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New Marine Algæ from the Gulf of California

BY

WILLIAM ALBERT SETCHELL
AND
NATHANIEL LYON GARDNER

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XXIX

EXPEDITION OF THE CALIFORNIA ACADEMY OF SCIENCES TO THE GULF OF CALIFORNIA IN 1921*

THE MARINE ALGÆ

BY

WILLIAM ALBERT SETCHELL

and

NATHANIEL LYON GARDNER

INTRODUCTION

Very little is known about the marine algæ of the western coast of North America south of the boundary of the United States. These coast lines, viz., of Mexico, Guatemala, Salvador, Nicaragua, Costa Rica and Panama, extend from somewhat above 32° lat. N. down to about 5° lat. N., or about twenty-seven degrees of latitude, while east and west, they extend from 77° long. W. to 118° long. W., or almost forty-one degrees of longitude. Altogether these west coasts of Mexico and the Central American states form a considerable proportion of the coast line of Pacific North America. From this extensive coast line there are at present fewer than sixty

*A general account of the expedition accompanied by a map showing all of the islands, etc., visited by the expedition is to be found in vol. XII, No. 6, of the Proceedings of the California Academy of Sciences for June 2, 1923.
A reprint of the map showing all of the islands, etc., visited by the expedition next to back cover of this paper.

species of marine algæ listed and where we might expect at least several hundred to occur.

Of the coast line of western North America south of the United States, the shores of the Gulf of California represent something more than a thousand miles and somewhere about forty species are listed from them (cf. Hariot, 1895 and M. A. Howe, 1911). From the Mexican coast, southward from the mouth of the Gulf of California, Liebmann, of Copenhagen, collected twelve species of marine algæ (cf. J. G. Agardh, 1847). M. A. Howe (1910) has remarked on the scantiness of the marine flora of the Bay of Panama where he found about fifty inconspicuous, mostly incrusting species and of which, as yet, he has not published any determinations. Of the islands off the coast, a few specimens have been collected on Guadalupe Island by Palmer and Brandegee, of which two species of Sargassaceæ have been described as new (cf. Grunow, 1915, p. 338, Gardner, 1913, p. 325, 1917, p. 386, and 1918, p. 448).

It is with the greatest interest, therefore, that we have undertaken the study of the comparatively large collection made by Mr. Ivan M. Johnston on the expedition of the California Academy of Sciences to the Gulf of California in the summer of 1921. In our study we have also included two other fairly extensive collections from the same region, viz.: one made in 1890 by T. S. Brandegee and Walter E. Bryant on the third expedition sent out by the California Academy of Sciences to explore Lower California, particularly the Cape region, and a collection made by Dr. and Mrs. Marchant in 1917. Among the specimens of these collections, we have detected one hundred and forty-four species and varieties, of which one hundred and eleven are, in our judgment, new to science. The Corallinaceæ and less conspicuous epiphytic forms remain for future study. These results are in line with the experience of Hariot and of Howe, each of whom, however, dealt with much smaller collections. Hariot (1895) describes three new species and lists four as referable to described species. Howe (1911), working over collections made chiefly at La Paz by G. J. Vives, and at San Felipe Bay (about five hundred miles north of La Paz) by D. T. MacDougal, describes seven new species, lists sixteen species as referable to described species, and notes four species not to be determined beyond the genus. In these two lists of species there is no duplication. Howe, in his list, reports on a few species found in the herbarium of Dr. C. L. Anderson (of Santa Cruz, California) whose collectors were unknown to him. These were undoubtedly collected by the first or second expedition of the California Academy of Sciences and previous to 1890. It seems likely that there will be found to be an exceedingly rich marine flora in the Gulf of California when it shall have been carefully and thoroughly explored.

The subtropical flora of the southern California coast extends down to Magdalena Bay, or possibly somewhat to the south of it, but at San José del Cabo, the water is evidently warm enough (25° C. or over) to be considered tropical and this condition extends up the Gulf. The winter marine flora may be subtropical, however, at least in portions of the Gulf of California. The more exact relations of the algal flora to temperature and to salinity, as well as to substratum cannot be entered into with any certainty at present, since full data are not yet available.

The affinities of the marine flora of the Gulf of California are with that of the Eastern Pacific, i. e., with the subtropical and tropical coasts of Western America, which we know chiefly through Howe's Marine Algæ of Peru (1914) and our own publications (incomplete) for the western coast of North America. There is a wealth of species of *Codium,* of *Sargassum,* of *Laurencia,* of *Grateloupia,* of *Gracilaria* and of *Ceramium.* There is a noticeable, and we may infer, significant lack of species of *Halimeda* and other calcareous Siphonales, of species of *Liagora, Galaxaura* and calcareous reds, but the Corallinaceæ of our collections are not, as yet, identified.

We desire to express our indebtedness to Mr. T. S. Brandegee, to Dr. and Mrs. Marchant and to Mr. Ivan M. Johnston for collections of marine algæ, undertaken at request and in addition to other duties, and to Dr. Anna Weber-van Bosse and to Dr. Marshall A. Howe for critical notes. To the California Academy of Sciences, and, in particular, to Dr. Barton W. Evermann and to Miss Alice Eastwood, we are indebted for the privilege of carrying through these studies.

MYXOPHYCEÆ

Family Chroococcaceæ

CHLOROGLOEA Wille, Algol. Not. I-VI, 1900, p. 5

Chlorogloea regularis S. and G. sp. nov.

Plate 12, fig. 1

Plants forming cushions very definitely circular in outline, up to 200 μ in diameter and 30 μ thick in the center; cells in the basal layer spherical to subspherical in the center of the thallus, cylindrical at the ends of the radiating rows, 0.5-1 μ diam., marginal cells 2 times as long as broad; cells in the vertical rows spherical; the radiating basal filaments dichotomously branched; color pale blue-green.

Growing in abundance on *Cladophoropsis robusta.*

Type: No. 1316, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 135a), at **Tortuga Island, Gulf of California.**

In its method of development this species of *Chlorogloea* resembles the genus *Radaisia.* The colony or plant starts as a single cell, which divides a number of times in different vertical planes, soon establishing a number of growing points around the margin of a circular plate. From this margin radiating rows of cells, or that which amounts to filaments, develop, which by dichotomous branching build up a solid basal layer. The largest plant noticed measured 200 μ in diameter. The cells in the center of the basal disk soon begin to divide in horizontal planes and contiguous rows of cells up to 30 μ long are generated. In the genus *Radaisia* the terminal cells of these vertical rows of cells, or filaments, produce gonidia. The gonidia formation is absent in *Chlorogloea.*

Family Chamæsiphonaceæ

DERMOCARPA Crouan, Notes sur Quelques Algues Marines Nouvelles, 1858, p. 70

Dermocarpa fucicola Saunders

A few colonies of a *Dermocarpa* which seem to be of this species have been observed intermixed with other species of Myxophyceæ as epiphytes on other algæ, notably upon *Graci-*

laria pachyderma. The general form and size correspond very well with the description and figures given by Saunders (1901, p. 397, pl. 46, figs. 4, 5). The plants do not form as large colonies as in typical material found along the coast of Washington and California. The length of the cells varies from 50 μ to 60 μ. We place it here pending further investigation of more typical material.

Dermocarpa Reinschii S. and G. sp. nov.

Plate 12, fig. 6

Cells epiphytic, narrowly to broadly pyriform, 18-24 μ long, 15-20 μ wide at the top, few to many forming colonies circular to irregular in outline; color steel blue; contents homogeneous; gonidia formed simultaneously, 1.5 μ diam.

Growing on various species of red algæ.

Type: No. 1317, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 34c), in June, at **Tortuga Island, Gulf of California.**

Dermocarpa Reinschii approximates very closely to *D. prasina* (Reinsch) Born. & Thur. The shape and size of the colonies do not agree entirely with the description and figures given by Bornet and Thuret (cf. Notes Algol., p. 76, pl. 26, figs. 6-9). This is particularly true of the shapes of the gonidangia and the arrangement of the gonidia. We have examined the material of Howe's *D. prasina* growing on *Chætomorpha cartilaginea* from Peru (Howe, Mar. Alg. Peru, p. 16). The colonies of this material are thicker and more extensive and there is a much greater polymorphism in the shapes of the cells. The cells in his material are very commonly "trumpet shaped." Ours do not show such variations. The type of *Sphænosiphon prasinus* Reinsch (Contrib. Alg. et Fung., p. 17, pl. 26, fig. 1) is probably not available and since the interpretations of Reinsch's conception of the species have been so varied and our plant differs so decidedly in dimension from all of them, we hardly feel justified in adopting the name of *D. prasina* for our material from the Gulf of California.

Dermocarpa Marchantæ S. and G. sp. nov.

Plate 12, fig. 12

Cells aggregated into relatively extensive colonies, at times several hundred, densely crowded, cuneate to balloon-shaped, 18-22 μ long, 9-12 μ broad at outer end; gonidia few, 2-2.5 μ in diam.

Growing on various species of algæ. Santa Rosalia, Lower California, opposite Guaymas. Type, Marchant, no. 108, May.

Only a very few specimens of this species of *Dermocarpa* have been observed producing gonidia. The gonidangia of these are no longer than the other larger cells. It is presumed that they are just coming into fruit. Little can be said of the method of formation of the gonidia on account of scarcity of material.

Dermocarpa sp.

Plate 12, fig. 11

There is a species of *Dermocarpa* which seems to be widely distributed along western Mexican borders. It is very generally present on various species of Dictyotaceæ in particular, as well as on a variety of other algæ. Figure 11 represents specimens growing on *Dictyota* sp. (Johnston, no. 5a). The rather uniformly cylindrical character of the cells and their wide expansion in a continuous stratum indicate that it is distinct from any known species, but since no specimens out of the many which we have observed have been found producing gonidia, we feel that it is too immature for us to attempt to diagnose and name it. The cells in the present state are 12-15 μ long. The only described species to which it at all approximates is *D. strangulata* Sauv. (1895, p. 8 (Repr.), pl. 7, fig. 4), which quite likely also represents an immature species. It is possibly only a young state of *D. Marchantæ*.

XENOCOCCUS Thuret, Essai Class. Nost., 1875, p. 373 (*Nom. nud.*); Bornet and Thuret, Notes Alg. 2, 1880, p. 73 (descr. of type).

Xenococcus deformans S. and G. sp. nov.

Plate 12, fig. 2 and plate 40, fig. a

Plants embedded in the cuticle of the host, 75-150 in a colony, dividing in two planes only; cells spherical to slightly pyriform, 10-14 μ long, 9-12 μ broad; contents homogeneous; color bright blue-green.

Growing in *Gelidium Johnstonii.*

Type: No. 1318, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 13a), in June, at **San Francisquito Bay, Lower California.**

This species of Myxophyceæ is the only representative of the genus *Xenococcus* which has been reported growing endophytically. Our attention was called to it by the peculiar effect it produces on the host. It was noticed that many specimens of the *Gelidium* had branches densely proliferating near or at their outer ends (Plate 40, fig. a). These short, densely crowded outgrowths proved to be infested by this species of Myxophyceæ. No gonidangia are present in our material, hence the generic position will have to stand in doubt for the present. Some of the cells are much larger than others, indicating preparation for gonidia formation. Its division in two planes only, excludes all other Chamæsiphonaceæ. It does not resemble very closely any of the known Coccogonales.

Family Oscillatoriaceæ

HYDROCOLEUM Kuetzing, Phyc. Gen., 1843, p. 196.

Hydrocoleum codicola S. and G. sp. nov.

Plate 12, fig. 3

Filaments associated more or less into loose rope-like colonies interwoven among the utricles of the host; sheath very delicate and hyaline, containing few to many trichomes; trichomes cylindrical or at times slightly tapering at the apices, pale blue-green, 2.75-3.25 μ diam.; cells not constricted at the dissepiments, 0.5-1.5 times as long as the diameter, the terminal cells somewhat enlarged and rounded with decidedly thickened end walls.

Penetrating among the utricles of *Codium* sp., in the upper sublittoral belt.

Type: No. 1319, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 8a), in June, at **San Marcos Island, Gulf of California.**

The habitat of this species of *Hydrocoleum* is decidedly unusual and the trichomes are the narrowest yet described for the genus. The genus typically has few and relatively large trichomes. It is difficult to distinguish the largest colonies from certain species of *Phormidium* but the smaller colonies are definitely bound together in a single sheath. The trichomes, however, are not densely intertwined like those of *Microcoleus.* It seems generally prevalent on various species of smaller *Codiums* in the Gulf.

Family RIVULARIACEÆ

CALOTHRIX AGARDH, Syst. Alg., 1824, p. XXIV

Calothrix nodulosa S. and G. sp. nov.

Plate 12, figs. 9, 10

Plants gregarious, loosely associated into small, stellate fascicles, 350-450 μ high; filaments decumbent at the base, the free end soon becoming erect, 28-32 μ diam., subcylindrical, tapering rather abruptly at the apices to blunt ends, not distinctly bulbose at the bases; sheath 3-4.5 μ diam., hyaline, homogeneous, closed for some time but later dissolving at the apex, becoming funnel-shaped above the middle where the trichome becomes constricted, eventually dies and the end breaks through to form a false branch; trichome aerugineous, 20-24 μ diam., very blunt at the apex, not terminating in a hair, cells 2-2.5 μ long, protoplast homogeneous, cross walls very inconspicuous; heterocysts 1-4, basal, variously shaped.

Forming microscopic fascicles on various species of *Laurencia.*

Type: No. 1320, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 9e), in June at **San Marcos Island, Gulf of California.**

This species appears to be most closely related to *C. consociata* (Kuetz.) Bornet et Flah., in habit and size, of all the described species, but differs in several minor details, particularly in not having the trichomes so long-attenuated and in the character of the sheath, which is much thinner, hyaline, and very delicately striate.

A pronounced character of the species is the constriction of the trichome in advance of the formation of intercalary heterocysts and the resulting hormogonia and false branching. This constricted appearance seems to be formed by the re-establishment of rapid growth at the attenuated apex of the trichome suddenly enlarging it at that point while the attenuated portion remains unchanged and finally dies, separating the trichome at that place. This character is not well shown in the illustration, plate 12, fig. 10.

Calothrix nidulans S. and G. sp. nov.

Plate 12, fig. 7

Plants epiphytic or slightly embedded in the gelatinous covering of the host, procumbent, 40-60 μ long, 10-12 μ diam. at the very much swollen base, much diminished above, not branched; sheath very delicate, hyaline and homogeneous; trichome dull æruginous, 9-11 μ diam. at the enlarged base, constricted at the dissepiments below, cross walls inconspicuous above; heterocysts basal, single, considerably flattened.

Growing on a fragment of a young filamentous brown alga, possibly *Liebmannia*. Locality not noted.

Type: No.1321, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 162), locality not noted.

This species is very close to *Calothrix parasitica* (Chauv.) Thuret, but differs in being much smaller in all of its dimensions and in not having hairs. The base is very decidedly bulbose and the three or four basal cells are very prominent and constricted at the dissepiments.

CHLOROPHYCEÆ

Family Caulerpaceæ

CAULERPA Lamouroux, Mem. Caulerpes, 1809, p. 141

Caulerpa Vanbosseæ S. and G. sp. nov.

Plate 13, figs. 13-15

Plants forming dense pulvinate masses 1.5-2 cm. thick, attached by delicate branched hyaline rhizoids; erect fronds irregularly and alternately (occasionally opposite) branched, more or less irregular, cylindrical; terminal ramuli slightly clavate; main fronds and ramuli 400-500 μ diam.; trabeculæ of numerous, delicate, much branched, cylindrical threads intertwined in the center of the filament; reproduction unknown.

Habitat unknown. Vicinity of La Paz. Type, Bryant, no. 1.

The plants on which we base our diagnosis seem most closely related to *Caulerpa fastigiata* Mont., both as regards habit and general structure, but they show, when boiled with potash solution, small papilliform projections from the inner surface of the walls. According to Correns (1894), who discovered such structures among the species of *Caulerpa,* these are wanting in *C. fastigiata* Mont. Through the kindness of Dr. Anna Weber-van Bosse, we have been able to study specimens of *C. fastigiata* sent by Montagne to Kuetzing. These cotypes show low but distinct papillæ and simple trabeculæ as well as more slender (180-220 μ) and less rigid filaments than *C. Vanbosseæ.* Our species, therefore, belongs to the section of Vaucherioideæ and is closely related to, but distinct from, *C. fastigiata* Mont.

Family Codiaceæ

HALIMEDA Lamouroux, Class. Polypes, 1812, p. 186

Halimeda discoidea Decne.

Marchant, no. 7, and Bryant, no. 2, La Paz. This species is apparently rather limited in distribution. Howe (1911, p. 492) reported it collected by Vives in the same locality.

CODIUM Stackhouse, Nereis Brit, 1797, p. XVI

In treating the genus *Codium* in this account, we have felt compelled to propose several new species, at the same time feeling that the treatment must be more or less tentative on account of lack of adequate material for comparison and especially on account of the paucity of material and the lack of suitable field notes from the region covered. Observations on the effect of age and habitat upon the structure of the various parts of the plant, especially the size and thickening of the end walls of the utricles, is highly desirable. We have endeavored to give as complete an account in descriptions, photographs, and drawings as the material at hand will warrant, awaiting more abundant material and further investigation to completely establish the validity of the species here proposed.

Codium tomentosum (Huds.) Stackh.

Plate 16, figs. 38, 39

In rendering our account of the Chlorophyceæ in the Marine Algæ of the Pacific Coast of North America (1920), we included *C. tomentosum* from La Paz, Mexico, rather on the authority of Howe (1911, p. 493), at the same time expressing some doubt as to the occurrence of typical material of this species within the range covered by our account. We are not now aware whether the type material of *C. tomentosum* is available to anyone, but during our present study we have examined the material of this species distributed by Le Jolis from Cherbourg in Algues Marines de Cherbourg, No. 204, of W. A. Setchell's copy. We are taking the view that this distribution, which was collected across the English Channel from the type locality of the species, viz., Exmouth in Devon, is likely to be as nearly typical as any which has yet been reported under this name. We have figured the utricles of this distribution in plate 16, figs. 38, 39, and with this material as the basis for our judgment we are still more convinced after a careful study of our material that it should not be included in the flora on the Pacific Coast of North America.

Otto C. Schmidt (1923), although excluding the West Indian forms still retains plants from many parts of the world under this species.

Codium simulans S. and G. sp. nov.

Plate 14, figs. 21, 22 and plate 31

Fronds up to 13 cm. high, 3-4 mm. diam., cylindrical, slightly flattened at the forkings and cuneate below; branching dichotomous throughout; utricles subcylindrical to clavate, 600-700 μ long, up to 200 μ diam. at the outer ends, which are rounded and somewhat flattened, never fornicate; terminal wall thickened, up to 50 μ thick, hairs 2 to several in a whorl, attached just below the thickened terminal wall; gametangia blunt, narrowly to broadly conical, tapering abruptly at the base, up to 250 μ long and 100 μ broad.

Growing on rocks in the upper sublittoral belt, San Marcos Island.

Type: No. 1322, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 8), in June, at **San Marcos Island, Gulf of California.**

Codium simulans approximates to *Codium tomentosum* more nearly than any of the other collections from the Gulf, as we interpret that species. The fronds of *C. simulans* are smaller, the dichotomies are slightly flattened and cuneate below, and the utricles have much thicker end walls than in *C. tomentosum,* and the hairs are at the uppermost portions of the lateral wall of the utricle. Howe's specimens of *C. tomentosum* are young, but seem to belong under *C. simulans* (cf. Howe, 1911, p. 493).

Codium conjunctum S. and G. sp. nov.

Plate 15, figs. 32, 33, and plate 32, fig. a

Thallus 2-5 cm. high, 2-2.5 mm. diam., attached by a relatively small holdfast, cylindrical above, somewhat flattened and profusely anastomosing at the base, branching dichotomous to sub-dichotomous above; utricles cylindrical, clavate to pestle-shaped, truncate to slightly round and smooth at the outer end, 400-500 μ long, up to 200 μ wide at the outer end, terminal wall thickened, up to 20 μ thick; gametangia (?) broadly fusiform, 180-240 μ long, 60-70 μ, up to 100 μ broad, not extending beyond the utricles.

Growing on rocks in the upper sublittoral belt.

Type: No. 1323, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 16), in June, at **Tortuga Island, Gulf of California.**

This species is to be distinguished by its small size, its relatively short utricles and especially by the profuse anastomosing of the fronds at the base. In this way small dense cushions are built up about a centimeter thick in which the fronds extend outwards more or less laterally. It is fruiting profusely and it is assumed to be nearing its maximum development.

Codium reductum S. and G. sp. nov.

Plate 14, figs. 23, 24 and plate 33

Thallus 15 cm. high, decidedly flattened towards the base, nearly cylindrical at the apices, dichotomously branched, gradually reduced in width from the base to the extremities; segments between the forkings cuneate; utricles narrowly to broadly clavate, rounded and smooth or blunt-conical at the apices, sometimes branching, 600-800 μ, up to 1250 μ long, up to 250 μ broad, terminal wall of utricle up to 30 μ thick, finely laminated, frequently umbonate; hairs numerous, attached very close to the ends of the utricles; gametangia (?) narrowly fusiform, 180-210 μ, at times up to 440 μ long, 60-90 μ broad.

Growing on rocks in the lower littoral belt.

Type: No. 1324, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 42), in June, at **Angeles Bay, Lower California.**

In this species of *Codium,* as well as in many others, there is a marked variation in the size and shape of the utricles. A sort of dimorphism seems to exist regarding their size. There is a typical size and form, possessed of a liberal range of variation, and interspersed among these there is a much smaller number of very decidedly large specimens always having much thinner end walls than the typical forms. The significance of this large type has not been interpreted. They bear gametangia (?) and are present in practically all of the species reported here.

Codium cuneatum S. and G. sp. nov.

Plate 16, figs. 34, 35 and plate 34

Thallus decidedly flabellate, attached by a relatively small spongy disk, 12-16 cm. high, branching very close to the base, regularly dichotomous, distinctly flattened, especially immediately below the forking, angles rounded; segments between the forkings broadly cuneate, up to 2 cm. wide below the forking, terminal branches numerous, much reduced; utricles 0.5-1 mm. long, 200-250 μ diam., large type up to 450 μ diam. at the outer end; side wall 2-3 μ thick, end wall 8-12 μ thick; hairs short, attached near the outer end of the utricles; sporangia sub-fusiform, widest below the center, 200-260 μ long, 90-110 μ wide; often extending beyond the utricle.

Growing on rocks in the upper sublittoral belt.

Type: No. 1325, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 47), in July, at **Smith Island, Gulf of California.**

The gross morphological features of this species, which distinguish it from all other known species, are the regularly dichotomous branching, the flattened and flabellate character of the frond, and the broadly cuneate segments between the forkings. These combined with the characters of the utricles and the gametangia are decidedly sufficient in our judgment to render this one of the most distinct of all the species of *Codium.*

The fronds are small at the base and the forking begins very close to the base. The specimens at hand are in full fruit and presumably are very near to maturity. They are forked about ten times. At each forking the frond widens rather decidedly and rapidly, reaching its greatest width at about the seventh forking, after which it is reduced very rapidly to the small apices only 2-4 mm. wide.

Its nearest relative would seem to be *C. Lindenbergii* Binder (in Kuetz., Tab. Phyc., vol. 6, pl. 97), but as described and figured, that species has longer and less cuneate segments and decidedly long and attenuated apices. Also the utricles as figured differ in shape from ours and are not represented as having thickened end walls.

Codium amplivesiculatum S. and G. sp. nov.

Plate 15, figs. 28, 29 and plate 35

Thallus cylindrical, somewhat flattened at the forking, 5-6 dm. high, main branches 6-9 mm. diam. in widest part, tapering slightly towards the base, terminal ramuli 1-2 mm. diam.; branching profuse, regularly dichotomous; branches gradually and much reduced in diameter upward; utricles 1.4-1.8 mm. long, of two kinds, the typical, 350-550 μ diam. at the outer ends and the rarer, up to 1 mm. diam. at the outer end, clavate, enlarging gradually upward; walls thin, 1.5-2 μ on the sides, 3-4 times as thick at the ends; hairs inserted near the outer end of the utricle; gametangia (?) fusiform, 350-400 μ long, 90-120 μ broad.

Specimens found floating.

Type: No. 1326, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74), in July, near south end of **Angel de la Guarda, Gulf of California.**

This species of *Codium,* according to the report by Mr. Johnston, is quite plentiful in the above mentioned locality. It was found growing in abundance and many specimens were floating in the bay. Only two complete specimens were collected. It seems to be very loosely attached by a small holdfast. A very striking feature of the gross morphology is the very gradual attenuation of the fronds upward, the widest part being at the base.

It is probably to be considered a near relative of *C. decorticatum* (Woodw.) Howe (Phyc. Studies, V., p. 494), who determined a specimen of the Vives Collection from La Paz and sets forth his reasons in full for changing the combination. Our plants are larger and have much larger utricles and the dichotomies are up to twelve, thus producing a very large number of slender branches.

The characters of the utricles are almost identical with those of *Codium longiramosum* of this paper.

Codium unilaterale S. and G. sp. nov.

Plate 15, figs. 30, 31 and plate 36

Thallus cylindrical to somewhat irregular, 20 cm. high, 3-4 mm. diam. at the base, enlarging slightly upwards, subterminal segments widest, dichotomous to sub-distichous, branching very close to the base, angles narrow; utricles nearly cylindrical to narrowly clavate, smooth and rounded to slightly conical at the outer ends, 700-900 μ long, 200-250 μ, up to 400 μ, broad; hairs sparse, attached very close to the outer end of the utricles; gametangia (?) sub-fusiform, widest below the center, attached above the center of the utricles, often projecting beyond them, 225-270 μ long, 90-120 μ broad.

Growing on rocks in the upper sublittoral belt.

Type: No. 1327, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74a), in July at **Pond Island, near south end of Angel de la Guarda, Gulf of California.**

One of the very striking characters of *Codium unilaterale* is the very unequal growth of one of the branches arising at the apex by an apparent equal splitting at the growing region. This method is prevalent throughout the plant and results in several main shoots with the branches all on one side, since with few exceptions it is the branch arising on the same side as the preceding branch which is reduced in growth.

Codium longiramosum S. and G. sp. nov.

Plate 15, fig. 27 and plate 37

Thallus cylindrical throughout, 4 dm. high, 5-8 mm. diam., tapering decidedly towards the base to a small short stipe and only slightly towards the apices; branching dichotomous, mostly near the base, moderately sparse; utricles of two forms, the typical, with smaller dimensions, narrowly clavate to slightly pestle-shaped, and the larger, fewer, up to 1.2 mm. diam., broadly clavate, interspersed among the typical, 1-1.8 mm. long, convex and smooth at the apices, with apical walls 8-14 μ thick; gametangia and zoosporangia unknown.

Type: No. 1328, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74b), in July, floating in **Rattlesnake Harbor, Pond Island, Gulf of California.**

Codium longiramosum is to be distinguished from all other known species by its sparse dichotomous branching, taking place mostly near the base, its long straight cylindrical branches slightly attenuated toward the apices and decidedly so at the base, along with certain microscopic characters. The utricles are relatively very large, especially one type, which is not very abundant. The side walls are very thin and the end walls as compared with the size of the utricles and with most species are likewise thin. Unfortunately we have but a single specimen and it is sterile. The characters of the utricles are almost identical with those of *Codium reductum*, of this paper, with which it was found floating.

Codium anastomosans S. and G. sp. nov.

Plate 16, figs. 36, 37

Thallus about 4 cm. long, 3-5 mm. diam., cylindrical, profusely anastomosing at the base, more or less spread out laterally, attached in the center by a disk-shaped holdfast and more or less by rhizoids along the prostrate fronds; branching sub-dichotomous; typical utricles narrowly clavate, at times branching, 45-70 μ diam.; an occasional large thin-walled specimen reaching 290μ diam.; apices mostly blunt conical, capped with a thick, hyaline, laminated cell wall, 35-50 μ thick, a few specimens up to 70μ thick; gametangia unknown.

Growing on rocks.

Type: No. 1329, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 84e), in June, at **Angel de la Guarda, Puerto Refugia Rocks, Gulf of California.**

This species of *Codium* combines characters of several species apparently, which seem to be very closely related, and possibly overlap each other. The profuse anastomosing of the fronds, spreading out laterally, forming more or less of a cushion, are characters slightly represented in *Codium cervicorne* and highly developed in *Codium conjunctum.* In thickness of frond and general method of branching it resembles *C. cervicorne.* The small size, the rounded to blunt-conical apices, and the decidedly thick end walls of the utricles are a combination of characters not found in any other species. Unfortunately we have but a single sterile specimen upon which to base the species, but its morphological characters seem too distinct not to warrant its being placed in a separate species, awaiting further investigation to establish well its entity.

Codium Brandegeei S. and G. sp. nov.

Plate 14, figs. 25, 26 and plate 30

Thallus 10-12 cm. high, cylindrical to slightly flattened, tapering gradually from the base upwards, terminal segments 2-3.5mm. diam., branching dichotomous; hairs 2-3 in a whorl near the top of the utricles; utricles 750-850 μ long, variable in diameter, 50-200 μ at widest part, narrowly clavate, apices rounded to subconical, terminal wall 30-45 μ up to 60 μ thick, frequently umbonate; gametangia (?) mostly narrowly fusiform, 240-280 μ long, 70-90 μ broad.

Habitat unknown. La Paz (?). Type, Brandegee, no. 28.

We have but a single specimen upon which to base this species. It was collected by T. S. Brandegee many years ago and probably at La Paz. It seems most closely related to *C. simulans* of this paper.

Codium cervicorne S. and G. sp. nov.

Plate 14, figs. 19, 20 and plate 32 b

Thallus cylindrical throughout, 4-6 cm. high, 3-5 mm. diam., attached by a relatively large spongy holdfast, several erect fronds arising from the same holdfast; branching subdichotomous, becoming almost unilateral towards the outer ends, angles wide and rounded; utricles 500-600 μ long, 75-225 μ in widest part, varying from narrowly cylindrical forms with end walls thickened up to 40 μ and more or less conical, to broadly clavate forms with end wall only slightly thickened and convex; gametangia (?) narrow-fusiform, 190-220 μ, at times up to 300 μ, long, 40-60 μ broad.

Cast ashore at Eureka, near La Paz, Lower California. Type, Marchant, no. 8, May.

Among the specimens of our collections of *Codiums* from the Gulf of California appear a few which although resembling *C. conjunctum* very closely as to form, are of a distinct species. It is to be distinguished from *C. conjunctum* in being a larger plant in all measurements, in having fewer branches, which are sub-dichotomous and almost unilateral, in having wider, rounder angles, and in having larger utricles and gametangia. There is a slight anastomosing of the fronds at the base, a character which is very prominent in *C. conjunctum.* The character of the branching reminds one of antlers of an elk.

Family CLADOPHORACEÆ

CHÆTOMORPHA KUETZING, Phyc. Germ., 1845, p. 203

Chætomorpha antennina (Bory) Kuetz.

Collected at Mazatlan, Mexico. Marchant, no. 100.

Kuetzing, sp. Alg. 1849, p. 379; Setchell and Gardner, Chlorophyceæ, 1920, p. 203. *Conferva antennina* Bory, Voy. quatre Îles d'Afr., vol. 2, 1804, p. 161. *Chætomorpha pacifica* Kuetzing, Sp. Alg. 1849, p. 379.

The cell walls of this collection, which seems to be thoroughly mature, are very thick, 60 μ above and up to 100 μ below.

CLADOPHORA KUETZING, Phyc. Gen., 1843, p. 262

Cladophora hesperia S. and G. sp. nov.

Plate 13, fig. 17

Fronds forming dense, thin mats on the substratum, profusely branched; di-trichotomous; main branches nearly uniform in diameter throughout, tapering only at the apices;

ramuli of different orders reduced in diameter at each forking and all tapering gradually to blunt apices; main filaments 190-230 μ diam., ultimate ramuli 25-40 μ diam.; main branches relatively strict, ramuli widely divaricate; segments slightly constricted at the dissepiments, 2-4 times as long as the diameter in the ramuli, up to 1 mm. long in the main filaments.

Growing in a muddy habitat, at the southern extremity of Lower California. Type, Brandegee, no. 21.

No data are available as to the habitat or the exact locality of this species of *Cladophora* nor the time of the year it was collected. The locality is undoubtedly along the coast of the southern extremity of Lower California, where Mr. Brandegee collected many flowering plants. Only a single mount was preserved, consisting of a mat of material about three inches square. There are a few fronds of a small *Enteromorpha* mixed with it, and the mass is quite muddy, indicating that the probable habitat is a mud-flat. There is no indication available as to the nature of attaching portions. The chromatophores, difficult to interpret in old dried material, occupy the periphery of the whole segment, both ends and sides, forming a thin stratum seemingly composed of closely crowded fine disks. The branching is very profuse, especially the ramuli of the fourth to sixth orders which extend in all directions and arise at almost right angles with the parent branch. The species is especially characterized by its profuse, short, divaricate and subulate ramuli.

CLADOPHOROPSIS Börgesen, Cont. Conn. du genre *Siphonocladus*, 1905, p. 259

Cladophoropsis robusta S. and G. sp. nov.

Plate 13, fig. 16

Fronds forming extensive dense tufts, 3-3.5 cm. high, attached by numerous branching rhizoidal filaments; erect filaments nearly cylindrical throughout, up to 1100 μ diam., sparsely forked at the base and bearing a few short lateral branches near the apex; segments very long except in the region of branches.

Growing on rocks in the upper sublittoral belt.

Type: No. 1330, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 135), in June, at **Tortuga Island, Gulf of California.**

This species may readily be distinguished from all other known species of *Cladophoropsis* by the large diameter and by the great length of the segments between the branches.

Family Ulvaceæ

ENTEROMORPHA Link, Epistola, 1820, p. 5

Among the collections of *Enteromorpha* from the Gulf of California at our disposal, we have identified four different known species, all of which, as far as we are able to ascertain, are new to the Gulf, and one species new to science. Doubtless others exist but have escaped collectors' notice.

Enteromorpha acanthophora Kuetz.

Plate 16, fig. 43 and plate 38

Cast ashore at Guaymas, Marchant, no. 1, May. On rocks in the lower littoral belt, Johnston, no. 39, June. La Paz (?) Brandegee, No. 29.

These specimens agree very well in habit with Kuetzing's figure of this species, Tab. Phyc., vol. 6, pl. 34. The specimens collected by Brandegee are probably older and do not seem quite typical in this stage of its life history. The plant figured (loc. cit.) is of a specimen of Johnston's collection, no. 39, June.

Enteromorpha prolifera (Muell.) J. Ag.

Cast ashore at Guaymas, Mexico, Marchant No. 4, May.

Marchant's material appears to be quite typical of this species, as understood and figured by Kuetzing, Tab. Phyc., vol. 6, pl. 30, and by J. G. Agardh, Till. Alg. Syst., part 3, p. 129, pl. 4, figs. 103, 104.

Enteromorpha tubulosa Kuetz.

Cast ashore at La Paz, Lower California. Johnston, no. 49, April.

Kuetzing, Tab. Phyc., vol. 6, pl. 32, fig. 2.

The material of this species is rather sparse and seems not to be typical. It is sparingly branched above. The membrane is 34-40 μ thick, and the cells are 14-18 μ diameter, as seen from above. It does not agree completely with either *E. tubulosa* or *E. prolifera,* both of which it resembles, but is seemingly closer to the former, where we are placing it.

Enteromorpha compressa (L.) Grev.

Guaymas, Mexico, Brandegee no. 7, and La Paz, Lower California, Brandegee, no. 17.

Greville, Alg. Brit., 1830, p. 180, pl. 18. *Ulva compressa* Linnæus, Fl. Suec., Ed. II, 1755, p. 433.

As we understand this species (cf. Setchell and Gardner, 1920, p. 251, 252), the material cited here is fairly typical.

Enteromorpha Marchantæ S. and G. sp. nov.

Plate 16, figs. 40-42

Fronds 4-7 cm. high, up to 1 cm. wide in widest parts, tubular, more or less bullate, clavate, tapering below to a delicate stipe, simple or with a few branches like the main frond and with delicate proliferations on the stipe; cells in the smooth parts arranged more or less in longitudinal and in cross rows, mostly square in surface view, 16-22 μ diam., membrane 24-27 μ thick; cell walls 2.5-3.5 μ thick, not thickened on the inside; chromatophore not filling the cell, mostly in the outer end of the cell.

Cast ashore at La Paz, Lower California. Type, Marchant, no. 3, May.

In form this species seems most closely related to forma *clavata* of *E. intestinalis.* It differs from all of the forms of *E. intestinalis* in having a thin wall on all sides of the cell, in having the cells arranged more or less in longitudinal rows, and in having the cells nearly cubical. The specimens are very much smaller than typical *f. clavata.*

ULVA LINNÆUS, Gen. Plant., 1737, p. 326

In this account we have listed three species of Ulva, viz., *U. dactylifera* S. and G., *U. lactuca L.,* and *U. rigida* Ag. Howe (1911, p. 490) reported *U. fasciata* Delile from La Paz and *U. lactuca rigida* (Ag.) Le Jolis from San Felipe Bay. We have not seen the material of these last two species but raise the question here whether the former may not be our *U. dactylifera* (S. and G., 1920, p. 272) and the latter one of the other species cited above.

Ulva dactylifera S. and G.

Growing on rocks in the upper sublittoral belt, San Marcos Island, Gulf of California, Johnston, no. 11a, June; Tortuga Island, Gulf of California, Johnston, no. 31, June; La Paz, Lower California, Brandegee, nos. 9 and 30; Eureka, near La Paz, Marchant, no. 5, May.

Setchell and Gardner, Phyc. Cont. I, 1920a, p. 285, pl. 26, fig. 1, Chlorophyceæ, 1920, p. 272, pl. 21, fig. 1.

As a rule the specimens from the Gulf have a more ample base and shorter "streamers," otherwise they approximate very closely the California plants.

Ulva rigida Ag.

Cast ashore, La Paz, Lower California. Marchant, no. 6, May.

Agardh, Sp. Alg., vol. 1, part 2, 1822, p. 410; Setchell and Gardner, Chlorophyceæ, 1920, p. 270.

We have three well preserved specimens of this species. All of them are somewhat smaller than the average size for this species. Structurally they seem typical of the species as we understand it.

Ulva lactuca L.

Growing on rocks in the lower littoral belt. Los Angeles Bay, Lower California, Johnston no. 40, June; Guaymas, Mexico, Johnston, no. 63, April.

Linnæus, Sp. Plant., vol. 2, 1753, p. 1163 (in part); Setchell and Gardner, Chlorophyceæ, 1920, p. 265.

Family CHÆTOPHORACEÆ

ENTOCLADIA REINKE, Zwei par. Algen, 1879, p. 476; Setchell and Gardner, Chlorophyceæ, 1920, p. 288

Entocladia condensata S. and G. sp. nov.

Plate 12, figs. 4, 5

Plants forming a disk of compact cells in the center, with a few short filaments extending outwards from the margin; cells in the center of the thallus 12-16 μ in surface view, angular; marginal filaments 7-9 μ diam.

Growing in the terminal membrane of the utricles of various species of *Codium.*

Type: No. 1331, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 26), in June, at **San Francisquito** Bay, **Lower California.**

E. condensata is quite similiar to *E. codicola* S. and G., growing in the utricles of *C. fragile* (Suring) Hariot, on the coast of California, but the cells are much larger throughout and the whole plant is more condensed. It is apparently quite widely distributed on a number of different species of *Codium* in the gulf.

Entocladia Polysiphoniæ S. and G. sp. nov.

Plate 13, fig. 18

Filaments distinct, very crooked, irregularly and much branched, branches often at right angles, arising from the middle of the cell, not coalescing in the center of the thallus to form a disk; cells very variable in shape and size, 4-9 μ diam., 3-6 times as long as the diameter; chromatophores parietal, pyrenoid single; zoosporangia (?) intercalary; formed from vegetative cells at irregular intervals in the filaments, numerous, up to 24 μ diam.; thallus up to 1 mm. diam.

Growing in the membrane of *Polysiphonia Marchantæ.* Guaymas, Mexico, Marchant, no. 50b, May; La Paz, Lower California, Bryant, no. 7a. Type, Marchant, no. 50b.

In a previous work (Chlorophyceæ, 1920, p. 289, 290) we discussed briefly the genus *Entocladia,* setting forth our conceptions of it, and expressed our difficulties in arriving at a complete and satisfactory arrangement of our Pacific Coast forms, owing to incomplete life histories of the organisms. We are compelled to acknowledge that the same difficulties stand in the way of disposing of these Mexican forms. Notwithstanding the presence of well developed sporangia (?) or gametangia (?) with completely formed reproductive cells within them, we are unable to say whether the reproduction is asexual or sexual, or whether the reproductive cells have two or four cilia, important matters in establishing relationships. All of our species thus far located on the Pacific Coast of North America are endophytic. They branch more or less abundantly, have a single parietal chromatophore and one pyrenoid.

We have in the three species, here newly proposed, apparently represented the extremes of variation in the matter of the formation of the thallus. In *E. condensata* the whole plant is practically a solid parenchymatous disk, with only a few peripheral short free filaments. In *E. Polysiphoniæ* there is no indication of a central parenchymatous disk. The filaments are all free, more or less crooked and distorted, and the branching is alternate or at times secund, usually arising from the center of the cells. Between these two extremes we have *E. codicola* S. and G. with a slight central disk, *E. mexicana* of this paper, and *E. cingens* S. and G. In all cases the reproductive cells are merely vegetative cells enlarged and more or less metamorphosed. In *E. Polysiphoniæ* those of the central part of the thallus are enlarged to almost spherical whereas those near the margin may only be slightly swollen. This condition does not seem to be the case in the other species.

Entocladia mexicana S. and G. sp. nov.

Plate 19, fig. 57

Thallus wholly endophytic, 350-450 μ diam., parenchymatous in the center with copious free filaments around the margin; cells in the center nearly equidiametric, 15-18 μ diam., cells of the free filaments 5-7 μ diam., 1.5-2.5 times as long; zoosporangia (?) scattered, numerous, up to 20μ diam..

Growing within the membrane of *Chætomorpha antennina.*

Type: No. 1332, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 49b), at **La Paz, Lower California.**

PRINGSHEIMIA Reinke, Einige neue braune und grüne Algen. 1888, p. 241

Pringsheimia Marchantæ S. and G. sp. nov.

Plate 12, fig. 8

Thallus epiphytic, up to 280 μ diam., often numerous and confluent on the host; cells in the center of the thallus nearly isodiametric, 15-20 μ diam., much reduced and elongated radially towards the margin, 3-4 μ diam., 2-3 times as long; chromatophore parietal; pyrenoid single; reproduction unknown.

Growing on various species of *Laurencia.* La Paz, Lower California. Type, Marchant, no. 68x, May.

We have seen neither gametes nor zoospores either in position or free. However, very frequently the cells in the center of the thallus are empty and we are therefore assuming that the plants are mature. If this is the case, *P. Marchantæ* is quite distinct from *P. scutata* Reinke, which has the reproductive cells very much elongated in the center of the host. The shape and size of the cells on the periphery are decidedly different from those of *P. scutata,* being much smaller and longer. It has no resemblance to *P.* (?) *Udotea* Börgesen, 1913, p. 11. We mark it as a new species pending further investigation.

MELANOPHYCEÆ

Family Ectocarpaceæ

ECTOCARPUS Lyngbye, Hydrophyt. Dan., 1819, p. 130

Ectocarpus Bryantii S. and G. sp. nov.

Plate 17, fig. 45

Fronds intertwined, forming a more or less continuous stratum, 1-2.5 mm. high, attached by relatively short, penetrating, rhizoidal filaments; erect filaments forked more or less at the surface of the host, with very few short ramuli above, nearly cylindrical, tapering slightly above, uncorticated; terminal cell blunt 28-32 μ diam., cells 1-2 times as long as broad; chromatophores small disks; zoosporangia unknown; gametangia narrowly to broadly fusiform, sessile or on 1-celled pedicels, 70-100 μ, up to 140 μ, long, 25-35 μ broad, scattered promiscuously along the whole length of the erect fronds.

Growing on *Codium Brandegeei.* La Paz, Lower California. Type, Bryant, no. 3a.

Ectocarpus Bryantii and *E. gonodioides* are evidently closely related to each other and both have near affinities in the *pusillus* group of Sauvageau (1895). They both differ from all of the forms proposed, in the method of branching and in having no hairs terminating the erect filaments.

Ectocarpus gonodioides S. and G. sp. nov.

Plate 17, fig. 44

Fronds minute, forming small tufts 500-550 μ high, attached by long, more or less hyaline rhizoidal filaments penetrating the host; filaments sparsely branched at the surface of the host, tapering rather abruptly at the base, long attenuated upward to a blunt apex, 18-24 μ diam. at the base, 10-14 μ at the apex; cells 1-2 times as long as broad; zoosporangia unknown; gametangia narrowly fusiform on 1-2 celled pedicels, near the base of the erect filaments, up to 125 μ long, 20-28 μ diam. in widest part.

Growing on *Codium cuneatum.*

Type: No. 1333, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 47e), in July, at **Smith Island, Gulf of California.**

The small tufts which this species of *Ectocarpus* produces remind one of the genus *Gonodia* (*Myriactis*), but the penetrating part, which extends relatively deep into the host, is composed of slender, almost colorless, slightly branched, closely intertwined filaments, which, however, do not coalesce or form a false parenchyma as in the case of some species of

Gonodia. The plants, though sparse, are in excellent fruiting condition. The chromatophores are too much disorganized for characterization.

Family CORYNOPHLOEACEÆ

GONODIA NIEUWLAND, Critical notes, IX, 1917, p. 30, *Myriactis* auct.

As pointed out by Nieuwland (1917, p. 30), *Myriactis* was applied by Lessing to a still recognized genus of flowering plants belonging to the Compositæ, in 1831. It became necessary, therefore, to adopt another generic name for the algæ which have been listed under this name and Nieuwland has proposed the name *Gonodia,* in honor of Eugene Gonod, and has made the new combination *Gonodia pulvinatum* (Kuetz.) Nieuwland *(loc. cit.).* As far as we know there have been but two other unmistakable species of the genus described. We are here making these new combinations and adding two new species.

Gonodia Sargassi (Yendo) S. and G. comb. nov.

Myriactis sargassi YENDO, Novae Alg. Japon., 1920, p. 3

Gonodia moniliformis (Foslie) S. and G. comb. nov.

Elachista moniliformis FOSLIE. *Myriactis moniliformis* (FOSLIE) KYLIN, Zur Kenntnis der Algenfl., 1910, p. 13, fig. 3

Gonodia Johnstonii S. and G. sp. nov.

Plate 17, figs. 46, 47

Plants forming dense minute tufts in the conceptacles and on other parts of the host, 160-200 μ high, attached by rather deeply penetrating, sparsely branched, rhizoidal filaments; erect fronds forked at the surface of the host, vegetative filaments unbranched above, decidedly clavate and blunt, at times tapering upwards above the center; cells in widest part 10-14 μ diam., 1-1.5 times as long as broad, slightly constricted at the dissepiments; zoosporangia broadly clavate, 65-75 μ long, 18-22 μ broad; gametangia cylindrical, 60-75 μ long, 6-9 μ

broad, densely fasciculate; both sets of reproductive organs borne on the same plant at the surface of the host.

Growing on *Sargassum insulare.*

Type: No. 1334, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 11b), in June, at **San Marcos Island, Gulf of California.**

Gonodia Marchantæ S. and G. sp. nov.

Plate 17, fig. 48

Fronds forming dense tufts with a pseudoparenchymatous base penetrating the host, the free portion about 200 μ long; filaments unbranched above the host, the lower portion composed of 2-3 long, narrow cells, abruptly changing into 2-3 asymmetrical swollen cells, then gradually attenuated upward to blunt apices; widest cells 18-22 μ, the length of the cells in the upper part equalling the breadth; pseudoparenchymatous cells doliiform to subspherical; zoosporangia broadly clavate, 55-65 μ long, 22-26 μ broad; gametangia cylindrical, densely fasciculate, 55-65 μ long, 6-7 μ broad; both sets of reproductive organs borne on the same plant at the base of the free filaments.

Growing on the fronds of *Sargassum horridum,* La Paz, Lower California. Type, Marchant, no. 22a, May.

G. Marchantæ differs from *G. Johnstonii* in the character of the basal penetrating portion, the former having few narrow filaments and the latter having a dense, copious, pseudoparenchymatous base. Two or three cells in the lower part of the free filaments are usually asymmetrical in *G. Marchantæ* and not so in *G. Johnstonii.* Neither species has hairs or any indication of having had them, a prominent character as figured by Thuret and Bornet in Etudes Phyc., pl. 7, figs. 2-6, for *Elachista pulvinata,* and mentioned by Yendo as "paraphysibus paucioribus" in *Myriactis Sargassi* (*loc. cit.*). *G. Marchantæ* is close to *G. pulvinata* in the character of the basal penetrating portion. *G. Johnstonii* in general resembles *G. moniliformis* but is much smaller throughout.

Family Myrionemataceæ

COMPSONEMA Kuckuck, Beitr. Kennt. Meeresalgen, 1899, p. 92

Compsonema immixtum S. and G. sp. nov.

Plate 17, fig. 49

Thallus inconspicuous, the basal filaments creeping among the gametangia of the host; erect filaments very numerous, all bearing gametangia; hairs and zoosporangia unknown; gametangia narrowly ellipsoidal, 24-30 μ long, 6-8 μ broad.

Growing on *Colpomenia sinuosa* f. *deformans.*

Type: No. 1335, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 58b), in July, at **Isla Partida, Gulf of California.**

This organism is on the border between *Myrionema* and *Compsonema* as we interpret these two genera (S. and G. Phyc. Cont. II-VI, 1920). Under the present conditions of the host it is impossible to learn much of the basal portion. It appears that the basal layer was largely developed before the gametangia of the host started to develop. Later these pushed out among the basal filaments and leaving these behind developed along with the gametangia of the epiphyte. The gametangia project beyond the general surface of the host nearly their entire length. On account of the pluriseriate nature of the gametangia we are placing it in the genus *Compsonema* rather than in *Myrionema.*

Family Sphacelariaceæ

SPHACELARIA Lyngbye, Hydrophyt. Dan., p. 130 (In part)

Sphacelaria furcigera Kuetz.

Plate 19, fig. 58

Kuetzing, Tab. Phyc., vol. 5, p. 27, pl. 90

A few tufts of a species of *Sphacelaria* which seems to be this species have been noted on different species of *Sargassum* from the Gulf. Marchant, No. 22b is a fruiting specimen, having apparently two forms of gametangia, represented on plate 19, fig. 58.

Sphacelaria brevicorne S. and G. sp. nov.

Plate 19, figs. 59, 60

Fronds 1-1.5 mm. high, attached by small penetrating filaments, branching very sparse and strict, 35 μ diam. below, 22-30μ near the tip; hairs arising near the tips, composed of 6-8 cells; zoosporangia and gametangia unknown; propagula tricornute, about 120 μ long, about 70 μ wide below the horns, composed of a few large cells, on 2-3 celled pedicels; horns short, blunt, composed of 2-3 cells.

Growing on *Sargassum polyacanthum* f. *americanum*. La Paz, Lower California. Type, Brandegee, no. 59.

S. brevicorne has a very close affinity in *S. cornuta* Sauv. (1901, p. 132, Repr.), the type locality of which is New Caledonia. Unfortunately we have no fruit on ours. We are basing the distinction from *S. cornuta* largely on the differences in the character of the propagula.

Family Encœliaceæ

COLPOMENIA (Endlicher) Derbès and Solier, Mém. phys. Alg., 1856, p. 11, Endlicher, Gen. Plant., Suppl. III, 1843, p. 26, n, 98b

Colpomenia sinuosa f. tuberculata (Saunders) S. and G.

San Francisquito Bay, Lower California, Johnston, no. 26, June; Los Angeles Bay, Lower California, Johnston, no. 117, May; La Paz, Lower California, Marchant, no. 13, May, and Brandegee, nos. 15 and 36.

Setchell and Gardner, Alg. N. W. Amer., 1903, p. 242.

C. tuberculata Saunders, Phyc. Mem., 1898, p. 164, pl. 32, figs. 1-3.

The specimens of all of these collections are sterile. They are larger and seem somewhat more membranaceous than any which have been reported from the California coast, the type locality being Monterey, California. Otherwise they seem quite typical.

Colpomenia sinuosa f. deformans S. and G.

Plate 19, figs. 61, 62

Isla Partida, Gulf of California, Johnston, no. 58, July. Setchell and Gardner (*loc. cit.*). *Scytosiphon bullosus* Saunders, Phyc. Mem., 1898, p. 163, pl. 31, figs. 1-7.

There is an extensive variation in the form. The type locality of Saunders' *Scytosiphon bullosus* is Pacific Grove, California. The character which the plants assume growing along the California coast is about one-half bullose base and the other half consisting of irregular, more or less finger-like projections above. In the region of the San Juan Islands, Washington, the upper free portion is saccate and up to ten inches long. The basal portion of the material from the Gulf, as represented on plate 19, fig. 61, has practically disappeared and only the narrow, finger-like portions remain. The gametangia in this material are longer than in the material found along the California and Washington coasts.

