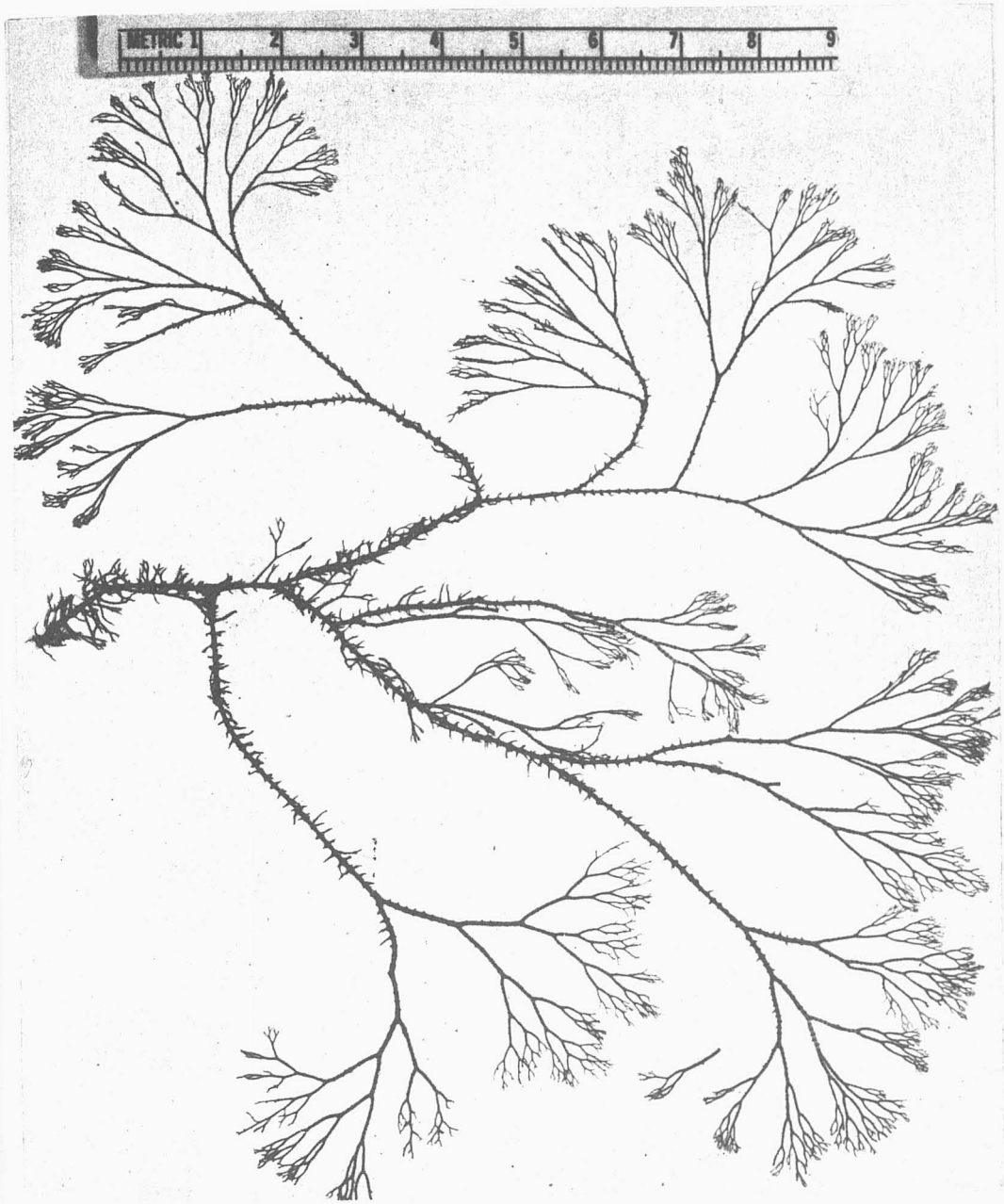
Pl.-3. Callophyllis violacea.



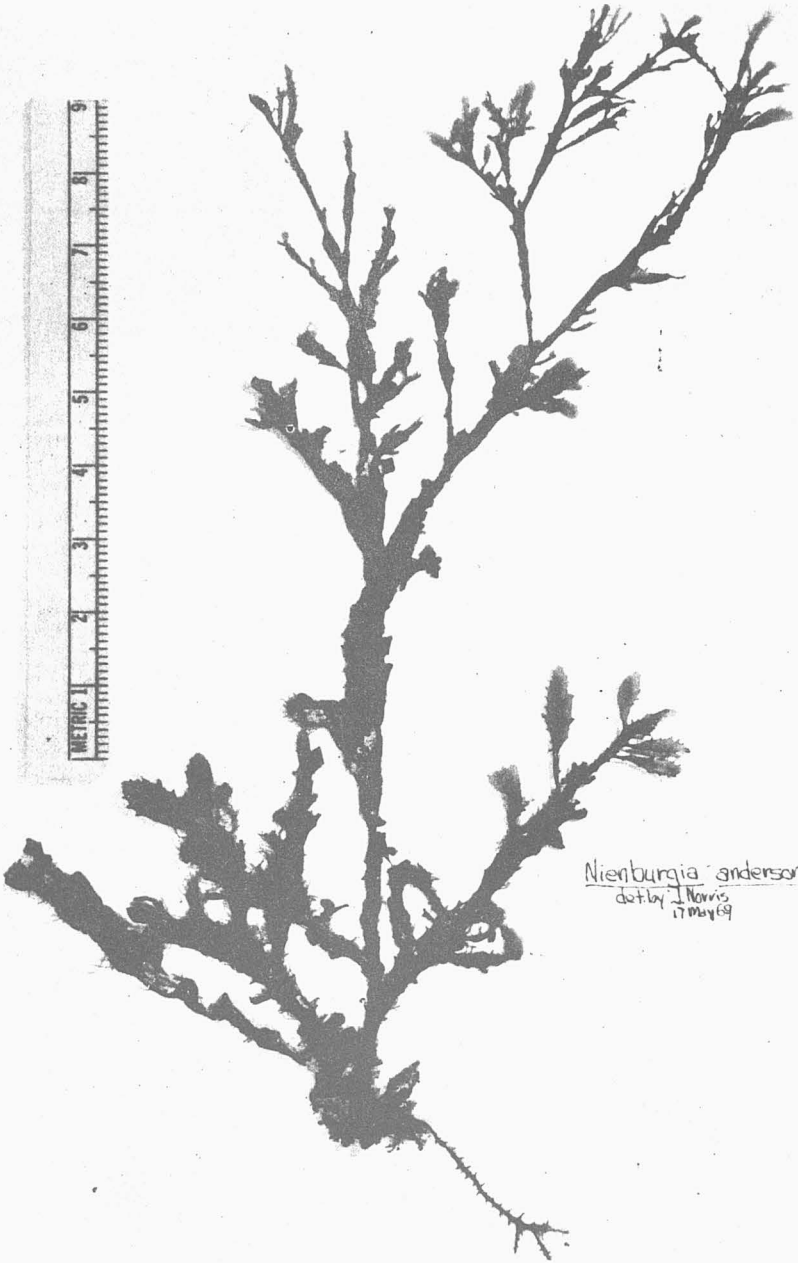
Pl.-4. Taylerophycus laxa.



Pl.-5. Botryocladia pyriformis.



Pl.-6. Ceramium pacificum.



Pl.-7. Nienburgia andersoniana.