Colpomenia sinuosa f. expansissima S. and G. f. nov.

Fronds 3-6 dm. in diam., thin, sinuose, with minute, spine-like projections.

Type: No. 1336, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 24), in June, at **San Francisquito Bay, Lower California.**

Johnston says in regard to the habitat: "Floating in large billowy masses out in the bay." Structurally the specimens seem very similar to *C. sinuosa* f. *expansa* Saunders *(loc. cit.)*.

In his description Saunders does not mention the size of the plants. The specimens distributed in Collins, Holden, and Setchell, Phyc. Bor.-Amer., no. 825, from La Jolla, measure only a few centimeters in diameter. Comparison of the fruits cannot now be made, since our material is all sterile.

HYDROCLATHRUS Bory, *in* Dict. Class., vol. 8, 1825, p. 419

Hydroclathrus clathratus (Bory) Howe

Cast ashore, La Paz, Lower California. Marchant, no. 12; Brandegee, no. 11.

Howe, Algæ *in* Britton and Millspaugh, Bahama Flora, 1920, p. 590

Hydroclathrus cancellatus Bory *(loc. cit.)*

Encœlium clathratum (Bory) Ag. Sp. Alg. vol. 1, 1822, p. 412

This alga has been known for a century or more and has been collected from a large number of widely separated localities, yet very little seems to be known of its method of development and the characters of its fruit. Harvey (1852, p. 120) expresses doubt as to whether all of the plants referred to this species actually belong to it. We are referring here the collections from La Paz with some hesitation, as we have no fruit to give a clue to its relationship. Statements concerning the fruit have been vague. Harvey (*loc. cit.,* p. 119) quotes Montagne, without citation, thus: "Spores minute, globose, collected into dot-like, scattered innate *sori,* accompanied by club-shaped, jointed filaments."

Farlow (1881, p. 88) states that *Hydroclathrus* has plurilocular sporangia like *Phyllitis* and *Scytosiphon,* but did not state whether he referred to *Hydroclathrus sinuosus* or to *H. cancellatus.* Mitchell (1893, p. 53), in considering the structure of *Hydroclathrus* Bory, treats *H. sinuosus* Zanard. along with *H. cancellatus.* She states (p.56), referring to *H. cancellatus*: "While one region of the thallus is fully formed and capable of producing sporangia, another may be still in a state of growth." . . . "On all the branches cryptostomata and sporangia are present in various stages of development." She did not figure the sporangia but we presume she referred to a type similar to that in *H. sinuosus* (*Colpomenia sinuosa*). Aside from these statements, so far as we are aware no one else has described or figured the fruit.

CHNOOSPORA Agardh, J, Nya Alg., 1847, p. 7

Chnoospora pacifica J. Ag.

Cast ashore, La Paz, Lower California. Marchant, no. 16; Brandegee, no. 39.

J. Agardh, Nya. Alg., 1847, p. 7; Kuetzing, Tab. Phyc., vol. 9, 1859, pl. 86, fig. 1. *Chnoospora fastigiata α pacifica* J. Agardh, Sp. Alg., vol. 1, p. 172.

Our material is in fine vegetative condition but has no fruit. It does not perfectly coincide with Kuetzing's figure in its vegetative character. The plants are dichotomously branched and the older parts are at times flattened. The terminal portions are profusely branched, forming short, dense clusters with divaricate branches, while the terminal ramuli, as shown in Kuetzing's figure, are few and erect. Kuetzing's figures were doubtless drawn from material of the type from the type locality, St. Augustine, Mexico.

Family Laminariaceæ

MACROCYSTIS Agardh, Sp. Alg., vol. 1, part 1, 1821, p. 46

Macrocystis pyrifera (Turner) Ag.

Caught on log line of vessel between Espiritu Santo Island and La Paz, Lower California. Johnston, no. 78, April.

Agardh *(loc. cit.), Fucus pyriferus* Turner, Fuci, vol. 2, pl. 110.

A single specimen about three feet long was brought aboard the vessel but no specimens were found growing attached within the Gulf.

Family Dictyotaceæ

NEUROCARPUS Weber and Mohr, Beitr. Naturk., vol. 1, 1805, p. 300 (242-246)

Neurocarpus zonarioides (Farlow) Howe

Growing on rocks in the upper sublittoral belt. Tortuga Island, Johnston, no. 22, June; Isla Partida, Johnston, no. 83, July.

Howe, Mar. Alg. Peru, 1914, pp. 69, 70. *Dictyopteris zonarioides* Farlow *in* Erythea, vol. 7, no. 8, 1899, p. 73.

The material of these collections seems to be identical with the material of *Dictyopteris zonarioides* Farlow, distributed from southern California in Collins, Holden, and Setchell, Phyc. Bor.-Amer. (Exsic), no. 581.

Howe (1914, p. 69) has brought forward new facts as to the priority of *Neurocarpus,* and it seems best to adopt this generic name rather than *Dictyopteris* or *Haliseris.*

Farlow (*loc. cit.*) compares the California specimen with *D. undulata* Holmes and properly, in our judgment, regards it as distinct.

Our plants are not fruiting and hence they are probably winter fruiting forms in that locality.

PADINA Adanson, Fam. Pl., vol. 2, 1763, p. 13

Padina Durvillæi Bory

Growing in the lower littoral and upper sublittoral belts. Guaymas, Mexico, Marchant, no. 11a, May; Brandegee, no. 8. Eureka, near La Paz, Lower California, Marchant, no. 32, May. La Paz, Lower California, Marchant, no. 15, May. Bryant, no. 8. San Marcos, Johnston, no. 3, June. Tortuga Island, Johnston, no. 17, June. San Esteban, Johnston, no. 54, April. Georges Island, Johnston, no. 73, April. San Francisquito Bay, Johnston, no. 76, June. San Pedro Martir, Johnston, no. 150, April. Isla Partida, Johnston, no. 154, April.

Bory, Dict. Class., vol. 12, 1827, p. 591; Voy. Coquille, 1828, p. 147, pl. 21, fig. 1.

Among these various collections there is a great variation in the size, thickness, and amount of laceration, as well as the arrangement of the fruit. Without more critical study of the material in its native habitat and histological comparison we are unable to state whether we are dealing with one or more than one species. We are grouping them all under the above name for the present without further comment.

DICTYOTA Lamouroux Nouv. Bull., Sci. Soc. Philom., vol. 1, 1809, p. 331

Dictyota crenulata J. Ag.

Plate 18, figs. 50, 51

Cast ashore, La Paz, Lower California. Brandegee, no. 24. J. Agardh, Nya. Alg., 1847, p. 7.

The collection listed above agrees very well with Agardh's brief description. We have not seen the type which is from St. Augustine, Mexico. The illustration (plate 18, fig. 50) is of a typical specimen of our collection in an advanced stage of development. The numerous proliferations represent plantlets developed from spores in situ.

Dictyota Johnstonii S. and G. sp. nov.

Plate 18, figs. 54-56 and plate 39

Fronds 12-16 cm. high, 5-8 mm. wide, 125-135 μ thick, composed of a single layer of large medullary cells surrounded by a single surface layer of small cells except in the lower part along the margin the medullary and surface cells become doubled; slightly stupose at the base, pinnate, dichotomously branched, angles acute to somewhat rounded, branches strict, margins smooth, color dark brown, black on drying; oogonia aggregated into elliptical or elongated areas, 115-125 μ long, 80-90 μ wide; tetrasporangia and antheridia unknown.

Growing on rocks in the upper sublittoral belt, San Marcos Island, Gulf of California, Johnston, no. 4, June.

Type: No. 1337, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 81), in July, at **Isla Partida, Gulf of California.**

Dictyota Johnstonii appears to belong to the subgenus or section of the genus, *Strigocarpus* J. Ag. (Anal. Algol. cont. 1, 1894, p. 73) and related to *D. pinnatifida* Kuetz., Tab. Phyc., vol. 9, 1859, p. 16, pl. 39, fig. 1, to *D. Pappeana* Kuetz. *(loc. cit.,* pl. 38, fig. 2), and to *D. liturata* Kuetz. *(loc. cit.,* fig. 1). The cross section in the central and lower parts of the frond has a structure similar to that shown by Okamura (1913, p. 33, pl. 109, figs. 3 and 7) for *D. marginata.* In *D. Johnstonii* the margins are thickened by divisions of the cells of both the medulla and the surface while in *D. marginata* increase in thickness is brought about by division of the medullary cells only.

Dictyota hesperia S. and G. sp. nov.

Plate 18, figs. 52, 53

Fronds linear, repeatedly branched, 8-10 cm. high, 2-4 mm. wide, 80-120 μ thick, more or less finely stupose at the base, dichotomously or at times subdistichously branched, antheridia and oogonia distributed over both surfaces on the same frond, oogonia single and antheridia in small circular groups; tetrasporangia single or in small irregular groups; oospores germinating freely in position.

Growing on rocks in the lower littoral and upper sublittoral belts, San Marcos Island, Gulf of California, Johnston, no. 5, June.

Type: No. 1338, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 32), in June, at **Tortuga Island, Gulf of California.**

Dictyota hesperia seems to belong to the subgenus or section of the group designated as *Pleiadophora* by J. Agardh (*loc. cit.*, p. 69) with close affinity with *D. sandvicensis* Sond.

New plants may be freely formed by growth of the oospores in position in the fronds. We have not been able to investigate the cytological characters of these spores to ascertain whether growth follows fertilization or whether the spores germinate parthenogenetically.

Family SARGASSACEÆ

SARGASSUM AGARDH, Sp. Alg., vol. 1, part 1, 1820, p. 1

In the posthumous publication of Grunow's work (1915-1916) two hundred and thirty species, besides a large number of varieties and forms of *Sargassum,* are listed. Notwithstanding this large number of published species, we find, in the region covered by our account, a considerable number of *Sargassums* which do not coincide with any of Grunow's descriptions. We feel compelled, therefore, to propose fifteen additions, leaving several others for future investigation, on account of lack of fruit and herbarium material with which to compare sterile specimens.

Sargassum acinacifolium S. and G. sp. nov.

Plate 21, fig. 82

Basal parts unknown; branches terete, smooth; leaves 12-16 mm. long, asymmetrical, the upper margin concave and smooth, the lower margin and apex coarsely dentate, ecostate, cryptostomata absent; vesicles situated at the base of the receptacles or more rarely among the receptacles, subspherical, smooth, apiculate, 1.5-2.5 mm. diam., on pedicels shorter than the diameter; receptacles 2-3 times forked, nearly cylindrical, not spiny, acuminate, more or less denticulate towards the apices.

Cast ashore. Guaymas (?), Mexico. Type, Brandegee, no. 2.

This species of *Sargassum* is a near relative, apparently, to *S. lapazeanum* and to *S. Bryantii,* both of this paper, but it differs sufficiently in leaf, bladder, and receptacle characters to warrant giving it a separate characterization.

Sargassum guardiense S. and G. sp. nov.

Plate 19, fig. 64

Basal parts unknown; primary branches up to 5 dm. high; secondary branches long and slender; branches and ramuli all smooth, terete; leaves slightly flattened, to filiform, ecostate, margins smooth, cryptostomata absent or rare; vesicles situated at the base of the fructiferous ramuli or among the branches of the receptacles, subspherical to slightly cylindrical, 2-4 mm. long, smooth, tapering at both ends, apiculate, on pedicels shorter than the diameter; receptacles 1-3 times forked, terete, not spinose, 5-8 mm. long, forming with the vesicles short heteroclyte cymes.

Cast ashore at Angel de la Guarda Island, Gulf of California.

Type: No. 1339, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 2), in June, at **Angel de la Guarda, Gulf of California.**

Unfortunately we have no complete specimens of this seemingly very well defined species of *Sargassum*. The character of the holdfast and of the main stipe, which are in many instances of much value in classification, cannot be stated. We have several clean primary branches which are in good fruiting condition and otherwise seemingly characteristic. The loose, open character of the branching and the shape and size of the vesicles remind one very much of some members of the genus *Cystophyllum* J. Ag. It has perhaps its nearest relative in *S. carpophyllum* but differs in leaf characters and in the vesicles being regularly lateral or terminal to the receptacles.

Sargassum lapazeanum S. and G. sp. nov.

Plate 20, fig. 74

Fronds 4.5-6 dm. high, arising from a solid parenchymatous disk; stipe 1.5 cm. long; primary branches 5-7, terete, smooth, giving rise to numerous long, slender, secondary branches; leaves 0.5-1.5 cm. long, asymmetrical, widest towards the apices, with very short petioles, the basal half of the upper margin smooth and concave, the remainder of the blade sharply dentate, midrib inconspicuous, cryptostomata abundant and conspicuous; vesicles scattered among the receptacles, ellipsoidal, 1-2 mm. long, transformed from the base of a leaf, mostly crowned by the remnants of the blade; receptacles 4-7 mm. long, 2-3 times forked, branches strict, spinulose, intermixed with leaves and receptacles forming a heteroclyte cyme.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 21, May.

Sargassum Bryantii S. and G. sp. nov.

Plate 21, fig. 83

Basal parts unknown; branches terete, more or less contorted; leaves 6-12 mm. long, 0.5 as broad as long, ecostate, asymmetrical, the upper margin concave and smooth, the lower margin and the end unevenly serrate; cryptostomata few and irregularly placed; vesicles numerous along the ramuli or more rarely intermixed with the receptacles, subspherical, marginate when young, spinose, short-petiolate; receptacles short, 4-8 mm. long, 1.5-3 mm. broad, irregular, cylindrical below, blunt or pointed, at times slightly spinose and crowned with a rudiment of a leaf.

Cast ashore near La Paz, Lower California. Type, Bryant, no. 5.

The characters of the receptacles do not agree in every particular with those given by J. Agardh (Sp. Sargas. Austral.) in his key to *Eusargassum*. They are not regularly two-edged and serrate-dentate along the margins. Many of them are slightly flattened above, somewhat spinose, and crowned with a leaf rudiment. It fits into this section better than into any other.

Sargassum horridum S. and G. sp. nov.

Plate 20, figs. 65, 66

Basal parts unknown; branches and branchlets muricate, leaves linear-lanceolate, acute, midrib percurrent, margins deeply and doubly serrate; cryptostomata numerous and conspicuous on the leaves, stems and vesicles; vesicles sparse, occupying the position of leaves near the base of the ramuli or scattered among the receptacles, spherical, 4-8 mm. diam., short-petiolate; receptacles decompoundly ramose, decidedly spinose.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 22, May.

Like the majority of our specimens from the Gulf of California, the specimens of this species of *Sargassum* have no holdfast or stipe. Presumably many of them grow only in the sublittoral belt and collectors have observed only such specimens as have been cast ashore, and these are usually fragmentary. Otherwise the specimens of *S. horridum* are in excellent condition.

Sargassum Marchantæ S. and G. sp. nov.

Plate 19, fig. 63

Basal parts unknown; primary branches 4.5-6 dm. high, terete, smooth; secondary branches numerous, densely fructiferous; leaves 4-6 cm. long, 3-5 mm. wide, linear-lanceolate acute, midrib percurrent, margins irregularly serrate-dentate; cryptostomata numerous and conspicuous; vesicles sparse, spherical, on short pedicels near the base of the ramuli or near the base of the branching receptacles, 4-6.5 mm. diameter, smooth; receptacle several times forked, occasionally one fork develops into a leaf or a vesicle forming a "heteroclyte cyme(?)," but all others fructiferous and from a single pedicel, supported near the base of a leaf, cylindrical, blunt, spinulose, the whole cyme 10-15 mm. long.

Cast ashore, Eureka, near La Paz, Lower California. Type, Marchant, no. 17, May.

Sargassum Marchantæ is probably genetically related to *S. Liebmanni* J. Ag.

Sargassum insulare S. and G. sp. nov.

Plate 20, figs. 67, 68 and plate 21, fig. 78

Fronds 7-9 dm. high, arising from a parenchymatous disk; stipe small, 5-10 mm. long; primary branches cylindrical throughout, 1-2 mm. diameter, smooth, moderately and alternately branched; leaves 1-2 cm. long, about half as wide as long, asymmetrical, the upper margin concave and mostly smooth, the lower margin and apex convex and crenate or dentate, ecostate; cryptostomata sparse; vesicles intermingled with the receptacles, spherical or sub-spherical, 1.5-2.5 mm. diameter, short-petiolate, often crowned by the remnant of a leaf; receptacles moderately branched, standing on a single pedicel on the base of a leaf, irregular in shape, clothed with scattered blunt spines, sometimes crowned by a rudiment of a leaf.

Growing on rocks in the upper sublittoral belt.

Type: No. 1340, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 11), in July, at **San Marcos Island, Gulf of California.**

Sargassum Brandegeei S. and G. sp. nov.

Plate 21, fig. 79

Basal parts unknown; branches and branchlets terete, smooth, without cryptostomata; branching rather dense in the upper parts; leaves 15-25 mm. long, 4-8 mm. wide, apices blunt, base cuneate, margins deeply serrate, cryptostomata absent; vesicles spherical, small, 2-3 mm. diam., smooth, apiculate or crowned by a rudiment of a leaf, supported by pedicels mostly shorter than their diameter, occupying positions of leaves toward the base of the ramuli, or scattered among the receptacles; receptacles in short dense racemes, with short distinct pedicels below but with sessile branches above, mostly blunt.

Cast ashore, Guaymas(?), Mexico. Type, Brandegee, no. 4.

Sargassum sinicola S. and G. sp. nov.

Plate 20, fig. 73

Basal parts unknown; branches and branchlets smooth, terete; leaves linear-lanceolate, acute, margins serrate-dentate, midrib percurrent, cryptostomata sparse, inconspicuous; vesicles numerous, mostly borne near the base of pedicel supporting the receptacles, spherical, smooth, 3-5 mm. diam., pedicels equaling the diameter; receptacles 1-3 times forked, the lower pedicellate, the upper sessile, cylindrical, with acuminate apices, not spinose.

Cast ashore. Eureka, near La Paz, Lower California; Marchant no. 20, May; La Paz, Lower California, Marchant, no. 26, May. Type, Marchant, no. 20.

This species seems nearly related to *S. podacanthum* Sond. and to *S. spinuligerum* Sond. but the leaves are much more "glandular" and the receptacles much more branched.

Sargassum polyacanthum f. americanum S. and G. f. nov.

Basal parts unknown; branches and branchlets up to 1.5 mm. diameter, moderately muricate; leaves 3-4 cm. long, narrowly lanceolate, acute, margins serrate-dentate, midrib percurrent, cryptostomata sparse; vesicles spherical, smooth, up to 8 mm. diameter, occupying positions of leaves along the ramuli or at times supported by a leaf; receptacles 1-2 times forked, 2.5-4 mm. long, obtuse-conical.

Cast ashore, La Paz (?), Lower California. Type, Brandegee, no. 27.

This species stands very close to *S. spinuligerum* Sond. The leaves are longer and narrower than in that species. There are also other specific differences.

Sargassum Johnstonii S. and G. sp. nov.

Plate 20, fig. 72 and plate 21, fig. 80

Basal parts unknown; primary branches relatively robust, terete, smooth, up to 8 dm. long, secondary branches numerous, densely crowded with fructiferous ramuli; leaves narrowly lanceolate, ecostate, margins sparsely denticulate, cryptostomata almost absent, 1.5-2.5 cm. long, 2-4 mm. wide; vesicles smooth, narrowly elliptical, merging gradually below into a short petiole, crowned by a mucron or a remnant of a blade, scattered along the fruiting rhachis among the receptacles, 3-5 mm. long, on pedicels shorter than their length; receptacles single or 2-3 times forked, nearly cylindrical, mostly blunt, with slightly denticulate apices.

Cast ashore.

Type: No. 1341, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 71), in April, at **Georges Island, Gulf of California.**

Related to *S. galapagense* Grun. but differs in having elongated, long-apiculate vesicles and slightly denticulate receptacles, and in details of leaf characters.

Sargassum Johnstonii f. laxius S. and G. f. nov.

Plate 21, figs. 75 and 81

Basal parts unknown; primary branches up to 13.5 dm. long, secondary branches very much less frequent and much longer than in the species; leaves filiform, 1-2 cm. long, cryptostomata sparse, inconspicuous; vesicles subspherical, mostly long-mucronate; receptacles 1-2 times forked, rarely simple, not denticulate.

Cast ashore at Guaymas, Mexico. Type, Marchant, no. 28.

This variety differs from the species in the following particulars: the secondary branches and fructiferous ramuli are very much more widely scattered and several times longer, the leaves are narrower, in fact they are filiform, the vesicles are very much shorter, about one and a half times as long as broad, and the receptacles are less branched and rarely if ever denticulate at the apices.

Sargassum Johnstonii f. gracile S. and G. f. nov.

Plate 21, fig. 76

Basal parts unknown; branches of all orders very slender, long, and wide apart, up to 1 mm. diam.; leaves filiform; vesicles narrowly ellipsoidal.

Cast ashore, Guaymas, Mexico. Type, Marchant, no. 28a.

This differs from the species in being decidedly more slender throughout, much less frequently branched, and in having the branches much longer and more delicate, and in having filiform leaves. In these respects they more nearly coincide with f. *laxius* but are much more delicate throughout than that form. The receptacles are young in the specimens at hand. The vesicles are practically the same in form as those of the species.

Sargassum cylindrocarpum S. and G. sp. nov.

Plate 21, fig. 77

Basal parts unknown; primary branches and branchlets smooth, terete; leaves 5-8 cm. long, 3-5 mm. wide, linear-lanceolate, acute, serrate-dentate, midrib percurrent, cryptostomata abundant and conspicuous; vesicles 5-8 mm. diameter, spherical, smooth, on stipes shorter than the diameter, occupying positions of leaves toward the base of the fructiferous ramuli; receptacles several times forked, cylindrical, blunt, 1-2 cm. long.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 11.

Sargassum herporhizum S. and G. sp. nov.

Plate 20, figs. 69-71

Fronds 6-8 dm. high, attached at first by a small parenchymatous disk, later the short stipe giving rise to erect primary branches in part and to horizontal branches which in turn develop attaching branches, hapteres, below and to erect branches above; primary branches slender, terete, smooth, densely clothed with leaves and with scattered secondary branches below and with fructiferous branches above; lower leaves sublinear, upper linear-lanceolate and acute, lower 3-5 mm. broad, upper 1-2 mm. broad, midrib percurrent, margins sparsely denticulate, cryptostomata absent; vesicles numerous, scattered among the receptacles, spherical to subspherical, smooth, rarely apiculate, 1-2 mm. diam., on pedicels as long as or longer than the diam.; receptacles short, 5-10 mm. long, sub-cylindrical, acuminate, only sparsely branched, tuberculate with conspicuous conceptacles; plants very dark on drying.

Growing in the upper sublittoral belt.

Type: No. 1342, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 72), in April, at **Georges Island, Gulf of California.**

Arrangement of the species of *Sargassum* found on the Pacific Coast of North America according to the system of Agardh (1889) as revised by Grunow (1915-1916).

Subgenus Phyllotrichia

Tribe V. Dimorphæ

1. *S. Palmeri* Grunow

Subgenus Eusargassum

Series I. Zygocarpicæ

Tribe I. Carpophylleæ

※ Receptacles terete, not spiny.

¢¢ Rachides terete or nearly so.

2. *S. acinacifolium* S. and G. sp. nov.
3. *S. guardiense* S. and G. sp. nov.

4. *S. lapazeanum* S. and G. sp. nov.

    ## Receptacles 2-edged (subangular), apex and margin serrate-dentate.

5. *S. Bryantii* S. and G. sp. nov.

    Series II. Acanthocarpicæ

    Tribe II. Glomerulatæ

    ## Rhachides terete

    ϕ Cryptostomata conspicuous.

6. *S. horridum* S. and G. sp. nov.
7. *S. Marchantæ* S. and G. sp. nov.

    ϕϕ Cryptostomata of leaves either minute or none

8. *S. Liebmanni* J. Ag.

    Tribe III. Biserrulæ

    # Illicifolia. Leaves more or less oblique at base

    ϕ Leaves ecostate

9. *S. Agardhianum* J. Ag.
10. *S. insulare* S. and G. sp. nov.

    Series III. Malacocarpicæ

    Tribe VI. Racemosæ

    # Acinariæ

    ϕ Cryptostomata almost absent or none

11. *S. Brandegeei* S. and G. sp. nov.

    ϕϕ Cryptostomata more or less conspicuous

    ψψ Vesicles spherical

12. *S. sinicola* S. and G. sp. nov.
13. *S. polyacanthum* f. *americanum* S. and G. f. nov.

    ## Glandulariæ

    ϕ Vesicles elongated, aristate

14. *S. Johnstonii* S. and G. sp. nov.
15. *S. Johnstonii* f. *laxius* S. and G. f. nov.
16. *S. Johnstonii* f. *gracile* S. and G. f. nov.

    ϕϕ Vesicles spherical

17. *S. cylindrocarpum* S. and G. sp. nov.

    ### Siliquosæ

    ϕ Younger receptacles rather cymose, confluent with the fertile rhachis, etc.

18. *S. herporhizum* S. and G. sp. nov.

    ϕϕ Younger receptacles swollen on a rhachis, etc.

19. *S. paniculatum* J. Ag.

RHODOPHYCEÆ

Family BANGIACEÆ

ERYTHROTRICHIA ARESCHOUG, Phyc. Scand., 1850, p. 209 (435 repr.)

Erythrotrichia polymorpha Howe

We have noticed scattered specimens, on various hosts, of a small, epiphytic red alga forming disks similar to those figured by Howe (1914, p. 77, pl. 29) for *E. polymorpha.* In one instance, Johnston, no. 32a, on *Dictyota hesperia,* they are sufficiently abundant to give the surface of the host a reddish hue. In no instance have we been able to observe the erect filaments from the center of the disks as figured by Howe (*l. c.,* figs. 8, 11-14), but according to Howe's idea the species may even come to complete maturity and reproduce without the development of these erect parts. We are placing our specimen here provisionally, awaiting further knowledge of the life-history of the species.

Howe, Mar. Alg. Peru, 1914, p. 77.

GONIOTRICHUM KUETZING, Phyc. Gen., 1843, p. 244,
in Linnæa, vol. 17, p. 89

We are not sure as to which one of the above publications may claim the priority in the publication of this genus. In neither work is reference made to the other. In Linnaea the name is a *nomen nudum.* We are considering the appearance in Phycologia Generalis as constituting the original publication.

Goniotrichum Alsidii (Zanard.) Howe

Growing sparsely on various species of algae. Seemingly particularly characteristic in Johnson, no. 167.

Howe, Mar. Alg. Peru, 1914, pp. 75, 76.

For a discussion of the literature and the reasons for the use of the above combination, see Howe (*loc. cit.*) whom we are following in placing this somewhat troublesome alga, troublesome as to its genetic relationship.

Family Gelidiaceæ

SCINAIA Bivona-Barnardi, *Scinaia*, etc., *in* L'Iride, 1822

For a discussion of the genus see Setchell, The *Scinaia* Assemb., 1914, p. 79 *et seq.*

Scinaia latifrons Howe

Cast ashore at Guaymas, Mexico, Marchant, nos. 53 and 57.

Howe, Phyc. studies V, 1911, p. 500; Setchell, *loc. cit.*

Several excellent specimens of this elegant species of *Scinaia* were taken at Guaymas. The only other known locality in the Gulf of California from which it has been reported is the type locality, La Paz.

Scinaia Johnstonæ Setchell

Dredged in 4-9 fathoms, Los Angeles Bay, Lower California. Johnston, no. 46. San Pedro Martir Island, Johnston, no. 106. Esteban Island, Johnston, no. 114.

Setchell, The *Scinaia* Assemb., 1914. p. 97.

The specimens here cited resemble very closely the type of the species as found at San Pedro, California, the type locality.

GELIDIUM Lamouroux, Essai, 1813, p. 41 (40 repr.)

Gelidium Johnstonii S. and G. sp. nov.

Plates 72, 73 and 46, a

Fronds flattened throughout, 7-12 cm. high, central axis up to 3 mm. wide, tapering abruptly at the base, and gradually upwards, dividing irregularly and more or less pinnately above into several segments, which in turn are 3-4 times regularly and pinnately divided; the ultimate, tetrasporic ramuli decidedly flattened; the ultimate, cystocarpic ramuli subcylindrical, cystocarps above the center; medulla composed of sparse cells and a few small scattered fibers, inner cortex of larger cells and abundant fibers, outer cortex of anticlinal rows of 3-4 cells.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 13, June; San Francisquito Bay, Lower California, Johnston, no. 27, June.

Type: No. 1343, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 27), in June, at **San Francisquito Bay, Lower California.**

Gelidium Johnstonii seems to be most closely related to *Fucus Amansii* Lamour. (Diss., 1805, p. 48, pl. 26, figs. 2-5) or *Gelidium Amansii* Lamour. (*in* Kuetzing, Tab. Phyc., vol. 18, 1868, p. 16, pl. 44). The original description and the figure represent a plant cylindrical throughout, with subdichotomous branching and acute ultimate ramuli. Our plant differs from this in being decidedly flattened throughout, and the branching is regularly pinnate. *G. Johnstonii* also resembles *G. Amansii* Okamura (Icon. Jap. Alg., vol. 3, 1913, p. 25, pl. 106). The tetrasporic ramuli in ours are more flattened and spatulate. Okamura does not figure nor describe the structure of the frond. We are thus in considerable doubt as to whether the two collections are identical, and incline to the belief that ours is an entirely distinct and undescribed species.

Gelidium decompositum S. and G. sp. nov.

Plate 71

Fronds flattened throughout, 6-9 cm. high, central axis up to 1.5 mm. wide, dividing irregularly into 4-7 primary branches, these in turn are densely 4-5 pinnately branched, pinnæ of each different order variable in length, nearly perpendicular to the axis of origin, many recurved, those of the third and fourth order often densely matted together; fibers absent in terminal and subterminal ramuli, scattered along the edges of the medulla of medium ramuli, scattered through the medulla in primary axes; cortex of a single row of palisade cells, subcortex of larger thick-walled cells; fruiting conditions unknown.

Growing on rocks in the lower littoral belt.

Type: No. 1344, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 23), in June, at **San Francisquito Bay, Lower California.**

Gelidium decompositum differs chiefly from *G. Johnstonii,* with which it seems somewhat closely related, in the greater irregularlity of the length of the pinnæ which are mostly very decidedly crowded together and stand more nearly perpendicular to the parts from which they arise, and in being smaller in all of their dimensions. The sub-cortex, and especially the cells of the medulla are decidedy larger and thicker walled.

Family GIGARTINACEÆ

GIGARTINA STACKHOUSE, Mém. soc. nat. Mosc., II, 1809

Gigartina Chauvinii (Bory) Mont.

Plate 46b and plate 70

Growing on rocks. San Esteban Island, Gulf of California, Johnston, no. 53, April; Georges Island, Gulf of California, Johnston, no. 101, April.

Montagne, Voyage Bonite, p. 72. *Sphaerococcus Chauvini* Bory, Voyage Coquille, no. 58, p. 165, pl. 26. *Chondroclonium Chauvini* Kuetzing, Tab. Phyc., vol. 17, 1867, pl. 70.

We have a series of plants listed under the above mentioned numbers which seem to be very close to the *Sphaerococcus Chauvini* of Bory, based upon the material collected by Lesson and Durville at Concepcion, Chile. Bory was confronted with the same difficulties, apparently, which have confronted us, viz. —a series of forms without any accompanying data as regards their habitat, variability, etc., and hence he finally grouped them under one species with three forms, α *latissimus,* β *intermedius* and γ *angustus*. Plate 70 may be taken as representing his widest form, and plate 46, figure b, as representing his narrowest form. Critical study of these various forms in their native habitat may reveal them to be distinct entities with wide, though limited, variations. For the present, with the scanty material at hand, we are grouping them all under one species.

Gigartina sp.

Johnston, no. 10a, represents a single small plant which seems to be unlike any known species. The specimen is sterile, and seems to be close to *G. tenella* Harvey. We are not venturing to name it.

GYMNOGONGRUS MARTIUS, Fl. Bras., I, 1833, p. 27

Gymnogongrus carnosus S. and G. sp. nov.

Plate 47, a, and plate 22, fig. 1

Fronds 7-10 cm. high, attached by a small disk-shaped holdfast, irregularly and subdichotomously branched, more or less flattened throughout, somewhat cartilaginous, gelatinizing readily in fresh water after drying; color purplish red; cystocarps relatively small, completely immersed in the tissues of the frond; tetraspores and antheridia unknown; medulla composed of large, rounded, thickwalled cells merging gradually into smaller subspherical cells of the subcortex, merging in turn into anticlinal rows of small, thick-walled cortical cells, 6-9 in a row.

Cast ashore.

Type: No. 1345, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 102), in April, at **San Pedro Martir Island, Gulf of California.**

The combination of characters of this species is not such as to make it unmistakably a member of the genus *Gymnogongrus.* It has a Gigartinaceous cystocarp, and the histological characters are mainly those of *Gymnogongrus.* The very gelatinous nature of the cell-walls, however, is quite different from those of all the known species of the genus.

DICRANEMA SONDER, Nova Algarum, 1845, p. 56

Dicranema rosaliæ S. and G. sp. nov.

Plate 22, fig. 6

Fronds 2-4 cm. high, 350-450 μ diam., sparsely and irregularly branched, cylindrical, tapering upwards to acute apices; medulla composed of a small group of compact, thick-walled, elongated cells, surrounded by about two layers of large, rounded thick-walled cells, with a few small angular cells interspersed just beneath the single layer of cortical cells more or less cubical in form; reproduction unknown.

Cast ashore. Santa Rosalia, across the bay from Guaymas, Mexico. Type, Marchant, no. 103.

Unfortunately all of the specimens of this species are sterile. We are placing them under *Dicranema,* basing our judgment wholly upon the vegetative characters.

CALLOPHYLLIS KUETZING, Phyc. Gen., 1843, p. 400, pl. 69, fig. 2, *in* Linnæa, vol. 17, 1843, p. 102 (*nom. nud.*)

Callophyllis Johnstonii S. and G. sp. nov.

Plate 51, a, b

Fronds 6-8 cm. high, 2-4 mm. wide, mostly tapering gradually upwards and more or less acute, consistency mucilaginous, color purplish, branching dichotomous to subdichotomous, angles relatively acute; medulla composed of thick-walled large cells, becoming smaller gradually outwards and interspersed with fine filaments; cortical cells small, easily separating into branched tufts; cystocarps scattered over the "disk" of the frond, numerous and prominent, often elongated lengthwise of the frond, with a single carpostome, not rostrate; antheridial plants thin and delicate; tetraspores unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1346, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 118), in June, at **Tortuga Island, Gulf of California.**

We have but a few specimens of this genus which seems sufficiently amply distinct from all known species to warrant its publication. Some specimens have, in addition to the regular larger branches, rows of short, closely set fimbriæ which bear fruit.

CALLYMENIA AGARDH, J. G., Algæ Med., 1842, p. 98

The original spelling is *Kallymenia.* The genus was founded upon *Rhodomenia Requienii* J. Ag., Symb., 1841, p. 12.

Callymenia pertusa S. and G. sp. nov.

Plate 49, b

Fronds thin and flabby, indefinite in form and size, rose colored, perforations numerous, relatively large, nearly circular, smooth; medulla composed of much branched, intertwined filaments passing rather abruptly on either side into a few relatively large angular cells in turn merging into short, 2-4 celled anticlinal rows, forming the cortex, the terminal cells in the rows being 4-6 μ diam., and 2-3 times as long; reproduction unknown.

Cast ashore.

Type: No. 1347, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 105), in April, at **San Pedro Martir Island, Gulf of California.**

Unfortunately the plants of this collection are too fragmentary and sterile to permit a complete diagnosis of the species. The habit is different from *C. perforata* J. Ag. and the perforations are different from those of *C. cribrosa* Harvey, while the structure is different from both.

Family Rhodophyllidaceæ

ANATHECA Schmitz, *in* Schmitz and Hauptfl., Rhodophyllidaceæ, *in* Engler and Prantl, Natürl. Pflanzenfam., 1896, p. 374

Anatheca elongata S. and G. sp. nov.

Plate 22, figs. 4, 5 and plate 69

Frond 15-18 cm. high, 5-8 mm. wide, irregularly branching into several elongated erect segments, and into numerous, short, subulate, perpendicular marginal pinnæ; medulla composed of a few small compact filaments, merging directly into large, rounded thick-walled parenchymatous cells with abundant contents, these becoming smaller, somewhat elongated radially and terminating in 2-3 layers of small, angular cortical cells; tetrasporangia 70-80 μ long, tetraspores zonate, terminal ones more or less conical; cystocarps and antheridia unknown.

Cast ashore.

Type: No. 1348, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 107), in April, at **San Pedro Martir Island, Gulf of California.**

The structure of this species of *Anatheca* is very similar to that of *A. furcata* S. and G. (1903, p. 310, pls. 23, 24) from Whidbey Island, Washington, but the plants are very much longer and narrower and the branching distinctly different. It is a much larger and coarser plant in every way than *A. dichotoma* Howe (1911, p. 502, pl. 29) from the Gulf of California.

EUCHEUMA Agardh, J. G., Nya Alg., 1847, p. 16

Eucheuma uncinatum S. and G. sp. nov.

Plates 67, 68

Fronds cylindrical, cartilaginous, 15-20 cm, up to 33 cm. high, 3-5 mm. diam., attached by a parenchymatous disk, branching freely into numerous long, slender, acute branches beginning near the base, all densely clothed with short, more or less branched, acute, uncinate, spinose, fructiferous ramuli; cystocarps occupying the base of the ramuli; antheridial and tetrasporic ramuli much more branched and uncinate than the cystocarpic; color purplish red.

Growing on rocks. San Francisquito Bay, Lower California, Johnston, no. 28, June; San Esteban Island, Gulf of California, Johnston, no. 54, April; Isla Partida, Gulf of California, Johnston, no. 80, July; Angel de la Guarda Island, Gulf of California, Johnston, no. 84a; North San Lorenzo Island, Gulf of California, Johnston, no. 86, June; San Esteban Island, Gulf of California, Johnston, no. 109, April; and Mazatlan, Mexico, Marchant, nos. 62 and 63, May.

Type: No. 1349, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 86), in May, at **North San Lorenzo Island, Gulf of California.**

The distinguishing characteristic of the species is the numerous branched, acute, uncinate ramuli. The ramuli are rarely branched, however, in the cystocarpic plants, which we have considered to belong to the species.

Eucheuma Johnstonii S. and G. sp. nov.

Plate 25, fig. 42 and plates 65, 66

Fronds cylindrical, cartilaginous, 40-50 cm. high, 3-6 mm. diam., gradually attenuated to acute apices; main frond extending nearly to the apex, profusely and alternately branched, branches of several orders, ultimate ramuli of short, acute spines, irregularly placed; cystocarps unknown; tetrasporangia 80-100 μ long, 30-40 μ broad; tetraspores zonate, very unequal in size, the two terminal ones apparently abortive.

Growing on rocks.

Type: No. 1350, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (Nos. 84 and 88b, tetrasporic plants), in June and July, at **Angel de la Guarda Island, Gulf of California.**

The plants of this species are apparently the largest that have yet been reported. The largest specimen measured over fifty centimeters and was broken off at the base so that the full length could not be ascertained. The extreme inequality in size of the tetraspores, so far as we are aware, has not before been reported. From the relatively small size of the two terminal ones in the sporangium, it would seem that they must be sterile. They are represented on plate 25, figure 42.

GELIDIOPSIS Schmitz, Mar. Florid., 1895, vol. 21, p. 148

Gelidiopsis tenuis S. and G. sp. nov.

Plate 22, fig. 2

Fronds 2-3 cm. high, 0.5-0.8 mm. diam., cylindrical, sparsely and alternately branched, long-attenuated, acute; reproduction unknown.

Cast ashore. Santa Rosalia, near Guaymas, Mexico. Type, Marchant, no. 104.

We have very little data upon which to base this species since all of the scanty material at our disposal is sterile. The structure of the fronds seems clearly that of a *Gelidiopsis,* and the size and method of branching seem to be distinct, differing sufficiently from all the few known species to warrant giving to it specific rank, awaiting further data with which to verify the conclusion. The medullary structure is denser than that of *G. variabilis* Harvey, from Ceylon.

GRACILARIA Greville, Alg. Brit., 1830, p. 121

Gracilaria Vivesii Howe

Plate 64

Cast ashore. Guaymas, Mexico, Marchant, no. 55.

Howe, Phyc. Studies V, 1911, p. 503, pls. 30 and 33.

The type locality of *G. Vivesii* is La Paz, Lower California. Although we have fairly extensive collections by Johnston, Marchant and Brandegee from this locality, nothing among them seems to agree with Howe's description and figures of the species. The specimens which we have here allied with this species seem to agree perfectly so far as color, form and structure are concerned. The plant figured on plate 64 is considerably larger (about twenty-four centimeters high) than the measurements given by Howe for his La Paz plant, but this is the largest of several specimens in the collection, and has a few more dichotomies than the type. We have a single plant with young cystocarps, rather sparsely scattered over the frond. The other specimens are sterile. Howe had only sterile and antheridial plants.

Gracilaria lichenoides (L.) Harv.

Growing in the sublittoral belt. Coyote Bay, or Concepcion Bay, Lower California, Johnston, no. 14, June.

Harvey, Alg. Tasm., 1844, p. 445.

The plants of this collection are sterile. They have the habit of *Fucus lichenoides* of Turner (Fuci, vol. 2, 1809, pl. 118) although they resemble *G. confervoides* as figured by Harvey, in Phyc. Brit., vol. 1, 1846, pl. 65. There is a rather more abrupt transition to two layered cortex than in the plant figured by Kuetzing for *G. lichenoides* in Tab. Phyc., vol. 18, 1858, pl. 81, b, otherwise the structure is practically the same.

Gracilaria vivipara S. and G. sp. nov.

Plate 24, figs. 28, 29 and plate 63

Fronds flat, 15-20 cm. up to 30 cm. high, 1.5-2.5 cm. up to 4 cm. wide, branching sub-dichotomous to flabellate-polytomous, segments decidedly cuneate, apices rounded, more or less rolled along the margin, with numerous proliferations of various shapes; main fronds up to 600 μ thick in the lower parts, terminal lobes much thinner; medulla composed of 4-5 more or less indefinite layers of thick-walled, subspherical cells, up to 400 μ diam., and with very sparse contents; the medulla merging rather abruptly into the subcortical tissue composed of a few rounded cells abundantly supplied with contents, and these merging into the cortex composed of 2-3 layers of cuboidal cells or at times slightly elongated radially; cuticle up to 10 μ thick; tetrasporangia numerous, distributed over the main parts of the fronds; cystocarps rather sparse, distributed over the frond; antheridia unknown; color dark violet purple.

Dredged from 4-6 fathoms. Smith Island, Gulf of California, Johnston, no. 61, June.

Type: No. 1351, Herb. Calif. Acad Sci., collected by Ivan M. Johnston (No. 36), in June, at **Los Angeles Bay, Lower California.**

This species of *Gracilaria* resembles in general form no other described species of the genus. It is much larger than *G. Cunninghamii* Farlow, much more proliferous and flabby than either *G. Vivesii* Howe or *G. peruana* Picc. and Grun., and is decidedly different from *G. Johnstonii* of this paper, although it seems to have its nearest relatives in these species.

Gracilaria pinnata S. and G. sp. nov.

Plate 61

Fronds flattened, sub-cartilaginous, 8-10 cm. high, 3-4 mm. wide, pinnately branched, the branches and terminal pinules all tapering gradually to acuminate apices; marginal pinules either alternate or secund; medulla composed of elongated cells in transverse section, decreasing in size toward the margins; cortex composed of 2 layers of small cuboidal cells; reproduction unknown; color purplish red.

Dredged in 4-6 fathoms.

Type: No. 1352, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 44), in June, at **Los Angeles Bay, Lower California.**

The basal portions of all of the plants in this collection are lacking. The plants, however, have the appearance of being nearly complete. They are all sterile. The method of branching and flatness of fronds allies them with J. G. Agardh's subgenus Podeum, but it does not agree with any of the species described under this section of the genus.

Gracilaria sinicola S. and G. sp. nov.

Plate 62

Fronds dark flesh colored, decidedly coriaceous, 15-20 cm. up to 30 cm. high, 2-3 cm. wide, dichotomously branched 4-6 times, segments only slightly cuneate, margins smooth, entire or at times slightly proliferous; terminal segments blunt, rounded, angles rounded; medulla composed of large rounded cells, merging into a few small spherical subcortical cells; cortex composed of 4-6 layers of small cuboidal cells, the surface layer two times as long radially as broad; cuticle 8-10 μ thick; cystocarps and antheridia unknown; tetrasporangia abundant, spread over the whole surface of the upper parts of the frond.

Type: No. 1353, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 108), in April, at **San Esteban Island, Gulf of California.**

Gracilaria sinicola is closely related to *G. Vivesii* Howe but the fronds are more rigid and coriaceous, are darker colored, have more acute angles, longer segments and a thicker cortex.

Gracilaria Johnstonii S. and G. sp. nov.

Plate 22, figs. 11-14 and plate 60

Fronds coriaceous, flat, 12-18 cm. up to 28 cm. high, 1-1.5 cm. wide, branching mostly poly-chotomous, segments mostly narrowed below, margins smooth, free from proliferations, terminal segments blunt, round, angles mostly rounded, color purplish red; medulla composed of large thick-walled cells merging into smaller, more or less spherical storage cells; cortex composed of 3-5 layers of small cells; cuticle 8-10 μ thick;

tetrasporangia numerous, scattered over the upper parts of the whole frond; cystocarps numerous, large and prominent, somewhat flattened; antheridia unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1354, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 62), in July, at **Isla Partida, Gulf of California.**

Gracilaria Johnstonii resembles in habit some of the wider forms of *G. multipartita* (Clem.) Harv. but the smallest specimens are larger than the widest of that species.

Gracilaria pachydermatica S. and G. sp. nov.

Plate 24, figs. 30, 31

Fronds attached by a small disk, cylindrical to slightly flattened, caespitose, 3-5 cm. high, 1.5-2.5 mm. diam., branching dichotomous, angles acute, color coral red; medulla composed of cells relatively uniform in size, nearly circular in cross section, merging almost directly into the cortex composed of 2-3 layers of cells except towards the base where it becomes 10-20 cells thick, parenchymatous, arranged in radial rows; reproduction unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1355, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 122), in June, at **Tortuga Island, Gulf of California.**

The habit of *Gracilaria pachydermatica* is close to the habit of *Sphærococcus obtusus* Kuetzing, (Tab. Phyc., vol. 19, 1869, pl. 21) from Ceylon. The fronds are more regularly dichotomous, much more densely cæspitose, and has the much thickened cortex on the stipe. Nothing is known of the reproduction in either species.

Gracilaria crispata S. and G. sp. nov.

Plate 22, figs. 7-10 and plate 44, a

Fronds complanate throughout, 4-7 cm. high, 400-600 μ thick, attached by a very small disk; color dark purplish red; branching polytomous into several distinct main branches, each again dividing into several smaller segments with crisped margins and finally terminating in very numerous fine flattened ramuli; fronds composed of 3-5 layers of medullary cells very variable in size, up to 200 μ diam. and subspherical, merging into 2-3 layers of smaller subcortical cells giving rise to anticlinal rows of 2-4 cells, the outer usually considerably elongated; cuticle 4-6 μ thick; tetrasporangia among the anticlinal cells, 40 μ long, 30 μ broad; antheridia arising from subcortical cells, borne in pockets irregular in shape and size surrounded by elongated cortical cells; mature cystocarps wholly superficial, scattered over the whole frond, mostly apiculate, placentæ narrow at base, extending upward and branching in all directions.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 51, May.

Gracilaria crispata has very much the same habit as *G. Millardetii* (Mont.) J. Ag. in the section Podeum of J. Agardh (Epicr., p. 422) but has apparently more of the structure of the members of his section, Pachycladia. Our plants are much smaller and much more profusely branched, especially so at the outer ends of the secondary branches. The placenta of the cystocarp has a structure worthy of note as being quite distinct from any which have been described in the genus. Contrary to the general rule, the base of the placenta is relatively small. The sterile, almost parenchymatous, mass of cell extends upward through the cavity of the cystocarp, branches in all directions, and finally terminates in simple spore bearing threads, giving rise to chains of carpospores.

The antheridia are similar to those described by Howe (Phyc. Studies, 1911, p. 503, pl. 33, figs. 1-5) in *G. Vivesii,* but the crypts are not so extensive as he illustrates for that species. The tetrasporangia are of the characteristic type, and occur in the narrow cortex of the anticlinal cells. The cortex in the cystocarpic plants is composed quite uniformly of two cells in the anticlinal rows except in the wall of the cystocarp which has several cells in a row. There is a much more abrupt change from the subcortical cells to the anticlinal cells than in either the tetrasporic or the antheridial plants. The antheridial plants are more laciniately divided and are less crisped along the margins than either the tetrasporic or cystocarpic plants.

Gracilaria subsecundata S. and G. sp. nov.

Plate 23, figs. 26, 27 and plate 59

Fronds subcylindrical, attached by a small disk, 10-14 cm. high, 1-2 mm. wide, branching variable, dichotomous, dichotomopalmate, distichous and secund, attenuated upwards and acute; medullary cells more or less angular, irregular in shape and size, merging into smaller parenchymatous cells radially elongated, these terminating in anticlinal rows 3-4 cells long; cystocarps and antheridia unknown; tetrasporangia of the usual *Gracilaria* type.

Cast ashore. Guaymas, Mexico. Type, Marchant, no. 56, May.

This species of *Gracilaria* is decidedly distinct from all of the others collected in the Gulf of California, and indeed seems to have no close relative outside of the Gulf. The relatively delicate acute fronds and the diversity of methods of branching are distinguishing characters.

Gracilaria lacerata S. and G. sp. nov.

Plate 51, C

Frond flattened, 6-8 cm. high, 2-5 cm. wide, color dark coral red, branching more or less irregular, margins somewhat proliferous, serrate, with scattered teeth, lenticular in cross section; medulla composed of thin-walled parenchymatous cells, surrounded by a few small angular cells, the whole clothed in a single layer of small, cuboidal cortical cells; cystocarps and antheridia unknown.

Cast ashore. Santa Rosalia, near Guaymas, Mexico. Type, Marchant, no. 102, May.

The plants of this species apparently have been subjected to abnormal treatment. They are covered with foreign material, and appear to be more or less battered. The tetrasporic plants have the characteristic tetraspores of the genus. It undoubtedly belongs to J. Agardh's section Podeum, and is possibly near to *G. corticata* J. Ag. and to *G. dentata* J. Ag., but is more lacerate or dentate than the former, and broader, thinner and less acutely dentate than the latter.

Gracilaria sp.

Plate 58

We have a few sterile specimens, Johnston, no. 123, of a species which seems to belong to the genus *Gracilaria,* and is well illustrated as to size and method of branching on plate 58. The structure is somewhat different from typical *Gracilaria* and having no fruit we list it here under this genus without a name.

Gracilaria sp.

We have three fragments of plants under Marchant, no. 64, which have the general appearance of *Gracilaria confervoides* but whose structure is quite different from the structure of that species as represented by Thuret and Bornet in Etudes Phycologiques, plate 40. The fronds are cylindrical, slightly branched and long attenuate. The medullary cells are up to 300 μ in diameter and change rather abruptly into two or three layers of smaller cells and finally these into anticlinal rows of four to six cells.

It is possibly near to *Gracilaria dura* (Ag.) J. Ag., but is much less branched than that species. We list it here with the hope that better material may be found, when its correct classification may then be made out.

CORALLOPSIS Greville, Alg. Brit, Syn., 1830, p. LIII

Corallopsis excavata S. and G. sp. nov.

Plate 23, figs. 24, 25 and plates 44, b, and 48

Fronds terete, cæspitose, 8-14 cm. high, 1-2 mm. diam., attached at first by a small disk, later by branched, creeping filaments or fronds, giving rise to numerous erect fronds; branching on all sides, alternate or opposite, often becoming fasciculate at the top, at times producing whorls of short, subulate ramuli mostly at the nodes; young plants and terminal ramuli of mature plants, particularly tetrasporic plants, deeply constricted at regular intervals forming fusiform segments, medulla composed of a loose network of fine filaments in the tetrasporic region, terminating toward the surface in anticlinal rows of cortical cells; in the vegetative region composed of narrow, parenchymatous cells elongated lengthwise of the filaments, merging into large cells, cells of the subcortex and terminating in short anticlinal rows of the cortex; color dark coral red; tetrasporangia numerous in cavities opening at several points in the fusiform segments, or internodes; tetraspores variable, mostly cruciate; cystocarps numerous, very prominent spherical to urn-shaped, placentæ large, dense, much elevated, pericarp thick, composed of anticlinal rows of small dense cells, carpostome small, single, carpospores very numerous, 7-10 μ diam., in radiating rows from the large placenta; antheridia unknown.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Johnston, no. 12, June; Tortuga Island, Johnston, no 21, June; Isla Partida, Johnston, no. 59, July; San Esteban Island, Johnston, no. 116, April; Angel de la Guarda Island, Johnston, nos. 129 and 130, June, all in the Gulf of California.

Type: No. 1356, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 59 with tetraspores, and No. 21 with cystocarps), in June and July, at **Tortuga Island and Isla Partida, Gulf of California.**

This interesting and apparently unique plant seems to be pretty generously distributed in the Gulf. We are in some doubt as to the genus to which it belongs. Judging from the description only, of the genus *Corallopsis* Grev., it seems best for the present to ally it with that genus. We have no specimens of any species of the genus for comparison. Indeed, most of the species have been imperfectly described. Its internal structure is differentiated into three tissues, whereas the description of the genus calls for only two. The structure of the cystocarp agrees very well with the generic description. Tetraspores have been described in only one species, viz.; *C. aculeata* (Her.) Holmes (New Mar. Alg., 1894, p. 336, pl. 18, fig. 16-20). The tetraspores in this species are regularly cruciate, but are developed near the surface in the anticlinal rows. The tetraspores of ours are developed in cavities extending to the center of the swollen, almost moniliform, portions of the ramuli. The tetraspores escape through numerous openings on the surface (plate 23, fig 25). We know of no other plant which has tetraspores borne in this way. It may thus become necessary, after a careful study of the species, especially of the antheridial plants, to create a new genus for its reception.

HYPNEA Lamouroux, Essai, 1813, p. 43

Hypnea pannosa J. Ag.

A few scattered specimens of a *Hypnea* which seems to belong to this species have been found among the Johnston specimens.

J. G. Agardh, Nya. Alg., 1847, p. 14.

Hypnea Johnstonii S. and G. sp. nov.

Plate 23, fig. 19-21 and plate 57

Fronds densely cæspitose, 7-10 cm. high, 1.5-2.5 mm. diam. freely branching near the decumbent base into long, rigid, tapering branches, these in turn producing numerous, aculeate ramuli on all sides, gradually reduced in length towards the apices; apices rounded, not terminated by a single cell; tetrasporangia borne on very short, densely branched, acuminate, fructiferous ramuli not constricted at the base; tetraspores zonate; cystocarps and antheridia unknown; color dark red.

Growing on rocks in the upper sublittoral belt. Tortuga Island, Culf of California, Johnston, no. 125, May; Angel de la Guarda Island, Gulf of California, Johnston, no. 1, June.

Type: No. 1357, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 1), in June, at **Angel de la Guarda Island, Gulf of California.**

Hypnea Marchantæ S. and G. sp. nov.

Plate 23, figs. 22, 23 and plates 42, a, and 56

Fronds cæspitose, 8-14 cm., up to 20 cm., high, up to 1 mm. diam., branching very irregular, of 5-8 orders, becoming smaller at each successive branching and more or less contorted, clothed throughout with short, relatively simple, perpendicular, sterile branches of varying lengths and in part with densely crowded, subulate, acute, more or less branched, fructiferous ramuli; tetrasporangia in swollen parts of the ramuli, usually some distance from the broad base; antheridia and cystocarps unknown; ramuli terminating in a single growing cell.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 48, May.

This species is to be distinguished from *H. Johnstonii* in being much longer, more delicate, in having more orders of branching, more densely crowded, less branched and more attenuate fructiferous ramuli, and in having a single apical cell instead of a group.

CORDYLECLADIA J. G. AGARDH, Sp. Alg., vol. 2, 1852, p. 702

Cordylecladia lemanæformis (Bory) Howe

"Sublittoral, on sandy beach. Very common." Los Angeles Bay, Lower California, Johnston, no. 35, June; La Paz, Lower California, Johnston, no. 48, April, and Marchant, no. 69, May.

Howe, Mar. Alg. Peru, 1914, p. 128. *Gigartina lemanæformis* Bory, Voy. Coquille, Bot. Crypt., 1828, p. 151. *Cordylecladia Andersonii* Grun. (in part) *in* Piccone Alg. Vettor Pisani 1886, p. 62.

We have a series of fine specimens of plants which we are referring to this species. They very much resemble some forms of *Gracilaria confervoides,* but they are much more profusely branched, decidedly more delicate, longer attenuate upward and are acute. The medulla is composed of large parenchymatous cells, merging abruptly into a rather thick cortex, composed of very small cells. The cystocarps are external, quite small, and somewhat flattened, with a broad flattened placenta. The color is light brown to almost black. The plant agrees fairly well with Bory's description (*loc. cit.*) and in part with that of Grunow (*loc. cit.*) who based his description of *C. Andersonii* in part upon plants collected by d'Urville at Paita, Peru, and in part upon plants collected by Anderson on the coast of California, but our knowledge of the species comes through the description and figure of Howe.

Family Bonnemaisoniaceæ

ASPARAGOPSIS Montagne, Phyt. Canar., 1840, p. XV

Asparagopsis Sanfordiana f. amplissima S. and G. f. nov.

Plate 22, fig. 3 and plate 41

Fronds up to 25 cm. high, several arising from creeping filaments attached to rocks at various points; primary branches very densely crowded, plumose, 3-5 cm. long, arising on all sides; antheridia in dense cylindrical clusters at the ends of the ramuli.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 37.

This form differs from the species principally in being much more ample in all of the upper branching portions. Apparently the antheridia have not previously been seen. We are describing and figuring them here.

Family Rhodomelaceæ

LAURENCIA Lamouroux, Essai, 1813, p. 42

Laurencia obtusiuscula S. and G. sp. nov.

Plate 23, fig. 17 and plate 55

Fronds 10-18 cm. high, terete; main axis mostly percurrent, 1-2 mm. diam.; secondary branches distant, alternately branched on all sides, all of the branches being long and slender and more or less crooked; color dark purple. The short lateral branches bearing the fructifications sub-verticellate; fructiferous ramuli several, frequently themselves branched, arising on all sides, forming conical shaped groups; cells of the main axis 25-35 μ diam., 2.5-3.5 times as long, ellipsoidal; cells of the fructiferous ramuli equilateral or slightly wider than long; cystocarps lateral on the ramuli, occupying the position of ultimate ramuli, flaskshaped with short neck, sessile, 600-700 μ diam.; tetrasporic ramuli cylindrical, up to 500 μ diam., blunt, scarcely constricted at the base; antheridia unknown.

Cast ashore. Eureka, near La Paz, Lower California, Marchant, nos. 40 and 46; La Paz, Lower California, Marchant, no. 67. Type, Marchant, no. 46, May.

Laurencia obtusiuscula seems, from its structure and general habit of growth, to be related rather closely to *L. papillosa* (Forsk.) Grev. but it differs very decidedly from that species as represented by Kuetzing (Tab. Phyc., vol. 15, pl. 62, a, b) in the character of the fructiferous ramuli. Those of *L. obtusiuscula* are cylindrical while those of *L. papillosa* are very short and broadly clavate, the younger ones subspherical. It seems best to coincide with the characters set forth by J. Agardh (Epicr., 1876, p. 653) for his group "Obtusæ," and is probably close to *L. obtusa* (Huds.) Lamour. or some described form.

Laurencia obtusiuscula var. corymbifera S. and G. var. nov.

Plate 23, figs. 15, 16 and plate 45, b

Fronds 4-7 mm. high, branching at the base into several main branches, ramuli sub-verticellate, the ultimate fructiferous ramuli crowded on short branches forming dense clusters; cystocarps and antheridia unknown; tetrasporic ramuli cylindrical, slightly constricted at the base.

Growing on rocks in the upper sublittoral belt.

Type: No. 1358, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 18b), in June, at **Tortuga Island, Gulf of California.**

A few specimens of this plant were separated from a collection from Tortuga Island which resemble those which we have called *L. obtusiuscula.* They differ decidedly in general aspects as comparison of the figures of the two, as here produced, readily show. The plants of var. *corymbifera* are much smaller, however we are unable to state whether these are typical specimens or otherwise. The tetrasporic plants are all which we have for study and these bear a close resemblance to *L. corymbifera* Kuetz. (Tab. Phyc., vol. 15, pl. 56, a, b) the tetrasporic ramuli are more numerous, however, and are not disposed in quite the same manner, and are more nearly cylindrical. If further discoveries should reveal these to be typical plants, the variety should doubtless be given specific rank.

Laurencia obtusiuscula var. laxa S. and G. var. nov.

Plate 29, fig. 67 and plate 52, b

Fronds 5-8 cm. high, up to 1 mm. diam., branching into several main branches, ramuli less numerous and more scattered than in the species; cystocarps and antheridia unknown.

Cast ashore. Guaymas, Mexico. Type, Marchant, no. 41, May.

We have but a few tetrasporic specimens of this plant upon which to base our judgment. They are very much smaller in general stature and much less profusely branched than *L. obtusiuscula*. The characters of the cells and of the tetrasporic ramuli agree very well with *L. obtusiuscula*. Further investigation to determine the typical size, and the discovery of cystocarpic and antheridial plants may reveal characters sufficiently different to warrant specific rank for it.

Laurencia paniculata (Ag.) J. Ag. f.

Growing on rocks in the lower littoral belt. San Francisquito Bay, Lower California, Johnston, no. 30b, June; Isla Partida, Gulf of California, Johnston, no. 69, June.

The plants of these collections agree fairly well with the descriptions of *L. paniculata* J. Ag. (not *L. paniculata* Kuetz.) and with Kuetzing's figure of *L. glandulifera* (Tab. Phyc., vol. 15, pl. 59, fig. c). Howe (Phyc. Studies V, p. 508) listed a plant of the Vives collection under *L. paniculata* from La Paz, Lower California. The plants of the Johnston collection are probably of the same species. Howe states that the Vives' plants are more slender and the ultimate branches more elongate than the specimens under that name distributed from

Southern California in Phycotheca Boreali-Americana, no. 1093. Our plants are likewise more slender and smaller and not so regularly branched as are the California specimens. We have not had any authentic specimens of *L. paniculata* J. Ag. for comparison, but judging from the descriptions alone, we feel that our plants are not identical with Agardh's. The surface cells throughout the whole length of the main axis are of about the same dimensions, approximately 20 μ across, and occasionally slightly longer than broad. The semiwhorled arrangement of the ultimate ramuli are the same in the Johnston plants as is figured by Kuetzing for *L. glandulifera.* More critical study will be required to establish definitely the specific rank of these forms.

Laurencia estebaniana S. and G. sp. nov.

Plate 24, fig. 34 and plate 45, a

Fronds more or less compressed, 7-10 cm. high, 2-4 mm. broad, considerably distorted; main stem somewhat percurrent with branches at times nearly as long, branching pinnate to alternate, subdistichous, with branches more or less decurrent, fructiferous ramuli in dense glomerules on short ramuli, the glomerules at times distichous and sub-opposite, at times alternate or more or less verticellate; the antheridial ramuli numerous, short-turbinate; tetrasporic and cystocarpic ramuli nearly cylindrical; surface cells on the main frond 10-14 μ diam., 1.5-2 times as long as broad, on the fructiferous ramuli length less than the diameter; antheridia in dense, much branched pyramidal clusters, the apical cell of each main cluster pedicellate, sub-spherical, 20-25 μ long, 16-20 μ broad; antheridia 2-3 μ diam.

Growing on rocks at San Esteban Island, no. 53c, in April and Smith Island, no. 89, in June.

Type: No. 1359, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53c), in April, at **San Esteban Island, Gulf of California.**

Laurencia estebaniana seems to have no close relatives on the Pacific Coast. It clearly belongs to Group IV, Pinnatifidæ, of J. Agardh (Epicr., 1876, p. 655) in which he groups all of the species with flattened or partially flattened fronds. Most of the fronds of *L. estebaniana* are decidedly flattened, but some of them are more or less terete above, and somewhat angled where the branches are decurrent. It is apparently most closely related to *L. flexuosa* Kuetz. but the tetrasporic ramuli are not arranged in whorls as represented by Kuetzing (Tab. Phyc., vol. 15, pl. 68) for that species.

Laurencia Johnstonii S. and G. sp. nov.

Plates 52, a, and 53

Frond up to 15 cm. high, cylindrical, slender throughout, attached by repeatedly branched rhizoidal filaments; primary axis percurrent, up to 1.5 mm. diam.; virgate, the secondary branches at times as long as the primary axis and clothed with very numerous, densely crowded, tertiary branches and ultimate fructiferous ramuli; color dark purple, black on drying; cells of the main axis equilateral to slightly longer than broad, with rounded angles; cells of the fructiferous ramuli slightly broader than long; fructiferous ramuli cylindrical, considerably constricted at the base, 375-425 μ diam., numerous, arising on all sides, of very numerous, short sub-ultimate ramuli, flask-shaped; antheridia unknown; terminal hairs in dense clusters, profusely branched, up to 130 μ long.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 127, June; San Francisquito Bay, Lower California, Johnston, No. 30a, June.

Type: No. 1360, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 127), in June, at **San Marcos Island, Gulf of California.**

Laurencia sinicola S. and G. sp. nov.

Plate 29, figs. 65, 66 and plate 50, a

Frond epiphytic, attached by a creeping thallus, decidedly compressed, 3-6 cm. long, 2-4 mm. broad, sparsely and pinnately branched, with branches at times as long as the main frond; surface cells of the main axis more or less ellipsoidal, 45-55 μ long 25-30 μ broad; fructiferous ramuli pinnately arranged, not constricted at the base, the antheridial tuberculate, the tetrasporic clavate-tuberculate, surface cells on the main frond 10-14 μ diam., 3-5 times as long; antheridia in loose paniculate clusters, the apical cell of each main cluster being pyriform, 7-9 μ long, 5-7 μ broad.

Growing on *Sargassum* sp. Eureka, near La Paz, Lower California, Marchant, nos. 34 and 47, May; San Marcos Island, Gulf of California, Johnston, no. 126, June. Type, Marchant, no. 47.

Laurencia sinicola is distinct in its gross morphological characters from all of the known species of *Laurencia* in the small size combined with the flattened frond. Its antheridial clusters are loose and composed of very delicate branches. The antheridia are small, 2-3 μ in diameter. It seems to be nearly related to *L. spectabilis* Post. and Rupr. but is very much smaller in all of its parts, less regularly pinnately branched and is epiphytic instead of growing on rocks.

Laurencia papillosa var. pacifica S. and G. var. nov.

Plate 23, fig. 18; plate 24, fig. 33; plate 43, a, b, and plate 54

Fronds pyramidal, 9-13 cm. high, main axis percurrent; fructiferous ramuli short, turbinate; antheridial and tetrasporic ramuli with several lobes around the terminal depression; antheridia borne in whorls on an axis terminated by a single large pyriform cell; color dark purple, almost black on drying; cystocarps not observed; cells on the surface of the main axis polygonal, closely appressed, thin, firm walled, 18-22 μ diam.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 9, June; Eureka, near La Paz, Lower California, Marchant, no. 38, May. Type, Marchant, no. 38.

We have examined some of the co-type material of *L. papillosa* (Forsk.) Grev. and find that the ultimate fructiferous ramuli are sub-spherical, in this respect agreeing very well with the figures of Kuetzing in Tab. Phyc., vol. 15, pl. 62, figs. a, b. Our plants agree very well in general form and method of branching with the descriptions of *L. papillosa* but the fructiferous ramuli in ours are much less numerous and not so densely crowded, are short and much more broadly turbinate than in the co-type material or as shown in Kuetzing's figures.

Comparison with Howe's plant, no. 128, of *L. papillosa* from the Bahamas, shows a considerable difference in the character and size of the surface cells. Ours are about 20 μ in diameter, are thin walled and are densely crowded together, while his are about 40 μ in diameter and are somewhat thicker walled. The antheridial and tetrasporic ramuli of var. *pacifica* are broadly turbinate with several distinct lobes surrounding the terminal depression.

Laurencia sp.

Plate 29, figs. 68, 69

Among the specimens of the Marchant collection a terminal fragment of a branch from a tetrasporic plant was found (Marchant no. 76) which approximates to the description of *L. virgata* (Ag.) J. Ag. The tetrasporic ramuli are about 5 mm. long, and occur in very dense clusters alternately arranged on the stem so that the main stem is almost obscured. These ramuli are cylindrical and about a half millimeter in diameter. It is distinct from any of the other Mexican species but too fragmentary to justify a name.

CHONDRIA Agardh, Syn. Alg. Scand., 1817, p. XVIII

Chondria acrorhizophora S. and G. sp. nov.

Plate 40, b

Fronds 4-5 cm. high, 500-700 μ diam., decompositely branched from near the base; main frond at times percurrent, more frequently divided into several secondary branches, the lower branches longest, forming a flat top, more or less resembling an inverted cone; the ultimate, tetrasporic ramuli numerous on all of the branches of different orders, 1-1.5 mm. long, standing at about 45° angle, constricted at the base, curved at times almost cirrhose at the apices; apices of the main branches nude for some distance, acute, usually uncinate; the subterminal ramuli frequently developing dense clusters of rhizoidal cells;

pericentral cells 5, large, surrounded by one layer of smaller, thick walled, angular cells, and the cortex composed of a single layer of cells; cortical cells thick walled, irregular in shape, 2-6 times as long as broad in surface view, decidedly elongated radially in cross section; pericentral cells of the lower parts of the main fronds having parts of the walls very much thickened.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 44, May.

Chondria acrorhizophora resembles in form and size *C. lanceolata* Harv. but our specimens are terete throughout while *C. lanceolata,* as figured by Harvey in Phyc. Austral., plate 239, is flattened. A nearer relative, as it seems to us, may be found in *C. tenuissima f. californica* Collins, in Phy. Bor. Amer. (Exsicc.) no. 636, from La Jolla, Calif. These plants are more robust than ours and have a distinctly different cell structure.

POLYSIPHONIA GREVILLE, Fl. Edin., 1824, p. 308

Polysiphonia Johnstonii S. and G. sp. nov.

Fronds ecorticate, relatively rigid, 5-8 cm. high, up to 1 mm. diam. at the base, tapering gradually from the base upwards, branched dendritically near the base into several primary branches moderately wide-spreading, which in turn are repeatedly branched alternately and terminated by dense fascicles of fructiferous ramuli which finally terminate in dense fascicles of long branched hairs; pericentral cells 6, up to 1 mm. long at the base of the fronds, reduced in length above becoming quadrate or less in the ramuli; color dark brownish red, almost black on drying; cystocarps supported on short pedicels, numerous on the terminal ramuli, sub-spherical 450-500 μ diam., clothed with large quadrate cells 60-70 μ diam., antheridia in terminal, pyramidal, dark colored clusters. Tetrasporangia unknown.

Growing on *Gracilaria* sp.

Type: No. 1361, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 110), in April, at **San Esteban Island, Gulf of California.**

There are no *Polysiphonias* with six pericentral cells which at all approximate to the characters of this Mexican form.

Our plant varies in almost every detail from any of the described species. In some respects it may perhaps be considered close to *P. decipiens* Mont., which has seven pericentral cells, but differs in other respects. As figured by Kuetzing, Tab. Phyc., vol. 13, pl. 65, figs, c-e, the growing apices of *P. decipiens* are much more blunt and lack the fine terminal divisions and fascicles of hairs so characteristic in ours.

Polysiphonia Marchantæ S. and G. sp. nov.

Plate 49, a

Fronds 5-8 cm. high, 450-550 μ diam. at the base, ecorticated, main branching sub-dichotomous, ramuli alternate, distant, divaricate, terminating in a fascicle of long branched hairs; color dark red; pericentral cell 5; 3-4 times as long as broad below, 0.5-1 times above; cystocarps on short pedicels, slightly beaked, 380-420 μ diam.; tetrasporic ramuli relatively short and considerably distorted; tetrasporangia few, near the ends of the ramuli, spherical, prominent, 80-110 μ diam.

Cast ashore at Guaymas, Marchant, no. 50; Eureka, near La Paz, Lower California, Marchant, nos. 52, 83, and 84; La Paz, Marchant, no. 66 and Brandegee, no. 12. Type, Marchant, no. 66. The Marchant plants were all collected in May, 1917.

This five-siphoned species seems to be quite generally distributed in the Gulf of California. Having been cast ashore among other algæ, the habitat and the character of the attaching parts will have to remain subjects for future investigation.

The very large and relatively short cells and the size and general appearance of the plant are characters very similar to those of *P. Johnstonii* of this paper. There is a constant difference in the number of pericentral cells, and differences in details of dimensions of parts which, along with differences in the character and method of branching, render the two distinct species.

Polysiphonia forcipata Harvey (Mar. Bot. of West Australia) seems to be a near relative of *P. Marchantæ,* as far as we may judge from the description. The figures of Kuetzing in Tab. Phyc., vol. XIV, pl. 44, figs. a-d, represent a plant of *P. forcipata* much more blunt, lacking the numerous small terminal divisions and fascicles of branched hairs which are prominent in ours. *P. forfex* Harvey, Phyc. Austr., pl. 96, considered by De Toni, Syll. Alg., vol. IV, p. 921, as a synonym of *P. forcipata,* has six pericentral cells and the forcipate ramuli much more blunt than ours.

Polysiphonia sinicola S. and G. sp. nov.

Fronds ecorticate, 7-10 cm. high, 250-350 μ diam. at the base, tapering only in the upper parts, branching alternate on all sides; ramuli strict, substance soft and flabby, color flesh red, pericentral cells 6; reproduction unknown.

Growing on rocks in the lower littoral belt.

Type: No. 1362, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 41), in June, at **Los Angeles Bay, Lower California.**

It may seem presumptuous to describe another *Polysiphonia* from the small amount of material at our disposal and particularly so when the same is completely sterile. The six siphoned species appear to be rather scarce and the morphological characters of this one seem sufficiently different from any known form to warrant giving this one a name, awaiting further investigation to establish its independence.

DIGENEA AGARDH, Sp. Alg., vol. 1, part 2, 1822, p. 388

Digenea simplex (Wulf.) Ag.

Cast ashore. La Paz, Lower California, Brandegee, no. 33.

Agardh, Sp. Alg., vol. 1, part 2, p. 389. *Conferva simplex* Wulfen, Crypt. Aquat., 1803, p. 17, n. 16.

The specimens of this collection are all sterile. Structurally they appear to be very similar to the specimens distributed in Collins, Holden and Setchell, Phyc. Bor. Amer., nos. 143 from Florida and 1939 from Bermuda.

HETEROSIPHONIA Montagne, Prod. Phyc. Pol. Antarct., 1842, p. 4.

Heterosiphonia sinicola S. and G. sp. nov.

Plate 28, figs. 59, 60 and plate 47, b

Fronds erect, 6-8 cm. high, terete; main frond usually percurrent, dendroidally branched, up to 1 mm. diam.; branches terminated by small dense fascicles of much branched acute filaments with cells about twice as long as broad; medulla with 5 large pericentral cells surrounded by a single layer of smaller irregular cells; cortex composed of a single layer of cells, very thick-walled and very irregular in size and form, 2-5 times as long as broad, thicker radially in cross section; cystocarps and antheridia unknown.

Cast ashore. Eureka, near La Paz, Lower California, Marchant, no. 49, May; La Paz, Marchant, no. 65, May; Marchant, no. 86a. Type, Marchant no. 65.

The nearest described relative of this species seems to be *H. coccinea* (Huds.) Falkenb.

COLACODASYA Schmitz, *in* Engler and Prantl., Natürl. Pflanzenfam., 1897, p. 473

Colacodasya sinicola S. and G. sp. nov.

Plate 28, fig. 63

Fronds very variable in size, up to 900 μ diam., solid, somatic portion spherical, attached by a broad base; cystocarpic fronds with ample somatic portion, covered with sessile or short stalked cystocarps; cystocarps spherical to slightly elongated, 160-180 μ diam.; antheridial fronds with smaller somatic portion giving rise to numerous antheridial branches, 400-500 μ long and sympodially branched; antheridia in dense fusiform clusters; tetrasporic fronds producing sparse short stichidial branches with short, slightly curved tips and tripartite tetraspores.

Growing on *Chondria acrorhizophora* S. and G. Eureka, near La Paz, Lower Caifornia. Type, Marchant, no. 43a, May.

Colacodasya sinicola is closely related to *C. verrucæformis* Setchell and McFadden, *in* McFadden, 1911, p. 149, pl. 19, growing on *Mychodea episcopalis* J. Ag. The material at hand, although having representatives of all three forms of fruit, is too sparse to admit of detailed study as to histological characters. The plants in general are smaller, the cystocarps are mostly sessile and more nearly spherical, not urceolate, and the tetrasporic ramuli, stichidia, are smaller, so far as the material at hand shows. These differences, coupled with having a different host and growing in a different temperature-region, seem to us sufficient to warrant keeping it separate for the present.

Family CERAMIACEÆ

CALLITHAMNION LYNGBYE, Hydr. Dan., 1819, p. 123

Callithamnion endovagum S. and G. sp. nov.

Plate 28, fig. 62

Plants parasitic (?), the endophytic portion extending completely through the frond of host, and composed of much branched, slender filaments, 5-7 μ diam., with cells very variable in length, giving rise to erect vegetative and reproductive filaments on both sides of the host; erect fronds blunt, up to 200 μ high, 8-10 μ diam., 2-5 times forked; cystocarps small, apparently with but a single lobe; tetrasporic and antheridial plants unknown.

Growing in the fronds of *Grateloupia prolongata* J. Ag.

Type: No. 1363, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53b), in April, at **San Esteban Island, Gulf of California.**

Only cystocarpic plants of this species have been observed, and these are young. There are but two cells in the carpogonal branch and the carpogonium surmounting these is about 50 μ long. There are no known species closely related to it.

CERAMIUM AGARDH, Syn. Alg. Scand., 1817, pp. XXVI and 60

The genus *Ceramium* seems to be well represented in the Gulf of California, but, as is usual in the warmer waters, most of the species are very diminutive, indeed some are microscopic, and their discovery has been more or less accidental or incidental in the study of the structure of their hosts, as has been our experience on several occasions. The amount of material has thus, in several instances, been very scanty and further study is highly desirable to clear up doubtful points and make known their complete history.

Ceramium procumbens S. and G. sp. nov.

Plate 27, figs. 51-54

Fronds microscopic, wholly prostrate, attached to the host by very short rhizoidal filaments, 0.5-1 mm. long, 45-55 μ diam., corticated only at the nodes, branching distichous, the ramuli parallel with the host, often opposite; tetrasporic ramuli short, clavate; tetrasporangia completely immersed, sparse, irregularly placed, 50 μ long, 40 μ broad; cystocarps single, or rarely 2-3 together, short-pedicellate, spherical, 50-60 μ diam., arising near the ends of ramuli, the main ramulus being pushed aside, 1-3 very short ramuli developing up around them; cystocarps few, 8-12, 20-25 μ diam.; antheridia on short specialized ramuli.

Growing on *Gelidium* sp., San Francisquito Bay, Lower California, Johnston, no. 27a, June, and on *Grateloupia prolongata,* Isla Partida, Gulf of California.

Type: No. 1364, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 27a), in July, at **Isla Partida, Gulf of California.**

The cystocarps are borne on short one-celled pedicels, and are most frequently single, but as many as three have been observed developing from the same node. The node becomes considerably enlarged, the main ramulus is turned to one side and a few very short ramuli arise from the node and develop around the cystocarp which appears now to sit upon the end of the frond.

This species seems very closely related to *Hormoceras pygmæum* Kuetzing (Tab. Phyc., vol. 12, pl. 75, figs. a-c) as regards branching and general structure. The magnification as given by Kuetzing (*loc. cit.*) makes our plant somewhat smaller. Kuetzing's plant seems less frequently branched and has no opposite branching, a character very prominent in ours. His plant apparently is erect, while ours is wholly prostrate.

Ceramium bicorne S. and G. sp. nov.

Plate 28, fig. 64 and plate 74

Fronds 5-8 mm. high, profusely and dichotomously branched, attached by a creeping, prostrate portion with rhizoids; main fronds up to 200 μ diam., completely corticated above, the internodes naked below but shorter than the corticated zones at the nodes; corticating cells not arranged in longitudinal rows, rounded to slightly angular; tetrasporangia completely immersed, irregularly placed in the much swollen terminal ramuli; antheridia on ramuli similar to the tetrasporic ramuli; cystocarps sessile, usually double, surrounded by 6-8 ramuli, some or all of which may develop farther and produce other cystocarps; carpospores numerous, irregular in form, up to 60 μ long.

Growing on *Gratcloupia* sp., upper sublittoral belt.

Type: No. 1365, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 62a), in July, at **Isla Partida, Gulf of California.**

The combination of creeping habit with erect fronds, the small size, dense dichotomous branching, almost complete cortication, immersed scattered tetrasporangia and the final development of two sharp points after the last division of the apical cell on the forcipate branches, distinguish this species from all other known species. The sharp points found on this species are not unique, as they are present in other species, notably *C. Johnstonii* of this paper.

Ceramium sinicola S. and G. sp. nov.

Plate 25, figs. 40, 41 and plate 75

Fronds 1-2 cm. high, dichotomously branched, the forcipate apices long and blunt, completely corticated above, internodes below partially naked; corticating cells not arranged in any definite order, 8-11 μ diam. in surface view, 3-5 sided, with rounded angles; tetrasporangia completely immersed, in a single whorl at the nodes, occupying several forks of the terminal ramuli; cystocarps and antheridia unknown.

Found unattached among the fronds of *Laurencia* sp.

Type: No. 1366, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 67b), in April, at **Ensenada Bay, Lower California.**

The basal portions of this species of *Ceramium* were not present, thus leaving some doubt as to the size of the plant. The largest filaments below the tetrasporic ramuli are 140 μ in diameter, and it seems quite probable that the portion of the frond below this is not much larger.

Ceramium Johnstonii S. and G. sp. nov.

Plates 76, 77

Fronds up to 3 cm. high, and 80 μ diam., dichotomously branched, producing below numerous, lateral, secondary branches simple or dichotomously branched, completely and densely corticated, but the corticating cells of the upper branches slightly separating at the center of the internodes, forming a very narrow clear ring; corticating cells not arranged in rows, much rounded, 7-10 μ diam.; at maturity the apical cells become very acute; tetrasporangia completely immersed, scattered irregularly in the main fronds and more or less regularly in 2-3 whorls in the small lateral ramuli; cystocarps and antheridia unknown.

Found floating among other algæ. San Pedro Martir Island, Gulf of California, Johnston, no. 104, April; San Esteban Island, Gulf of California, Johnston, No. 111, April.

Type: No. 1367, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 104), in April, at **San Pedro Martir Island, Gulf of California.**

The distinguishing characters of this species are the development of the tetrasporangia immersed in the dense cortex of the main fronds and in the short-lateral ramuli towards the base; and the slight separation of the corticating cells forming a narrow clear area or ring at the internodes in the ramuli and upper branches. The height and general size of the plants can not be definitely stated, as we have but a few fragments to judge from. From the general appearance of the lower parts of these, it seems that the species is rather diminutive.

Ceramium serpens S. and G. sp. nov.

Plate 27, fig. 58

Thallus microscopic, creeping on the host and attached by short rhizoids, arising singly at a node, only sparsely forking, giving rise to a few sparsely branched, erect, fructiferous ramuli; mature creeping filaments 30-40 μ diam., at the nodes, corticated only at the nodes, the internodes naked and equal to, or up to, 4 times as long as the nodes; tetrasporangia usually single at the nodes, spherical, 20-25 μ, up to 40 μ, diam., extruding through the cortex; cystocarps and antheridia unknown.

Growing on *Laurencia* sp. La Paz, Lower California. Type, Marchant, no. 67c, May.

This is a very delicate and inconspicuous species, and although the material at hand is very scanty and only tetrasporic plants having been observed, the character of these having the tetrasporangia extruded and borne singly at the nodes, makes it entirely distinct from any known species. Its nearest relative, among the known Mexican forms, is *C. procumbens* of this paper, from which, however, it may be readily recognized by the tetrasporic characters.

Ceramium interruptum S. and G. sp. nov.

Plate 26, fig. 47

Fronds 8-12 mm. high, 180-250 μ diam. towards the base, enlarged above, branching regularly dichotomous, densely corticated above, except the first internode just above the forkings, corticated only at the nodes below; tetrasporangial branches up to 500 μ diam., decidedly torulose, tetrasporangia imbedded beneath the cortex, disposed more or less irregularly in 2-3 whorls, slightly ellipsoidal, 30-35 μ diam., 40-45 μ long; cystocarps mostly single, sessile on an enlarged obconical base, surrounded by a whorl of 5-8 ramuli which are either short and in part incurved or long and at times giving rise to other cystocarps; carpospores numerous, pyriform to slightly angular, enclosed within a very hyaline membrane; antheridial ramuli less enlarged and less torulose than the tetrasporic ramuli; antheridia completely covering their outer ends.

Epiphytic upon other algæ. Eureka, near La Paz, Lower California. Type, Marchant, no. 78, May.

But a single small tuft of this species was gathered among the other forms found cast ashore. Fortunately all three forms of reproductive cells were present in these specimens, and the whole material seems in typical condition. Having such a small quantity of material, however, leaves us in doubt as to whether or not these are typical in height. The method of attachment to the host is by short, thick rhizoidal branches, a few from a node.

A conspicuous character present in practically all of the fronds, especially prominent in the tetrasporic and antheridial fronds, is the uncorticated internode just above the forking. The upper parts of all the fronds are densely corticated except these special internodes, a character which we have not seen, nor have we read of it in any other species. This is apparently too regular to be accidental, and we are using it as a basis for the specific name. Towards the base, the internodes become less and less corticated, but the length of the internodes only slightly exceeds the length of the nodes.

Ceramium caudatum S. and G. sp. nov.

Plate 27, figs. 55-57

Fronds 10-15 mm. high, branching dichotomous by splitting of the apical cell, many uncinate secondary branches of different lengths, at times in whorls, arising at the nodes; corticated only at the nodes; internodes of main filaments 120-140 μ diam. at the base of the fronds and nodes 180-200 μ diam.; internodes 290-350 μ long at the base of the fronds; tetrasporangia numerous in whorls at the upper margin of the corticating cells, decidedly pedicellate; cystocarps and antheridia unknown.

Floating among other algæ. Eureka, near La Paz, Lower California. Type, Marchant, no. 48b, May.

Ceramium fimbriatum S. and G. sp. nov.

Plate 26, figs. 43, 44

Fronds diminutive, regularly dichotomous, corticated only at the nodes; main filaments 70-90 μ diam. at the nodes, the internodes 2-3 times as long as the nodes in the main fronds; the outer cell on each node on the convex surface of the forcipate apices develops into a short thick hair, rounded at the outer end, 55-65 μ long, 28-32 μ broad, unseptate, soon deciduous; fruiting characters unknown.

Found floating among *Centroceras clavulatum.* Eureka, near La Paz, Lower California. Type, Marchant, no. 87a, May.

We hesitate to name this species of *Ceràmium* based on such scanty material at our disposal. Only a few fragments were observed while studying specimens of *Centroceras.* However, the vegetative characters are so unlike those of any described species of which we have any definite knowledge, that we feel justified in naming and describing it as well as the material will permit. The presence of a single row of thick, short, unseptate hairs, which are soon deciduous, on the outer curves of the apices, is the distinguishing character.

Ceramium horridum S. and G. sp. nov.

Plate 26, figs. 49, 50 and plate 79

Fronds 6-8 cm. high, completely corticated throughout, dichotomously branched, the branches gradually attenuated upwards, at maturity terminating in acute cells, clothed throughout with whorls of short, lateral, tetrasporic ramuli arising at each node, which in turn are beset with numerous, short, lateral, sharp spines; main fronds 700-900 μ diam.; tetrasporangia immersed without definite order in the ramuli; cells arranged more or less in longitudinal rows, especially in the internodes 2-3 times as long as broad; cystocarps and antheridia unknown.

Cast ashore among other algæ. Guaymas, Mexico. Type, Marchant, no. 91, May.

The two outstanding characters of this species are the whorls of short tetrasporic ramuli, three to five at each node, and the acute, spine-like growing points at their apices and for some distance back, as well as on the main branches. The growing points, apical cells, are normal cells during the period of rapid growth, but on nearing maturity of the tetraspores, they practically all divide two to three times and the branches become very acute. The size of the mature plants, the complexity of branching, their habitat, whether epiphytic or growing on rocks, the character of the attaching portions, and the character of the cystocarps and antheridia are matters for further investigation. The few fragments obtained, however, are so decidedly different from any known species, that it seems the part of wisdom to put it on record.

Ceramium sp.

Plate 29, figs. 70, 71

Growing on *Eucheuma* sp. Mazatlan, Mexico, Marchant, no. 63a, May.

Only some small fragments of this species of *Ceramium* were found among other algæ, and these are of antheridial plants. The ramuli were completely corticated only at the fruiting ends, the remaining lower parts are corticated only at the nodes. It seems to be an undescribed species, at least nothing like it was admitted by Agardh in his latest revision, but the absence of other fruit, especially the tetraspores, makes its identity too uncertain and therefore unwise to name it at present.

CENTROCERAS KUETZING, *in* Linnæa, vol. 15, "1841," p. 731

Volume 15 of Linnæa bears the imprint 1841, Kuetzing's paper "Ueber *Ceramium* Ag.," appeared in the last Heft of this volume. In this paper, among other genera, he erected the genus *Centroceras.* In Phycologia Generalis, 1843, he treats of the genera and species mentioned in his previous paper, and consistently cites 1841 as the date of publication. Later, in Species Algarum, 1849, he consistently refers only to the Phycologia Generalis in citing the place of publication of the new genera erected in the above mentioned publication, which is manifestly misleading. At the same time, in citing the species treated in Linnæa, he uses the date 1842 instead of 1841. Howe (1914, p. 158) cites 1842.

Centroceras clavulatum (Ag.) Mont.

Growing on rocks in the upper sublittoral belt. Tortuga Island, Gulf of California, Johnston, no. 144, May; Eureka, near La Paz, Lower California, Marchant, no. 87, May, and no. 42, May.

Montagne, *in* Durieu, Flore d'Algerie, p. 140; Howe, Mar. Alg. Peru, 1914, p. 158. *Ceramium clavulatum* Agardh, *in* Kunth, Syn. Pl. Aeq., vol. 1, 1822, p. 2.

Centroceras bellum S. and G. sp. nov.

Plate 26, fig. 48 and plates 40c and 78

Fronds 1-1.5 cm. high, more or less prostrate at the base and attached by numerous pluricellular hairs, 1-3 arising at a node, becoming erect at the outer ends, completely corticated, subsecundly branched; main fronds 110-130 μ diam.; branches all arising at the nodes back of the growing point; tetrasporic ramuli stichidia-like, considerably enlarged above the base for some distance, each tapering very gradually to a blunt terminal growing cell and more or less curved at the apex; corticating cells in very regular longitudinal rows on the older parts of the frond and quadrate, except at the slightly swollen nodes, where they are divided into 2-4 smaller cells, and on the fruiting part of the tetrasporic ramuli; tetrasporangia completely immersed, a single whorl at each node; cystocarps and antheridia unknown.

Cast ashore at Guaymas, Mexico. Type, Marchant, no. 85, June.

The complete cortication with quadrate cortical cells arranged very definitely in longitudinal rows on the main fronds seem undoubtedly to ally this plant with the genus *Centroceras,* rather than with the genus *Ceramium,* to which, however, it is very closely related. These characters, along with the size of the cells and the diameter of the main filaments, make it almost identical with *Centroceras clavulatum* with respect to those characters in that species, but the total absence of sharp-pointed surface cells, particularly at the apices, so characteristic of *C. clavulatum,* the method of branching which is always subterminal, whereas all described species of *Centroceras* have dichotomous branching brought about by longitudinal division of the apical cell, and the method of tetraspore formation, the tetraspores being formed by specialized ramuli, for the most part, make it a very distinct and beautiful species, decidedly different from any other known at present.

Family Grateloupiaceæ

GRATELOUPIA Agardh, Sp. Alg., vol. 1, part 2, 1822, p. 221

Grateloupia prolongata J. Ag.

Plate 80

Growing in the upper sublittoral belt. San Francisquito Bay, Lower California, Johnston, no. 25, June; San Esteban Island, Gulf of California, Johnston, no. 53a, April; Isla Partida, Gulf of California, Johnston, no. 87, July.

J. G. Agardh, Nya Alg., 1847, p. 10.

We have grouped a series of several plants under this species varying greatly in size and in width of fronds. The type of the species was collected at "Pochetti," Mexico, and Agardh does not mention the size of the plants. De-Toni (Syll. Alg., vol. 4, p. 1565) gives the height of the plant as 10-18 cm. Some of our specimens are 50 cm. high and only 3-5 mm. wide, but others come within the range of the description given by De-Toni. It is quite possible that we are here dealing with more than one species, but until a greater quantity of material can be examined, preferably in its native habitat, the question of their identity will have to remain somewhat in doubt.

Grateloupia squarrulosa S. and G. sp. nov.

Plates 81, 82

Fronds 40-55 cm. high, branching exceedingly variable, of 5-8 orders; main frond more or less percurrent, flat, 5-15 mm. wide, pinnately branched at the margins, with branches very variable in size, some erect, some patent, others recurved, all with broad bases; the surface, as well as the margins of the main frond, more or less covered with branches, the whole frond thickly beset with short, blunt, branched spines; reproduction unknown; color dark purplish red.

Cast ashore. Smith Island, Gulf of California.

Type: No. 1368, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 60), in June, at **Smith Island, Gulf of California.**

Although we have no fruiting specimens of this species, the gross morphological characters are so unlike any described species that we feel certain of its specific identity. It probably grows at some depth below low tide as the specimens, all incomplete, were found cast up on the shore.

Grateloupia acroidalea S. and G. sp. nov.

Plate 26, figs. 45, 46

Fronds flabellate, flattened, up to 2 cm. high, 0.5-1 mm. wide, attached by a small disk; branching dichotomous from near the base; terminal ramuli swollen at the apices; center of the frond stuffed with fine, branched filaments merging into filaments with larger arachnoid cells, these in turn merging into larger, more or less irregular, cells giving rise to the anticlinal rows of the cortex; tetrasporangia 50-60 μ long, 12-20 μ broad; tetraspores cruciate; cystocarp completely embedded within the frond; antheridia unknown; color very dark purplish red, almost black on drying.

Guaymas, Mexico, Marchant, no. 58, May; on rocks in the upper sublittoral belt, Johnston, no. 121.

Type: No. 1369, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 121), in June, at **Tortuga Island, Gulf of California.**

This species of *Grateloupia* clearly belongs to J. G. Agardh's section of the genus *Chondrophyllum.* It differs from *G. dichotoma* J. Ag. in having decidedly swollen apices, for which character it is named. It is quite near to *G. fastigiata* J. Ag. but is shorter and narrower. Ours has the cystocarps and tetraspores only in the terminal segments.

Grateloupia Howeii S. and G. sp. nov.

Plate 83

Fronds membranaceous, up to 30 cm. high and 6 cm. wide, tapering to a small, short stipe attached by a disk, unbranched, or forked near the base and with an occasional marginal lanceolate branch; the whole beset with numerous Gigartinoid spines; color brownish red, nitent on drying; large cells of the subcortex 25-50 μ long.

Cast ashore.

Type: No. 1370, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 113), in April, at **San Esteban Island, Gulf of California.**

We are dedicating this species to Dr. M. A. Howe, to whom we sent specimens for study and for comparison with *G. denticulata* Mont., to which it seems closely related. After comparing it with sections and a photograph of the type specimen of *G. denticulata* he concludes that our plant is not identical with that species.

Grateloupia Johnstonii S. and G. sp. nov.

Plate 84

Fronds flat, membranaceous, up to 40 cm. high, varying much in width, of the same branch in different parts, up to 20 cm. branching pinnate, of 5-6 orders; ultimate pinnules short, subulate, acute, perpendicular to the frond, main branches arising at about 45° angle; color coral red; reproduction unknown.

Cast ashore.

Type: No. 1371, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 88), in July, at **Angel de la Guarda Island, Gulf of California.**

This species of *Grateloupia* seems closely related to *G. squarrulosa* but differs in thickness, color, number and character of the ultimate pinnules, and the angle at which the branches arise. Unfortunately the whole life history can not be presented here on account of the lack of fruiting material.

Estebania S. and G. gen. nov.

Fronds complanate, firm-mucilaginous, profusely anastomosing at the dichotomously branched tips; center of the fronds packed with fine, densely intertwined, much branched filaments, surrounded on all sides by 1-2 layers of large ovoid cells merging outwardly into smaller cells, in turn merging into short anticlinal rows of small cells; tetraspores cruciate, not in sori; sexual reproduction unknown.

Lacking cystocarps, we are unable, at present, to classify with complete satisfaction the plants which we are here placing in the new genus *Estebania.* We are assigning them provisionally to the family Grateloupiaciæ. They resemble *Polyopes Bushiæ* in general appearance, but this resemblance is only superficial or remotely so in structure. There is also a resemblance to *Grateloupia dichotoma.* In *Polyopes* the tetraspores are aggregated into sori or nemathecia, while in *Estebania* they are evenly distributed over the fruiting area of the fronds. The general structure, the absence of an apical cell and the cruciate tetraspores more strongly suggest the Grateloupiaceæ than any other family.

Estebania conjuncta S. and G. sp. nov.

Plate 25, figs. 35, 36 and plates 85, 86

Fronds up to 4 mm. broad, dichotomously branched, the branches anastomosing with each other soon after arising; color coral red; central or medullary filaments 3-4 μ diam.; surrounding ovoid cells up to 200 μ diam., thick walled; anticlinal rows of cortical cells 4-7 cells long, 4-6 μ diam., subspherical; tetrasporangia elongated radially; tetraspores cruciate, dividing in three planes.

Floating and entangled among other algæ. San Esteban Island, Gulf of California, Johnston, nos. 53f and 115; San Pedro Martir Island, Gulf of California, Jonhston, no. 103, April; Angel de la Guarda Island, Gulf of California, Johnston, no. 130, June.

Type: No. 1372, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 115), in June, at **San Esteban Island, Gulf of California.**

The very pronounced character of this species, a character which we have considered to be of generic rank, is the firm coalescence of the young branches almost as soon as they have arisen, leaving at first a very small open space, almost microscopic. As the fronds grow, this space increases until it may become one or two inches across. This branching is fundamentally dichotomous and is extensive. However, as the plants age proliferations, more or less profuse along the edges of the frond, arise. These very frequently begin to divide dichotomously and a flabellate lateral is produced.

The plants at our disposal are all fragmentary, hence the actual size can not be stated. Nothing is known of their method of attachment or whether they are epiphytic or saxicolous. The fronds are very fragile and flabby. On being soaked in fresh water after having been dried, they soon dissolve, making it very difficult to handle them under such treatment.

POLYOPES J. G. AGARDH, Oefver., 1849, p. 85

Polyopes sinicola S. and G. sp. nov.

Plate 28, fig. 61 and plate 42, b

Fronds complanate, 3-5 cm. high, 3-5 mm. wide, width diminishing from the center of the frond towards the apices at each forking; dichotomously branched; color brown, almost black on drying; medulla composed of very densely compact and intertwined branched filaments merging abruptly on all sides into rows, 10-13 cells long, as seen in cross section, of closely compact, short, cylindrical cells, the terminal cell of each row, or the surface cells being more or less pearshaped; reproduction unknown.

Growing on rocks, in the lower littoral and upper sublittoral belts. Los Angeles Bay, Lower California, Johnston, no. 38, June; Isla Partida, Gulf of California, Johnston, no. 85, July; Angel de la Guarda Island, Gulf of California, Johnston, no. 84d, June.

Type: No. 1373, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 85), in July, at **Isla Partida, Gulf of California.**

PRIONITIS J. G. AGARDH, Sp. Alg., vol. 2, part 1, 1851, p. 185

Prionitis Sternbergii (Ag.) J. Ag.

Growing on rocks in the upper sublittoral belt. Georges Island, Gulf of California, Johnston, no. 100, April; Tortuga Island, Gulf of California, Johnston, no. 119, June; San Marcos Island, Gulf of California, Johnston, no. 6, June.

J. G. Agardh, Sp. Alg., 1851, p. 190. *Sphærococcus Sternbergii* Agardh, Sp., 1822, p. 275.

We have a series of specimens of *Prionitis* which agree fairly well with the description of *P. Sternbergii* (Ag.) J. Ag. as given by De-Toni (Syll., Alg., p. 1851). The species of this genus are subject to much variation in form, size and extent of branching. Our material proves this to be no exception to the rule. Careful study in the field may reveal several overlapping species.

Prionitis abbreviata S. and G. sp. nov.

Plate 25, fig. 39 and plate 50, b

Fronds fasciculate, 4-6 cm. high, 1.5-3 mm. wide, 500-600 μ thick, tapering to a narrow subcylindrical stipe; apices blunt, branching di-tri-chotomous, the margins with numerous fructiferous (?) pinnules; color dark red; reproduction unknown; medulla packed with fine branched filaments, merging on either side into small parenchymatous cells giving rise to anticlinal rows of cortical cells 2-3 μ diam., 4-6 μ long; cortex about 125μ thick.

Growing on rocks.

Type: No. 1374, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53e), in April, at **San Esteban Island, Gulf of California.**

This species appears to be most closely related to the group of plants of various forms which we have tentatively placed under *P. Sternbergii* (Ag.) J. Ag. The fronds are chiefly thinner, the branching more regularly dichotomous, and the pinnules less numerous than the smaller forms of that species.

Family NEMASTOMACEÆ

SCHIZYMENIA AGARDH, J., Sp. Alg., vol. 2, part 1, 1851, p. 169

Schizymenia Johnstonii S. and G. sp. nov.

Plate 88

Fronds wide-ligulate to lanceolate, with more or less undulate and crisped margins, up to 25 cm. long and 8 cm. broad, about 400 μ thick, tapering abruptly at the base to a short, 1.5-2.5 cm. long, stipe, attached by a very small disk; color dark dull coral red; medulla composed of loose fine hyphæ with thick, soft gelatinous walls, extending in all directions and giving rise towards the surface to dichotomously branched erect filaments terminating in anticlinal rows of 1-3 cells; the basal cells of the short erect filaments spherical, 6-8 μ diam.; surface cells cylindrical, 3-4 μ diam. and 2-2.5 times as long; cystocarps large, completely embedded within the fronds, extending inwards beyond the middle of the frond; antheridia and tetrasporangia unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1375, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 56), in July, at **Isla Partida, Gulf of California.**

Schizymenia Johnstonii seems closely related to *S. undulata* J. Ag. It is, however, slightly thicker, different in color, has a more ovate base and oblong shape, and larger cystocarps which extend deeper into the frond.

Schizymenia violacea S. and G. sp. nov.

Plate 25, figs. 37, 38 and plate 87

Fronds up to 30 cm. long, 15 cm. broad, 230 μ thick, broadly ovate, more or less lacerate and margin slightly undulate; base broad and rounded to subcordate; stipe complanate, about 1 cm. long, attached by a very small disk; color violet purple; medulla composed of fine hyphæ closely packed, merging into spherical, subcortical cells 10-14 μ diam. terminating in anticlinal rows of 1-2 cells, 4.5 μ diam., 1.5 times as long; cystocarps variable in size, some superficial and some extending to the middle of the frond, very compact; tetrasporangia ellipsoidal, 28-32 μ long, 14-16 μ broad, with cruciate tetraspores very numerous, nearly over the entire frond, except the base.

Growing on rocks in the upper sublittoral belt.

Type: No. 1376, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 82), in April, at **San Esteban Island, Gulf of California.**

This species of *Schizymenia* has near relations in *S. cordata* J. Ag., *S. apoda* J. Ag., and *S. erosa* J. Ag., judging from the general shape. It has, however, fewer cells in the anticlinal rows and is thinner than any of the three, in fact is the thinnest one yet described except *S. Dubyi.* From this species it differs in having fewer cells in the anticlinal rows and has a more compact medulla.

HILDENBRANDTIA NARDO, Isis, von Oken, 1834, p. 675

Hildenbrandtia rosea Kuetz.

Kuetzing, Phyc. Gen., 1843, p. 384

A few specimens of an encrusting red alga have been found on small pebbles among larger algæ. They have the structure of *Hildenbrandtia rosea* Kuetz. but are sterile.

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EXPLANATION OF PLATES

The drawings have been prepared under the direction of N. L. Gardner by Miss Ruth J. Powell ("del. P."), Miss Anna Hamilton ("del. H.") and by Mr. W. P. Keasby ("del K."). The photographs were made by Mr. W. C. Matthews.

Plate 12

Chlorogloea regularis S. and G.

Fig. 1, a. Surface view. b. Section view. X 500 (del. H.)

Xenococcus deformans S. and G.

Fig. 2. A sketch showing the plants within the cuticle of the host. X 500 (del. H.)

Hydrocoleum codicola S. and G.

Fig. 3. A group of ends of filaments. X 750 (del. P.)

Entocladia condensata S. and G.

Fig. 4. A surface view. X 125 (del. K.)

Fig. 5. A section view, showing the plant within the cell wall of the host. X 125 (del. K.)

Dermocarpa Reinschii S. and G.

Fig. 6. A group of plants, mostly mature. X 250 (del. K.)

Calothrix nidulans S. and G.

Fig. 7. A group of plants in various stages of development. X 250 (del. K.)

Pringsheimia Marchantæ S. and G.

Fig. 8. A surface view. X 250 (del. H.)

Calothrix nodulosa S. and G.

Fig. 9. A group of mature plants. X 125 (del. K.)

Fig. 10. A group of plants in various stages of development. X 100 (del. P.)

Dermocarpa sp.

Fig. 11. A group of immature plants. X 500 (del. P.)

Dermocarpa Marchantæ S. and G.

Fig. 12. A group of plants, some showing gonidia. X 500 (del. P.)

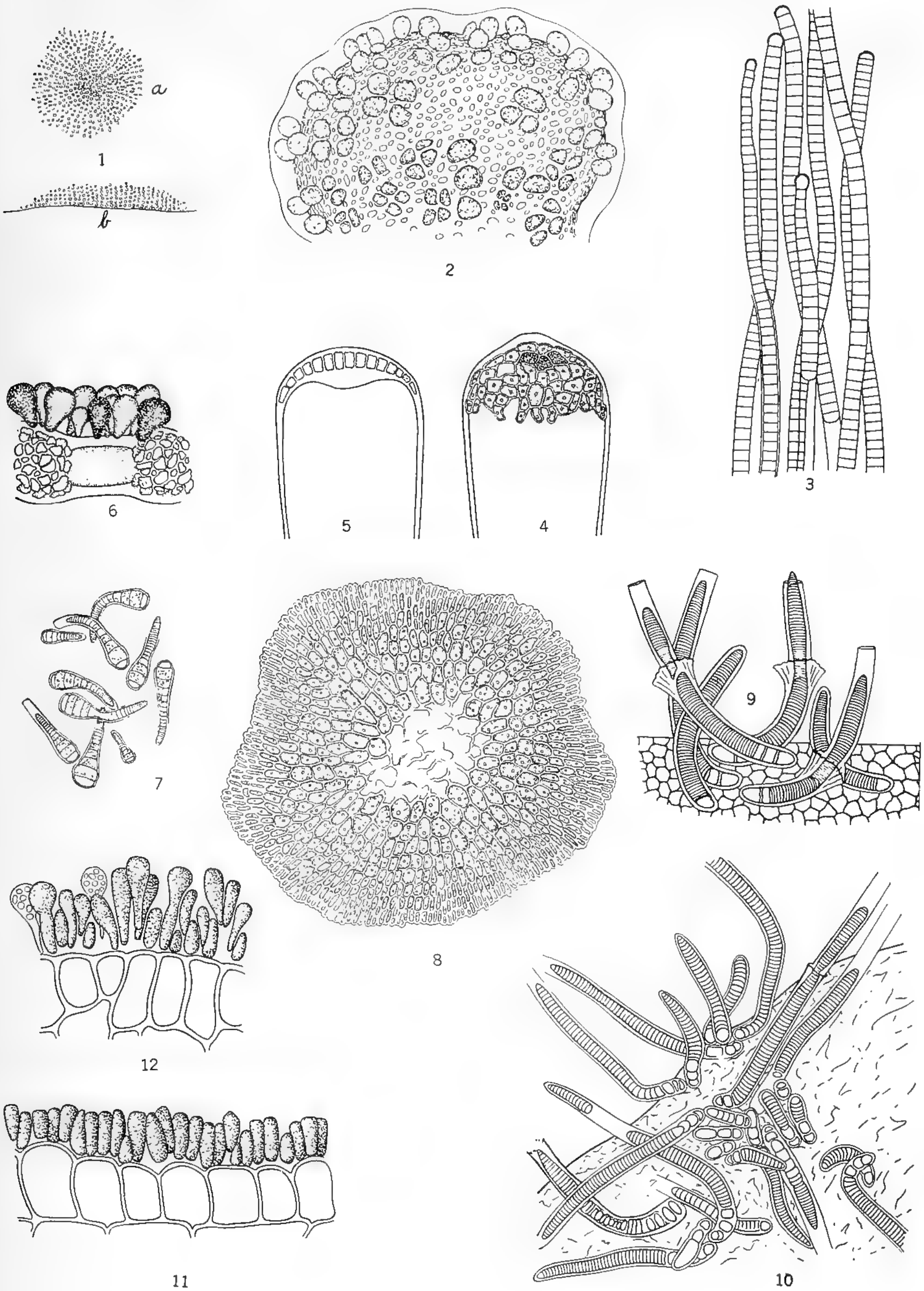
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Plate 13

Caulerpa Vanbosseæ S. and G.

Fig. 13. A habit sketch. X 0.5 (del. P.)

Fig. 14. A sketch of a portion of a plant showing method of branching and a few rhizoids. X 2 (del. P.)

Fig. 15. A piece of a filament showing trabeculæ. X 25 (del. H.)

Cladophoropsis robusta S. and G.

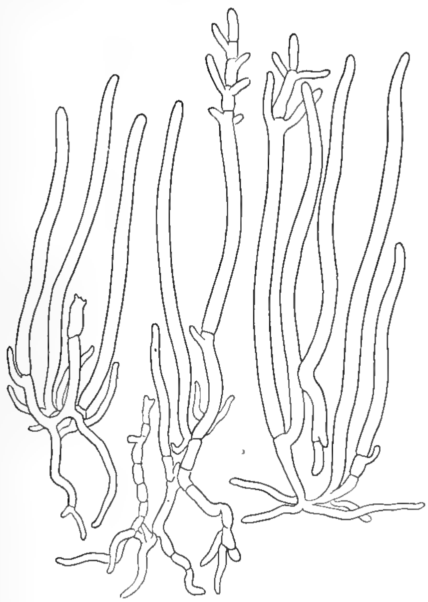
Fig. 16. A habit sketch. X 2 (del. H.)

Cladophora hesperia S. and G.

Fig. 17. A habit sketch. X 40 (del. P.)

Entocladia Polysiphoniæ S. and G.

Fig. 18. A habit sketch of a portion of a plant showing sporangia X 125 (del P.)



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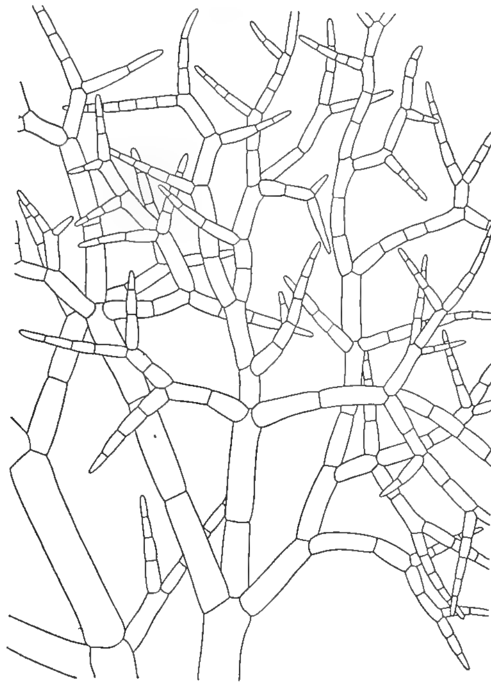

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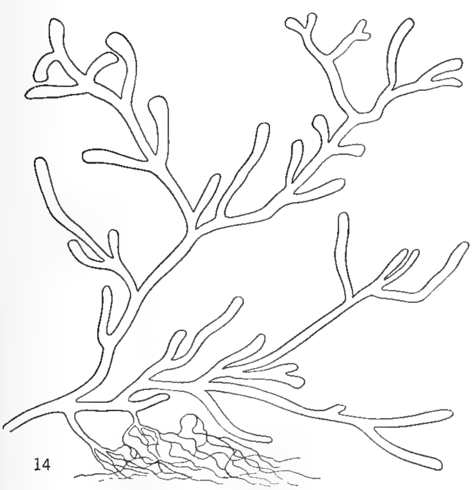

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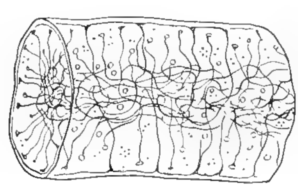

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Plate 14

Codium cervicorne S. and G.

Fig. 19. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 20. A group of typical utricles. X 25 (del. P.)

Codium simulans S. and G.

Fig. 21. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 22. A group of typical utricles. X 25 (del. P.)

Codium reductum S. and G.

Fig. 23. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 24. A group of typical utricles. X 25 (del. P.)

Codium Brandegeei S. and G.

Fig. 25. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 26. A group of typical utricles. X 25 (del. P.)

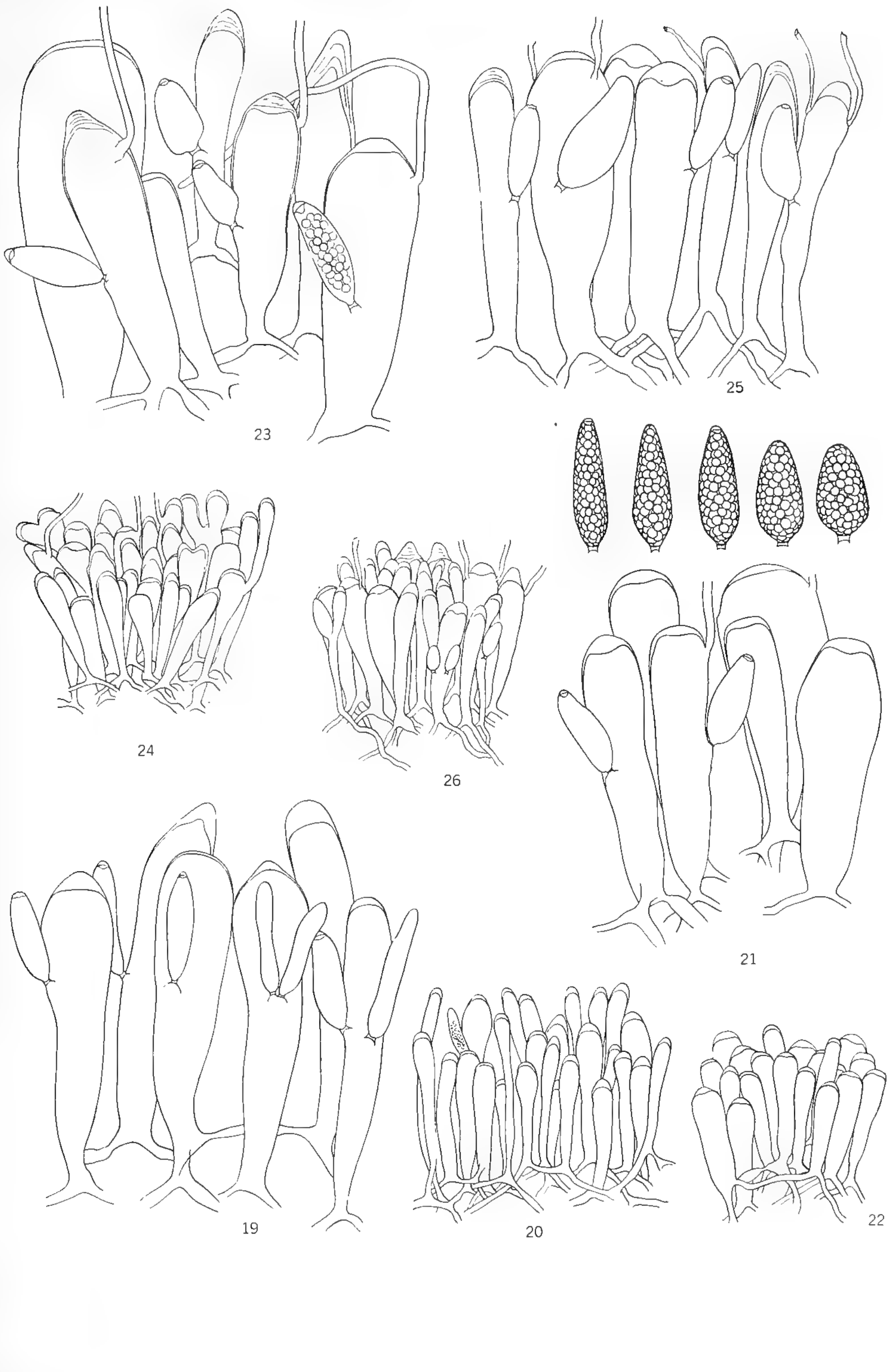
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Plate 15

Codium longiramosum S. and G.

Fig. 27. Three utricles showing different shapes and sizes, the largest ones always having the thinnest end wall. X 38 (del. P.)

Codium amplivesiculatum S. and G.

Fig. 28. A single utricle of the large thin walled type. X 38

Fig. 29. Two utricles of the smaller type, typical in shape and size. X38 (del. P.)

Codium unilaterale S. and G.

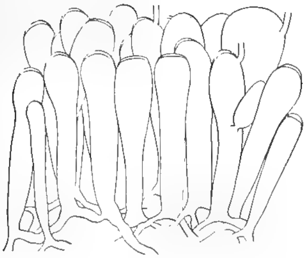
Fig. 30. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 31. A group of typical utricles. X 25 (del. P.)

Codium conjunctum S. and G.

Fig. 32. A group of utricles showing variation in shape and size. X 65 (del. H.)

Fig. 33. A group of typical utricles. X 25 (del. H.)



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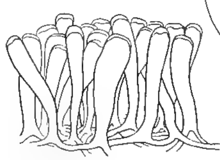

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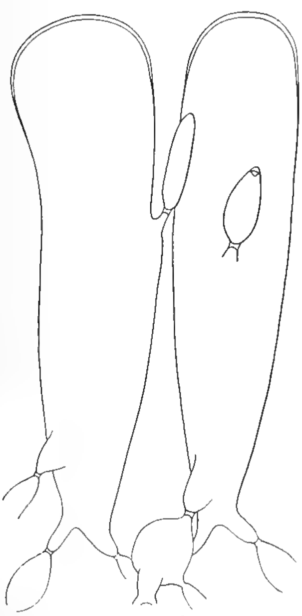

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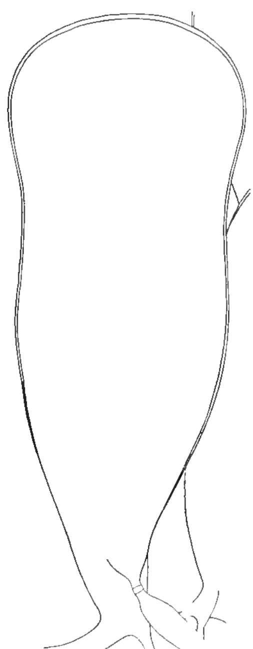

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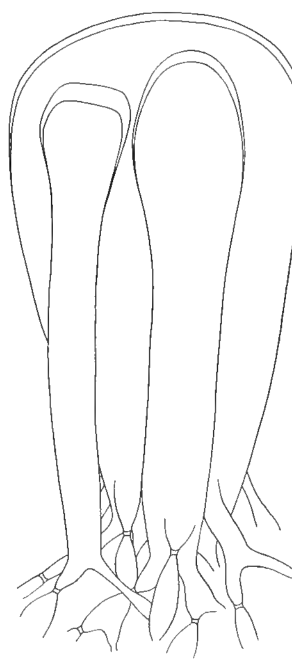

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Plate 16

Codium cuneatum S. and G.

Fig. 34. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 35. A group of typical utricles. X 25 (del. P.)

Codium anastomosans S. and G.

Fig. 36. A group of utricles showing variation in shape and size. X 65 (del. P.)

Fig. 37. A group of typical utricles. X 25 (del. P.)

Codium tomentosum (Huds.) Stackh.

Fig. 38. A group of utricles showing variation in shape and size. X 65. From W. A. Setchell's copy of Le Jolis Alg. Mar. de Cherbourg, no. 204. (del. K.)

Fig. 39. A group of typical utricles. X 25. Ibid. (del. K.)

Enteromorpha Marchantæ S. and G.

Fig. 40. Habit sketch of a group of plants. X 0.5 (del. P.)

Fig. 41. Surface view. X 250 (del. P.)

Fig. 42. Cross section view. X 250 (del. P.)

Enteromorpha acanthophora Kuetz.

Fig. 43. A habit sketch of a portion of a frond. X 3 (del. H.)

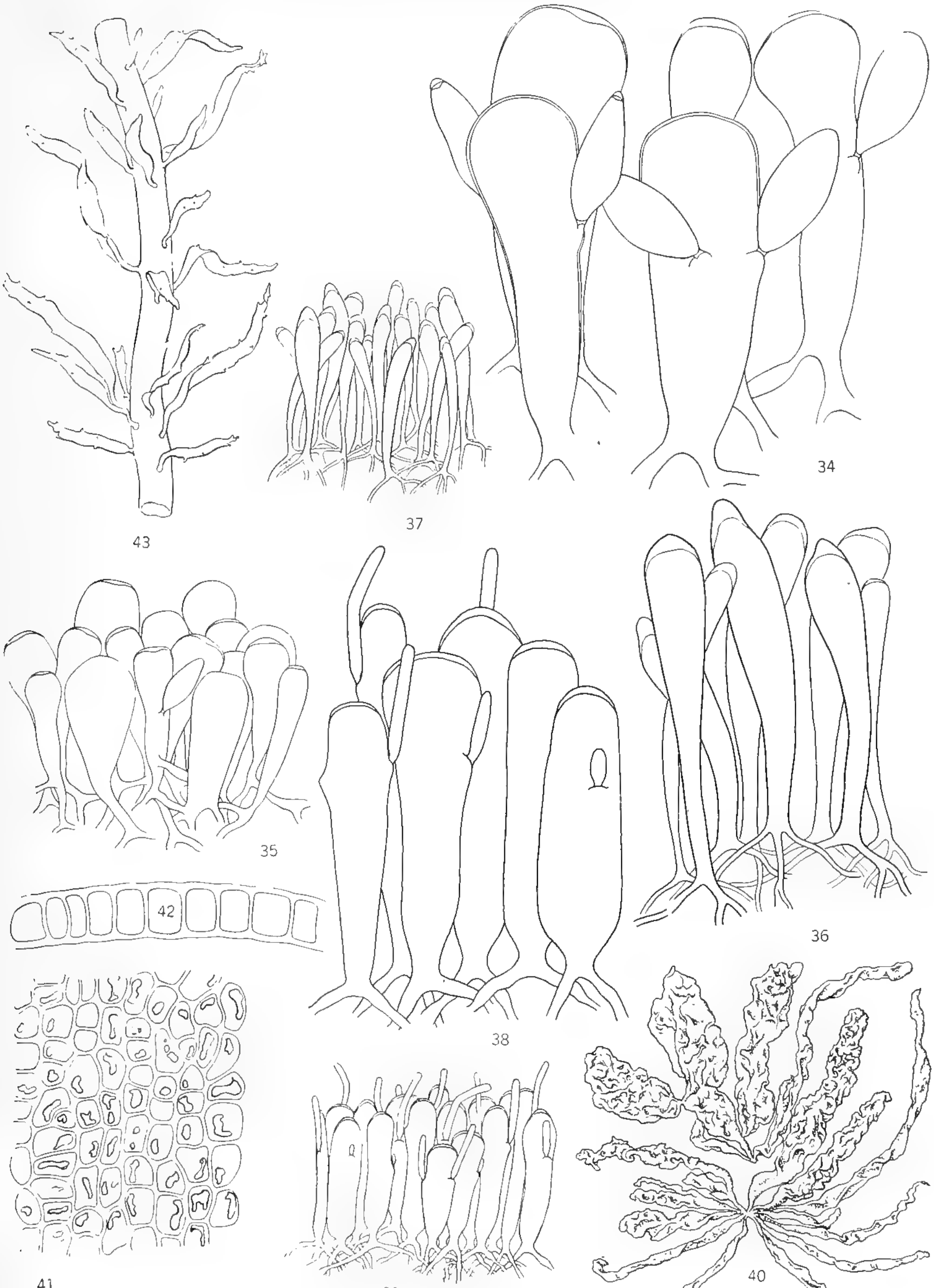

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Plate 17

Ectocarpus gonodioides S. and G.

Fig. 44. Habit sketch of a small tuft of plants, showing the rhizoidal penetrating portion below the gametangia, which are outside of the host. X 125 (del. H.)

Ectocarpus Bryantii S. and G.

Fig. 45. A series of gametangia showing extremes in shape and size X 250 (del. H.)

Gonodia Johnstonii S. and G.

Fig. 46. Two branches showing both gametangia and zoosporangia on the same plant. X 250 (del. P.)

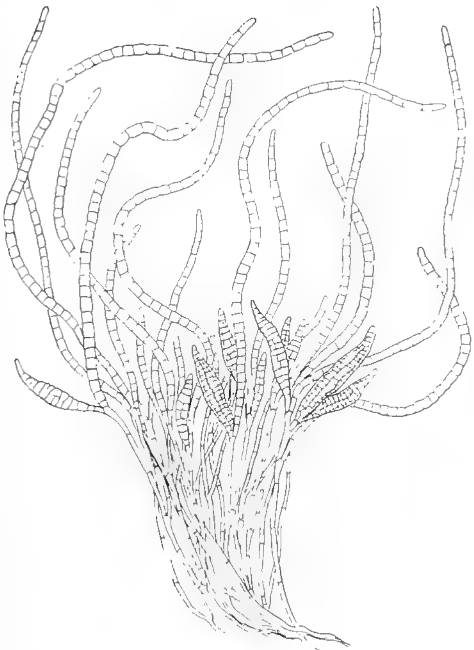
Fig. 47. A plant showing only gametangia. X 250 (del. P.)

Gonodia Marchantæ S. and G.

Fig. 48. A group of filaments with gametangia and one zoosporangium. X 125 (del. H.)

Compsonema immixtum S. and G.

Fig. 49. A section through the host, showing the gametangia extending beyond those of the host. X 250 (del. P.)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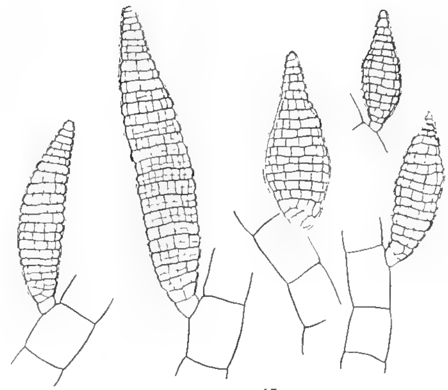
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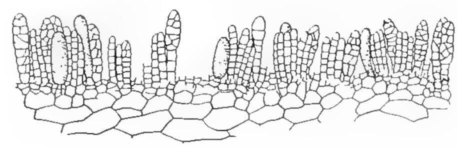
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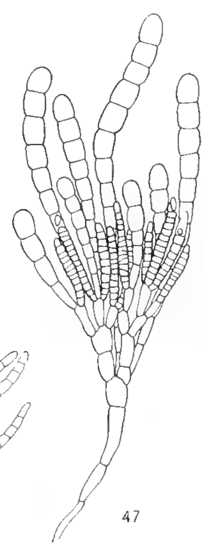
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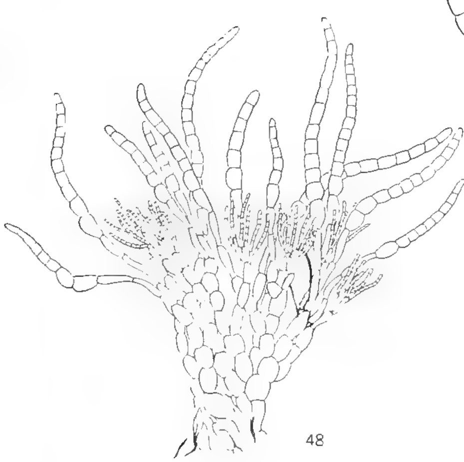
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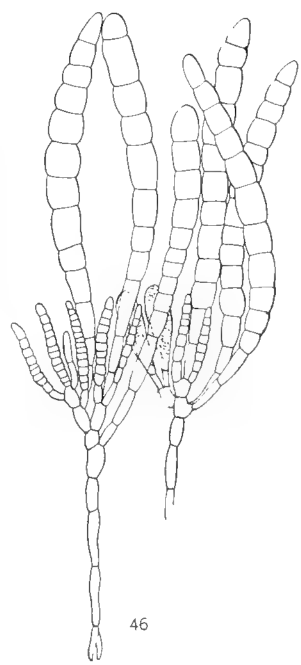
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Plate 18

Dictyota crenulata J. Ag.

Fig. 50. A habit sketch of a portion of a frond, showing numerous young plants germinating in position from öogonia. X 2 (del. H.)

Fig. 51. A surface view of a portion of a frond, showing arrangement of cells, a group of antheridia and a group of öogonia. X 50 (del. H.)

Dictyota hesperia S. and G.

Fig. 52. A habit sketch of a portion of a frond. X 0.5 (del. H.)

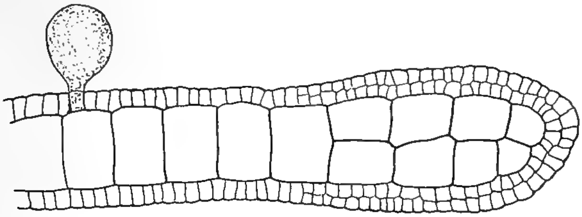
Fig. 53. A surface view showing arrangement of cells, a group of antheridia and scattered öogonia. X 100 (del. H.)

Dictyota Johnstonii S. and G.

Fig. 54. A habit sketch of a portion of a frond, showing the method of branching and the distribution of the groups of öogonia. X 0.5 (del. H.)

Fig. 55. A cross section at the margin of the frond, showing a single öogonium and the double layer of cortical cells and of medullary cells. X 100 (del. H.)

Fig. 56. Same as fig. 55. X 50 (del. H.)



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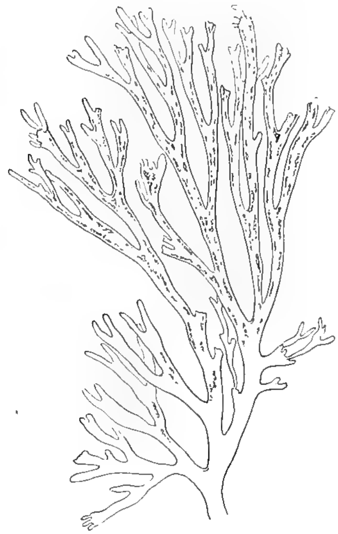

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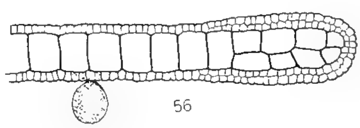

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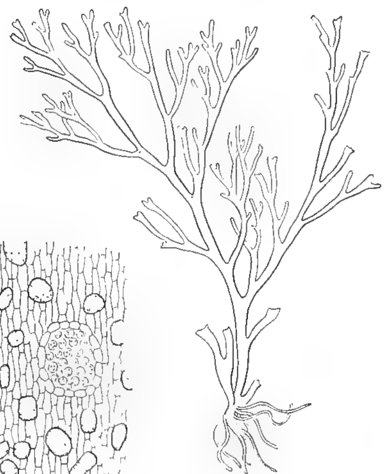

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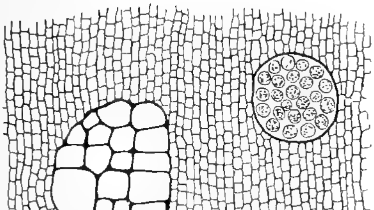

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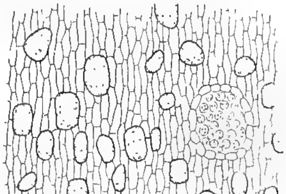

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Plate 19

Entocladia mexicana S. and G.

Fig. 57. A surface view of a portion of a thallus, showing sporangia scattered over the center and the free filaments around the margin. X 250 (del. H.)

Sphacelaria furcigera Kuetz.

Fig. 58. Sections of a frond showing one male gametangium and one female gametangium. X 125 (del. K.)

Sphacelaria brevicorne S. and G.

Fig. 59. A sketch showing a few sections of the frond and a single propagulum. X 250 (del. H.)

Fig. 60. A sketch to illustrate the character of a hair. X 250 (del. H.)

Colpomenia sinuosa f. *deformans* S. and G.

Fig. 61. A habit sketch showing the great predominance of the finger-like portions of the frond over the base portion. X 0.5 (del. P.)

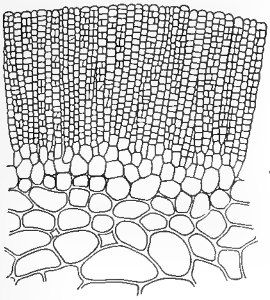
Fig. 62. A section through the fruiting portion, showing the character of the soma cells and of the gametangia. X 250 (del. P.)

Sargassum Marchantæ S. and G.

Fig. 63. A habit sketch of a fragment of a frond, showing the characters of the leaves, the vesicles and the receptacles. X 2 (del. H.)

Sargassum guardiense S. and G.

Fig. 64. A habit sketch of a fragment of a frond, showing the characters of the leaves, the vesicles and the receptacles. X 2 (del. H.)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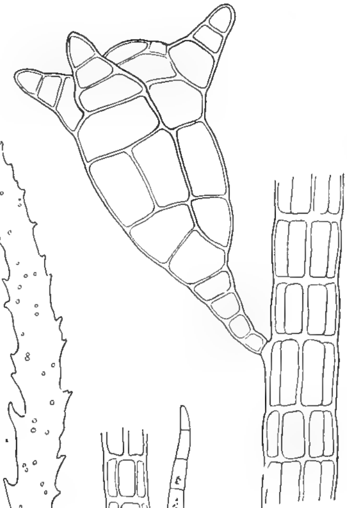
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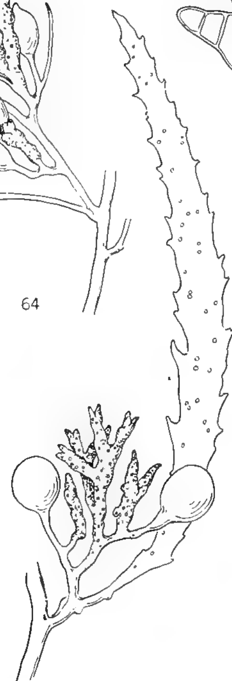
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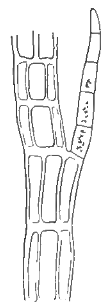
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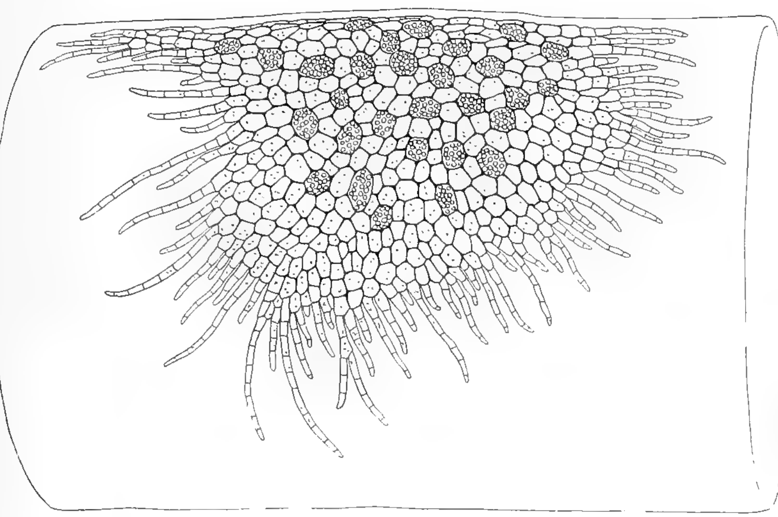
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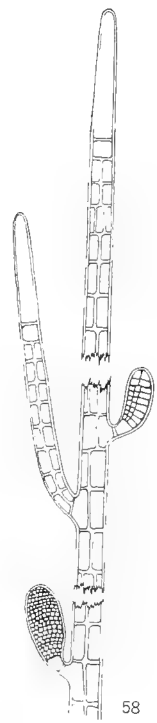
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Plate 20

Sargassum horridum S. and G.

Fig. 65. A habit sketch showing the character of the leaves. X 1 (del. P.)

Fig. 66. A habit sketch of a fragment of the frond, showing the characters of the vesicles and the receptacles. X 1.5 (del. P.)

Sargassum insulare S. and G.

Fig. 67. A habit sketch of portions of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. P.)

Fig. 68. The same as fig. 67, but showing more profuse branching of the receptacles. X 1.5 (del. P.)

Sargassum herporhizum S. and G.

Fig. 69. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Fig. 70. A habit sketch showing the original short stipe and holdfast at the left, a horizontal creeping frond with holdfasts below and erect fronds above. X 0.5 (del. P.)

Fig. 71. A habit sketch to show different positions of the vesicles. X 1.5 (del. P.)

Sargassum Johnstonii S. and G.

Fig. 72. A terminal segment of the frond showing the arrangement and characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum sinicola S. and G.

Fig. 73. A habit sketch of a fragment of a frond showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum lapazeanum S. and G.

Fig. 74. A habit sketch of a portion of a frond showing the characters of the leaves, a single vesicle and the receptacles. X 1.5 (del. P.)

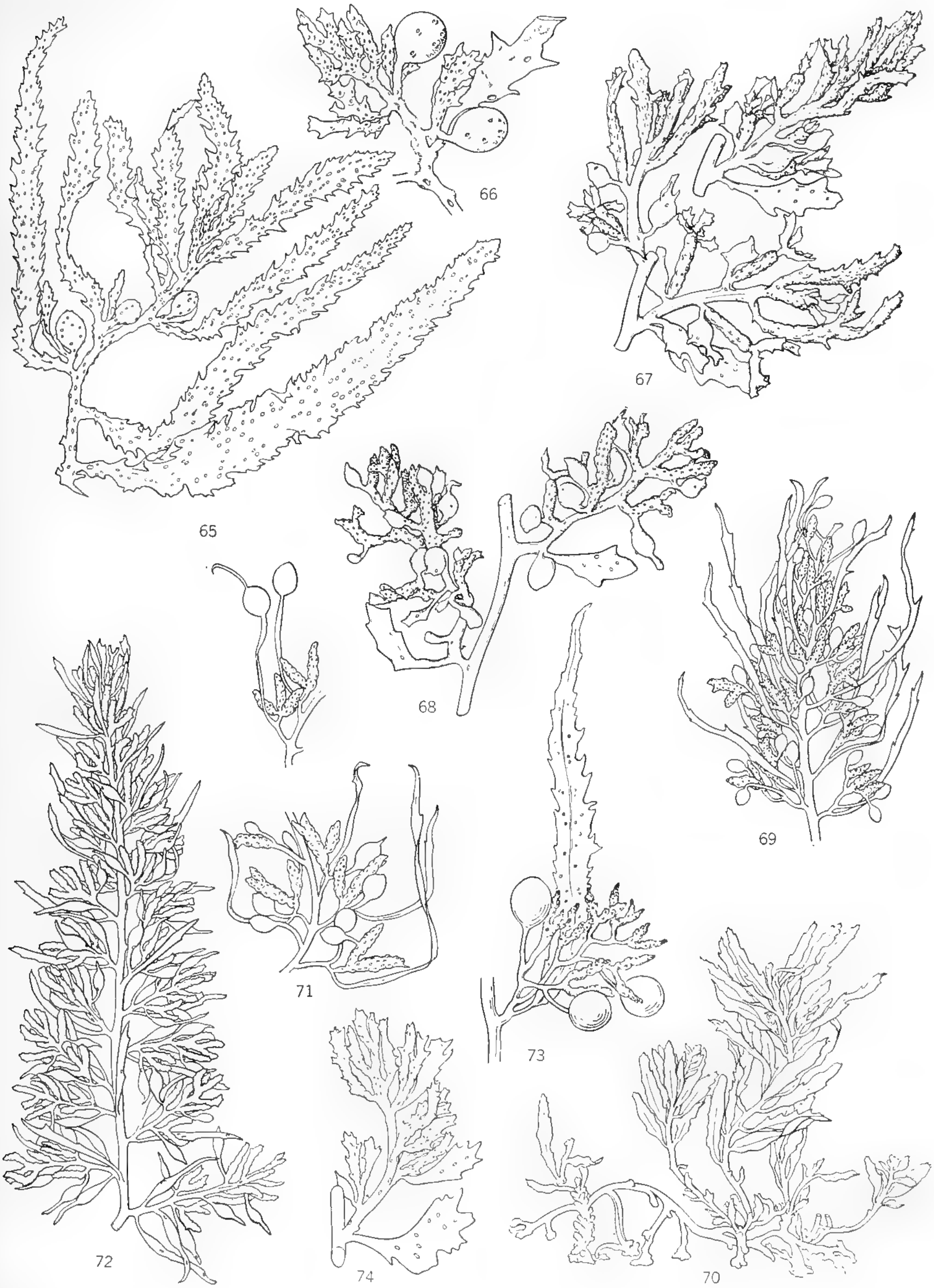
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Plate 21

Sargassum Johnstonii f. *laxius* S. and G.

Fig. 75. A habit sketch of terminal segments of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. H.)

Sargassum Johnstonii f. *gracile* S. and G.

Fig. 76. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum cylindrocarpum S. and G.

Fig. 77. A habit sketch of a terminal fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum insulare S. and G.

Fig. 78. A habit sketch of the terminal portion of a frond, showing the arrangement and characters of the leaves and receptacles. X 1.5 (del. P.)

Sargassum Brandegeei S. and G.

Fig. 79. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum Johnstonii S. and G.

Fig. 80. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. P.)

Sargassum Johnstonii f. *laxius* S. and G.

Fig. 81. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum acinacifolium S. and G.

Fig. 82. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum Bryantii S. and G.

Fig. 83. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)


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Plate 22

Gymnogongrus carnosus S. and G.

Fig. 1. A cross section of a portion of a frond. X 125 (del. H.)

Gelidiopsis tenuis S. and G.

Fig. 2. A longitudinal section of a portion of a frond. X 125 (del. H.)

Asparagopsis Sanfordiana f. *amplissima* S. and G.

Fig. 3. A short lateral branch bearing antheridia. X 30 (del. K.)

Anatheca elongata S. and G.

Fig. 4. A section view showing the characters of the tetrapores. X 200 (del. P.)

Fig. 5. A cross section view of a tetrasporic frond. X 50 (del. P.)

Dicranema rosaliæ S. and G.

Fig. 6. A cross section of a mature frond. X 125 (del. H.)

Gracilaria crispata S. and G.

Fig. 7. A habit sketch of a fragment of a frond. X 1 (del. P.)

Fig. 8. A surface view showing groups of antheridia among the soma cells. X 250 (del. P.)

Fig. 9. A cross section of a tetrasporic plant. X 100 (del. P.)

Fig. 10. A section view showing the antheridia in pits. X 125 (del. P.)

Gracilaria Johnstonii S. and G.

Fig. 11. A surface view showing the groups of antheridia among the soma cells. X 125 (del. P.)

Fig. 12. A cross section showing the cortical and subcortical cells of a sterile frond. X 125 (del. P.)

Fig. 13. A cross section showing the antheridia in pits.

Fig. 14. A portion of a complete cross section of a sterile frond. X 50 (del. P.)

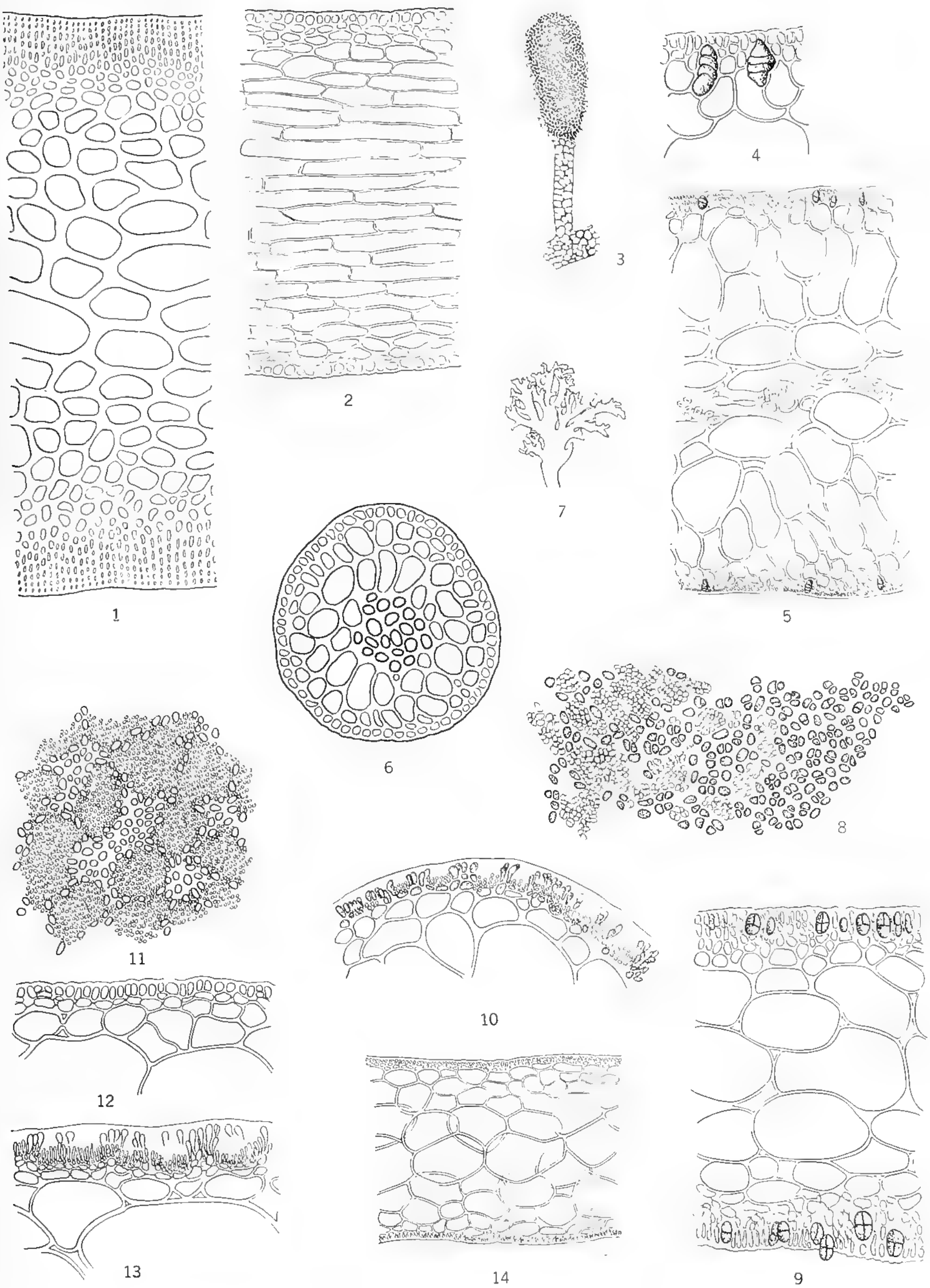
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Plate 23

Laurencia obtusiuscula var. *corymbifera* S. and G.

Fig. 15. A habit sketch of the end of a frond. X 2 (del. K.)

Fig. 16. A sketch of a group of tetrasporic ramuli. X 10 (del. K.)

Laurencia obtusiuscula S. and G.

Fig. 17. A sketch of a group of tetrasporic ramuli. X 10 (del. K.)

Laurencia papillosa var. *pacifica* S. and G.

Fig. 18. A sketch of an antheridial ramulus. X. 10 (del. K.)

Hypnea Johnstonii S. and G.

Fig. 19. Sketch of the end of a branch showing the character of the growing region. X 125 (del. K.)

Fig. 20. A sketch of a group of tetrasporic ramuli. X 15 (del. K.)

Fig. 21. A sketch showing the shape, size and arrangement of tetraspores. X 200 (del. K.)

Hypnea Marchantæ S. and G.

Fig. 22. A sketch of a branch with tetrasporic ramuli. X 15 (del. K.)

Fig. 23. A sketch of the end of a branch showing the character of the growing point. X 125 (del. K.)

Corallopsis excavata S. and G.

Fig. 24. A sketch of a cross section of a tetrasporic branch, showing the disposition of the tetrasporangia, the arrangement of tetraspores and the openings through which the tetraspores escape. Diagrammatic (del. P.)

Fig. 25. A sketch of a tetrasporic ramulus. X 2.5 (del. P.)

Gracilaria subsecundata S. and G.

Fig. 26. A cross section of a tetrasporic frond, showing the cortical and subcortical cells and tetraspores in position. (del. P.)

Fig. 27. A cross section of a tetrasporic frond. (del. P.)

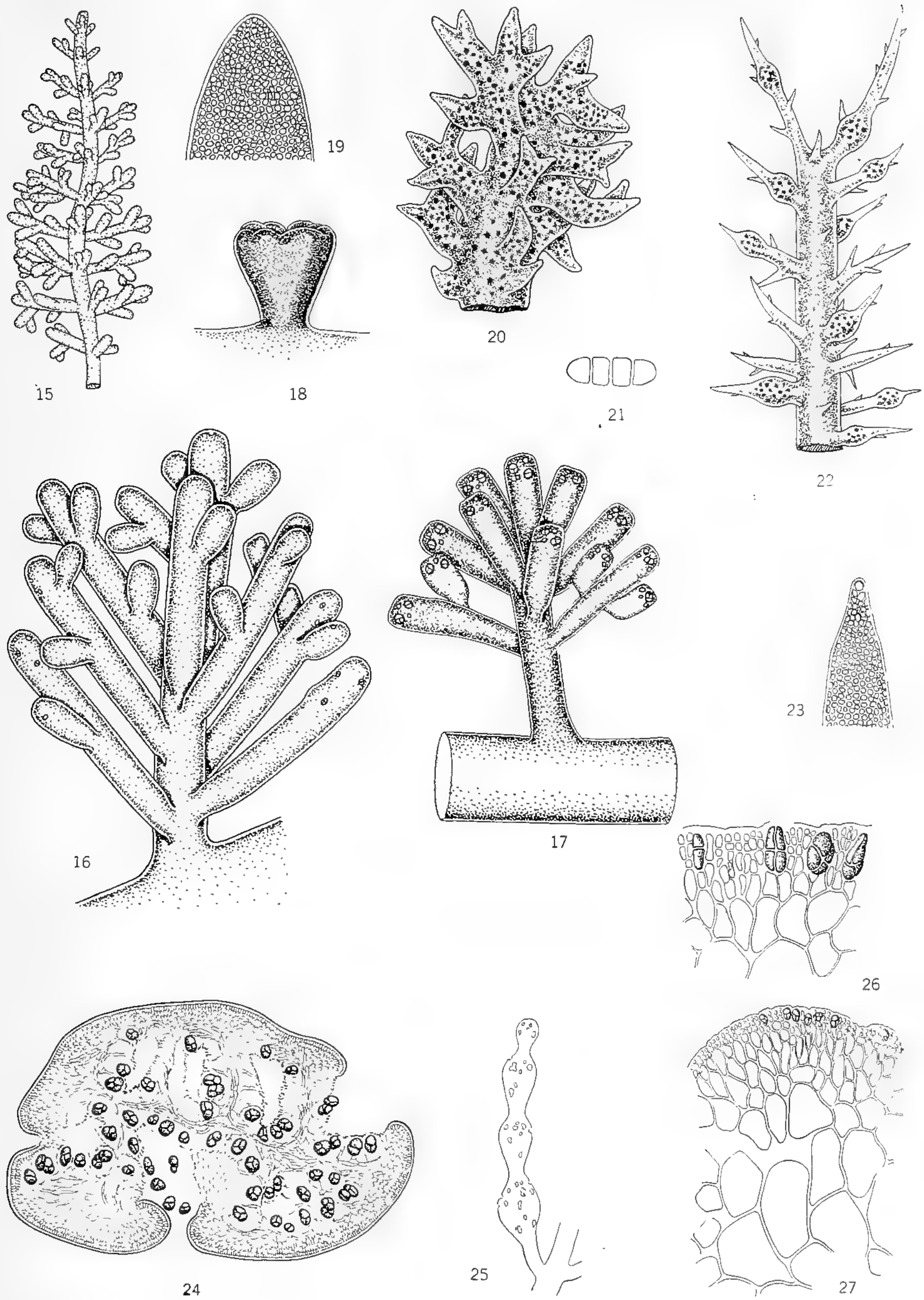
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Plate 24

Gracilaria vivipara S. and G.

Fig. 28. A portion of a cross section of a sterile frond. X 125 (del. H.)

Fig. 29. A portion of a cross section of a tetrasporic frond. X 125. (del. H.)

Gracilaria pachydermatica S. and G.

Fig. 30. Habit sketch of a mature frond. X 1 (del. P.)

Fig. 31. A portion of a cross section of a frond near the base. X 125. (del. H.)

Gymnogongrus carnosus S. and G.

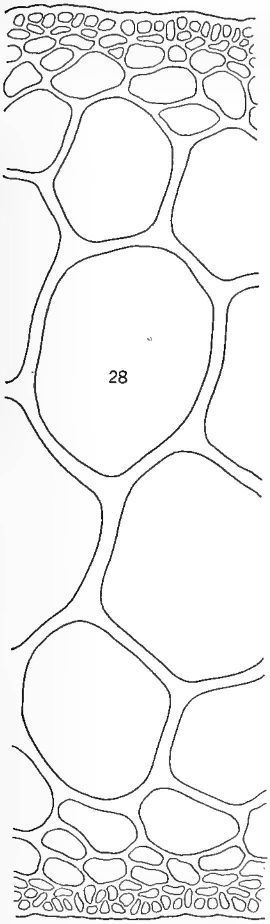
Fig. 32. A complete cross section of a frond. X 25 (del. H.)

Laurencia papillosa var. *pacifica* S. and G.

Fig. 33. A sketch of a cluster of antheridia. X 125 (del. K.)

Laurencia estebaniana S. and G.

Fig. 34. A sketch of a cluster of antheridia. X 150 (del. K.)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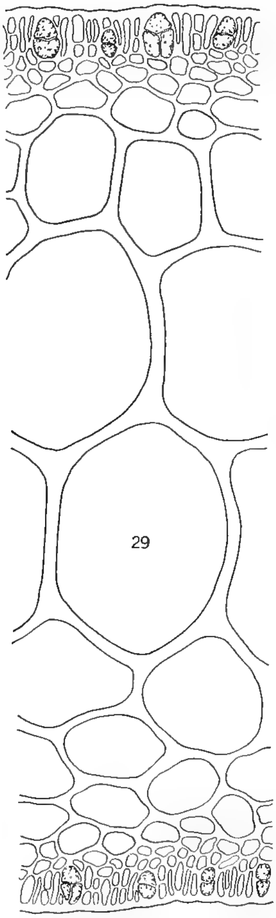
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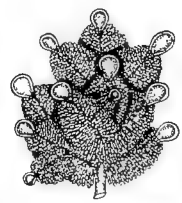
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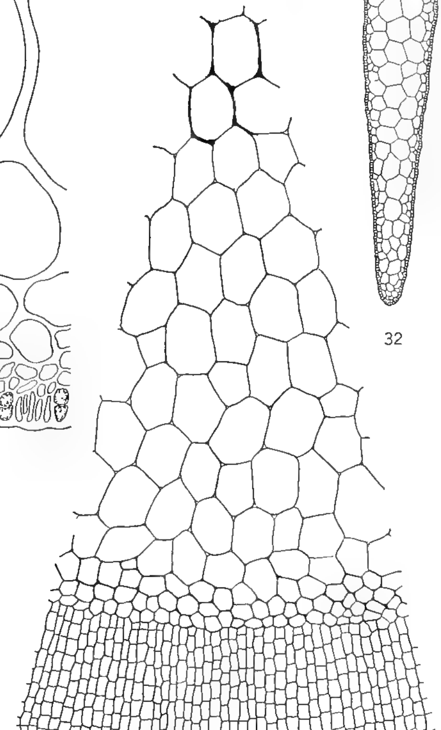
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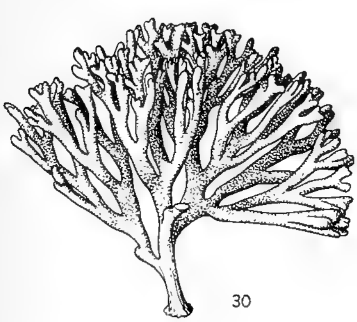
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Plate 25

Estebania conjuncta S. and G.

Fig. 35. A portion of a cross section of a tetrasporic frond. X 125 (del. H.)

Fig. 36. A portion of a cross section of a tetrasporic frond. X 75 (del. K.)

Schizymenia violacea S. and G.

Fig. 37. Sketch of a part of a cross section of a cystocarpic frond. X 150 (del. K.)

Fig. 38. Sketch of a part of the cortex of a tetrasporic frond. X 150 (del. K.)

Prionitis abbreviata S. and G.

Fig. 39. A sketch of a cross section of a frond extending from the center to the surface. X 250 (del. H.)

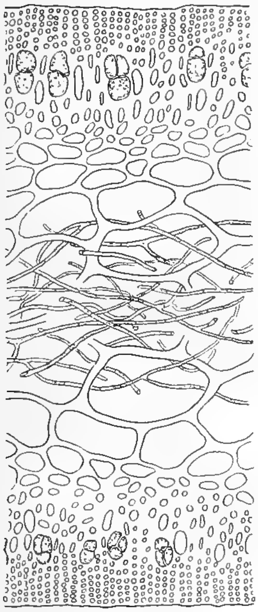
Ceramium sinicola S. and G.

Fig. 40. A sketch of a segment of a tetrasporic branch. X 125 (del. K.)

Fig. 41. End of the same branch shown in fig. 40. X 125 (del. K.)

Eucheuma Johnstonii S. and G.

Fig. 42. A sketch of a single tetrasporangium, showing the inequality in size of the tetraspores. X 125 (del. P.)



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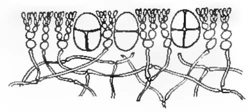

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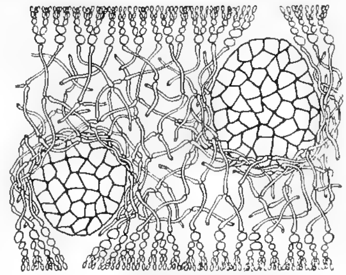

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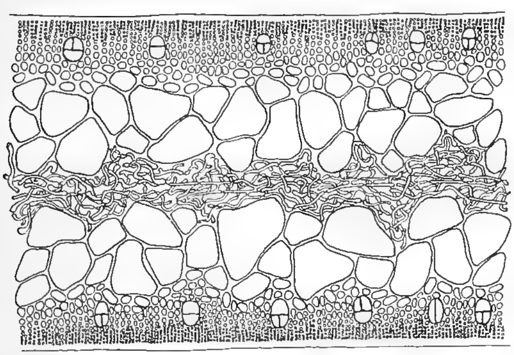

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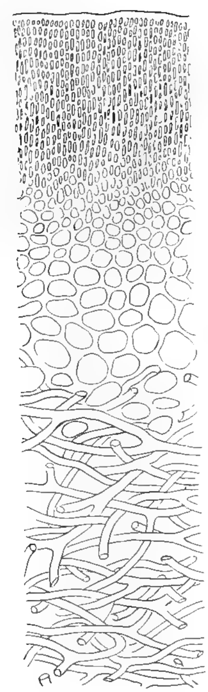

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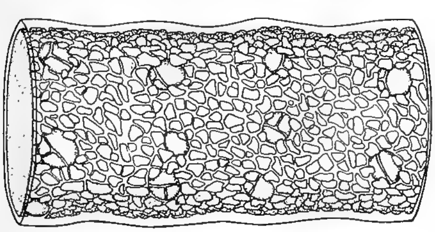

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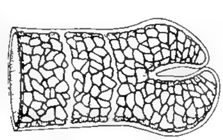

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Plate 26

Ceramium fimbriatum S. and G.

Fig. 43. A diagrammatic sketch of a fragment of a frond.
Fig. 44. A sketch of a terminal branch. X 125 (del. P.)

Grateloupia acroidalea S. and G.

Fig. 45. A sketch of a portion of a cross section, vegetative to the left and tetrasporic to the right. X 250 (del. P.)
Fig. 46. A sketch of a mature whole frond. X 1 (del. P.)

Ceramium interruptum S. and G.

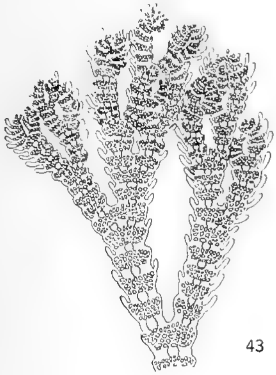
Fig. 47. A sketch of a branched segment of a tetrasporic frond, showing the interrupted cortication. X 50 (del. K.)

Centroceras bellum S. and G.

Fig. 48. A sketch of segments of a tetrasporic plant. X 125 (del. P.)

Ceramium horridum S. and G.

Fig. 49. A sketch of a terminal fragment of a frond. X40 (del. P.)
Fig. 50. A sketch of the ends of three branches, the upper one having two growing points. X 125 (del. P.)



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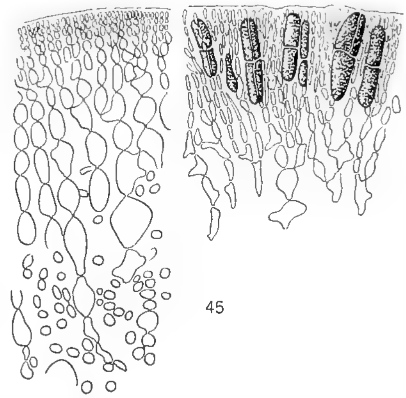

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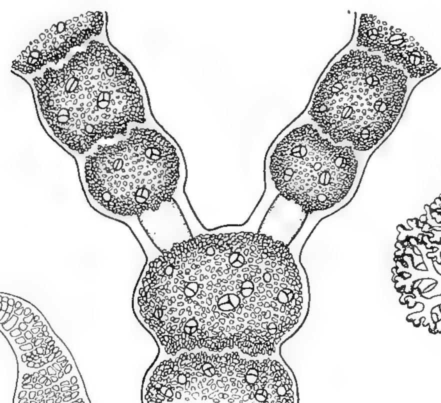

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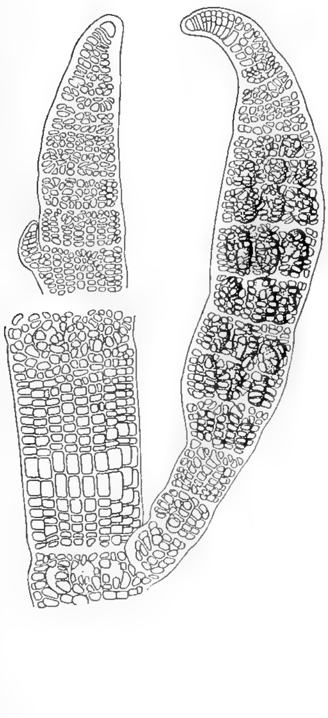

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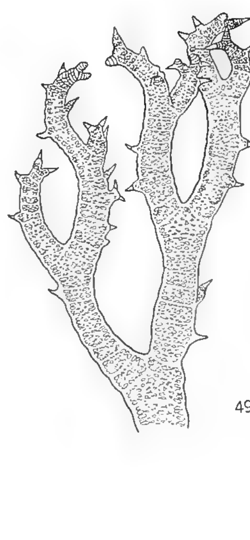

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Plate 27

Ceramium procumbens S. and G.

Fig. 51. A sketch of a portion of a mature frond, showing mostly opposite branching. X 30 (del. K.)

Fig. 52. A sketch of a short lateral tetrasporic ramulus. X 125 (del. K.)

Fig. 53. A sketch of a cystocarpic ramulus. X 125 (del. K.)

Fig. 54. A sketch of an antheridial ramulus. X 125 (del. K.)

Ceramium caudatum S. and G.

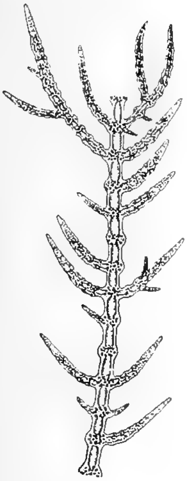
Fig. 55. A sketch of a segment of a mature tetrasporic ramulus. X 125 (del. K.)

Fig. 56. A sketch of a segment of the main frond near the base. X 125 (del. K.)

Fig. 57. A sketch of the end of a tetrasporic branch. X 125 (del. K.)

Ceramium serpens S. and G.

Fig. 58. A sketch of a portion of a tetrasporic plant, showing a horizontal filament with attachments and with erect free branches. X 125 (del. P.)



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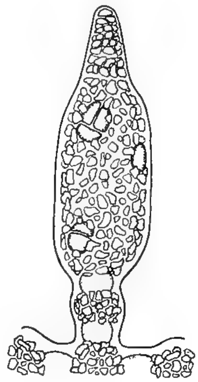

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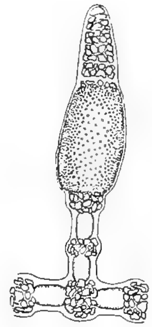

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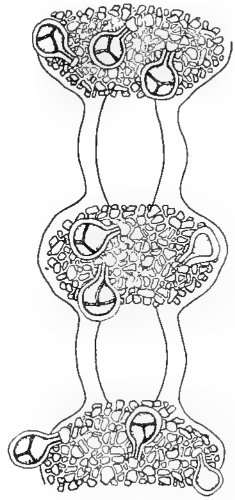

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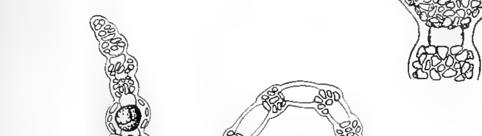

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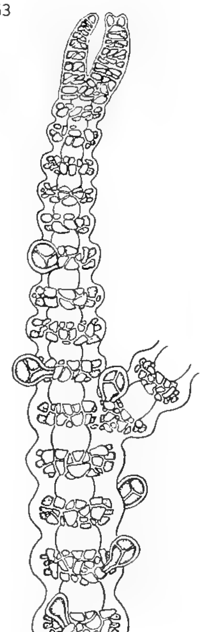

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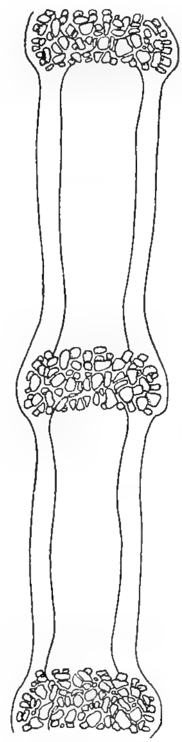

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Plate 28

Heterosiphonia sinicola S. and G.

Fig. 59. A sketch of a segment of a frond showing the character of the surface cells and of the interior cells. X 60 (del. H.)

Fig. 60. A cross section of a mature frond. X 75 (del. H.)

Polyopes sinicola S. and G.

Fig. 61. A cross section of a frond at the margin. X 75 (del. K.)

Callithamnion endovagum S. and G.

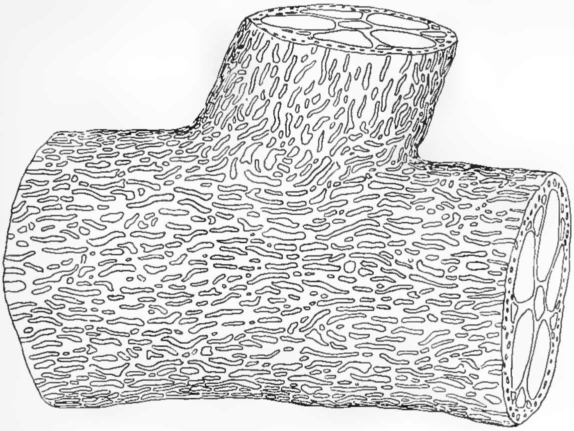
Fig. 62. A sketch of a cross section of the host, showing the penetrating filaments of the *Callithamnion*, and the free filaments with procarps. X 125 (del. K.)

Colacodasya sinicola S. and G.

Fig. 63. A sketch of a free filament showing numerous antheridia. X 125 (del. H.)

Ceramium bicorne S. and G.

Fig. 64. Sketches of terminal fragments. X 250 (del. H.)



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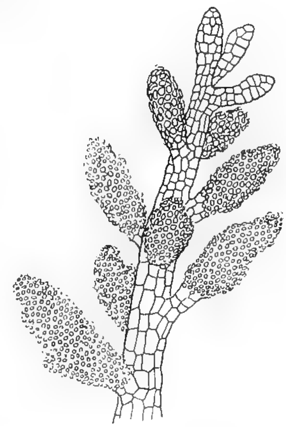

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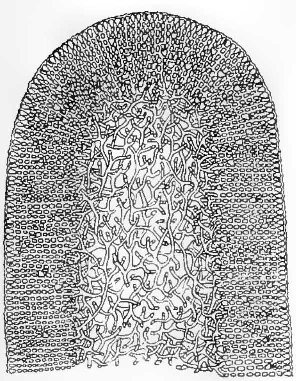

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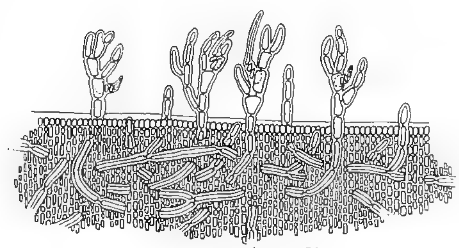

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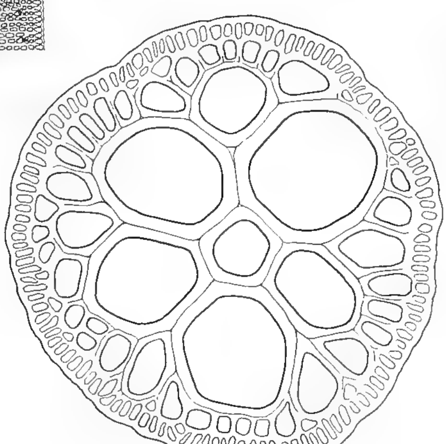

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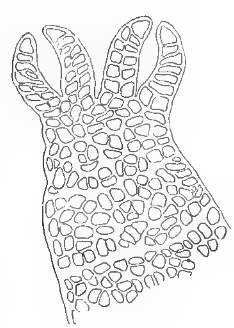

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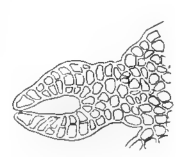


Plate 29

Laurencia sinicola S. and G.

Fig. 65. A sketch of a fragment of a tetrasporic frond. X 4 (del. K.)
Fig. 66. A sketch of a fragment of a cystocarpic frond. X 10 (del. K.)

Laurencia obtusiuscula var. *laxa* S. and G.

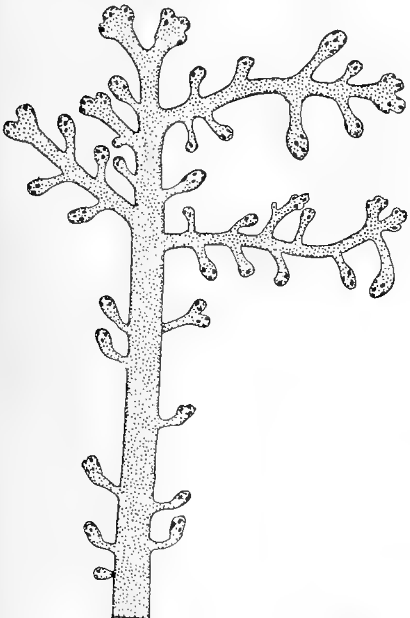
Fig. 67. A sketch of a few tetrasporic ramuli. X 10 (del. K.)

Laurencia sp.

Fig. 68. A sketch of a tetrasporic ramulus. X 40 (del. P.)
Fig. 69. A sketch of a fragment of a plant. X 1.5 (del. P.)

Ceramium sp.

Fig. 70. A sketch of a terminal fragment of an antheridial frond. X 125 (del. P.)
Fig. 71. The same as fig. 70. X 25 (del. P.)



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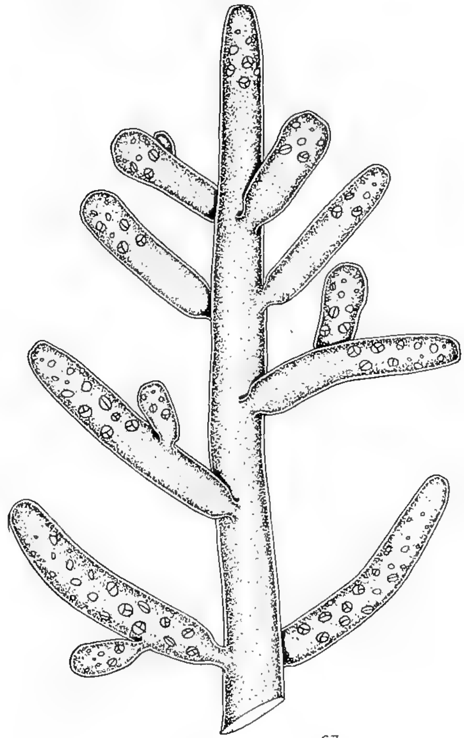

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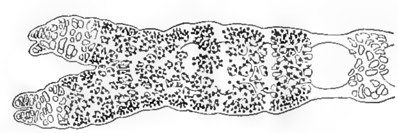

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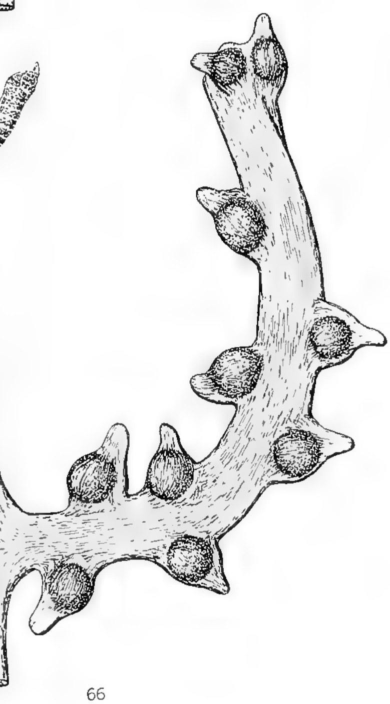

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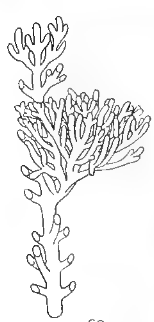


69

68

Plate 30

Codium Brandegeei S. and G.

A photograph of the type specimen.

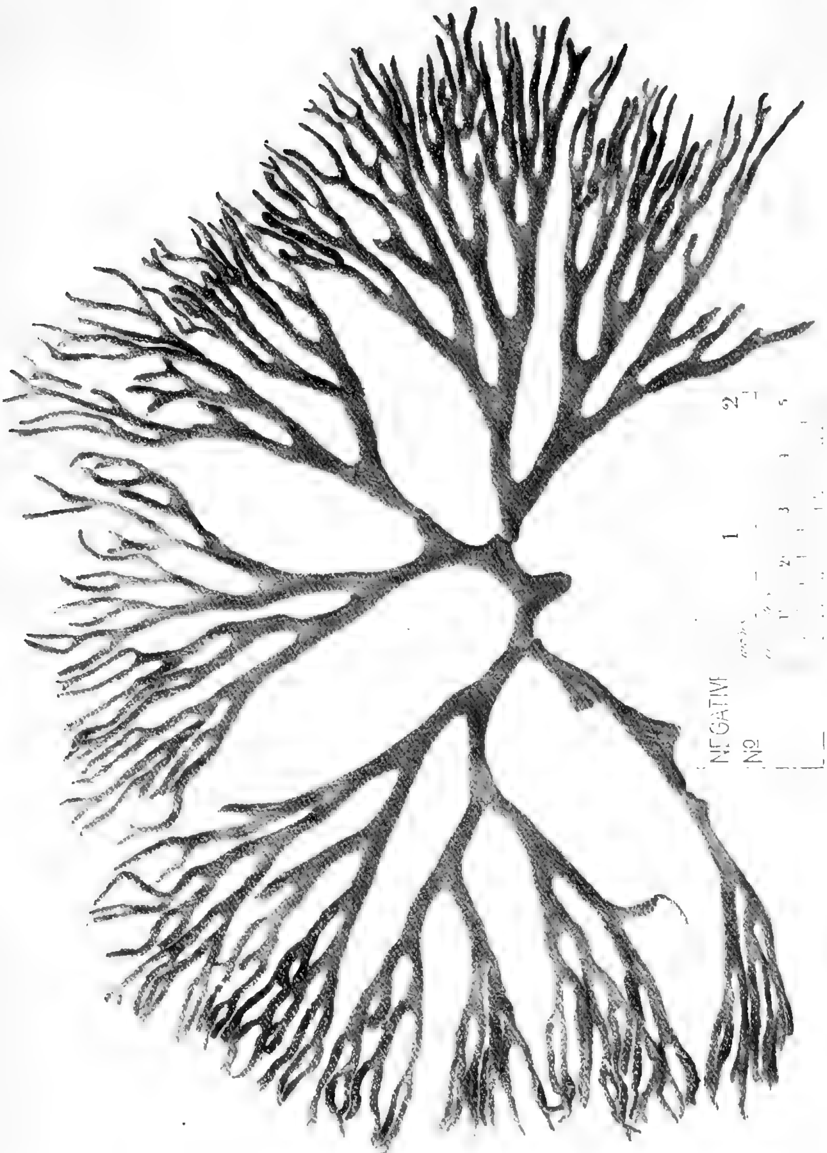


Plate 31

Codium simulans S. and G.

A photograph of the type specimen.

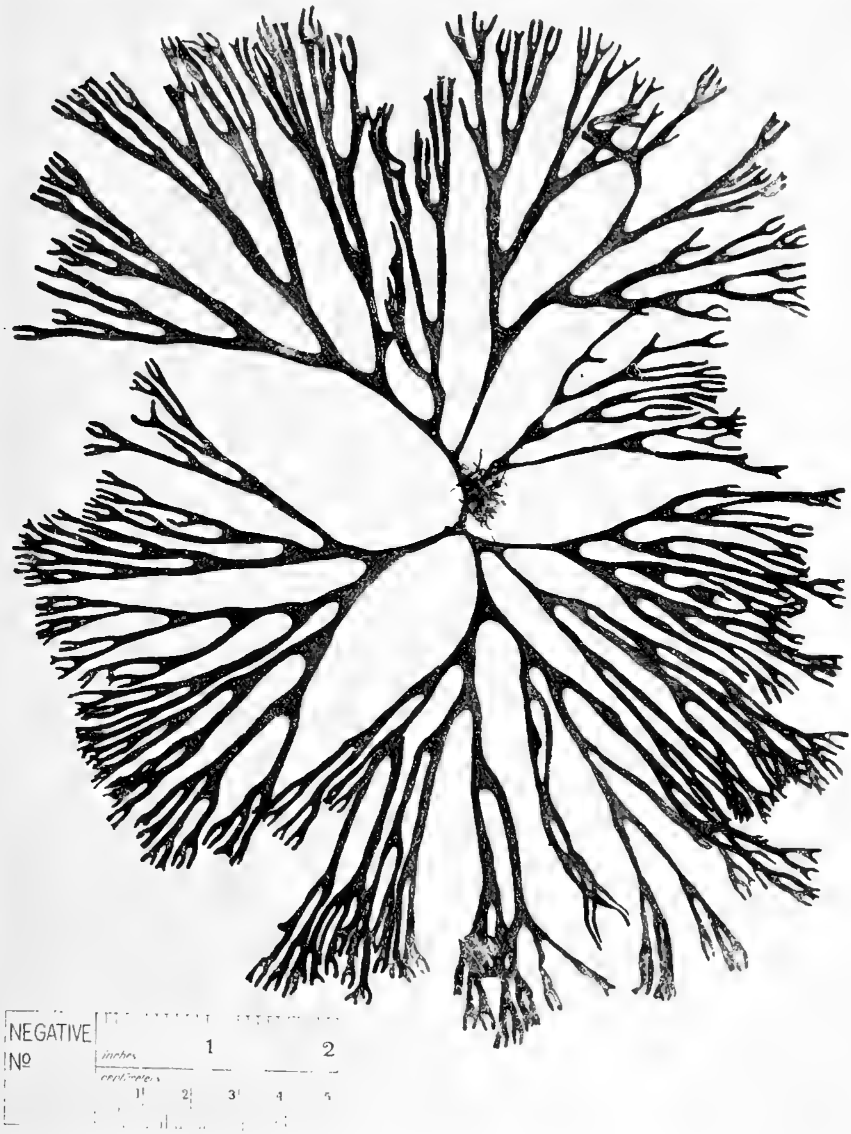


Plate 32

A. *Codium conjunctum* S. and G.

A photograph of the type specimen. X 1.

B. *Codium cervicorne* S. and G.

A photograph of the type specimen. X 1.

a

b

Plate 33

Codium reductum. S. and G.

A photograph of the type specimen dried. X 1.

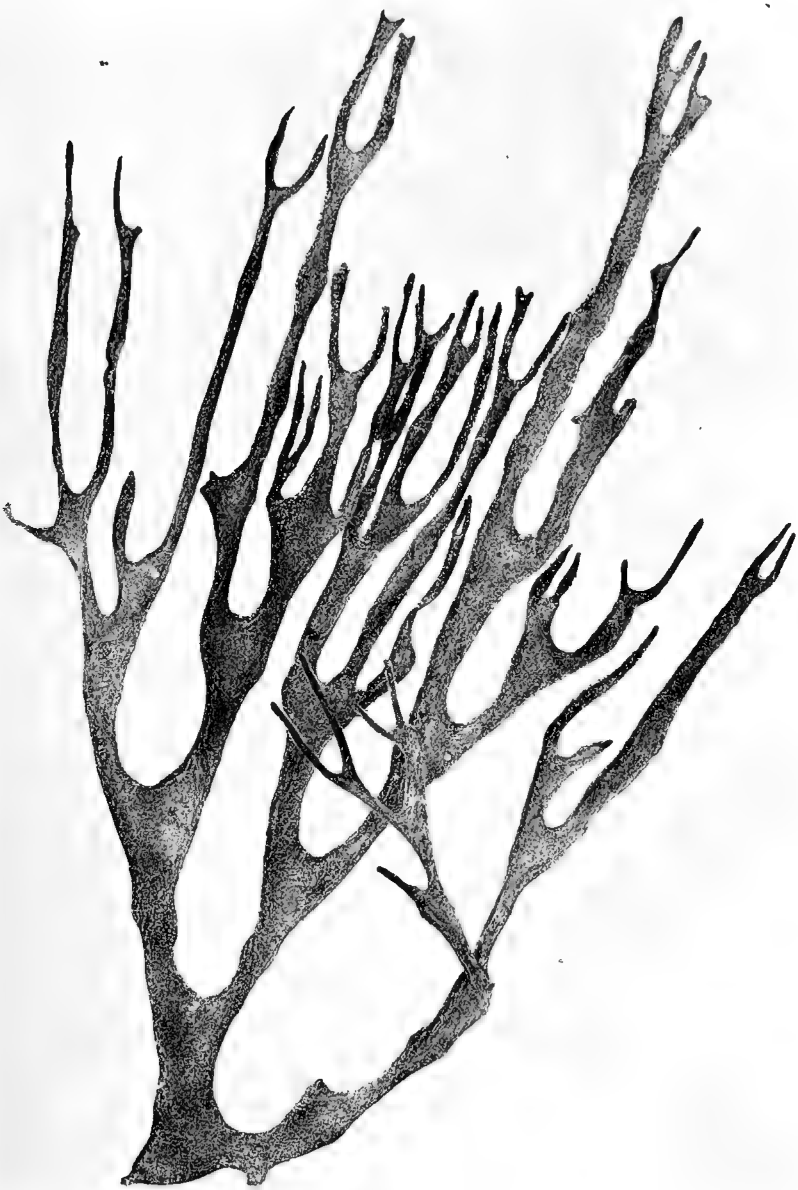


Plate 34

Codium cuneatum S. and G.

A photograph of the type specimen.

Plate 35

Codium amplivesiculatum S. and G.

A photograph of a portion of the type specimen, dried.

Plate 36

Codium unilaterale S. and G.

A photograph of the type specimen. X 1.

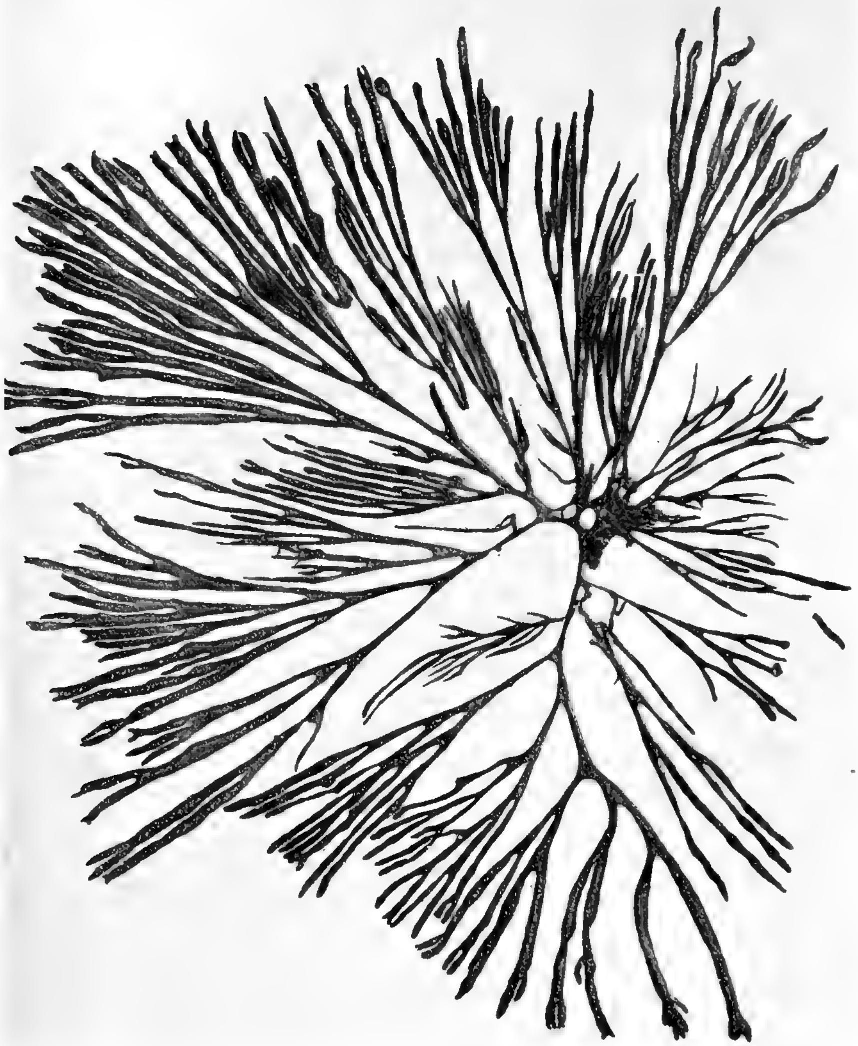


Plate 37

Codium longiramosum S. and G.

A photograph of the type specimen.

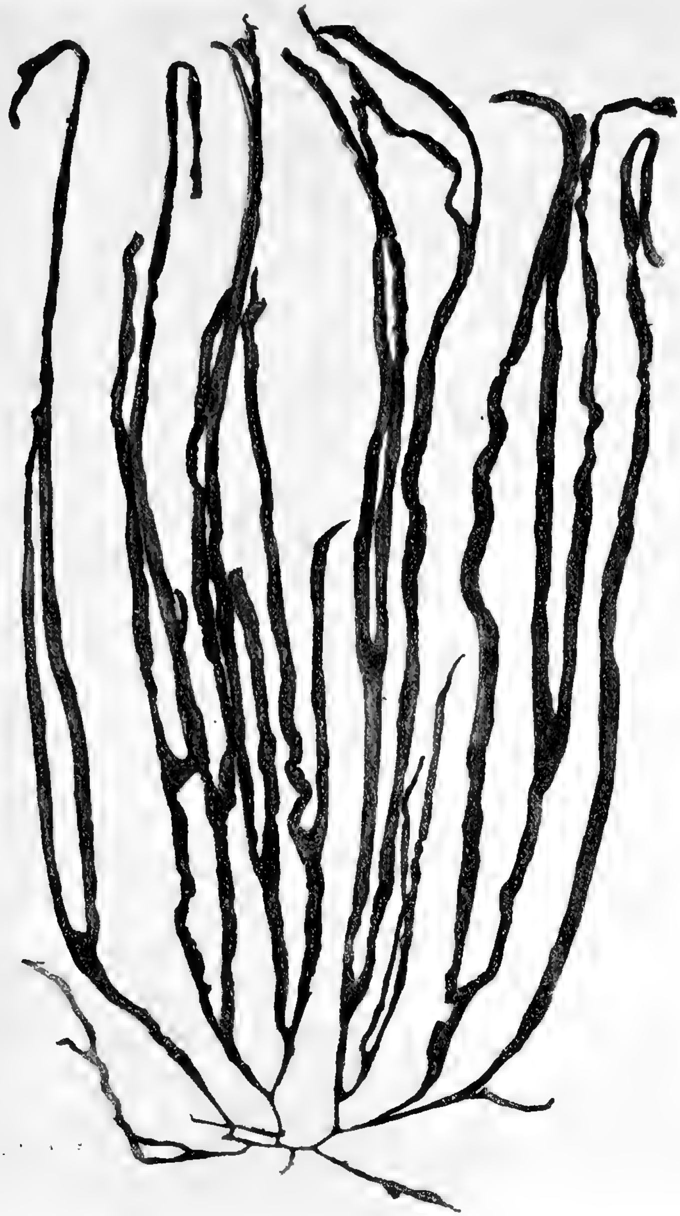


Plate 38

Enteromorpha acanthophora Kuetz.

A photograph of a few typical specimens of the collection, Johnston, no. 39. X 1.

Plate 39

Dictyota Johnstonii S. and G.

A photograph of the type specimen. X 1.

Plate 40

A. *Xenococcus deformans* S. and G.

A photograph showing the deformed host.

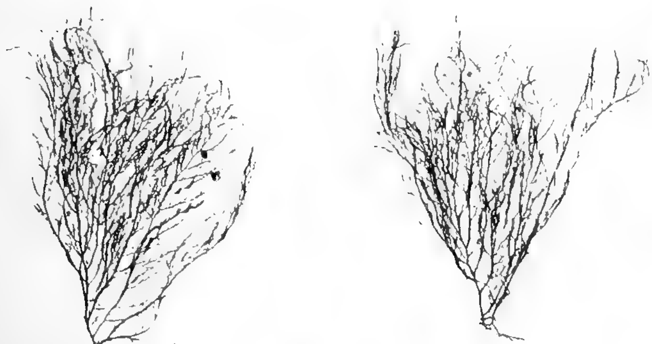
B. *Chondria acrorhizophora* S. and G.

A photograph of two tetrasporic plants showing habit. X 1.

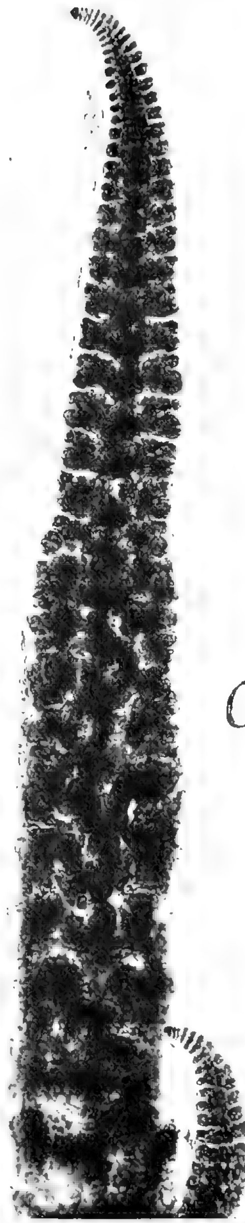
C. *Centroceras bellum* S. and G.

A photograph showing the character of the end of a filament. X 145.

A



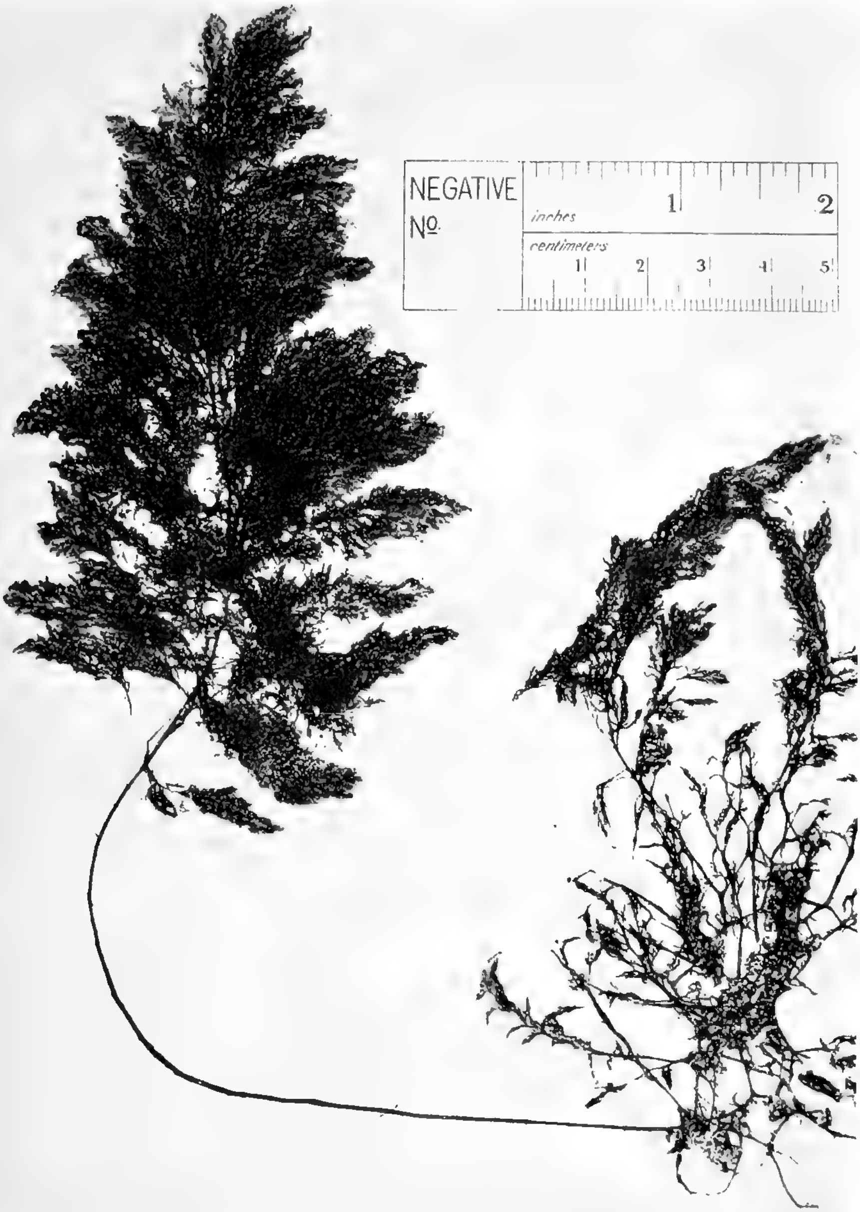
b



C

Plate 41

Asparagopsis Sanfordiana f. *amplissima* S. and G.
A photograph of the type specimen showing the general habit.


NEGATIVE
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centimeters
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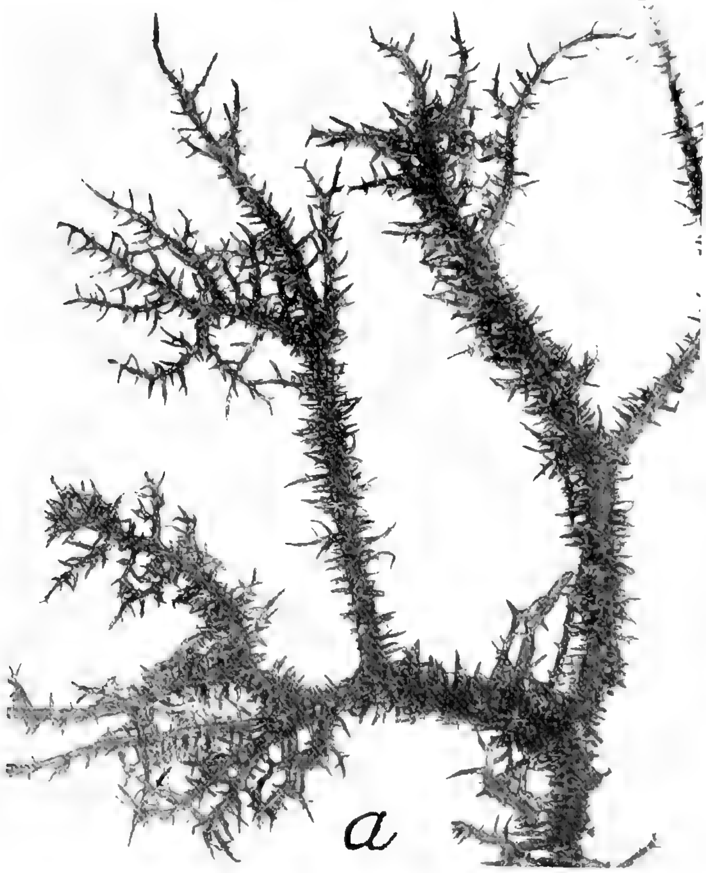
Plate 42

A. *Hypnea Marchantiæ* S. and G.

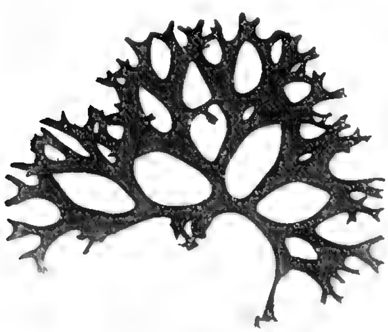
A photograph of a fragment of a tetrasporic plant. X 10.

B. *Polyopes sinicola* S. and G.

A photograph of the type specimen. X 1.



a



b

Plate 43

Laurencia papillosa var. *pacifica* S. and G.

A, X 1. B, X 3.


b
a

Plate 44

A. *Gracilaria crispata* S. and G.

A photograph of the type specimen. X 1.

B. *Corallopsis excavata* S. and G.

A photograph showing the moniliform tetrasporic branches. X 1.

a

b

Plate 45

A. *Laurencia estebaniana* S. and G.

A photograph of the type specimen. X 1.

B. *Laurencia obtusiuscula* var. *corymbifera* S. and G.

A photograph of the type specimen. X 1.

a

b

Plate 46

A. *Gelidium Johnstonii* S. and G.

A photograph of a fragment of a cystocarpic plant. X 4.

B. *Gigartina Chauvinii* (Bory) Mont.

A photograph of the type specimen. X 1.

b

a

Plate 47

A. *Gymnogongrus carnosus* S. and G.
A photograph of the type specimen. X 1.

B. *Heterosiphonia sinicola* S. and G.
A photograph of the type specimen. X 1.

a

b

Plate 48

Corallopsis excavata S. and G.

A photograph of the type specimen. X 0.5.

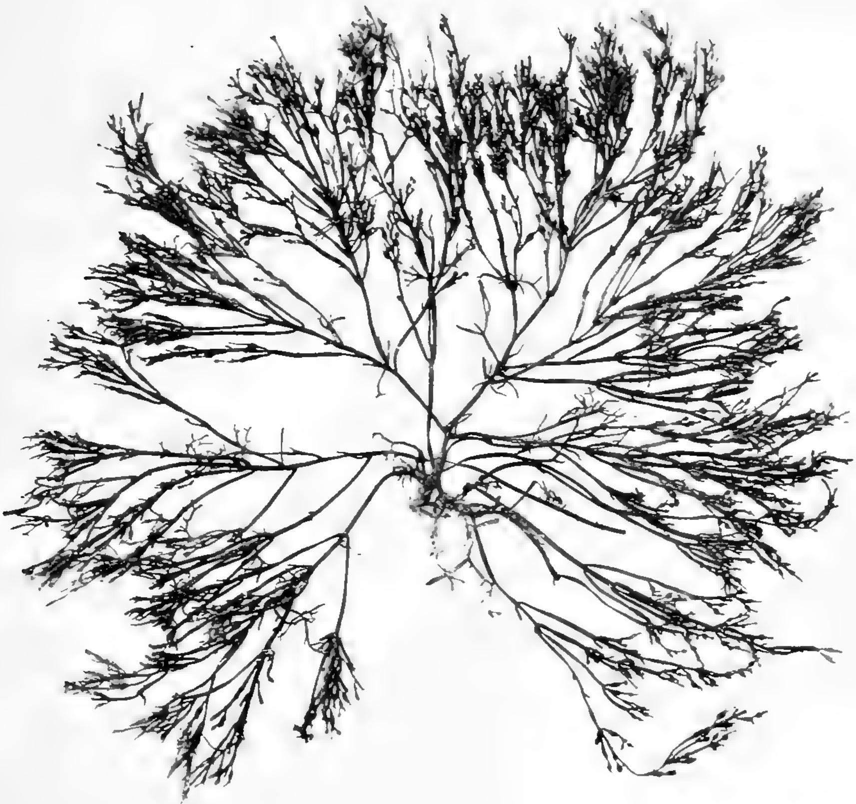


Plate 49

A. *Polysiphonia Marchantæ* S. and G.

A photograph of the type specimen. X 1.

B. *Callymenia pertusa* S. and G.

A photograph of the type specimen. X 1.

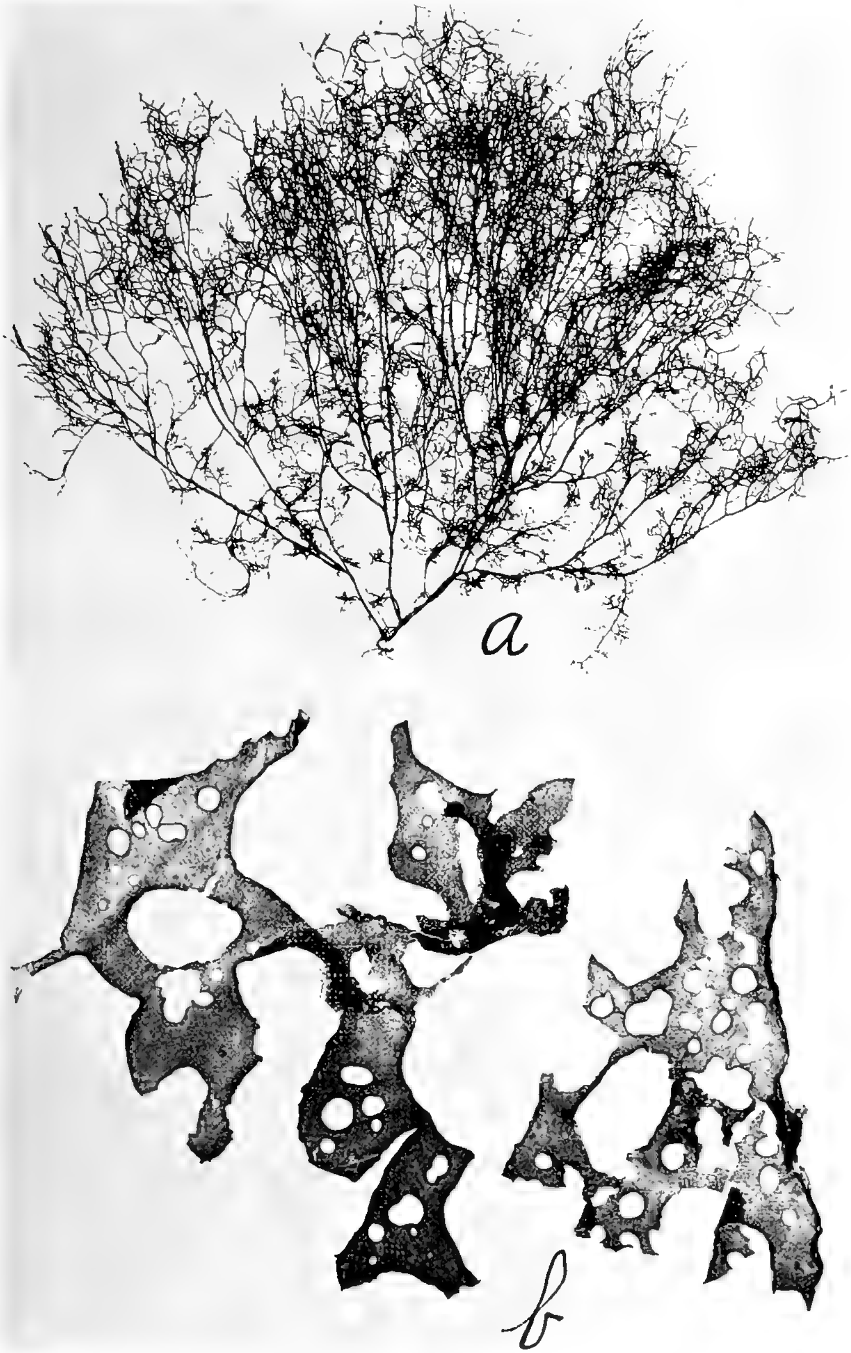

a
b

Plate 50

A. *Laurencia sinicola* S. and G.

A photograph of the type material.

B. *Prionitis abbreviatus* S. and G.

A photograph of the type specimen. X 1.

a

b

Plate 51

A. *Callophyllis Johnstonii* S. and G.

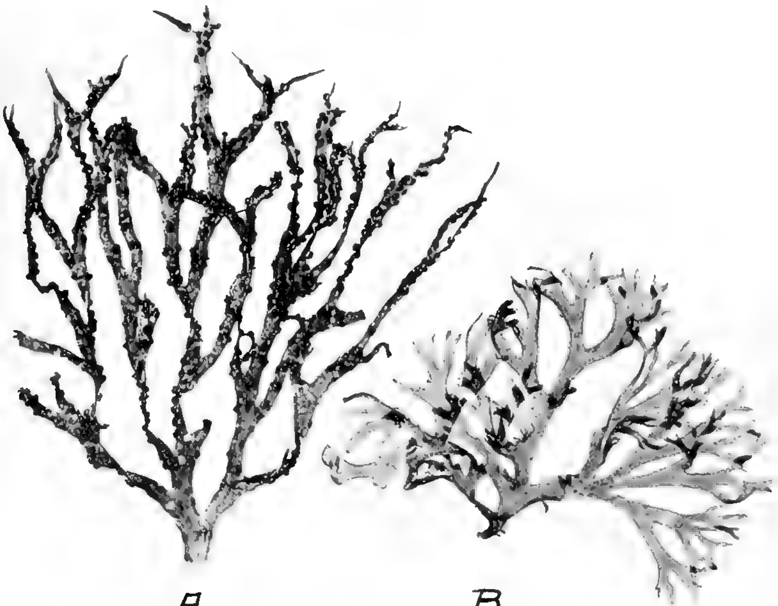
A photograph of the type specimen of a cystocarpic plant. X 1.

B. *Callophyllis Johnstonii* S. and G.

A photograph of a tetrasporic plant. X 1.

C. *Gracilaria lacerata* S. and G.

A photograph of typical specimens. X 1.



A B

C

Plate 52

A. *Laurencia Johnstonii* S. and G.

A photograph of a small plant. X 1.

B. *Laurencia obtusiuscula* var. *laxa* S. and G.

A photograph of the type specimen. X 1.

Plate 53

Laurencia Johnstonii S. and G.

A photograph of the type specimen. X 1.

Plate 54

Laurencia papillosa var. *pacifica* S. and G.

A photograph of the type specimen. X 1.

Plate 55

Laurencia obtusiuscula S. and G.

A photograph of the type specimen. X 1.

Plate 56

Hypnea Marchantae S. and G.

A photograph of the type specimen, (a) tetrasporic, (b) sterile. X 1.

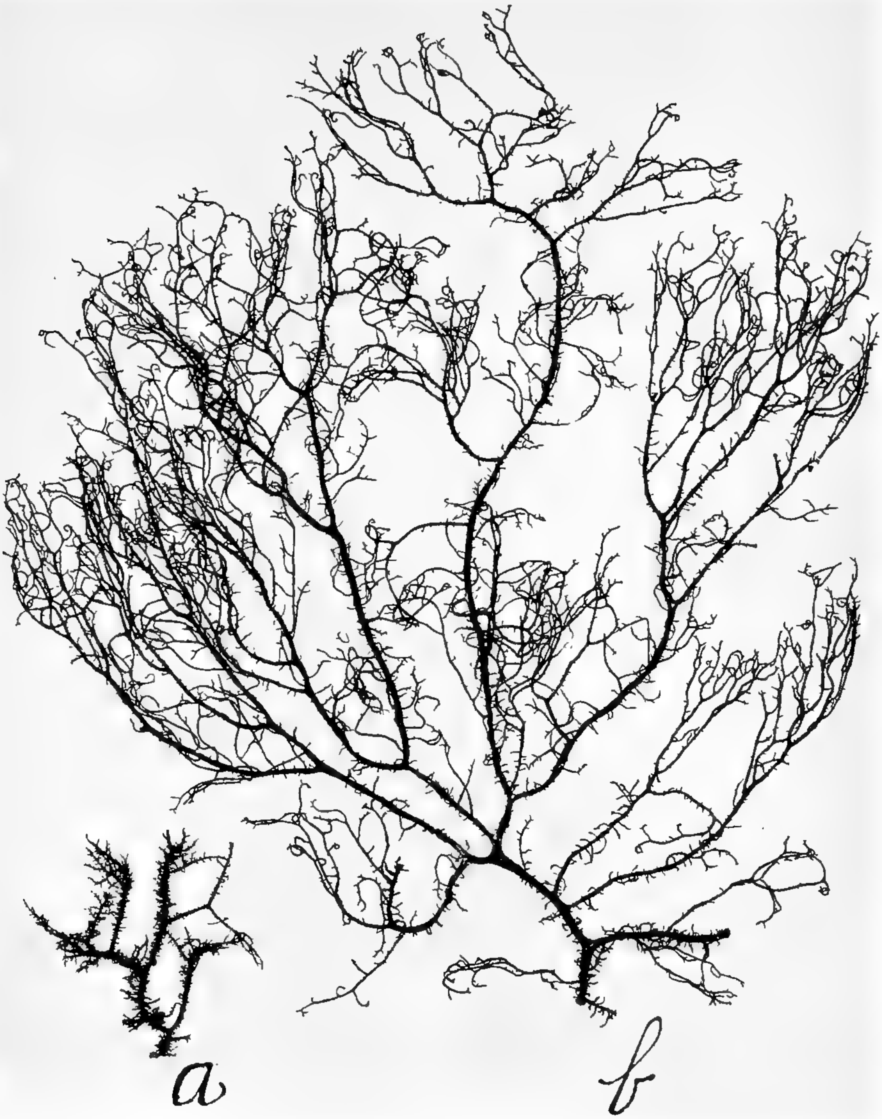

a
b

Plate 57

Hypnea Johnstonii S. and G.

A photograph of the type specimen. X 1.

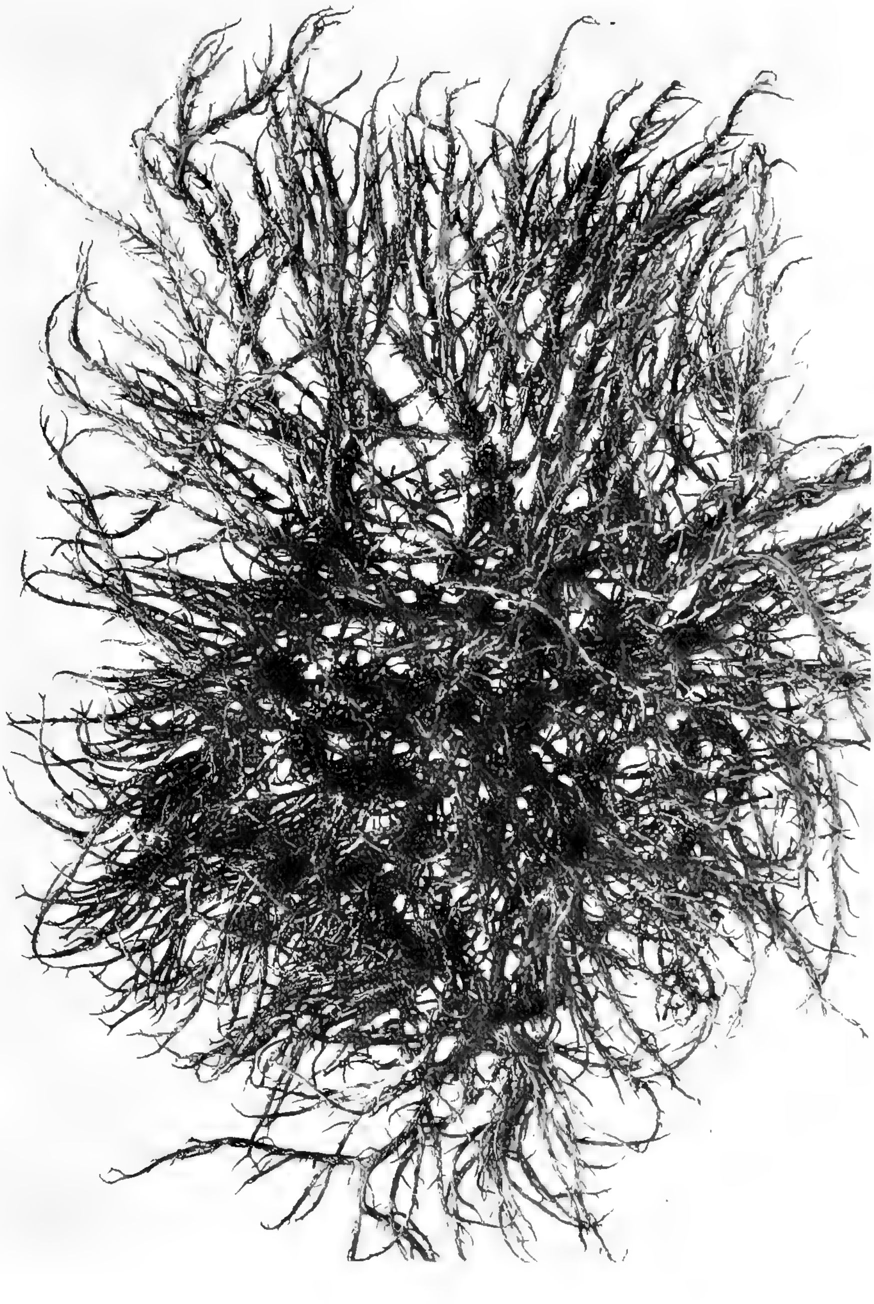


Plate 58

Gracilaria sp. X 1.

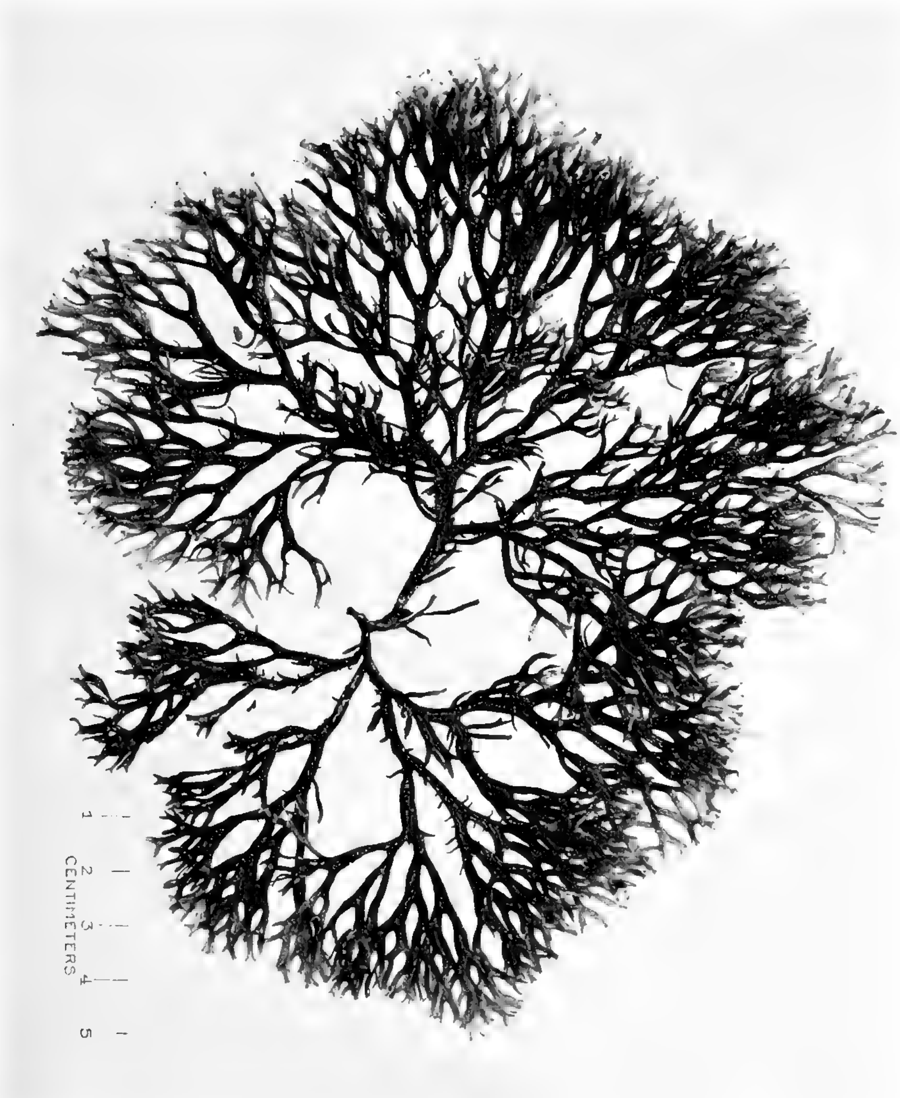
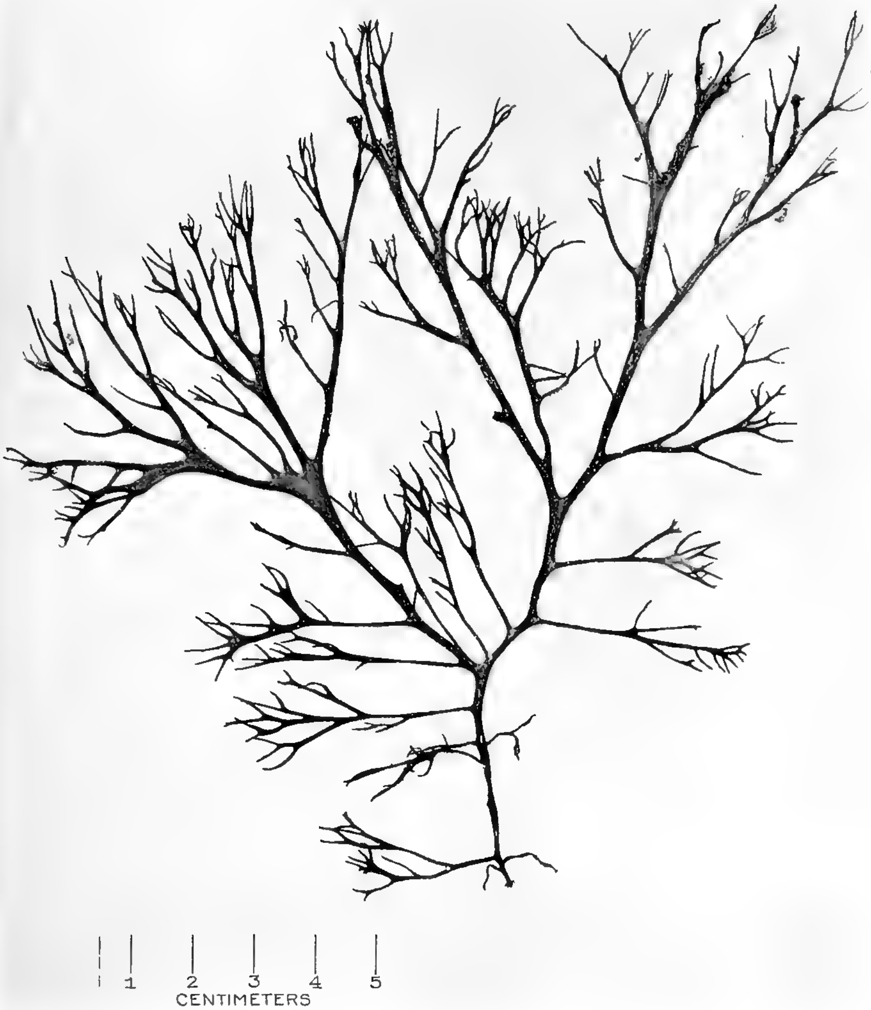

1 2 3 4 5
CENTIMETERS

Plate 59

Gracilaria subsecundata S. and G.

A photograph of the type specimen. X 1.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CENTIMETERS

Plate 60

Gracilaria Johnstonii S. and G.

A photograph of the type specimen. X 0.5.

Plate 61

Gracilaria pinnata S. and G.

A photograph of typical fragments of sterile plants. X 1.

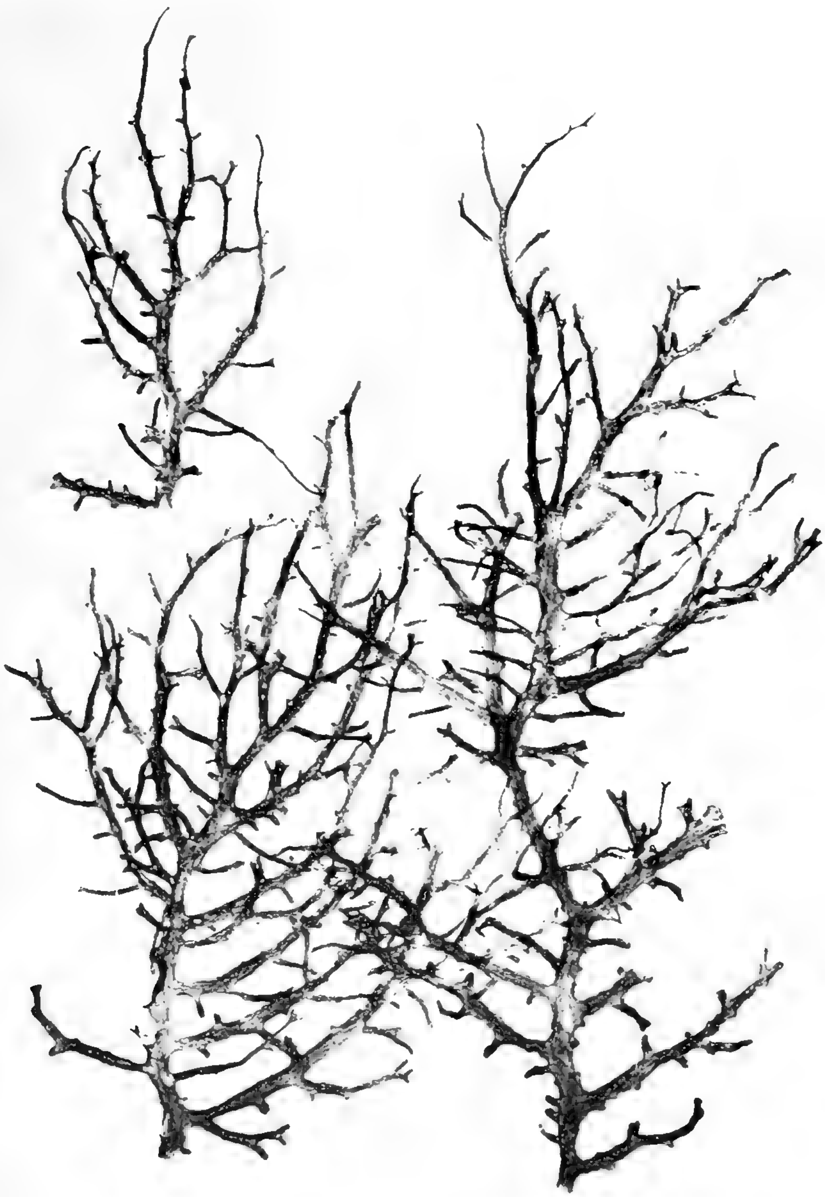

Plate 62

Gracilaria sinicola S. and G.

A photograph of the type specimen. X 2/3.

Plate 63

Gracilaria vivipara S. and G.

A photograph of the type specimen. X 2/3.

Plate 64

Gracilaria Vivesii Howe.

A photograph of a sterile specimen.

Plate 65

Eucheuma Johnstonii S. and G.

A photograph of a fragment of a tetrasporic plant. X 1.

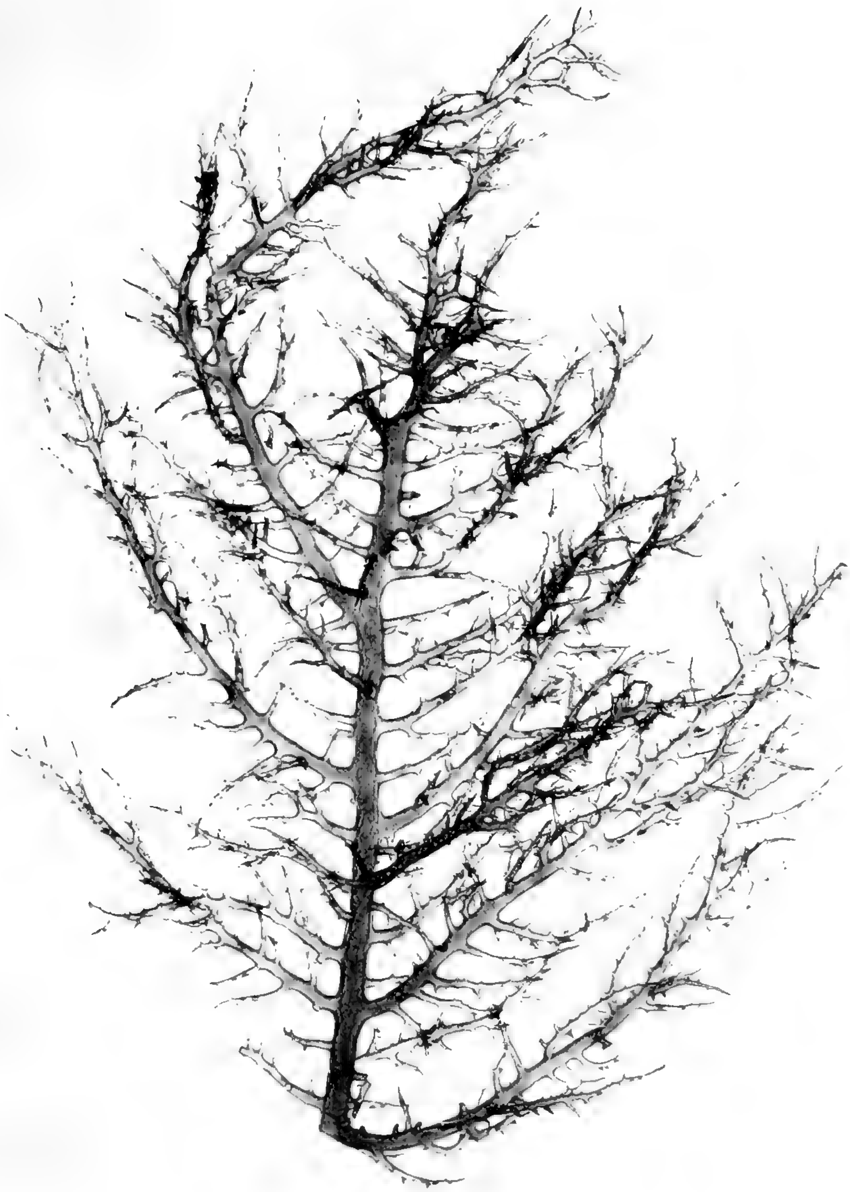

Plate 66

Eucheuma Johnstonii S. and G.

A photograph of a fragment of a tetrasporic plant. X 2.

Plate 67

Eucheuma uncinatum S. and G.

A photograph of a fragment of a tetrasporic plant, showing the branched character of the uncinate ramuli. X 3.

Plate 68

Eucheuma uncinatum S. and G.

A photograph of the type specimen of cystocarpic plant. X 1.

Plate 69

Anatheca elongata S. and G.

A photograph of the type specimen.

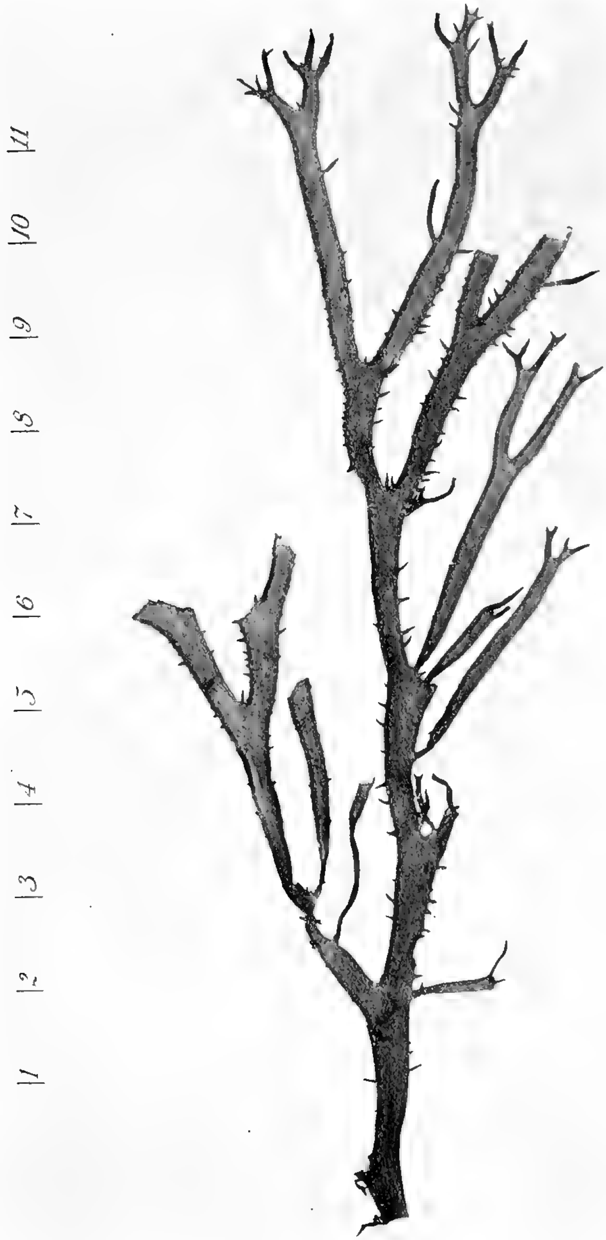

Plate 70

Gigartina Chauvinii (Bory) Mont.

A photograph of a wide specimen. X 2/3.

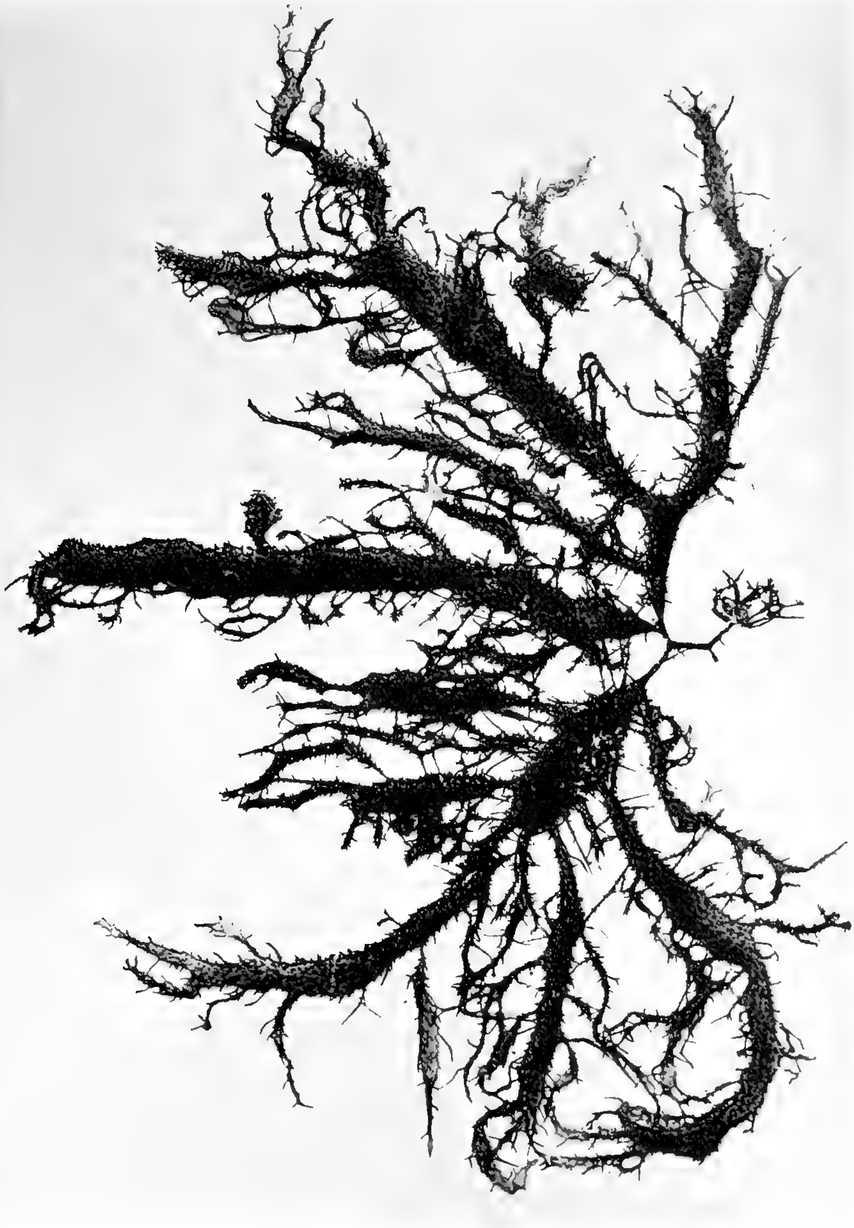

Plate 71

Gelidium decompositum S. and G.

A photograph of the type specimen. X 1.

Plate 72

Gelidium Johnstonii S. and G.

A photograph of the type of a cystocarpic specimen. X 1.

Plate 73

Gelidium Johnstonii S. and G.

A photograph of the type of a tetrasporic specimen. X 1.

Plate 74

Ceramium bicorne S. and G.

A photograph of the type specimen, cystocarpic. X 10.

Plate 75

Ceramium sinicola S. and G.

A photograph of fragments of tetrasporic plants. X 10.

Plate 76

Ceramium Johnstonii S. and G.

A photograph of a typical portion of a tetrasporic plant with numerous proliferations. X 6.5.

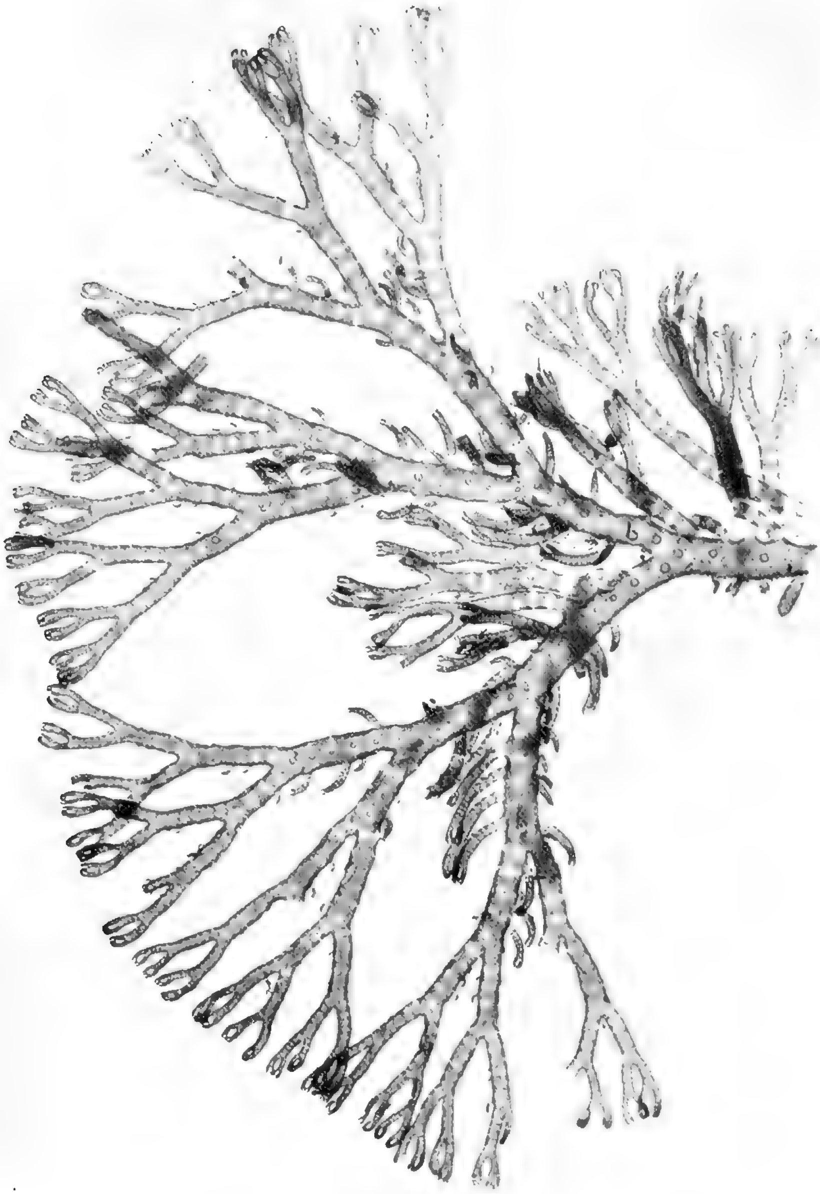

Plate 77

Ceramium Johnstonii S. and G.

A photograph of typical fragments of a tetrasporic plant nearly free from proliferations. X 10.

Plate 78

Centroceras bellum S. and G.

A photograph of typical fragments of tetrasporic plants, showing the single undivided growing points. X 10.

Plate 79

Ceramium horridum S. and G.

A photograph of typical tetrasporic plants. X 5.

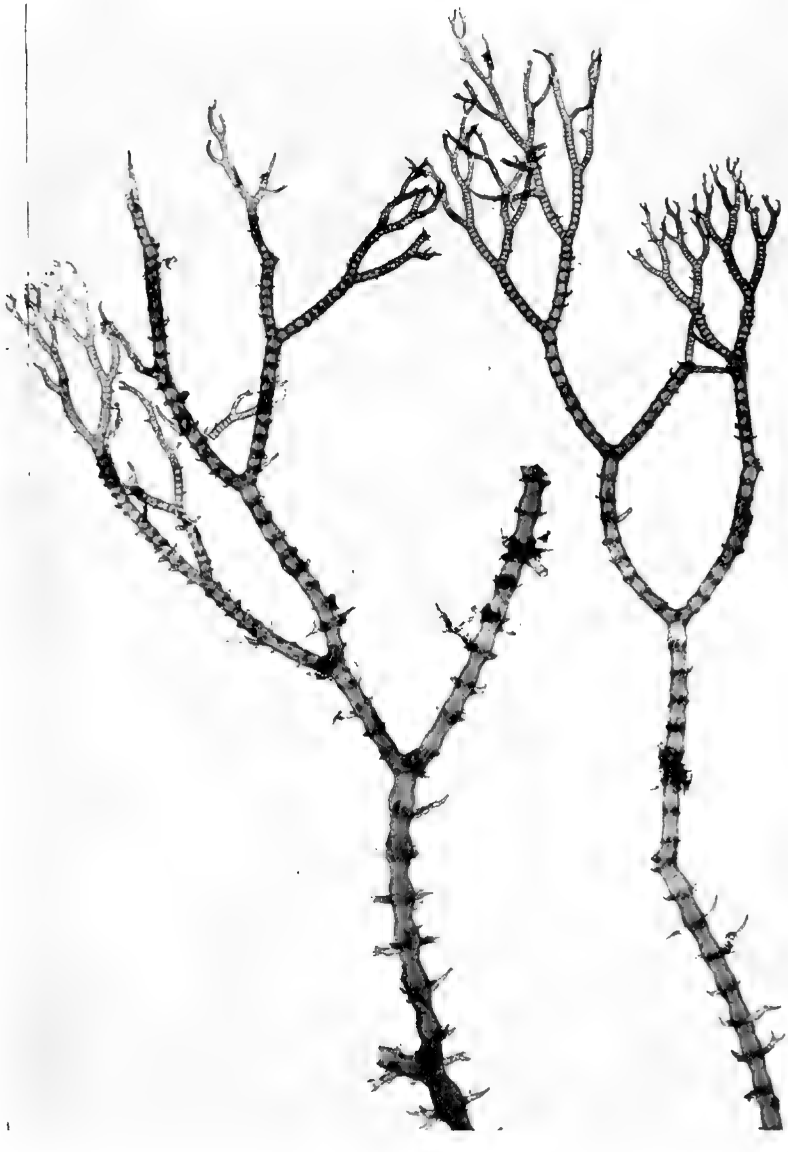

Plate 80

Grateloupia prolongata J. Ag.

A photograph of a group of long narrow plants. X 0.3.

Plate 81

Grateloupia squarrulosa S. and G.
A photograph of a portion of the type specimen. X 0.75.

Plate 82

Grateloupia squarrulosa S. and G.

A photograph of a portion of a sterile frond. X 3.

Plate 83

Grateloupia Howeii S. and G.

A photograph of a group of typical specimens.

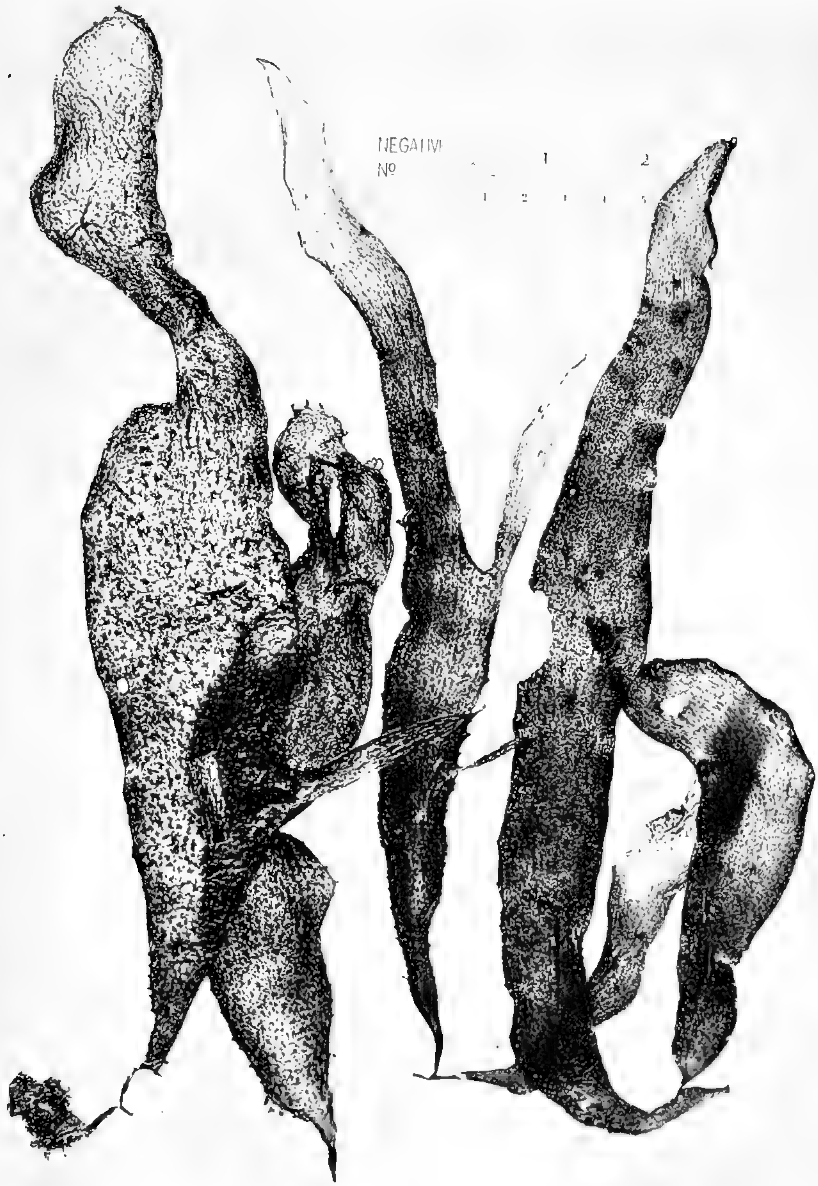

Plate 84

Grateloupia Johnstonii S. and G.

A photograph of the type specimen. X 0.5.

Plate 85

Estebania conjuncta S. and G.

A photograph of the type specimen. X 2.

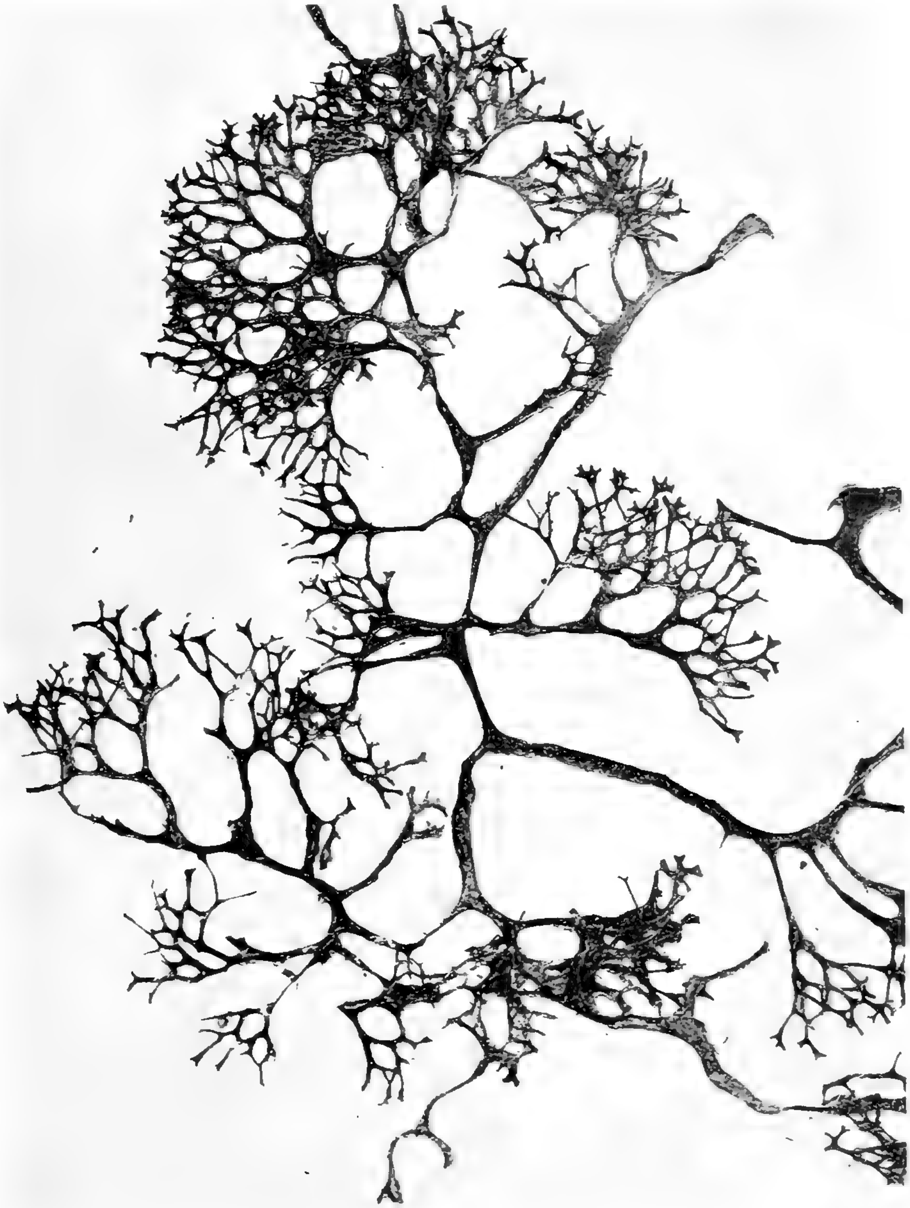

Plate 86

Estebania conjuncta S. and G.

A photograph of a specimen with only slight anastomosing. X 2.

Plate 87

Schizymenia violacea S. and G.

A photograph of the type specimen.


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centimeters
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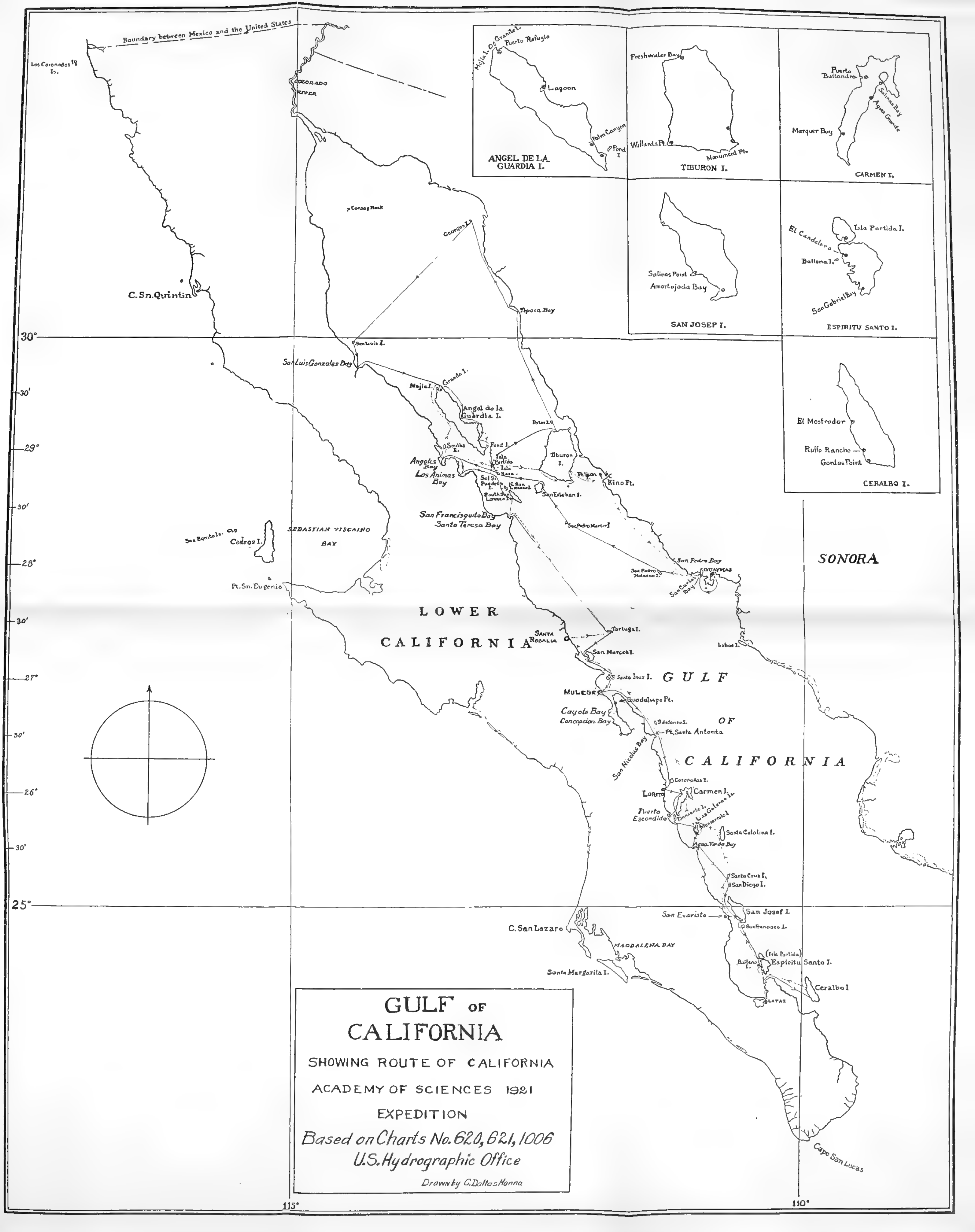
Plate 88

Schizymenia Johnstonii S. and G.

A photograph of the type specimen.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SHOWING ROUTE OF CALIFORNIA
ACADEMY OF SCIENCES 1921
EXPEDITION
Based on Charts No. 620, 621, 1006
U.S. Hydrographic Office
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Boundary between Mexico and the United States
Los Coronados Is.
COLORADO RIVER
C. Sn. Quintin
Consag Rock
Georges I.
Tepoca Bay
San Luis I.
San Luis Gonzales Bay
Mejia I.
Granite I.
Angel de la Guardia I.
Patos I.
Tiburon I.
Smiths I.
Pond I.
Angeles Bay
Los Animas Bay
Isla Partida
Isla Raza
Pelican
Kino Pt.
San Esteban I.
San Francisquito Bay
Santa Teresa Bay
San Pedro Martir I.
Cedros I.
San Benito Is.
SEBASTIAN VISCAINO BAY
Pt. Sn. Eugenio
San Pedro Bay
San Pedro Nolasco I.
GUAYMAS
San Carlos Bay
SONORA
LOWER CALIFORNIA
SANTA ROSALIA
Tortuga I.
San Marcos I.
Lobos I.
Santo Inez I.
GULF OF CALIFORNIA
MULEGE
Guadalupe Pt.
Coyote Bay
Concepcion Bay
Ildefonso I.
Pt. Santa Antonita
San Nicolas Bay
Coronados I.
LORETO
Carmen I.
Puerto Escondido
Danzante I.
Las Galeras Is.
Monserrate I.
Santa Catalina I.
Agua Verde Bay
Santa Cruz I.
San Diego I.
San Evaristo
San Josef I.
San Francisco I.
C. San Lazaro
MAGDALENA BAY
Santa Margarita I.
(Isla Partida)
Ballena I.
Espiritu Santo I.
Ceralbo I.
LA PAZ
Cape San Lucas
30°
30'
29°
30'
28°
30'
27°
30'
26°
30'
25°
115°
110°
Mejia I.
Granite I.
Puerto Refugio
Lagoon
Palm Canyon
Pond I.
ANGEL DE LA GUARDIA I.
Freshwater Bay
Willards Pt.
Monument Pt.
TIBURON I.
Puerto Ballandra
Salinas Bay
Agua Grande
Marquer Bay
CARMEN I.
Salinas Point
Amortajada Bay
SAN JOSEF I.
Isla Partida I.
El Candelero
Ballena I.
San Gabriel Bay
ESPIRITU SANTO I.
El Mostrador
Ruffo Rancho
Gordas Point
CERALBO I.

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OF THE

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FOURTH SERIES

VOL. XII, No. 30, pp. 951–1218, map May 31, 1924

XXX

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BY

IVAN MURRAY JOHNSTON

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XXX

EXPEDITION OF THE CALIFORNIA ACADEMY OF SCIENCES TO THE GULF OF CALIFORNIA IN 1921

THE BOTANY (THE VASCULAR PLANTS)

BY

IVAN MURRAY JOHNSTON

From the middle of April to the middle of July, 1921, the writer was botanist of the expedition which the California Academy of Sciences sent out for the biological exploration of the islands and shores of the Gulf of California. During the three months spent on the expedition, collections were made on all the 30 odd important islands in the gulf, at five localities in Sonora, and at 14 localities on the peninsula of Lower California. The present paper embodies the results which have been derived from the collections, field observations, and subsequent herbarium studies. Although especially concerned with the flora of the gulf islands and shores, the paper contains much relating to the flora of Lower California.

GEOGRAPHY

The peninsula occupied by the territory of Lower or Baja California is the boldest feature of the west coast of Mexico. It has a width varying between 50 and 225 kilometers and extends southeastward for about 1600 kilometers, spanning 10 degrees of north latitude (22° 53′ to 32° 42′) and nearly eight degrees of west longitude (117° 8′ to 109° 25′). Between this peninsula and the mainland coast, occupied by the Mexican states of Sonora and Sinaloa, occurs the narrow strip of water called the Gulf of California. The gulf varies from 100 to 200 kilometers in width, and, like all the other topographic features of the region, has a southeasterly trend. Within the Gulf of California there are about 40 islands with areas of 20 to 1000 square kilometers, and about as many more islets and rocks. These islands and rocks are mainly close to shore; only opposite the middle of the peninsula do they extend out towards midgulf.

GEOLOGY

The gross features of the peninsula of Lower California are the result of extensive block faulting which has tilted, except in the extreme south, the component mountain blocks towards the west. This is strikingly evidenced in the oriented front with which the peninsular mountain blocks face the gulf, particularly so in the huge cliff-like escarpments that form the gulf-face of the Sierra Giganta, and in the abruptly arising east face of the granitic ranges that occupy the northern half of the peninsula. Practically every section across the peninsula (cf. Darton, Jour. Geol., **29**:722, f.2-4. 1921) shows a definite and often considerable tilting towards the west. The present features of the peninsula resulted mainly from an extensive uplift in late Tertiary time. The subsidence and deepening of the trough of the present gulf was probably contemporaneous with the peninsular uplift. The peninsula has not, however, been in a static condition since the close of the Tertiary. The wide occurrence and the variable heights of Pleistocene and Recent sediments show that elevation and subsidence has occurred, and that the movements were not general, but rather of local character, the various mountain blocks being affected very unequally. The submergences during Pleistocene and Recent were probably very short and are not to be compared with the very general inundations during the Tertiary.

The Gulf of California is a submerged trough lying between the elevated areas that now form the peninsula and the Mexican mainland. Structurally, it is intimately related to the area in California now occupied by the Colorado Desert, that area of negative altitude being usually considered the dried-out northern part of the ancient Gulf of California which has been cut off from the lower gulf by a delta-dam built by the Colorado River. The present gulf is not a very deep body of water. A narrow tongue 2000 meters in depth extends up midgulf for 250 kilometers to somewhere opposite San Josef Island, and a broader tongue of 1000 meters depth extends as far north as San Pedro Martir Island. Depths of 500 meters occur north to the straits between Angel de la Guarda and Tiburon islands, but north of that point the gulf gets no deeper than 200 meters and averages considerably less. With the exception of the straits just mentioned, there is no suggestion of the occurrence or previous existence of a land bridge across the gulf. The gulf seems to be a trough which gradually lessens in depth from the middle towards the sides, and from the mouth towards the head.

Little seems to be on record regarding the larger phases of the geology of the Sonoran coastal region. That region appears to consist largely of volcanic hills and sandy plains. It seems probable that most of the Sonoran coast arose from the sea at about the same period as the land across the gulf. The hills about Guaymas and for about 80 kilometers to the north are volcanic, consisting of basalt, tufa, and agglomerate. In the hills behind Guaymas a number of old sea-caves were noted which, though now over 50 meters above the ocean, contained unconsolidated sands and modern shells. This indicates recent movement in at least one section of the coast. South of Guaymas the mountains recede and a broad low sandy plain fronts the ocean. About 90 kilometers north of Guaymas another sandy plain faces the sea. From the latter projects a volcanic mass, similar to the adjacent Pelican Island, bearing the name of Kino Point. The range of hills which appears on the mainland opposite Tiburon Island is probably volcanic like the island. About Tepoca Bay the hills are scoriæ-covered, but the bluffs along the shore are recent alluvium.

Roughly speaking, the peninsula of Lower California consists of three grand petrographic divisions: a northern granitic region, a central volcanic-sedimentary region, and an extreme southern granitic region. Regarding these regions the following facts are of interest:

The half of the peninsula north of latitude 28° is characterized by its diverse relief and by an abundance of intrusive rocks. Vulcanism seems to have played only a minor part in the formation of this area. Along this section the prevailing light color of the rocks was particularly noted since it contrasted so with the brown which was the dominant color in the region just south. No large sedimentary deposits were seen, but here as in all other parts of the gulf, are numerous elevated beaches several meters above the present level of the gulf. Along the western side of this section of the peninsula Eocene beds are reported as common (Darton, Jour., Geol., **29**:728. 1921). Emmons and Merrill (Bull. Geol. Soc. Amer., **5**:503-511. 1894) have found evidences of peneplaining in the interior, as well as travertine beds supposed to have been derived from lake deposits. Tectonic forces have been recently active in the area, for Wittich (Mem. Soc. Cien. Antonio Alzate, Mexico, **35**:122. 1920) reports the occurrence near San Borja Mission of an elevated beach containing modern shells, although at an altitude of 1052 meters.

The gulf islands off the northern part of the peninsula are peculiar in that they are almost wholly volcanic, whereas the adjacent peninsula seems to be largely granitic. They appear to represent a range of partially submerged hills separated from the adjacent peninsula by a channel of over 400 meters depth. Angel de la Guarda, Smiths, Sal si Puedes, and North and South San Lorenzo, certainly belong to the same group, as shown by their uniformity in structure and their alignment. It is probable that San Esteban also belongs to this group, for though nearer to Tiburon Island it is surrounded by depths, and is composed of rock which seems to indicate affinities with the islands to the west of it. San Esteban Island has scoriæ-covered slopes and much breccia. Tiburon Island is volcanic (Jones, Mining World, **32**:269-270. 1910), but not so pronouncedly so as Angel de la Guarda Island and its associates, and seems to be structurally similar to the hills on the adjacent Sonoran coast from which it is separated only by a shoal channel averaging less than 4 meters depth. South San Lorenzo Island is topped by a thick bed of gypsum which is probably of similar age and origin as the gypsum deposits about Santa Rosalia which Fuchs (Soc. Geol. France, III, **14**:81. 1886) seems to consider late Miocene or early Pliocene. Although Angel de la Guarda Island is entirely volcanic, in the harbor at the north end (Puerto Refugio) there is an islet composed of a coarse-grained granite. San Luis Island, which lies 100 kilometers northwest of Angel de la Guarda Island, is wholly volcanic, being composed of ash and basalt, and probably is to be associated with the local evidences of volcanic activity observed back of San Luis Gonzales Bay.

The second petrographic division of the peninsula is characterized by a relative scarcity of intrusive material and by a uniformity of topography. It consists primarily of a huge, tilted, cañon-cut, lava-capped plateau. From the gulf it is grandly picturesque. At the north end stands the triple peak of the volcano of Las Tres Virgines. A little farther south there begins a huge wall which shows the truncate strata of the faulted blocks that form that section of the peninsula. This tremendous scarp-face, which rises only a few kilometers from the gulf shore and stretches away for many kilometers as an imposing wall 1000 to 1500 meters high, is called the Sierra Giganta. Its rocks are evidently stratified and, according to Darton (Jour. Geol., **29**:745. 1921), consist of a mixture of late Tertiary sandstones, conglomerates, agglomerates, tufas, and lavas. Only bedded volcanic fragments were seen in the cañons visited. Gabb (Browne, Resources Pac. Coast, Lower Calif., 115. 1868) reporting that the volcanic fragments in the agglomerates decrease in size, number, and attrition as the strata approach the west, suggests that the beds may have been derived from a mid-Tertiary land-mass lying to the east of the present peninsula. What are assumed to be Pliocene deposits were frequent along this section of the peninsula. The plain back of San Nicolas Bay consists of a series of gently sloping and very fossiliferous strata which probably are to be correlated with the beds occurring near Loreto and on the level plain of Coronados Island. On Monserrate Island and on the south end of Carmen Island there are also large, slightly dipping fossiliferous beds. Elevated beaches of recent date are common, but are particularly well developed at Puerta Ballandra on Carmen Island where a fine fossil coral-reef was noted.

The islands of the midsection of the peninsula are various in structure. Tortuga is a recently extinct volcano separated from the peninsula by a depth of 1300 meters. San Marcos seems to be partly granitic (?) and partly gypsum, and is connected to the peninsula by shoals scarcely eight meters deep. Ildefonso seems to be a basaltic mass similar to San Pedro Martir. Coronados consists of a pile of basalt situated upon (?) a sedimentary plain and connected by shoals to the peninsula. Danzante and Espiritu Santo (the latter belonging to the third section of the peninsula) both have structures similar to that in the Sierra Giganta and probably represent less elevated fragments of that mass. Carmen (Cook, Eng. & Mining Jour., **85**:545-546. 1908), San Josef (Mex. Bol. Minero, **2**:504-505. 1916), Monserrate, San Diego, Santa Cruz, and Catalina all seem largely composed of intrusives, perhaps of the pre-Cretaceous granitic rocks which Darton (Jour. Geol., **29**:725. 1921) indicates as underlying the peninsula. With the exception of Tortuga and Ildefonso, all the islands in this part of the gulf connect with the peninsula through shoals or obvious alignments with topographic features. This is well exemplified in the case of Catalina, Santa Cruz, San Diego, and San Josef which are in line and composed of the same rock yet separated by depths of from 80 to over 400 meters.

The third petrographic division of the peninsula consists of that area south of La Paz which is commonly known as the cape region or cape district. It is a very definite division since it is separated from the area immediately north by a sandy plain of less than 30 meters altitude. This plain was probably flooded in comparatively recent times and the present cape region was then an island. The district is very rough, consisting of several compact mountain ranges (Nelson, Mem. Nat. Acad. Sci., **16**:62-65. 1921). The highest and most massive mountain block, which forms the western half of the region, consists of granite, but the eastern half is formed of metamorphic and volcanic rocks and even, according to Eisen (Proc. Calif. Acad. Sci., II, **5**:754. 1895), scattering beds of limestone. The cape region has its abrupt face on the west and appears to slope towards the east. It is therefore the only exception to the prevailing westerly tilt of the peninsula. Tertiary deposits are reported by Wittich (Boll. Soc. Geol. Mex., **6**:7. 1909) to be common, and the same author speaks of an abundance of elevated beaches (Globus, **97**:379. 1910).

There are two islands lying off the cape region. Ceralbo is granitic and lines up with Punta Arena de la Ventana from which it is separated by a channel of 150 meters depth. Fossiliferous sediments, probably of Pliocene age, are perched on the island near Ruffo's Ranch. Espiritu Santo seems to have the relation to the Sierra Giganta already indicated. It is composed of large tilted stratified deposits of volcanic material which are resting upon granitic rocks that are well exposed along the east side of the island (Darton, Jour. Geol., **29**:725, f.4, sec. 21. 1921). The island is separated from the peninsula by a shoal channel the maximum depth of which is 15 meters. The point of land forming the eastern arm of La Paz Bay appears to be wholly volcanic, but though Espiritu Santo is connected to it by shoals, the two may not be structurally related inasmuch as they show a lack of agreement in the bolder features of structure.

CLIMATE

Since Nelson (Mem. Nat. Acad. Sci., **16**:95-102. 1921) has treated the subject in detail, the climate of the region will here be discussed only in the most general way; suffice to say that the islands in, and the area surrounding, the Gulf of California are decidedly arid, the annual rainfall averaging under 5 centimeters. The yearly precipitation is not only small, but is irregular in occurrence and quantity, the region being subjected to alternations of wet and dry years. In the extreme north the rains occur mainly in the winter, but over the remainder of the gulf area they come usually between July and October. As in the deserts to the north, the region about the gulf is visited by short cloudbursts which may pour out on a small area as much as 1.5 decimeters of rain and put raging torrents into the broad commonly dry washes. The visit to the gulf area was made following a year of very light rain and during the closing months of the dry season. During the last days of June showers occurred along the Sonoran coast about Guaymas, and when that area was visited a week later many shrubs were found hastening into bloom.

During spring and summer the gulf is visited by northwesterly breezes which are preceded in winter by heavy winds from the same direction. With the coming of autumn and the rainy season the region is harried by fierce electrical storms coming from the southeast. These fall storms, the so-called cordonazos, blow violently for several days and at times become so furious as to be very destructive to life and property on the peninsula.

In the gulf area the average winter temperature is between 20° and 25° C. The hottest months are in the summer and early autumn, when temperatures of 30° to 40° C. are common. During the summer the gulf waters become very warm, in the south as high as 25° or 30° C., too hot for enjoyable bathing.

PHYTOGEOGRAPHY

Floristically, the region about the Gulf of California, here loosely designated as the "gulf area," is not homogeneous, nor, as might be supposed, is it essentially similar to the adjacent region immediately north of the international boundary. It was observed that two distinct floras are present within the gulf area. One was recognized as very similar to the flora of Southern California (this largely a modified austral one); the other was strange and later found to be a southernly-derived, arid, tropical flora. Very roughly, it may be said that the floristic break in the gulf area occurs at about 29° 30′ N. latitude. Of course the flora does not change abruptly when that latitude is crossed, but the total effect on either side of it is different and the difference becomes more pronounced as it is left behind. The two principal floras of the gulf area may be taken as constituting a northern or Californian, and a southern or Sinaloan province.

The northern province of the gulf area has the flora of southern California weakly diluted by tropical elements. This flora in its characteristic form was found on the peninsula at San Luis Gonzales Bay, but south of that point its hold on the territory seems to consist only of insignificant local areas. At San Felipe Bay, north of San Luis Gonzales Bay, the flora, as listed and photographed by MacDougal (Carnegie Inst. Wash. Publ. **99**:42-43, t. 45-47. 1908), is essentially that of the Colorado Desert. The flora of the delta of the Colorado River and the area adjacent is even more strongly like that of the Colorado Desert (MacDougal, op. cit., 33-34 and 40-42). A nearly typical Colorado Desert landscape and flora were found on the Sonoran coast at Tepoca Bay. The same flora occurs in a diluted form on the north end of Tiburon Island. It is also to be noted that 70% of the plants collected in the Pinacate Mountain Region (Contr. U. S. Nat. Herb. **16**:7-20. 1912), an area southeast from the Colorado River delta, represent species found in the Colorado Desert of California.

The plants which may be considered typical of the northern province in the gulf area are: *Fouquieria splendens, Opuntia bigelovi, Parosela spinosa, Franseria ilicifolia, Frankenia palmeri, Coldenia palmeri* and *Encelia farinosa.* Within the province the flora may be strikingly like that of the Colorado Desert, as for example, at San Luis Gonzales Bay and Tepoca Bay where most of the following grew together:—*Larrea divaricata, Encelia farinosa, Fouquieria splendens, Parosela spinosa, Parosela emoryi, Hyptis emoryi, Olneya tesota, Prosopis chilensis, Franseria dumosa, Bebbia juncea,* and *Opuntia bigelovi,* as well as such lowly plants as *Cryptantha angustifolia, Coldenia palmeri, Œnothera cardiophylla, Trichoptilium incisum, Perityle emoryi, Hofmeisteria pluriseta, Trixis californica, Simmondsia chinensis, Peucephyllum schottii, Psathyrotes ramosissima, Parosela mollis, Eriogonum inflatum, Mohavea confertiflora,* and *Mirabilis tenuiloba.*

Little is known of the land immediately back of the coast in Sonora, but the evidence at hand seems to indicate that the tropical elements range much farther northward in the interior than they do along the gulf. A more detailed statement can be made of the peninsula flora which lies back from the gulf coast. As Nelson (Mem. Nat. Acad. Sci., **16**:117-118, t. 31. 1921) has shown, the northern part of the peninsula is clearly occupied by three very distinct life-districts, all continuations of districts occurring north of the international boundary. First, there is the northeast corner of the peninsula consisting of the narrow gulf-fronting plain east of the high mountains, which has a flora almost wholly that of the Colorado Desert and which is charactertistic of the Lower Sonoran Zone of this area (cf. Abrams, Bull. N. Y. Bot. Gard. **6**:321-322. 1910). Second, there are the conifer-clad summits of the high mountain which run for over 200 kilometers south from the international boundary and which have a dilute boreal flora characteristic of the Canadian and Transition zones (cf. Abrams, op. cit., 303-312). Third and finally, there is the northwest part of the peninsula lying west of the high mountains and extending southward to about Rosario in which there occurs the dilute Upper (?) Sonoran Zone flora characteristic of the San Diego Bay Region (cf. Abrams, op. cit., 319-320). Nelson has named these three biotic areas the Colorado Desert District, the San Pedro Martir District, and the San Diegan District. Brandegee (Zoe. **4**:199-210. 1893) has listed the most conspicuous species of the San Pedro Martir and San Diegan districts. In the interior of the peninsula most of the Californian species seem to reach their southern limit near the southern end of the San Pedro Martir Range at about N. lat. 30°, but along both coasts they appear to push a little further southward.

The southern province of the gulf area has a flora evidently derived from the arid tropical flora of Sinaloa and southern Sonora. When compared with the northern province it presents a group of genera almost completely different, and a vegetation which seems more lignescent. On the peninsula, it is this section that has developed such startling types as *Veatchia discolor, Fouquieria columnaris,* and *Machærocereus eruca,* as well as a large number of peculiar but unobtrusive forms which all together warrant the treating of this southern part of the peninsula as a distinct division of the Mexican arid tropical flora. This peninsular flora breaks up into two districts, the Cape Sierran District and the Comondú District.

The Cape Sierran District includes the higher parts of the cape region and at least the higher cañons of the Sierra Giganta. It is small in area, but highly interesting, having a flora with affinities in California and in the Mexican highlands.

It is characterized by *Pinus cembroides, Glaucothea brandegeei, Populus monticola, Nolina beldingi, Arbutus peninsularis,* and *Quercus devia,* as well as by many other less conspicuous species. Brandegee (Zoe. **3**:226. 1892) in his general paper on the cape region mentions many species of this district, designating them as growing on the "mountain tops." The Cape Sierran District represents the Upper and Lower Sonoran zones, which, due to their narrowness in the present case, had best be treated as one.

The Comondú District is the largest and most important floral district on the peninsula, and is populated by species which in immediate origin are almost exclusively tropical. The whole district is to be classed as belonging to the Arid Tropical Zone. With the exception of the minor areas occupied by the Cape Sierran District, all the peninsula lying south of N. lat. 30° appears to belong to the Comondú District. Due to its large size and great range of topography, the district is very rich in species, many of which are endemic.

Taken as a whole, the Comondú District is characterized by such common trees and shrubs as *Fouquieria peninsularis, Bursera rhoifolia, Jatropha spathulata, Pachycereus pringlei, Machærocereus gummosus, Atamisquæa emarginata, Stegnosperma halimifolia, Viscainoa geniculata,* and *Pithecollobium confine.* As would be expected in any such attenuated area spanning so much latitude, the factor of geographic isolation has come into play and the flora shows tendencies to form minor phytogeographic areas that occupy definite segments on the peninsula. Within the Comondú District this segmenting tendency of the flora has resulted in the formation of three subdistricts which correspond more or less closely with the petrographical divisions of the district. These are called the Viscaino Desert Subdistrict, the Sierra Giganta Subdistrict, and the Cape Subdistrict.

The Viscaino Desert Subdistrict occupies the Viscaino Desert and the granitic country lying north of the volcanic region, or very roughly, a little more than the northern middle quarter of the peninsula. This subdistrict is characterized particularly by *Veatchia discolor* var. *pubescens* and by *Fouquieria columnaris,* but is also indicated by the endemic *Sideroxylon leucophyllum, Salvia californica, Aster frutescens,* *Maurandya flaviflora, Cuscuta veatchii, Perezia palmeri, Gilia palmeri, Loeselia gloriosa (Gilia gloriosa* Brandg.), *Pelucha trifida,* and *Phacelia pauciflora.* The subdistrict was first defined as a district by Nelson (Mem. Nat. Acad. Sci. **16**:118-119, t.31. 1921) who erred in referring it to the Upper Sonoran Zone rather than to the Arid Tropical Zone. The bulk of the widely distributed and feature-forming peninsular trees and shrubs reach their northern limit within this subdistrict. The flora of the Viscaino Desert Subdistrict is characterized, and certainly is populated, by species and genera of plants whose relations are undoubtedly southern. The inclusion of this subdistrict in the same zones as the districts to the north seems therefore very unnatural. That there is a profound change in the flora just south of the 29th parallel may be seen from the fact that *Viscainoa geniculata, Jatropha spathulata, Yucca valida, Fouquieria peninsularis, Pedilanthus macrocarpus,* and *Stegnosperma halimifolia* all appear near that latitude, and the large Burseras and columnar cacti extend but a short distance north of it. The Viscaino Desert Subdistrict fronts on the gulf from about Los Angeles Bay south to the beginning of the volcanic region in about latitude 28°. It includes Angel de la Guarda Island, and probably San Esteban and San Lorenzo islands.

The Sierra Giganta District consists of the lower slopes of the Sierra Giganta and the sandy plain at their base. It extends south to about latitude 24° 30′ where it is replaced by the Cape Subdistrict. The characteristic plants are *Veatchia discolor, Justicia insolita, Gossypium harknessii, Ephedra peninsularis, Prosopis palmeri, Mascagnia macroptera, Ditaxis brandegei,* and *Ruellia californica.* This subdistrict has many abundant species in common with the one south of it. Among these are *Ficus palmeri, Lysiloma candida, Forchammeria watsoni, Wilcoxia striata, Rhizophora mangle, Jacquemontia eastwoodiana, Celosia floribunda, Melochia tomentosa,* and *Euphorbia xanti.*

The Cape Subdistrict is probably the best known section of the Comondú District and consists of the lower levels of the cape region. It is characterized by *Maba intricata, Washintonia sonoræ, Lysiloma microphylla, Bursera cerasifolia,* *Cyrtocarpa edulis, Gossypium davidsonii, Gochnatia arborescens, Castela peninsularis, Coulterella capitata, Ruellia peninsularis,* and *Turnera humifusa.* Brandegee (Zoe 3:223-231. 1892) gives a description and analysis of the "Flora of the Cape Region," but unfortunately does not distinguish between the low altitude flora characteristic of the Comondú District and the montane flora characteristic of the Cape Sierra District.

There is a group of species which range the entire length of Lower California and into California and Arizona. The most conspicuous of these are *Beloperone californica, Hibiscus denudatus, Olneya tesota, Larrea divaricata, Bursera microphylla, Euphorbia eriantha, Simmondsia chinensis, Lycium richii,* and *Porophyllum gracile.*

Data are not at hand for a satisfactory attempt at indicating the floral districts of the Sonoran coastal belt. The vicinity of Guaymas is the only locality in the region which is at all well known and it seems to have a flora somewhat similar to that occurring in the Comondú District, particularly the Cape Subdistrict, on the peninsula. The range of hills which extends along the coast north of Guaymas seems to contain much of the Guaymas flora which also reappears very diluted on the south end of Tiburon Island. The flora about Guaymas, judging from the outstanding species such as *Jacquinia pungens, Acacia willardiana, Guaiacum coulteri,* etc., appears to extend northeastward towards Hermosillo and Ures and thence southward towards Sinaloa. As already indicated, the northern part of the Sonoran coast has a southern continuation of the Colorado Desert flora.

At San Pedro Bay, about 20 kilometers west of Guaymas, the flora is extremely anomalous. Associating with distinctly Sonoran species, are *Lysiloma candida, Ficus palmeri, Acacia californica, Glaucothea armata, Carlowrightia fimbriata,* etc., all characteristically peninsular or insular plants not otherwise known from the Sonoran mainland. The study of this local pocket of peninsular species in its relations to present and past distribution in the gulf area is an interesting problem for some future phytogeographer.

ECOLOGY

Ecologically, the gulf area is composed of a number of different communities of which at this time it seems best to mention only the most important. The plant communities of the area readily break up into halophytic and xerophytic groups.

The halophytic communities occur primarily along the shore of the ocean. In the south gulf province there is a well-developed littoral community composed of *Rhizophora mangle, Laguncularia racemosa,* and *Avicennia nitida* which reaches its best development in coves and esteros where the water is still. Of the three, Rhizophora is the most successful, growing in greatest abundance and in the deepest water. Tide-flats, salt-marshes, and salt-flats are common features along the gulf coast. In shallow places periodically submerged *Salicornia pacifica* is the characteristic and prevalent plant. Associated with it are *Monanthochloë littoralis* and *Batis maritima,* and in the north province *Salicornia europæa* and *Frankenia grandiflora.* Weakly saline flats are frequent and perhaps represent irregularly flooded areas or recently elevated land in the process of freshening. The characteristic plant of these flats is *Suæda ramosissima,* a plant which over the south province is accompanied by *Maytenus phyllanthoides.* In the vicinity of Guaymas, *Zizyphus sonorensis* and *Eupatorium sagittatum* are also common on the saline flats. Several species of Atriplex frequent alkaline areas as do also *Lycium richii* and *Vallesia glabra.* Beaches along the gulf are composed of either cobblestones or sand. When the latter they are usually naked but occasionally covered with stems of *Vaseyanthus insularis.* The only typical arenicolous strand plants are *Ipomœa pes-capræ,* which carpets the beaches south of La Paz, and *Abronia maritima,* which is local on the upper beach through the gulf area. Other minor species of the strand are *Jouvea pilosa, Euphorbia incerta,* and *Euphorbia leucophylla,* all from the south province. Thickets of *Allenrolfea occidentalis* and *Frankenia palmeri* almost universally cover the banks at the head of sand beaches in the northern part of the gulf area. The dune communities are varied and interesting. In the north they have a suffrutescent flora composed of *Frankenia palmeri,* *Franseria dumosa,* and the southerly ranging *Palafoxia linearis* and *Parosela emoryi.* In the south *Aplopappus arenarius, Wislizenia refracta, Parosela divaricata,* and *Houstonia mucronata* become the characteristic dune shrubs. *Perityle robusta* is a very conspicuous annual in the south while on the dunes of the Sonoran coast *Helianthus niveus* is very noticeable. Many of the gulf islands are at present, or evidently were in the past, bird rookeries, and their surfaces are stained and their meagre soil impregnated with the phosphates of guano. On the guano islands the flora usually consists of a low cover of *Atriplex barclayana* and *Amaranthus watsoni,* and to a minor extent also of *Cressa truxillensis, Trianthema portulacastrum,* and *Portulaca pilosa.*

The xerophytic communities compose the flora of the areas back from the coast. The most prolific and characteristic one found in the gulf area is that of gravelly flood channels or washes. Over most of the region, gravelly cañon floors have a dense growth composed of *Olneya tesota, Viscainoa geniculata, Atamisquœa emarginata, Prosopis chilensis, Simmondsia chinensis, Hyptis emoryi, Cercidium microphyllum* and *Bursera rhoifolia,* most of which are joined in the south by *Lysiloma candida, Fouquieria peninsularis, Celosia floribunda, Karwinskia humboldtiana, Jatropha spathulata, Gossypium harknessii,* and *Opuntia cholla.* The hillsides have a characteristic, but not a very rich association of species. In the north, *Fouquieria splendens, Encelia farinosa,* and *Larrea divaricata* predominate, but in the south province the slopes have a rather monotonous cover of *Bursera microphylla, Fouquieria peninsularis, Jatropha spathulata, Pachycereus pringlei, Lysiloma candida,* and a variety of agaves and mammillarias. The flora of the gravelly coastal plain is a dilution of that of the washes. It is a notable fact that generally speaking, the coastal flora becomes more dense and luxuriant progressively southward. The cliffs possess a distinct flora, the most conspicuous element being *Ficus palmeri.* The other plants of this community are *Hofmeisteria pluriseta, Sympetaleia rupestris, S. aurea, Hofmeisteria classifolia, H. fasciculata, Maurandya flaviflora, Aristlochia brevipes, Coreocarpus dissectus,* and various lactiferous mammillarias. The Ficus and the species of Sympetaleia and Hofmeisteria are frequent on the cliffs facing the sea.

RELATIONSHIPS AND ORIGINS OF THE BIOTA

The northernmost section of the peninsula has what is very evidently only a southern extension of the flora of California, but the southern two-thirds has a flora clearly and definitely allied to, and derived from, the flora now occupying Sinaloa, southern Sonora, and the states of southern Mexico. The latter relationship is shown by the presence on the peninsula of such genera as Maytenus, Ficus, Lysiloma, Colubrina, Rhizophora, Ruellia, Bursera, Antigonon, and a host of others. As a rule, those plant species of wide-spread genera which occur in southern Lower California have their close relatives inhabiting Sinaloa and southern Sonora. The flora of the Cape Sierran District has forms which are closely related to species now inhabiting the highlands of central Mexico, but strangely this easterly derived flora occurs intermixed with a flora characteristic of the Californian foothills and lower mountain slopes. Although the flora of the southern sections of the peninsula is definitely allied to that of the adjacent Mexican mainland, its means of ingress is hardly obvious. The floristic mixture on the mountains in the cape region, and the faunal distribution on the peninsula as a whole, are complicating factors which make a theory for biotic origins difficult to formulate.

Before a satisfactory hypothesis can be chosen which will explain present-day distribution of life on the peninsula it is best that a brief inquiry be made into the facts of animal distribution in the area. For this purpose a study has been made of the available data on mammals (exclusive of bats), reptiles, amphibia, and gastropods. As Nelson (Mem. Nat. Acad. Sci., **16**:117. 1921) has pointed out, all but one of the 140 species and subspecies of land mammals known from the peninsula belong to stocks which have clearly gained the peninsula from the north and have spread over it by southward migrations. With the exception of Oryzomys, all the genera of peninsular mammals occur in California and in many cases the same species occurs there as well. The nearest relative of *Oryzomys peninsulæ,* which is known only from the vicinity of San José del Cabo, is a species of Sinaloa, and Nelson (Mem. Nat. Acad. Sci., **16**:124. 1921) even suggests that the peninsular species is a man-transported introduction from Mazatlan. According to Schmidt (Bull. Am. Mus. Nat. Hist. **46**:611. 1922) there are 138 species and subspecies of reptiles known from the peninsula and adjacent islands. With the exception of six species contained in the genera Bipes, Sator, Ctenosaura, and Phyllodactylus, and three included in Natrix, Elaphe and Pseudemys, all the reptiles clearly had ancestors which entered the peninsula from the north and spread southward. The six exceptions first mentioned are evidently tropical in relationship and all but *Phyllodactylus tuberculosus* are endemic. *Phyllodactylus tuberculosus* ranges widely along the west coast of tropical America. Its presence was recently discovered even in the Colorado Desert of California. Among the endemic reptiles of tropical relationships *Bipes biporus* is most interesting, it being a weak two-legged burrowing lizard belonging to a very ancient, nearly extinct family. It is restricted to the cape region and finds its nearest relation in a monotype of the Mexican tableland. Sator is a saurian genus of two species, known only from Ceralbo, San Diego, and Santa Cruz islands. Its closest affinities are apparently with a Sceloporus of the Coliman region in Mexico. *Phyllodactylus unctus* is endemic to the cape region. *Ctenosaura hemilopha* occurs in the cape region and on Ceralbo, San Esteban, and San Pedro Nolasco islands. Its relations are in southern Mexico. The scattered distribution of the species in the gulf area suggests the relic occurrence of a species once widely distributed. Elaphe, Natrix and Pseudemys "are widespread in North America, and their absence in the Sonoran deserts of the United States is due to absence of suitable habitat conditions." Hence it is not at all improbable that the peninsular species gained the area of Lower California in a period when climatic conditions in southwestern United States were more favorable to a wide distribution of these genera in that region. There is no particular reason for believing them to have reached the peninsula directly from the Mexican mainland. There are eight amphibians known from Lower California, of which only four are wide-ranging, the bulk occurring only in the north-most section of the peninsula. All the species are unquestionably migrants from north of the international boundary. Definite figures regarding the gastropods are lacking, but it can be said that the most common snails in the northern sections of the peninsula and down the west coast to about Magdalena Bay, are helicoid snails of the genus Micrarionta which have their relations to the northward. Over the southern parts of the peninsula the snails of the genus Bulimulus and Cœlocentrum are most common, and are evidently related across the gulf in southern Sonora and Sinaloa.

From the fact presented, it is seen that the land vertebrates as a whole have gained the peninsula from the north and have since expanded to colonize the entire peninsula. On the other hand, many gastropods and plants seem to have entered the territory from across the gulf. It seems, therefore, that a recent land connection between Sonora and Lower California is impossible, for if such a connection existed, we should expect to find the southern part of the peninsula occupied, not only by easterly derived plants, but by easterly derived vertebrates as well. It is indeed strange that the modern vertebrate fauna of Sinaloa and southern Sonora is practically absent from Lower California when the modern flora of Sinaloa and Sonora is not only present, but actually dominates the most of Lower California. These facts make clear the interesting and complex problem concerned with the explanation of the origin of the peninsular biota. Our problem is to explain the obviously different origins of the peninsular flora and fauna, and to explain why the complimentary fauna and flora of the biota from which each invasion came is not represented, or is but weakly developed on the peninsula.

The cape region seems to be a very old area, and appears to have escaped complete submergence since its initial elevation early in the Tertiary. During the long periods previous to the Pliocene the cape region was separated from California by a long stretch of water, for at that time the strata of the present volcanic plateau were horizontal and still under the sea. The cape region of Tertiary times was probably a larger area than now and connected for a time with the Mexican mainland. While joined easterly to the Mexican coast, the fauna and flora of that region gained access to the cape region. Among many other species the ancestors of the southerly-derived reptiles, the Oryzomys, and the heavy-seeded montane trees, such as Pinus, Quercus, and Arbutus, came over on the Tertiary land connection.

The Peninsula as a whole came into existence during the late Pleistocene. The tremendous uplift which made the Peninsula probably reacted to cause the subsidence of the territory now forming the trough of the gulf. Whatever land connections there may have been between the mainland and the cape region were obliterated, and the cape region assumed its present relation to the mainland and to the peninsula as a whole. At the close of the Tertiary the fauna and flora of the cape region must have been essentially Mexican, and when the opportunity was finally offered the animals and plants began to extend up the Peninsula.

For some reason the fauna and flora were subjected to a crisis during the Pleistocene, and all but a few vertebrates such as Bipes, Sator, Phyllodactylus, and Oryzomys were destroyed. Among the plants the existing representatives of the Sierra Madran flora, and possibly a number of lowland types escaped, but very likely, as with the vertebrates, most of the peinsular species of that time were destroyed. The crisis may have been brought about by a cooling of the climate or by an increase of precipitation; but whatever its cause, the change must have permitted better adapted forms to come down from the north. These forms competing with the old biota then under a disadvantage, were able to win out and finally supersede the original fauna and flora. The Sierra Madran elements of the present cape region being able to stand more rain and cold than the then existing tropical lowland forms, were no doubt able to adapt themselves to the Pleistocene crisis and afterwards find a suitable home in the high mountains where they are found today. The flora of California probably extended south to the cape during the period of climatic change, and upon its close left a few stragglers to associate with the Sierra Madran elements in the montane areas of the cape region.

As the climate gradually became what it is today, the northerly derived vertebrates were able to adapt themselves to the new conditions; for the gulf was an effective barrier to the southern forms which might at once be better adapted to the new environment and hence able to claim the region at the expense of the northerly forms then actually inhabiting it. With the flora the conditions were different, for better means of dispersal allowed seeds of the southern forms to reach the peninsula, to compete with and finally drive from the southern sections of the territory the Californian forms then occupying it.

Winds have probably been the important agents in populating the peninsula with plants. The excessively violent winds that accompany the autumn storms can readily carry seeds, or at any rate drive flotage over the gulf for great distances. The frequency, violence, and direction of these storms, as well as the excellent opportunities offered for the picking up of seeds by the wind or for the washing into the sea of seed-carrying debris, makes them potent factors in distributing plants over the gulf area. Nelson (Mem. Nat. Acad. Sci. **16**:96-97. 1921) gives some very illuminating data regarding the fierceness and strength of the rain and wind storms which sweep over the gulf area.

To understand insular distribution in the Gulf of California one must appreciate that the gulf area is one of great, unequal, and widespread diastrophism, and that the blocks forming the islands have been moved more or less independently of the large blocks forming the adjacent peninsula or mainland. It is a natural first assumption that the islands have been connected to the adjacent land in comparatively recent times, and that these connections are indicated by topographical alignments and shoals. This assumption, however, seems to have been correct only in a few instances. From the height of deposits on the peninsula and the comparatively low altitude at which they occur on the islands, it seems that the islands have been relatively little affected by the submergences and elevations which have left their mark on the peninsula. That modern shells are found on the peninsula at 1000 meters does not indicate that the adjacent islands even when less than 1000 meters high, were submerged, for the islands and peninsula are separated by a line of active faulting which makes the movements of the islands more or less independent of the risings and sinkings across the riff. As a corollary. depths do not necessarily indicate a lack of land connection in the past, for the forces that heaved up the peninsula and shaped the present gulf trough could well move the small chips of land forming the islands and separate or join them to the peninsula with a minimum of effort.

The great majority of the gulf islands do not appear to have been joined to the peninsula or mainland in recent times, and as a general rule it seems that their fauna and flora must have been brought to them by wind and waves. The biota of Tiburon Island seems to indicate a compartively recent and complete connection of that island with the adjacent mainland, the fauna and flora with slight modifications being the same as that on adjacent Sonora. The islands of San Josef and Espiritu Santo have vertebrate faunas nearly as complete as would be expected were they once connected with the peninsula, but at the same time they are lacking forms which one would naturally expect if the connection did exist. The endemic stamp which characterizes the faunas of these islands, and which especially contrasts them with Tiburon Island, probably indicates a comparatively long separation from the peninsula. Isolation and the working of some environmental factor may have eradicated the missing forms which connection with the peninsula, if it once existed, certainly would have contributed to the islands. Ceralbo Island stands in marked contrast to Espiritu Santo and San Josef islands. Whereas Ceralbo has but two mammals (Peromyscus and Perognathus) and six reptiles (Verticaria, Sator, Ctenosaura, Dipsosaurus, Callisaurus, Crotalus and Coluber), Espiritu Santo Island has six mammals (Peromyscus, Perognathus, Neotoma, Lepus, Ammospermophilus, and Bassariscus) and 12 reptiles (Verticaria, Uta 3 spp., Sceloporus Cnemidophorus, Sauromalus, Phyllodactylus, Coluber, Chilomeniscus, and Crotalus), and San Josef Island has six mammals (Perognathus, Dipodomys, Neotoma, Sylvilagus, Odocioleus, and Bassariscus) and 11 reptiles (Verticaria, Uta, Sceloporus, Callisaurus, Cnemidophorus, Dipsosaurus, Phyllodactylus, Coluber, and Crotalus 2 spp.). It seems that either San Josef and Espiritu Santo islands have been connected with the peninsula while Ceralbo have not been so connected, or that the two former have had better opportunities for having things carried to them. It is possible also that San Josef and Espiritu Santo islands have changed but little since their isolation, whereas in the meantime Ceralbo may have developed some unfavorable conditions which have greatly reduced its original fauna. Any one or all these conditions would account for the differences between the fauna of Ceralbo and that of Espiritu Santo and San Josef islands. It seems more probable, however, that the true explanation lies in assuming that Ceralbo has not been connected, or at least as completely connected, with the peninsula as has its neighboring islands. Excluding Tiburon, San Josef, Espiritu Santo and Ceralbo islands, the remaining gulf islands have vertebrate faunas which usually consist of one or two rodents and several lizards which in most cases represent endemic species with relations on the adjacent coast. Direct land connection seems, therefore, to have been in only a few cases the means of populating the gulf islands. The faunas of the more remote islands seem to indicate a fortuitous origin. For example, Tortuga Island has a Bulimulus, a Crotalus, a Sceloporus, and a Peromyscus (?)all of which appear to be endemic. This motley fauna seems best explained as a flotage cargo, especially as the island is a volcano only recently extinct.

The flora of the gulf islands shows no tendency towards endemism. Certainly not 1% of the insular flora is endemic, and even that small percentage of endemism will probably disappear when the coast of adjacent mainland and peninsula is well explored. Endemism is not as high on the gulf islands as would be expected in a continuous region covering the same expanse of latitude. That the vertebrate fauna on the gulf islands is mainly endemic to each island, and that endemism is the great exception and by no means the rule in the flora, seems to indicate that some factor is at work with the flora which inhibits the production of insular endemisms. The lack of endemism seems best attributed to the great frequency with which peninsular or mainland seeds are brought to the islands and incipient endemism quashed.

Taking in all, it seems probable that the gulf islands have been largly populated by descendants of those animals which, clinging to shrubbery or debris, have been washed out into the gulf by some one of the sudden torrential storms. If the flotage happens to be soon washed ashore on one of the islands, and the island is suitable to the animal's needs, these fortuitous circumstances may allow the animal to populate the new territory. Once the island has been claimed by some form, then successive attempts at populating it would be made with greater and greater difficulty due to genetical swamping and to the probable competition to which the new arrival would be subjected during the critical period in which it must adapt itself to its new home. The chances that a gravid female or that a pair of one species may be washed up coincidently upon an island is remote; but were this a frequent happening, endemism would not be universal among the insular animals. On the other hand, plants on a given island can spring from a single seed which can be carried by wind, bird, or in the pods of some bush washed into the gulf by storm water. The chances of successful animal introductions are very few as compared with the chances of successful plant introductions, and the relative endemism in the two great phyla seems to reflect the effect of this condition.

EXPLORATION

The first botanical exploring in the gulf area was done by Thomas Coulter. Coulter was connected with a mining company and was located at Hermosillo, Sonora, for a number of months in 1829 and 1830. During this time, or later, he visited the principal cities along the west coast of Mexico. Coulter made a large collection of plants, but these were never made the subject of a special study. The data accompanying his specimens are meagre and notoriously inaccurate, for he apparently used geographic names loosely and allowed his labels to become mixed. A detailed discussion of Coulter's travels has been given by Coville (Bot. Gaz. 20:519. 1895).

Though not the first in the general region, the collections made by Richard Hinds and George Barclay of the British exploring ship *Sulphur,* became the basis of Bentham's "Botany of the Voyage of H. M. S. Sulphur." The volume mentioned contains the initial descriptive account of the flora of Lower California. The *Sulphur* cruised along the west coast of

Lower California in 1839, making stops at San Quintin, Magdalena Bay, and Cape San Lucas.

The next exploration made in the general region was that conducted by John Xantus de Vesey, who was stationed at Cape San Lucas and made botanical collections there during 1859 and 1860. The Xantus collections were studied by Asa Gray (Proc. Am. Acad. **5**:153-173. 1861) who prepared an important paper upon them.

The most extended and important explorations made in the gulf area were those carried on by Edward Palmer. His earliest work in the region was done in 1869 on the coastal plains of Sonora in the region of the Yaqui River, and in the area of the Colorado River delta. In 1870 he spent two days on Carmen Island. No special paper was ever published on these collections. Palmer's important work in the gulf area began in 1887 when he spent 18 weeks at Guaymas, eight days on San Pedro Martir Island, several weeks at Mulegé, and four weeks at Los Angeles Bay. The large collection which he amassed was studied by Sereno Watson, who prepared a notable paper upon the subject (Proc. Am. Acad. **24**:36-82. 1889). Palmer spent three days early in May, 1889, at Lerdo, Sonora, near the head of the gulf, and made a small collection which was written up by Vasey and Rose (Contr. U. S. Nat. Herb. **1**:27-28. 1890). In 1890 Palmer spent two weeks at La Paz, and then sailing north to Santa Rosalia where he remained from February 24 to March 15 collecting about that port and the adjacent town of Santa Aguada, made brief stops at Isla Raza and San Pedro Martir Island. The 1890 collections were treated at length by Vasey and Rose (Contr. U. S. Nat. Herb. **1**:63-90. 1890). The first week in March, 1890, Palmer spent in revisiting Carmen Island and then made collections upon which Rose reported in a special paper. (Contr. U. S. Nat. Herb. **1**:129-134. 1892). Following his last visit to Carmen Island Palmer turned his attention to regions beyond the gulf area. Stafford (Pop. Sci. Mo. **78**:341-354. 1911) has written interestingly concerning Palmer's career as a collector.

C. G. Pringle, though one of the most important collectors in other parts of Mexico, played but a minor role in the botanical exploration of the gulf area. In 1884 he collected in northwestern Sonora, apparently working out from the mining town of Altar and down the Asuncion River valley. He is definitely known to have visited Cape Lobos during this journey. Gray and Watson described miscellaneous species from his collections, but no general account of the latter was ever written.

T. S. Brandegee has been the most thorough and important botanical explorer of the peninsula. Though he botanized throughout the length of Lower California, he collected on the gulf only at La Paz. Brandegee has written much on the flora of Lower California, his most useful papers being his "Plants from Baja California" (Proc. Calif. Acad. Sci. II, **2**:117-216. 1889) and his "Flora of the Cape Region" (Proc. Calif. Acad. Sci. II, **3**:108-182. 1891).

Léon Diguet, for three years an employé of the Boleo Company, landed at Santa Rosalia late in 1896 in the capacity of biological explorer for the Paris Museum of Natural History. He proceeded overland to La Paz going there by way of Mulegé, Purisima, and Comondú. After a time at La Paz he went to Todos Santos and from there to La Laguna in the high mountains. Eventually he returned to Santa Rosalia, going through La Paz, Comondú, Loreto, and Mulegé. He next went by boat to Los Angeles Bay where he spent two days. Upon his return to Santa Rosalia he proceeded northward overland to Calamujuet or beyond. At the close of this last trip, after a period of six months, he sailed for Guaymas. Going overland he proceeded southward into Sinaloa, at least to Mazatlan, and finally went to Jalisco where he spent considerable time before embarking for France. While at Santa Rosalia and La Paz, he had numerous opportunities to visit the islands in the gulf and is known to have set foot upon Tortuga, Carmen, Catalina, Espiritu Santo, and Ceralbo. Although his opportunities were great, Diguet's collections seem to be meagre and poorly supplied with data. His best collecting was in the cacti, but in that group as in others, he seemed to have gotten only the common or spectacular things. Data regarding Diguet's itinerary are to be found in the early volumes of the Bulletin du Muséum d'Histoire Naturelle (particularly **1**:4, 28-30. 1895. and **2**:78.1896).

Besides having published much on the region, J. N. Rose visited it in June, 1897, and spent about two weeks collecting about Guaymas and La Paz. He collected a second time about Guaymas in March, 1910, when he was assisted by P. C. Standley and P. G. Russell. In 1911, Rose was on the *Albatross* and spent most of April cruising in the Gulf of California. At that time he visited San José del Cabo, Ceralbo Island, Espiritu Santo Island, La Paz, San Josef Island, Santa Cruz Island, Catalina Island, Agua Verde Bay, Carmen Island, Mulegé, Concepcion Bay, San Francisquito Bay, Angel de la Guarda Island, San Esteban Island, Tiburon Island, Turner ("Seal") Island, and Guaymas. An interesting brief account of the last visit is to be found in the Journal of the New York Botanical Garden (**12**:263-272. 1911).

Between March, 1905, and February, 1906, E. W. Nelson and E. A. Goldman traversed the length of the peninsula and made very large biological collections. The points visited on the gulf are San Felipe Bay, Calamajuet Landing, Santa Rosalia, Mulegé, La Paz, Espiritu Santo Island, and Ceralbo Island. A large plant collection was made by Goldman (Contr. U. S. Nat. Herb. **16**:309-371. 1916) who published a valuable paper upon his bontanical observations. A detailed and very interesting running account of the expedition is to be found in Nelson's admirable monograph on Lower California (Mem. Nat. Acad. Sci. **16**:13-48. 1921).

A notable botanical reconnaissance was made in 1904 by D. T. MacDougal (Bot. Gaz. **38**:44-63. 1904) about the mouth of the Colorado River and at San Felipe Bay. In 1907 he headed an expedition to the Pinacate Mountains and the plants collected there were treated at length by Rose and Standley (Contr. U. S. Nat. Herb. **16**:5-20. 1912). The only point on the gulf actually touched was Adair Bay where a small collection was made by G. Sykes.

Our knowledge of the gulf area flora has been furthered by a number of small collections. One of these was made at La Paz in 1847 by Major Rich. In 1876 T. H. Street of the U. S. Navy gathered a few odd plants in the gulf, giving as localities, Pulpito Point, Canvas Point, and Angel de la

Guarda. Walter Bryant, the ornithologist, made a small plant collection on Espiritu Santo and San Josef islands in April, 1892. In 1895 a visit was made to Tiburon Island by W. J. McGee who made a small collection of plants. W. M. Gabb traversed the peninsula in 1867 and made a scrappy collection of cacti upon which, unfortunately, many new species were based. Gabb touched the gulf only at La Paz, Loreto, and Mulegé.

For the details of the present expedition see the "General Account" by J. R. Slevin (Proc. Calif. Acad. Sci. IV, 12:55-72. 1923).

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Dr. J. N. Rose of the United States National Herbarium has given invaluable help with the cacti; and Mr. E. P. Killip of the same institution has contributed critical determinations of the Passifloræ. Dr. B. L. Robinson of the Gray Herbarium and Dr. S. F. Blake of the United States Department of Agriculture, have both supplied valued opinions concerning the Compositæ. The greatest debt, however, is to Miss Alice Eastwood, Curator, Department of Botany, California Academy of Sciences, whom the writer thanks for his nomination as expedition botanist and for the material assistance which made the preparation of this paper possible.

INTRODUCTION TO THE CATALOGUE

The following catalogue enumerates the species and varieties of vascular plants collected on the expedition. A serious attempt has been made, however, to make the catalogue something more than a mere list of names and localities, for under each heading there has been an attempt to give original data regarding the habits, habitat, and distribution of each of the forms in the gulf area. For the sake of definiteness, all the expedition collections have been mentioned, the collection numbers being consistently cited in parentheses following the mention of the proper localities. The carefully selected and very full first set of exsiccatæ, as well as the types of all new species described herein, are to be found in the Herbarium of the California Academy of Sciences at San Francisco, California.

With the view of helping future workers in the area it has been thought best to give taxonomic bibliography. Complete bibliography has been given of those species with few synonyms and of those species which are confined to the gulf area, but of widely ranging species with complicated synonymy only a few of the important items have been listed. Type localities have been listed, and, with the western species particularly, it has been the plan to state the locality as precisely as data will allow regardless of the original wording.

The nomenclature is according to the International Rules. The attitude towards species is conservative. It has been the rule not to propose any species for which several good quantitative diagnostic characters could not be enumerated. The flora of Lower California has been described without such a rule, for as in other regions in an early stage of botanical exploration, the flora has been approached with a keenly, not to say recklessly, analytic attitude, and species, many of them very critical ones, have been based on meagre material and without comparison or indication of crucial characters. It is not surprising, therefore, that it has been frequently necessary to revaluate described species, for many have stood, and no doubt others still stand, only because the proper comparisons have never been made, or because an adequate series has never been collected. There are numerous forms on the peninsula which bear binomials although they are merely peninsular strains of widely ranging species. Due to its length and span of latitude, the peninsula has been particularly fitted for the development of geographic races. In dealing with geographic forms, which are very numerous in the area, the principle so successfully applied by mammalogists and ornithologists has been accepted, and geographic races have been given subordinate rank under the species. Forms with geographically correlated developments have been considered worthy of a name, even when the development is rather trivial in character.

The major part of the work on this paper was done in the University of California Herbarium where access was had to the types and rich peninsular collections of Mr. Brandegee. Subsequent to the months of study in California the manuscript was thoroughly overhauled at the United States National Herbarium and at the Gray Herbarium. All the collections rich in peninsular material have been consulted, and the greatest proportion of the types of those species first described from Lower California and adjacent areas have been studied.

CATALOGUE OF SPECIES COLLECTED

I. Polypodiaceæ

1. **Adiantum capillus-veneris** L.

Adiantum capillus-veneris L., Sp. Pl. 1096. 1753.—*Type locality:* Europe.

Very common in the large cañon back of Escondido Bay (4112) where it lines all the seeps down to about 300 m. altitude.

2. **Notholæna californica** D. C. Eaton

Notholæna californica D. C. Eaton, Bull. Torr. Cl. **10**:27. 1883.—*Type locality:* San Diego County, California.

The most abundant fern in the gulf area, though not common. It was collected at Los Angeles Bay (3460), Santa Cruz Island (3915, 3916), Espiritu Santo Island (3998, 3999, 4006, 4007), Ceralbo Island (4032), and La Paz (4020). It frequents rocky slopes, growing under or about rocks. On the islands, yellow and white forms were found growing together and appearing to agree in all respects save the color of the powder on their surfaces.

3. **Notholæna lemmoni** D. C. Eaton

Notholæna lemmoni D. C. Eaton, Bull. Torr. Cl. **7**:63. 1880.—*Type locality:* Santa Catalina Mountains, Arizona.

Seen at La Paz (4019), Escondido Bay, and San Pedro Bay (4336). At San Pedro Bay it was locally abundant on a rocky hillside, but at the other stations only a few odd plants were noted growing in rocky places.

4. **Pityrogramma triangularis** var. **maxoni** Weatherby

Pityrogramma triangularis var. *maxoni* Weatherby, Rhodora **22**:119. 1920.—*Type locality:* Rincon Mountains, Arizona.

Seen only on Tortuga Island (4185) where it was very common about rocks inside the old crater.

5. **Thelypteris augescens** var. **puberula** (Feé) Munz & Johnston, n. comb.

Aspidium puberulum Feé, Mem. Soc. Nat. Strasburgh **6**:40. 1865.—*Dryopteris puberulum* Baker, Synop. Fil. 495. 1874. —*Dryopteris feei* Chr., Index Fil. 264. 1905.—*Type locality:* Huatusco, Vera Cruz.

Very common and conspicuous in wet, sheltered places in the large cañon in the Sierra Giganta back of Escondido Bay (4117, 4118). This fern grows very rankly at altitudes above 400 m., frequently becoming 15 dm. high.

II. Gnetaceæ

6. **Ephedra peninsularis** Johnston

Ephedra peninsularis Johnston, Univ. Calif. Pub. Bot. **7**:437. 1922.—*Type locality:* Magdalena Island.

Seen only on Coronados Island (3757) where a single plant was found growing among the rocks of a broken-up lava flow. The plant was staminate and formed a very intricately branched flat-topped mass 7 dm. high and 18 dm. broad. The species is doubtfully distinct from *E. nevadensis* Wats.

III. Typhaceæ

7. **Typha angustifolia** L.

Typha angustifolia L., Sp. Pl. 971. 1753.—*Type locality:* Europe.

A small colony of this species grew in wet sand at 400 m. altitude in the large cañon back of Escondido Bay (4116). What is probably the same species was observed in a sterile condition at Mulegé where it formed large clumps about the reservoir.

IV. Potamogetonaceæ

8. **Ruppia maritima** L.

Ruppia maritima L., Sp. Pl. 127. 1753.—*Type locality:* Europe.

Collected from an irrigation ditch at Mulegé (3672) and from the bay at La Paz (4012). It grew abundantly in one of the pools of the abandoned oyster-culture plant on Espiritu Santo Island. The material from Lower California seems to have the beak on the fruit better developed than the material from California and probably is referable to the variety *rostrata* Agardh. (cf. Rhodora **16**:125. 1914).

9. **Zannichellia palustris** L.

Zannichellia palustris L., Sp. Pl. 969. 1753.—*Type locality:* Europe.

Abundant in a warm still pool near the margin of the reservoir at Mulegé (3671). Brandegee has collections from Comondú.

V. Najadaceæ

10. **Najas guadalupensis** (Spreng.) Morong

Najas guadalupensis Morong, Mem. Torr. Bot. Cl. **3**:2. 1893.—*Caulinia guadalupensis* Spreng., Syst. **1**:20. 1825.—*Type locality:* Isle of Guadeloupe, West Indies.

Occurring in great abundance in a spring-fed pool on the ranch at San Evaristo Bay (4093). Another species of this genus, *N. marina* L., is known from Mulegé *Palmer* (type collection of var. *mexicana* Rendle, Trans. Linn. Soc. II, **5**:398. 1899) and San Gregorio *Brandegee.*

VI. Gramineæ

11. **Aristida adscensionis** L.

Aristida adscensionis L. Sp. Pl. 82. 1753.—*Aristida bromoides* H.B.K., Nov. Gen. et Sp. **1**:110. 1816—*Type locality:* Ascension Island.

Collected on San Esteban (3203) and Angel de la Guarda (4215) islands. The latter collection has the lateral awns erect and about a fourth as long as the middle awn.

12. **Aristida californica** Thurb.

Aristida californica Thurb., Bot. Calif. **2**:289. 1880.—*Aristida californica* var. *fugitiva* Vasey, Contr. U. S. Nat. Herb. **3**:49. 1892.—*Type locality:* Colorado Desert, California.

Collected on a rocky hillside on Angel de la Guarda Island (4218) and on the sandy plain back of La Paz (3054).

13. **Bouteloua barbata** Lag.

Bouteloua barbata Lag., Var. Cienc. 2^4:141. 1805.—*Chondrosium polystachyum* Benth., Bot. Sulph. 56. 1844.—*Bouteloua polystachyum* Torr., Pacif. R. R. Rep. **5**:366. t. 10. 1857.—*Type locality:* Mexico.

Several large colonies of this species were found with Atriplex on the guano-covered flats of Patos Island (3245).

14. **Bouteloua repens** (H.B.K.) Scrib & Merr.

Bouteloua repens Scrib. & Merr., U. S. Dep. Agr. Div. Agrost. Bull **24**:26. 1891.—*Dinebra repens* H.B.K., Nov. Gen. et Sp. **1**:172, t. 52. 1816.—*Type locality:* Near Acapulco, Guerrero.

A single plant of this grass was found growing with *Panicum geminatum* in a moist rock-crevice on a cañon floor at the head of San Carlos Bay (4351).

15. **Bouteloua rothrockii** Vasey

Bouteloua rothrockii Vasey, Contr. U. S. Nat. Herb. **1**:268. 1893.—*Type locality:* Cottonwood, Arizona.

A specimen from a dry rocky hillside back of Guaymas (3087) is doubtfully referred here. It is low, under 15 cm., and has ascending culms, but otherwise seems to be typical.

16. **Cenchrus pauciflorus** Benth.

Cenchrus pauciflorus Benth., Bot. Sulph. 56. 1844.—*Type locality:* Magdalena Bay, Lower California.

Common in cultivated fields at Mulegé (3682).

17. **Cenchrus palmeri** Vasey

Cenchrus palmeri Vasey in Brandg., Proc. Calif. Acad. Sci. II, 2:211. 1889.—*Type locality:* Guaymas, Sonora.

A common and characteristic grass in sandy soil throughout most of the gulf area. Although collections were made only at San Francisquito Bay (3560) and on Tiburon Island (3251), the plant being mainly dried up, the characteristic burs were recognized at San Luis Gonzales, Los Angeles, Las Animas, and San Nicolas bays; and on Angel de la Guarda, Carmen, Monserrate, San Josef, San Francisco, and Ceralbo islands. When present the plant was common, for the vicious burs were ubiquitous, and heedless kneeling on the ground nearly always produced specimens.

18. **Chloris virgata** Swartz

Chloris virgata Swartz, Fl. Ind. Occ. 1:203. 1797.—*Chloris elegans* H.B.K., Nov. Gen. et Sp. 1:166, t. 49. 1816.—*Type locality:* Antigua, West Indies.

Several plants of this species grew from a crack in the lava on a gulch bottom on Tortuga Island (3610).

19. **Distichlis palmeri** (Vasey) Fassett, n. comb.

Uniola palmeri Vasey, Gard. & For. 2:401, f. 124. 1889.—*Type locality:* Horseshoe Bend 12-15 miles above the mouth of the Colorado River, Sonora.

Seen only at Las Animas Bay (3491) where it was common along the foot of a bank at the edge of a tide-flat. It is a very coarse rhizomatous grass the very brittle stems of which reach a height of 12 dm. when partially supported by brush. The more or less convolute leaves are pungent and can prick rather painfully. The collection seems to be the only one made on the peninsula proper and to set the southern-most known locality for the species.

Due to a technical character of doubtful value, the occurrence of one or two sterile lemmas in the pistillate spikelet, this species was originally referred to Uniola, a genus in which it is utterly strange as to habit. The gross aspect of *Uniola palmeri* is that of a rankly growing Distichlis. According to

Holm (Bot. Gaz. **41**:275. 1891) the leaf-anatomy is also suggestive of that genus. Mr. N. C. Fassett has also observed that it agrees with Distichlis in its diœcious habit, and sexually dimorphic inflorescences and spikelets. A complete discussion of the situation will soon be published by Mr. Fassett in his taxonomic study of Distichlis.

20. **Gouinia brandegei** (Vasey) Hitchc.

Gouinia brandegei Hitchc., U. S. Dept. Agri., Bur. Pl. Ind. Bull. **33**:21. 1903.—*Diplachne brandegei* Vasey, Proc. Calif. Acad. Sci. II, **2**:213. 1889.—*Type locality:* Magdalena Island, Lower California.

A coarse tufted grass becoming 8 dm. high which was rare on rocky benches on San Esteban Island (4399). It has been collected on Carmen Island by Palmer.

21. **Heteropogon contortus** (L.) Beauv.

Heteropogon contortus Beauv. in R. & S. Syst. **2**:836. 1817.—*Andropogon contortus* L., Sp. Pl. 1045. 1753.—*Type locality:* India.

Seen only on South San Lorenzo (4199) and San Esteban (3208) islands where it is frequent on rocky cañon floors.

22. **Imperata hookeri** Rupr.

Imperata hookeri Rupr. in Anders., Öfv. Vet. Akad. Förh. **12**:160. 1855.—*Type locality:* Texas.

Several colonies were found on a stream-side in the Sierra Giganta back of Escondido Bay (4123). It grew at about 500 m. altitude. The plant does not appear to have been previously collected so far south on the peninsula; in fact, the only peninsular record (Contr. U. S. Nat. Herb. **17**:197. 1913) is from the extreme northern part.

23. **Jouvea pilosa** (Presl) Scrib.

Jouvea pilosa Scrib., Bull. Torr. Cl. **23**:143. 1896.—*Brizopyrum pilosum* Presl, Rel. Haenk. **1**:280. 1830.—*Type locality:* Acapulco, Guerrero.

A large colony of this diœcious grass grows on Carmen Island (3835) on the dunes along the shore of San Francisco Bay. This station extends the known limits of the species some 120 km. to the northward, the previous known stations in the gulf area being San José del Cabo, La Paz, and San Josef Island.

24. **Leptochloa uninervia** (Presl) Hitchc. & Chase

Leptochloa uninervia Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**:383. 1917.—*Megastachya uninervia* Presl, Rel. Haenk. **1**:283. 1830.—*Leptochloa imbricata* Thurb. in Wats., Bot. Calif. **2**:293. 1880.—*Type locality:* Mexico.

A few plants were found on the bank of an irrigation ditch at Mulegé (3683).

25. **Monanthochloë littoralis** Engelm.

Monanthochloë littoralis Engelm., Trans. Acad. St. Louis **1**:436. 1859.—*Type locality:* Texas.

Collected only from about the lagoon on Raza Island (3219), but observed in similar situations at Tepoca Bay and at the Lagoon on Angel de la Guarda Island. The Pacific Coast material of the species has a sharp cusp terminating the leaves whereas that from Texas commonly has blunt leaf-tips.

26. **Muhlenbergia microsperma** (DC.) Kunth

Muhlenbergia microsperma Kunth, Rev. Gram. **1**:64. 1829. —*Trichochloa microsperma* DC., Cat. Hort. Monsp. 151. 1813.—*Type locality:* Mexico.

Observed only on Tortuga and San Pedro Martir (4398) islands. At the latter station it is the only endogen and is very abundant.

27. **Paspalum distichum** L.

Paspalum distichum L., Syst. Nat. ed. 10, 855. 1759.—*Type locality:* Not given.

Very common on the saturated meadow-lands surrounding the reservoir at Mulegé (3668).

28. **Panicum geminatum** Forsk.

Panicum geminatum Forsk., Fl. Aegypt. 18. 1775.—*Type locality:* Egypt.

Frequent in moist rock-crevices in a cañon near San Carlos Bay (4350).

29. **Setaria macrostachya** H.B.K.

Setaria macrostachya H.B.K., Nov. Gen. et Sp. 1:110. 1816.—*Chætochloa macrostachya* Scrib. & Merr., U. S. Dept. Agri. Div. Agrost. Bull. 21:29. 1900.—*Chætochloa rigida* Scrib. & Merr., U. S. Dept. Agri. Div. Agrost. Bull. 21:30. 1900.—*Type locality:* Guanajuato, Mexico.

Extremely abundant on north-facing slopes on San Pedro Nolasco Island (4397) where it makes some hillsides appear as hayfields. A few small colonies were seen on San Esteban (4396) and Tortuga islands growing on cañon bottoms. All the material collected is in very advanced maturity.

30. **Sporobolus virginicus** (L.) Kunth

Sporobolus virginicus Kunth, Rev. Gram. 1:67. 1829.—*Agrostis virginicus* L. Sp. Pl. 63. 1753.—*Sporobolus pungens* Kunth, Rev. Gram. 1:68. 1829.—*Type locality:* "Virginia."

Forming a large colony on a sandy beach near the south end of Monserrate Island (3869). The previous collections on the Pacific Coast are from Guaymas, San Francisquito Bay, Santa Margarita Island, and Cedros Island.

31. **Triodia pulchella** H.B.K.

Triodia pulchella H.B.K., Nov. Gen. et Sp. 1:155, t. 47. 1816.—*Tricuspis pulchella* Torr. Pacif. R. R. Rep. 4:156. 1857.—*Tridens pulchellus* Hitchc. in Jepson, Fl. Calif. 1:141. 1912.—*Type locality:* Southern Mexico.

Frequent on gravelly benches in a cañon on South San Lorenzo Island (4413).

VII. Cyperaceæ

32. **Cyperus dioicus**, n. sp.

Perennial from a rootstock; leaves rather firm, flat, smooth, lower ones 10-25 cm. long and 4-8 mm. wide; leaves of involucre usually reflexed, 1-3, 6-10 cm. long, 25 mm. wide, the longest much surpassing the inflorescence; culms slender, few, smooth, obtusely triangular, 2.5 mm. thick, 6-12 dm. long, bending over and allowing the viviparous plants which are produced at the base of the inflorescence to strike root; umbels of 3-6 usually compound rays, longest primary ray about 3 cm. long; inflorescence globose, 3-8 cm. broad, dense to open according to crowding of spikelets; spikelets usually numerous, 6-20 mm. long, 1.5-3 mm. wide, 18-50-flowered, strongly flattened; scales closely imbricate, reddish-brown with a light-colored keel and margin, broadly ovate, mucronate, 3-nerved, glabrous, keel serrulate near apex; rachis narrowly winged; flowers diœcious; stamens 3, persisting after dehiscence as protruding ligulate scarious appendages; mature anther linear, acuminate, 1-2 mm. long, about 0.12 mm. wide; filaments about 0.5 mm. long; style trifid, nearly 3 mm. long, exceeding the glumes, lobes pubescent and exceeding the undivided portion; achenes 0.66 mm. long, 1/3-1/4 as long as the subtending scale, nearly white, ovate, mucronate, 3-angled.

Type: No. 1277, Herb. Calif. Acad. Sci., collected by I. M. Johnston (No. 4145), about June 17, 1921, a moist area at **Agua Grande, Carmen Island, Gulf of California.**

A very remarkable species, most nearly related to *C. canus* Presl, and to a species here questionably called *C. mexicana* Liebm. *(Pringle 6044* and *J. D. Smith 2229,* in Gray Herb.) *Cyperus dioicus* is quite distinct from *canus* and *mexicanus,* differing in many inconspicuous details and in such conspicuous and important features as size and shape of inflorescence, in the number, length, and direction of stem leaves, in the direction, length, and size of culms, and notably in its viviparous habit. Though very different in general appearance, the three species are quite similar in spikelet details, all being diœcious, all having similarly shaped, closely appressed scales which are serrulate near the apex, all having the same peculiar stamens composed of short filaments and very long anthers, and all having similar pistils. The spikelet details, especially staminal characters, show relationship with the African *C. alternifolius* and its allies of the section Textiles, but the presence of basal leaves in *dioicus* is atypical in that section. Most representatives of the section Textiles have numerous stem leaves, whereas *dioicus* has but few of them. In other than its diœcious habit and large stamens, it is remarkably like *C. dentatus* of the section Haspani, having the spikelets of similar shape and color, achenes of similar size and color, similarly distributed and equally abundant leaves, and, finally, a similar viviparous habit.

The plant is particularly interesting because of its agamic reproduction. Every stem produces just above the involucral leaves several buds which early grow into vigorous leafy young plants, and which commonly crowd or frequently develop at the expense of the inflorescence. The culm averages just under a meter in length, slender, and at best, hardly capable of erect growth, usually becomes top heavy, due to the inflorescence and viviparous plants, and arches over with the flower cluster touching the ground. The bud-grown plants strike root very readily once they come in contact with the soil, and at once repeat the process by developing their culms which are frequently near flowering before they reach the ground. A vigorous colony of this Cyperus presents a mass of arched stems which trip one up much as does *Eleocharis rostellata*.

Pistillate specimens were collected on Carmen Island (4145) and staminate ones in the cañon back of Escondido Bay (4124). In the Brandegee collection there are six sheets of this new species, one collected by Purpus (7575) at Cañon San Pablo, and five gathered by Brandegee at San José del Cabo, Corral de Piedra, Sierra de la Laguna, and San Raimond Creek. No attempt seems to have been made to determine the specimens. The plant is evidently typical of the southern half of the peninsula ranging from San Pablo south to the cape.

33. **Cyperus ferax** Rich.

Cyperus ferax Rich., Act. Soc. Hist. Nat. Paris **1**:106. 1792.—*Cyperus speciosa* Vahl, Enum. **2**:364. 1806.—*Type locality:* Cayenne.

A few scattered colonies were found growing along seeps in the cañons about San Pedro Bay (4305). The plant grows in tufts of 1-6 stems. On the peninsula it has been collected by Palmer at Mulegé and by Brandegee at Comondú, Sierra de San Francisco, and San José del Cabo.

34. **Cyperus lævigatus** L.

Cyperus lævigatus L. Mant. **2**:179. 1771.—*Type locality:* Cape of Good Hope.

Forming dense sods on the boggy areas about the numerous springs at Palm Tree Wells, Los Angeles Bay (3437). Other collections have been made in Lower California at Calamujuet (a very robust form), Los Angeles Bay, and Mulegé.

35. **Eleocharis caribæa** (Rottb.) Blake

Eleocharis caribæa Blake, Rhodora **20**:24. 1918.—*Scirpus caribæus* Rottb., Descr. Pl. Rar. Progr. 24. 1772.—*Eleocharis capitata* of authors.—*Type locality:* "insula Caribæa St. Crucis."

Locally common in moist gypsum soil on San Marcos Island (3634), and in a sweetwater bog at San Evaristo Bay (4091). Brandegee has specimens from Corral de Piedra, San Gregorio, and San José del Cabo.

36. **Scirpus americanus** Pers.

Scirpus americanus Pers., Synop. **1**:68. 1805.—*Scirpus pungens* Vahl, Enum. **2**:255. 1806.—*Type locality:* South Carolina.

Collected only at Los Angeles Bay (3431) where it forms a little sod by one of the springs of the Palm Tree Wells. Noted also at Mulegé. Brandegee has it from San José del Cabo and San Fernando.

37. **Scirpus olneyi** Gray

Scirpus olneyi Gray, Bost. Jour. Nat. Hist. **5**:238. 1845.—*Type locality:* Seekonk River, Rhode Island.

Growing about one of the water holes at the Palm Tree Wells at Los Angeles Bay (3448) and about the reservoir at Mulegé. Brandegee has it from San José del Cabo.

VIII. PALMÆ

38. **Glaucothea armata** (Wats.) Cook

Glaucothea armata Cook, Jour. Wash. Acad. Sci. **5**:236. 1915.—*Brahea armata* Wats., Proc. Am. Acad. **11**:146. 1876. —*Erythea armata* Wats., Bot. Calif. **2**:212. 1880.—*Type locality:* Cantillas Cañon, Lower California.

Palms of this species are very common in a large cañon (called Palm Cañon) on the east side of Angel de la Guarda Island (3407, 3408, 3423). The plants are scattered up the dry gravelly bed of the cañon and become 8 m. high when growing in sheltered places. The palm was again seen in a wild state on the Sonoran coast at San Pedro (4340) and San Carlos (4349) bays where they were associated with the more abundant *Sabal uresana.* They grew 6-10 m. high and differed from the Sabal in their preference of cañon bottoms to cañon sides. Cultivated trees were observed at Los Angeles Bay, Mulegé, and Guaymas. The species seems to affect gravelly washes and cañon beds. It appears to be self-trimmed, and develops scarcely buttressed trunks which are about 3-4 dm. broad a meter above the ground. Flowering begins when the trunk is less than 2 m. high. The inflorescence exceeds the leaves and becomes 3-4 m. long. The mesocarp of the ripe fruit has a pleasant date-like flavor.

Cook considers *Glaucothea armata* to be generically distinct from the Guadalupe Island, *Erythea edulis* Wats. With this we are inclined to agree. When Glaucothea was proposed, however, Cook failed to appreciate that several other species (i.e. *Erythea brandegei, E. elegans,* and *E. aculeata*) were so close to *armata* that their generic relations to that species are indubitable, and that when these species are considered the white waxy coat present in *armata* and emphasized in the generic name, ceases to be of generic value. Cook made several statements which need correcting; e.g., in *armata* the leaves do not have a bowed midrib, the ligule frequently does have a tomentose cushion, and the inflorescence is not erect but horizontal or reflexed; furthermore all the plants seen had trunks as slender as, or even more slender than, *Erythea edulis,* they flowered as young, and had similarly colored flowers.

The generic differences between Erythea and Glaucothea reside in developments of petiole and inflorescence. In Erythea the petiole becomes reflexed by bending near the point of attachment, tears loose from the sheath, and thereby exposes most of its length. In Glaucothea the petiole remains attached to the sheath, becoming reflexed by a bend a decimeter or more above the point of attachment, hence fails to disclose a goodly portion of its length, and so appears shorter. In Erythea the inflorescence has stout branches, is rather dense, and is evidently shorter than the leaves; it has spathes subtending all the primary branches as well as having (usually) two empty ones on the basal portion of the flowering branch. Glaucothea has a somewhat more specialized inflorescence which differs in elongation, slenderness, and reduction of parts; the flowering branch extending far beyond the leaves and the four or five lower sheaths being flowerless. The terminal branch of the inflorescence is particularly elongated, appearing as the spatheless elongation of the flowering branch.

The San Carlos Bay collection is referable to *E. armata* var. *microcarpa* Becc. (Webbia **2**:136. 1907) but does not seem to differ from the Angel de la Guarda Island collections in other than small size of fruit. It is doubtful whether size of fruit is significant, but an effort should be made to see whether or not it is geographically correlated.

39. **Glaucothea brandegeei** (Purpus), n. comb.

Erythea brandegeei Purpus, Gartenflora **52**:11, f. 1-2. 1903. —*Type locality:* Mountains back of San José del Cabo, Lower California.

Seen in a wild state only in the deep cañon in the Sierra Giganta back of Escondido Bay (4107) where it is very common down to about 350 m. altitude. It grows along the stream bed or in sheltered recesses on the mountain side and may become 15-22 m. high although the common height is only about 10 m. The trunk is apparently self-trimmed. This new station extends the known range of the species some distance to the northward, the only previously known stations being in the cape region. The palm found growing with Phœnix about the old water hole on Catalina Island (4105) is probably this species, but it is highly improbable that the species is native on the island.

This palm is nearest to *G. armata* and perhaps eventually will be found to intergrade with it. The most apparent difference between the two species is in the foliage. *Glaucothea armata* has the fronds heavily glaucous on both surfaces, whereas *G. brandegeei* has the upper surface green or at least greener than the lower surface, which is more or less glaucous. Purpus suggests that *brandegeei* has leaves of thinner texture, but, though this seems to be true in the young fronds, the single available mature frond of *brandegeei,* that from near San José del Cabo, is an exact duplicate, in all but its green upper surface, of the fronds of typical *armata.* The thinner leaves and the greater height of growth in *brandegeei* may be due to the comparatively moister and less arid condition in which it grows as contrasted with *armata.*

The fruit of *G. brandegeei* needs study. Purpus has given a figure (f. 2) which shows the peculiar stipe-like process found on the fruit in the type collection. Mature fruit of *armata* does not show the process developed to such a marked degree. The fruit with the type of the Sinaloan **Glaucothea aculeata,** n. comb. (*Erythea aculeata* Brandg.) lacks the stipe-like process and, though of the same size as the fruit of *brandegeei* figured by Purpus, is larger than the fruit in isotype material of *brandegeei.* **Glaucothea elegans,** n. comb. *(Erythea elegans* Becc.) is another closely related species. It is known only from Sonora and is characterized by its pear-shaped fruit.

40. **Sabal uresana** Trel.

Sabal uresana Trel., Rep. Mo. Bot. Gard. **12**:79, t. 36-37. 1901.—*Inodes uresana* Cook, Bull. Torr. Cl. **28**:534. 1901.—*Inodes roseana* Cook, Bull. Torr. Cl. **28**:534. 1901.—*Sabal roseana* Becc., Webbia **2**:83. 1907.—*Type locality:* A few miles north of Ures, Sonora.

Growing in great abundance in the vicinity of San Pedro Bay where it forms forests in the cañons and on the mountain sides near the gulf shore. Smaller colonies also occur at San Carlos Bay (4345). At both stations the plant grows with *Glaucothea armata,* but greatly exceeds that species in number of individuals. Cultivated plants occur on the plaza at Guaymas. The species is most at home on broad gravelly cañon floors but is also frequent on the hillsides. At San Pedro Bay scattered trees grow even on the cliffs that arise from the gulf shore. Immense groves occur near the gulf a few kilometers south of San Pedro Bay, but no visit was made to them.

The tree commonly grows about 12 m. high with a self-trimmed, clear trunk about 3 dm. in diameter. The spadix is paniculate, ascending, and about the length of the fronds or frequently even exceeding them, due to the drooping frond segments. The fronds are slightly glaucous, but the petioles are quite so, especially above. The average leaf-blade has a span of about 19 dm. and a length of about 15 dm., but some large fronds are 20 dm. broad and 17 dm. long. The segments of the frond are drooping and flap in the breeze; near the center of the frond they are cut 1/2-3/5 way to base but near the margins the cutting almost reaches the ligule. The petioles average about 18 dm. in length, though some 25 dm. long were noted. The base of the petiole has a flare of over 25 cm. but the width of the middle segments is only about 4 cm. The dried fruit is strongly depressed, brown in color, and averages about 15 mm. in width and 12 mm. in thickness. The seeds are mahogany in color, depressed rounded, about 12 mm. broad and 7 mm. high. The surface is usually smooth or finely rugose, though a few seeds have the coarse reticulate rugosities illustrated by Trelease. The embryo is lateral, lying horizontally or placed at an angle as sharp as 40°; its location is marked by a small circular impression on the testa. The branchlets of the inflorescence are not spindle-shaped, but unthickened and 1-2 mm. in diameter.

The determination of this palm is difficult as it is intermediate between *S. uresana* and *S. roseana*. The two species have been distinguished by shape of spadix branchlets, size and form of tree, position of embryo, and surface of seeds. Before the shape of spadix branchlets can be used, it will be necessary to demonstrate by field observations that the development in the type of *uresana* is not an unimportant individual variation. Beccari (Webbia **2**:76. 1907) has shown that the embryo differences between the two species are illusionary, while the author's observations reveal that the embryo position is too variable for a specific character. In the San Carlos Bay collections the seeds vary from smooth to strongly reticulate, and so the use of that character is impossible. It seems as though the surface of the seeds must be affected by differences in maturing. *Sabal roseana* is supposed to have larger leaves and to be a taller and more slender tree than *S. uresana.* The San Pedro Bay and San Carlos Bay plants have these latter characters of *roseana* save that the trunk is as stout as given for *uresana.* It seems that *roseana* should stand as a southern non-glaucous form of *uresana* and should be called **Sabal uresana** var. **roseana,** n. comb. With *roseana* thus disposed of, the present glaucous Sonoran plant would be called typical *S. uresana.*

IX. Lemnaceæ

41. **Lemna cyclostasa** (Ell.) Schleid.

Lemna cyclostasa Schleid., Linnæa **13**:390. 1839.—*Lemna minor* var. *cyclostasa* Ell., Bot. S. C. and Ga. **2**:518. 1824.—*Type locality:* Beaufort, South Carolina.

Growing on a still pool back of the Typha clumps about the reservoir at Mulegé (3701). Brandegee has collected the same thing in the Sierra de San Francisquito of the cape region.

X. Bromeliaceæ

42. **Hectia pedicellata** Wats.

Hectia pedicellata Wats., Proc. Am. Acad. **26**:155. 1891.—*Hectia montana* Brandg., Erythea **7**:9. 1899.—*Type locality:* Guadalajara, Jalisco.

Forming dense colonies on rock-ledges in the cañons about San Pedro Bay (4314) and above 300 m. altitude in the Sierra Giganta back of Escondido Bay (4106).

XI. Commelinaceæ

43. **Tradescantia heterophylla** Brandg.

Tradescantia heterophylla Brandg., Univ. Calif. Pub. Bot. **10**:181. 1922.—*Type locality:* Sierra El Taste, Lower California.

A plant which, with little doubt, represents this species, was locally common in the crevices of a basalt ledge on a sheltered bend in a gorge-like constriction in a ravine at the isthmus on Espiritu Santo Island (3987). The plant has a cluster of fleshy, linear roots which grow wedged into crevices, and a slender stem 3-4 dm. long which hangs down loosely from them. Only crisped stems were found but living roots were sent to Dr. Rose at the National Museum. Growing with the Tradescantia were *Dudleya albiflora* and a lactiferous Mammillaria, neither of which was seen elsewhere.

XII. JUNCACEÆ

44. **Juncus balticus** var. **mexicanus** (Willd.) Kuntze

Juncus balticus var. *mexicanus* Kuntze, Rev. Gen. **3**^{2}:320. 1898.—*Juncus mexicanus* Willd. in R. & S., Syst. **7**:178. 1829. —*Juncus balticus* f. *mexicanus* Parish, Muhl. **6**:119. 1910.—*Type locality:* Mexico.

Common about the water holes at Los Angeles Bay (3435).

XIII. LILIACEÆ

45. **Yucca valida** Brandg.

Yucca valida Brandg., Proc. Calif. Acad. Sci. II, **2**:208, t. 11. 1889.—*Type locality:* San Gregorio, Lower California.

Seen only at San Francisquito Bay (3547) where a few large trees grow scattered over the sandy plain heading the bay. The plants were 6 m. high and composed of 1-9 ascending trunks which were loosely branched above. The inflorescence is erect and 3-6 dm. long.

XIV. AMARYLLIDACEÆ

46. **Agave deserti** Engelm.

Agave deserti Engelm., Trans. Acad. St. Louis **3**:310. 1875. —*Agave pringlei* Engelm. in Baker, Handb. Amaryll. 182. 1888.—*Agave dentiens* Trel., Rep. Mo. Bot. Gard. **22**:51, t. 38-40. 1912.—*Agave consociata* Trel., Rep. Mo. Bot. Gard. **22**:53, t. 43. 1912.—*Agave nelsoni* Trel., Rep. Mo. Bot. Gard. **22**:61, t. 65-67. 1912.—*Type locality:* San Felipe, California.

Collections referable to this species were collected on Angel de la Guarda Island (3405a-g), San Esteban Island (3194), Los Angeles Bay (3487, 3489), and San Marcos Island (3649, 3650). At all these stations it grew in colonies on hillsides. This is the thickish-leaved, surculose, acaulescent agave that is frequent over northern Lower California.

Considerable time was spent at Palm Cañon on Angel de la Guarda studying the variation in one large colony of this species. It was found that the common leaf-shape was acutely triangular with the blade 10-11 cm. wide at the base and gradually tapering to the point. The leaf-margin was usually unarmed or with an occasional weak tooth (3405c). The leaves varied from dagger-shaped (3405d,g) and only 6-8 cm. wide at the base by 4-6 dm. long, to definitely triangular (3405c), 10-11 cm. wide at the base, and tapering to the point 3 dm. away. All became smaller as the tip was approached, but some tapered evenly from the base (3405c,d,f) whereas others were abruptly contracted above the base (3405a,b,e). The margins vary from entirely naked (3405e) to armed with friable triangular teeth 2-3 mm. long and 5-8 mm. apart. Photographs of the colony mentioned are so similar to one (Rep. Mo. Bot. Gard. **22**: t. 41. 1912) of *A. deserti* taken at its type locality that, to all appearances, they might represent different views of the same colony.

On San Esteban Island the plant is common in small colonies on the scoriæ-covered hillsides. The inflorescence becomes 6 m. high. Though prevailingly with denticulate leaf-margins some plants have the leaf-margins entirely unarmed. Trelease's *A. dentiens* is based on material from San Esteban Island but does not seem worthy of recognition. In shape, the leaves are similar to the prevailing forms on Angel de la Guarda Island.

At Los Angeles Bay the plants seemed rather constant in shape and armature of leaves. They differed from the Angel de la Guarda plants in having the leaves parallel-margined and with coarser and more widely-spaced teeth. It is frequent on the rock slopes of the hills back from the shore.

On San Marcos Island the plant was seen only on gypsum and was much reduced in stature. On exposed mesas it formed small cæspitose groups with leaves 8-15 cm. long, and inflorescences 15 dm. high with pauciflorous almost capitate flower-clusters. In ravines or sheltered places the leaves become 25 cm. long, and the inflorescence 25 dm. high and more branched. The leaves are broadest above the middle, and, though occasionally linear-oblong, are usually oblong in outline. The armature consists of a few coarse straight teeth.

Observations on the islands lead one strongly to doubt the value of leaf-shape and armature as diagnostic characters. It seems particularly undesirable that species be based upon them without any idea of the extent of variation exhibited in the field. The colony on Angel de la Guarda Island contains a number of diverse forms. As species have been made in Agave, all of them are deserving of specific recognition. Since such taxonomic treatment would be impossible to the author, he has relegated to synonymy a number of species based on leaf-shape and armature.

47. **Agave chrysoglossa,** n. sp.

Leaves in rather loose acaulescent rosettes, 5-15 dm. long, 4-6 cm. wide, widest just below the middle, linear-lanceolate, pale yellowish green, glaucescent, concavo-convex, especially towards the apex; spine 25-35 mm. long, subulate or linear-subulate, sulcate to somewhat above the middle, brown, becoming ashy; decurrent for 2-3 dm. and confluent with the narrow firm straight unarmed margin of the leaf; inflorescence 25-40 dm. high, usually bent over, a dense spicate-racemose cluster 15-20 dm. long and about 1 dm. broad; pedicels 4-5 mm. long each with a pair of reflexed filiform or subulate bracts that are 2-3 cm. long and dilated near the base; peduncles stout, 3-4 mm. long; flowers geminate, about 3 cm. long; perianth oblong in the bud, with a broad tube 3 mm. long and bright yellow linear somewhat obtuse segments 15 mm. long and 3-3.5 mm. wide; filaments inserted in the throat, 25-30 mm. long, yellow, flattened; anthers arcuate, 8-9 mm. long; capsule oblong, about 2 cm. long, 12 mm. wide; seeds numerous, dull black, 2-2.5 mm. wide.

Type: No. 1278, Herb. Calif. Acad. Sci., collected April 17, 1921, by I. M. Johnston (no. 3123) on the rocky slopes of **San Pedro Nolasco Island, Gulf of California.**

This very beautiful species grows on San Pedro Nolasco Island (3123). When found it was enlivening the rocky mid-slopes of the island with spectacular, bright yellow tongues of color. The plants grew singly and produced dense elegant spicate floral clusters 1-2 m. long and 8-10 cm. broad which, due to their weight, almost invariably bent over with their tips nearly touching the ground. The same, or a closely related species, was observed in a sterile condition at San Pedro Bay (4338). The relationships of this species are with *A. vilmoriniana* Berger of Jalisco. This latter was described from a sterile garden plant and differs in its foliage.

48. **Agave oweni,** n. sp.

Acaulescent, surculose; leaves green, lightly glaucous, stiffly spreading, almost flat, 5-8 dm. long, from a base 6-8 cm. broad, abruptly contracted to a sword-like blade 20-25 mm. wide; spine brown to ashy, straight, 10-14 mm. long and 3-5 mm. broad, stout and compressed-terete below but ending in a more or less well pronounced angular acumen 3-4 (or 9) mm. long, evidently decurrent for about 1 cm. and then confluent with the horny leaf-margin, broadly and deeply grooved to about the middle; teeth on a straight hard leaf-margin, blackish brown, thin but hard and firmly attached, sharp, antrorse, triangular, 20-35 mm. long, 1-4 cm. apart; inflorescence 18 dm. high, stalk 38 mm. thick 6 dm. above ground; panicle ovate or oblong in outline, open; pedicels stout, 2-4 mm. long, becoming obese in fruit; flowers pale yellowish, 4 cm. long; ovary fusiform, about 2 cm. long; perianth-tube 4 mm. deep, 11 mm. wide, 6-grooved without; perianth lobes erect, linear-lanceolate, 15-17 mm. long, about 4 mm. wide at the broadened base, obtuse with thickened inrolled tips; filaments compressed-filiform, 35 mm. long, less than 1 mm. wide, adfixed in the throat of perianth-tube; style 40-43 mm. long; capsule oblong, 40-45 mm. long, 20-25 mm. wide; seeds shiny black, 7-8 mm. long, 5-6 mm. wide.

Type: No. 1279 Herb. Calif. Acad. Sci., collected April 14, 1921, by I. M. Johnston (no. 3085) on an islet in **Guaymas Harbor, Sonora.**

Frequent on a scoriæ-covered islet in Guaymas Harbor (3085), and what is assumed to be the same is very common on the rocky slopes about San Carlos Bay. The narrow leaves give the sterile plants much the general appearance of *Yucca whipplei.* The new species evidently belongs to Berger's (Die Agaven 230. 1915) Unterreihe Tequilanæ of the Reihe Rigidæ, and its nearest described relative seems to be *A. yaquiana* Trel. (Contr. U. S. Nat. Herb. 23:120. 1920). *Agave yaquiana* comes from between Hermosillo and Ures and is known only from its leaves which differ from those of *A. oweni* in being more coarsely toothed, 5 cm. (instead of 25 mm.) wide, and in having a spine 25 (not 10-14) mm. long. The new species may be only a geographic form of *A. yaquiana,* but material from the intermediate area and a complete description of *A. yaquiana* are needed before the final disposition of *A. oweni* can be made.

The species is named for Mr. Virgil Owen, ornithologist of the expedition, whose interest in botany added many interesting plants to the collections.

49. **Agave sleviniana,** n. sp.

Acaulescent, non-surculose; leaves yuccoid, glaucous, lance-linear, abruptly narrowed above the very broad base but slightly widening again near the middle and then gradually contracted to the tip, 5-6 dm. long, 25-30 mm. wide near the middle, stiffly spreading; spine light brown to ashy, almost straight, compressed acicular, usually 35 (30-40) mm. long, 3-3.5 mm. wide, with a slit-like groove extending to the middle, narrowly decurrent for 10-12 cm., confluent with the upper pair of teeth; teeth ashy, comparatively few, 10-35 mm. apart, 6-10 mm. long, mostly broadly triangular, variously curved, antrorse, on straight leaf margins; inflorescence 3 m. high, narrowly paniculate above; scape 25 mm. thick 5 dm. above ground; pedicels 5-8 mm. long; flowers in compact clusters, 4 cm. long, with very thin linear-oblong lobes 16-17 mm. long and 4 mm. wide, tube 2 mm. deep; ovary fusiform 17 mm. long; filaments inserted in the throat of the perianth tube, 25 mm. long; anthers 17 mm. long.

Type: No. 1280 Herb. Calif. Acad. Sci., collected April 11, 1921, by I. M. Johnston (no. 3043) on a hillside near **La Paz, Lower California.**

Clearly a near relative of *A. sobria,* with which it agrees in floral characters, but very different from all forms of that species in its very narrow yucca-like leaves. The new species might be considered only a form of *sobria* were it not that the latter species is represented at La Paz by a very evident geographic variety. Rather than accredit another variety to a locality already occupied by a geographical form, *A. sleviniana* is described as a species with the hope that some student may determine its proper relations by further observations about the type locality. The plant is frequent on the rocky cañon sides near the ocean just east of La Paz (3043). It was recognized by some small boys who wrote its name as "sabia."

The species is named for Mr. Joseph Slevin, herpetologist and head of the expedition.

50. **Agave sobria** Brandg.

Agave sobria Brandg., Proc. Calif. Acad Sci. II, 2:207. 1889.—*Agave cerulata* Trel., Rep. Mo. Bot. Gard. 22:55, t. 45-47. 1912.—*Agave carminis* Trel., Rep. Mo. Bot. Gard. 22:55, t. 48-49. 1912.—*Agave affinis* Trel., Rep. Mo. Bot. Gard. 22:56, t. 52-53. 1912.—*Agave avellanidens* Trel., Rep. Mo. Bot. Gard. 22:60, t. 61-62. 1912.—*Type locality:* Comondú Mesa, Lower California.

Found on the steep hillsides of Carmen and Danzante (3857) islands, and at Escondido (3843) and Agua Verde (3887) bays. The plant has a loose, solitary rosette of a few flat, lanceolate leaves, and an inflorescence usually 2-3 m. high. The collection from Escondido Bay came from a sandy wash where it grew 75 dm. high and had leaves over a meter long, but the common habitat at that locality was on rocky hillsides where the plants became only half as large as those growing in the wash. The Danzante Island plants have rather coarse teeth. Mature capsules from the island collection are 55 mm. long, whereas those from Agua Verde Bay are only 30 mm.

long. As here taken, *A. sobria* includes the common non-surculose agave of the volcanic region along the Sierra Giganta. It varies much in the development of teeth, and in the south is replaced by the following variety:

51. **Agave sobria** var. **roseana** (Trel.), n. comb.

Agave roseana Trel., Rep. Mo. Bot. Gard. **22**:59, t. 58-60. 1912. *Agave connochætodon* Trel., Rep. Mo. Bot. Gard. **22**:58, t. 57. 1912. *Type locality:* Espiritu Santo Island.

Collected at three different points on Espiritu Santo Island (3989, 3990, 4001, 4002, 4003) where it is frequent on mesas and on steep slopes. The inflorescence becomes 25-40 dm. high. The plants show considerable variation in foliar characters, the leaf-length varying from 2-6 dm., the width from 5-10 cm., and the shape from linear-lanceolate to acutely oblanceolate. The teeth vary from slender to stout, from small (8 mm.) to very large (25 mm. long), and from triangular to tortuous. There seems to be variation in armature according to the age of the plant. The prevailing form on the island (represented by no. 4002) is slightly less heavily armed than is the taxonomic type of *A. roseana*. *Agave connochætodon* from Santa Maria Bay is too close to *roseana* and is simulated by some of the collections from Espiritu Santo Island. On the peninsula *roseana* has been collected at La Paz and near Pichilinque. As here taken it differs from *A. sobria* in its coarse armature and southern range, and agrees with it in its general aspect, habit, and floral structures.

The agaves of Lower California have been treated in a special paper by Trelease (Rep. Mo. Bot. Gard. **22**:37-65, t. 18-72. 1912) which is admirable for its abundance of carefully selected photographs of types and critical specimens. While studying the Academy collections Trelease's paper has been critically reviewed in the light of the new material and of the acquired field knowledge, and it seems quite evident that Trelease has segregated too finely, due to his over use of leaf-shape and dentition as specific characters. Because of this fact the following new synopsis of the peninsular agaves has been prepared:

Agave promontorii Trel. and *A. aurea* Brandg. are closely related species, the former growing in the cape region and the latter in the vicinity of Comondú. These may be only geographical forms of one species, but as they differ in two unrelated floral measurements, there is reason for maintaining them at least temporarily. The differences are in breadth and length of the perianth lobes. The flowers are similar in size and general appearance, and the plants are the same in habit and aspect. *Agave brandegeei* Trel., from San José del Cabo, is a mixture composed of leaves of *promontorii* and flowers of a species related to *sobria.* The relation between *A. datylio* Weber and *A. vexans* Trel. is somewhat similar to that between *promontorii* and *aurea.* *Agave datylio* comes from the cape region and *vexans* from the middle Sierra Giganta. They differ mainly, if not only, in the length of the stamens. There being only one character involved, the latter is here treated as **A. datylio** var. **vexans,** n. comb. *Agave shawii* Engelm. includes *A. sebastiana* Greene, *A. orcuttiana* Trel., *A. pachyacantha* Trel., and *A. goldmaniana* Trel. These latter species are based on foliar shape and armature which are not constant nor of any value as specific characters. All the segregates of *A. shawii* are the same in appearance, according to Mr. Brandegee.

Surculose; plants simple.
  Perianth lobes broadly lanceolate, united below into a distinct tube; leaves with small close-set teeth.
    Perianth lobes broad, 15 mm. long, 8-12 mm. broad..........A. aurea
    Perianth lobes narrow, 18 mm. long, 6-8 mm. broad... A. promontorii
  Perianth lobes lance-linear, scarcely united; leaves with coarser more widely spaced teeth.
    Leaves lance-linear, 3 cm. wide or less..................A. sleviniana
    Leaves broadly lanceolate or oblanceolate, 5-15 cm. wide.
      Leaf margin nearly straight, with rather small unhooked teeth ....A. sobria
      Leaf margin deeply repand, with coarse hooked teeth ....A. s. roseana
Non-surculose; rosettes several to each root.
  Short caulescent; leaves obovate, ovate, or oblong, marginal teeth confluent; scape stout; rosettes dense, globular ....A. shawii

Acaulescent; leaves linear or oblong, marginal teeth distinct; scape slender; rosettes usually very loose.
  Flowers ochroleucous, conspicuously tubular, stamens adfixed low in tube; leaves linear; spine stout, scarcely decurrent.
    Filaments 35-40 mm. long, exceeding perianth by 20-25 mm. .... A. datylio
    Filaments 20-30 mm. long, exceeding perianth by 10-15 mm. .... A. d. vexans
  Flowers yellow, lobes united only at base, stamens adfixed in throat of very short tube; leaves ovate to linear-oblong or lanceolate; spine long decurrent.
    Leaves broadest above base, about half as broad as long, 15 cm. long, ovate acuminate, forming dense globular rosettes .... A. margaritæ
    Leaves broadest at base, less than a third as long as wide, 15-80 cm. long, oblong to linear; rosettes loose .... A. deserti

Agave sp.

A single plant of an apparently undescribed species was found on a gravelly bench near the ocean at San Pedro Bay (4338). The leaves are flat, acuminate, obovate, recurving, broadest between the middle and the apex, 5-6 dm. long, 15 cm. wide, and form loose non-surculose rosettes. The inflorescence becomes 27 dm. high. The plant seems to fall in the Unterreihe Euscolymoides of Berger's monograph (Die Agaven 185. 1915) and near *A. saundersii.* It appears to be undescribed but is not named here due to the lack of flowers. The mature fruit is rough, and seems to have rather thick walls.

XV. Orchidaceæ

52. **Epipactis gigantea** Dougl.

Epipactis gigantea Dougl. in Hook., Fl. Bor. Am. **2**:202. 1830.—*Serapias gigantea* Eaton, Proc. Biol. Soc. Wash. **21**:67. 1908.—*Amesia gigantea* Nels. & Macbride, Bot. Gaz. **56**:472. 1913.—*Type locality:* Northwest America.

Very common in moist sheltered places in a cañon in the Sierra Giganta back of Escondido Bay (4395). It occurs most abundantly above 500 m. altitude.

XVI. Saururaceæ

53. **Anemopsis californica** H. & A.

Anemopsis californica H. & A., Bot. Beechey 390, t. 92. 1841.—*Type locality:* Santa Barbara, California.

Common on the moist meadows about the reservoir at Mulegé (3692).

XVII. Salicaceæ

54. **Populus monticola** Brandg.

Populus monticola Brandg., Zoe 1:274. 1890.—*Populus brandegeei* Schneider, Ill. Handb. Laubh. 1:23. 1904.—*Type locality:* Sierra de la Laguna, Lower California.

Found in the upper parts of the large cañon in the Sierra Giganta directly back of Escondido Bay (4120). Previously known only from the type region in the Sierra Laguna about 250 km. to the southward. The tree is common along a small stream, first appearing at about 350 m. alt. and above that growing with *Glaucothea brandegeei* and forming a canopy over the brook. It is a large tree becoming 18 m. high. Bailey (Stand. Cycl. Hort. 2756. 1916) has inferred that this species is merely an escaped form of *P. alba,* but the discovery of this new and very isolated locality would seem to make such an assertion highly improbable.

55. **Salix bonplandiana** H. B. K.

Salix bonplandiana H.B.K., Nov. Gen. et Sp. 2:20, t.101-102. 1817.—*Type locality:* Hidalgo.

Fruiting specimens of this willow were taken from a few young trees growing about the water-holes at Los Angeles Bay (3450). Probably the same species was seen at Mulegé, Escondido Bay, and La Paz.

XVIII. Ulmaceæ

56. **Celtis lævigata** var. **brevipes** (Wats.) Sarg.

Celtis lævigata var. *brevipes* Sarg., Bot. Gaz. **67**:226. 1919. —*Celtis brevipes* Wats. Proc. Am. Acad. **14**:297. 1879.—*Type locality:* Near Camp Grant, Arizona.

To the above variety is doubtfully referred the Celtis collected from rocky ground in the cañon back of Escondido Bay (4108). The plant is locally infrequent, forming a loose shrub 25-35 dm. high on the cañon side and usually in places somewhat protected by sheltering ledges. The Celtis mentioned by Goldman (Contr. U. S. Nat. Herb. **16**:323. 1916) is the same. Other collections of the plant have been made at San Pablo by Purpus (141), and at Corral Piedra and San Julio Cañon by Brandegee. The peninsular plants have been usually referred to *C. reticulata,* but surely they are not that species, for they differ in having glabrous and much less veiny leaves. They have stiffer and less elongate leaves than Arizonan *brevipes* and may be distinct.

XIX. Moraceæ

57. **Ficus palmeri** Wats.

Ficus palmeri Wats., Proc. Am. Acad. **24**:77. 1889.—*Ficus brandegei* Standley, Contr. U. S. Nat. Herb. **20**:22. 1917.—*Type locality:* San Pedro Martir Island.

Widely distributed over the gulf area where it was seen on San Pedro Nolasco (3126, 3138, 3139, 3140), San Pedro Martir (3153, 3162), South San Lorenzo (3528, 3534), San Marcos (3625, 3629), Ildefonso (3739, 3740), Carmen (3803), Danzante (3861, 4406), Monserrate, Catalina, Santa Cruz, San Diego (3932, 4097), San Josef, Espiritu Santo (3971, 3979), and Ceralbo (4066) islands; and at San Pedro (4315), San Carlos (4365), Escondido, and Agua Verde (3885) bays. It is a tree which grows in cañons, on mountain sides, and on ocean cliffs down to within a few meters of the water. Although its surroundings vary it seems invariably to grow from the crevices of rocks. The plant varies much in habit according to its habitat, being prostrate or spreading with a breadth of only 1-2 m. and a height of 2-4 dm. when growing in exposed places, forming a domed growth 2-3 m. high when growing in sheltered but dry places, and forming a widely spreading tree 12 m. high and 15 m. broad when in cañons. The plant exhibits its most interesting phase when growing on precipitous cliffs on which it forms grotesque reliefs of broad white roots that spread out and downward over the cliff-face like tangled taffy strands. On San Marcos Island the tree frequents high, sometimes overhanging, gypsum cliffs and lets fall cascades of taffy-like roots from heights of over 30 m. Occasional trees produce aerial roots formed of a brush-like mass 1-3 dm. long borne on the end of a hanging strand sometimes several meters long. The production of aerial roots seems to be an individual matter, for this development may be present or absent on the trees in a single colony. The trunk is white and is usually short, but in well developed trees like those observed at San Pedro Bay the trunk may become 3 m. high and 18 dm. thick.

There is considerable variation in pubescence, even in a single locality, some plants having densely pubescent leaves and silky-villous twigs, whereas others are glabrate or even glabrous. Since there is complete gradation between strongly pubescent and glabrous forms at many localities it becomes impossible to follow Standley in segregating the glabrous forms under the name of *F. brandegei.* The leaves also vary in shape. The common form is cordate, but ovate forms are frequent, and on Danzante Island a single plant was found which had narrowly oblong leaves. The only fully ripe fruit seen was that on a glabrous plant on Ildefonso Island; it was glabrous, yellowish, strongly depressed-globose, and 20-25 mm. broad. The pubescence on the receptacles probably varies with that on the stems and leaves, as immature figs on very pubescent plants are shaggy white-villous. The peduncles do not complete their growth until after the fruit is about one-third developed when they elongate rapidly and finally become 2-5 cm. long. *Ficus palmeri* is the most massive tree in the gulf area and is well known under the name of "salate." Though previously unknown from the mainland of Sonora it was found to be frequent at San Carlos Bay and to be very common about San Pedro Bay. The species has been collected on Tiburon Island.

XX. Urticaceæ

58. **Parietaria debilis** Forst.

Parietaria debilis Forst., Prodr. 73. 1786.—*Type locality:* New Zealand.

A single large plant was found growing over wet gravel in the cañon in the Sierra Giganta back of Escondido Bay (4119).

XXI. Loranthaceæ

59. **Phoradendron californicum** Nutt.

Phoradendron californicum Nutt., Jour. Acad. Phila. II, **1**:185. 1848.—*Type locality:* California.

Seen only at the north end of Angel de la Guarda Island (3383) where frequent on *Cercidium microphyllum,* and near Willard's Point on Tiburon Island where common on *Prosopis chilensis.* It forms compact intricate pendant masses 5-10 dm. broad.

59a. **Phoradendron californicum** var. **distans** Trel.

Phoradendron californicum var. *distans* Trel., Univ. Ill. Bull. **45**:21, t. 13. 1916.—*Type locality:* Arizona.

Very common on *Prosopis chilensis* at Agua Verde Bay (3907). The habit is quite similar to, but the inflorescence is very different from, that of the species.

60. **Phoradendron diguetianum** Van Tiegh.

Phoradendron diguetianum Van Tiegh., Bull. Mus. Hist. Nat. Paris **1**:31. 1895.—*Phoradendron eduardi* Trel., Univ. Ill. Bull. **45**:46, t. 47. 1916.—*Phoradendron globuliferum* Trel., Univ. Ill. Bull. **45**:48, t. 51. 1916.— *Phoradendron brachyphyllum* Trel., Univ. Ill. Bull. **45**:49, t. 53. 1916.—*Phoradendron aureum* Trel., Univ. Ill. Bull. **45**:49, t. 52. 1916.—*Phoradendron tumidum* Trel., Univ. Ill. Bull. **45**:49, t. 53. 1916.—*Phoradendron peninsulare* Trel., Univ. Ill. Bull. **45**:50, t. 55. 1916.—*Phoradendron saccatum* Trel., Univ. Ill. Bull. **45**:50, t. 55. 1916.—*Type locality:* Lower California.

Common at most of the stations south of Carmen Island (3841). On Santa Cruz Island (3922) it is extremely abundant and vigorous on Castelia, forming huge masses which often nearly equal the host in size. Otherwise found almost universally on *Jatropha spathulata* on which it forms small masses 1-2 dm. long. There seems to be only one variable species of this group in Lower California and not seven as Trelease has indicated in his monograph. Trelease based his species on too few specimens; he entirely disregarded natural distribution, and characterized his species on what seems to be no more than individual variations. The peninsular material agrees in having thick leaves and a compact habit, and is very close to certain mainland forms particularly to *P. globuliferum* which is doubtfully synonymous.

61. **Phoradendron brachystachum** (DC.) Nutt.

Phoradendron brachystachum Nutt., Jour. Acad. Phila. II, 1:185. 1847.—*Viscum brachystachum* DC., Prodr. 4:280. 1830.—*Type locality:* Between Tampico and Real del Monte, Mexico.

Doubtfully referred here is the plant collected on *Jacquinia pungens* at Guaymas (3115) and Tiburon Island (4275).

62. **Struthanthus hænkei** var. **angustus,** n. var.

Leaves linear or lance-linear, sessile or subsessile, 5-10 mm. wide, 5-9 cm. long.

Type: No. 1281, Herb. Calif. Acad. Sci., collected July 7, 1921, by I. M. Johnston (no. 4331) on leguminous trees at **San Pedro Bay, Sonora.**

Frequent on *Acacia willardiana, A. californica,* and *Lysiloma microphylla,* in the cañons about San Pedro Bay (4331) where it forms very elongate pendent clusters 3-12 dm. long. The fruit is reddish. *Struthanthus hænkei* DC. is represented in Sonora by the present narrow-leaved form which, due to its geographic correlation, deserves at least varietal recognition.

XXII. Olacaceæ

63. **Schœpfia californica** Brandg.

Schœpfia californica Brandg., Proc. Calif. Acad. Sci. II, **2**:139. 1889.—*Type locality:* San Gregorio, Lower California.

Seen only at San Nicolas Bay (3711) where a small colony grew in a sandy wash. The plants were dense shrubs 18-30 dm. high with readily falling, leathery or slightly fleshy, dark colored leaves.

64. **Ximenia pubescens** Standley

Ximenia pubescens Standley, Contr. U. S. Nat. Herb. **20**:212. 1919.—*Type locality:* Between Mixtepic and Colotepic, Oaxaca.

A dense, intricate, rounded shrub 9-12 dm. high with subcoriaceous glaucous leaves. A few plants were found in the sandy mouth of a cañon bordering on the dunes at San Nicolas Bay (3718). The species is known only from western Mexico and is characterized by its pubescence and its thick veinless orbicular leaf-blades.

XXIII. Aristolochiaceæ

65. **Aristolochia brevipes** var. **acuminata** Wats.

Aristolochia brevipes var. *acuminata* Wats., Proc. Am. Acad. **18**:148. 1883.—*Aristolochia watsoni* Wooton & Standley, Contr. U. S. Nat. Herb. **16**:117. 1913.—*Type locality:* "New Mexico."

Collected in the cañons back of Las Animas (4302) and Agua Verde (3878) bays where its trailing stems form mats, 3-6 dm. broad, on the soft earth at the foot of cliffs. A similar plant was found climbing through densely shaded bushes in the cañon back of Escondido Bay (4128).

XXIV. Polygonaceæ

66. **Antigonon leptopus** H. & A.

Antigonon leptopus H. & A., Bot. Beech. 308, t. 69. 1840. —*Type locality:* Tepic, Mexico.

This very showy vine was seen at San Pedro (4302) and San Carlos bays on the Sonoran coast, and, excepting Catalina Island, at every station along the peninsular coast from Coronados Island and Loreto southward (3844, 3874, 4076). It is a slender, herbaceous climber which grows over rocks on steep slopes, or, more commonly, climbs through the trees in the washes and forms loose growths over their tops. The sepals are usually dark red but at San Pedro Bay they were pink. The large, loose clusters of dark-red flowers are very conspicuous and are most attractive when growing through such light colored branches as *Lysiloma candida.*

67. **Coccoloba goldmanii** Standley

Coccoloba goldmanii Standley, Contr. U. S. Nat. Herb. **23**:245. 1922.—*Type locality:* Valley of the Rio Fuerte, Sinaloa.

Common locally in a narrow cañon at San Pedro Bay (4308). An open shrub or small tree 18-45 dm. high. It grew under large fig trees, and with Sabal and Glaucothea, helped to form a dense almost impenetrable tangle in the cañon bottom.

68. **Eriogonum deflexum** Torr.

Eriogonum deflexum Torr., Bot. Ives Rep. 24. 1860.—*Type locality:* Three Point Bend, Colorado River.

A coarse ramose form of this species was collected in a sandy wash at San Luis Gonzales Bay (3342), on dunes near the south end (4212), and on talus slopes near the north end (3372) of Angel de la Guarda Island. The same form was collected at Calamujuet by Brandegee. It grows 8-60 dm. high.

69. Eriogonum galioides, n. sp.

Perennial from a taproot, mainly glabrous and finely glandular; stems numerous, widely spreading, diffusely dichotomously or trichotomously branched, forming a rounded open dome 2-6 dm. high; leaves in a basal rosette and a few at lower nodes, coriaceous, glabrous above, sparingly setose-hirsute below and on petioles, blade ovate 5-8 mm. long and 4-6 mm. wide, petiole 9-14 mm. long; nodes of inflorescence usually with three-parted bracts whose lobes are divaricate, oblong and more or less connate below; peduncles in the forks and terminal, 2-10 mm. long, straight; involucres 1.5-2 mm. high, 5-parted into ovate-oblong lobes that are widely spreading at maturity, 8-16- but commonly about 10-flowered; pedicels 1-2 mm. long; calyx about 1 mm. long, yellow, in age whitish or rosy and twice as long, glabrous; inner calyx segments lanceolate or ovate-lanceolate, closely enveloping the fruit; outer sepals strongly accrescent, loose and more or less incurving, prolonged-cordate, the basal areas on either side of medial line becoming scarious and saccate-dilated; achenes ovate-lanceolate in outline, the body ovate, the acumen trigonous, about 1.7 mm. long.

Type: No. 1282, Herb. Calif. Acad. Sci., collected April 28, 1921, by I. M. Johnston (no. 3315) in a gravelly wash on **San Luis Island, Gulf of California.**

Seen only on San Luis Island (3315) where common along gravelly washes and to a less extent on hillsides also. At the time of collection it was the only common green flowering herb. The plant is perennial, forming rounded, rather open, clumps as much as 6 dm. high. Herbarium material of the species suggests the habit of certain of the suffrutescent species of Galium.

The new species belongs to the subgenus Ganysma and seems nearest to the annuals, *E. thomasii* and *E. thurberi.* Its outstanding feature is the parted involucre, a development usually considered diagnostic of Oxytheca. Indeed the gross aspect of the plant does have a suggestion of Oxytheca, but since in most characters it fits naturally among certain of the Eriogonums and does not closely approach any of the known Oxythecas, the involucral development should be disregarded while placing the species generically. It is to be noted that *E. galioides* does not possess the two other developments characteristic of Oxytheca; i.e., lenticular achenes and awn-tipped involucral bracts. Among the species of the subgenus Ganysma the new species is amply characterized by its perennial habit, parted involucres, small setose leaves, and glabrous saccate sepals. The calyx developments are remarkably like those in *E. thomasii.*

70. **Eriogonum inflatum** var. **deflatum,** n. var.

Eriogonum glaucum Small, Bull. Torr. Cl. **25**:51. 1898.—*Type locality:* Colorado Desert, California.

Collected at Tepoca (3301) and Los Angeles (3481) bays, and on Angel de la Guarda (3371), Tortuga (3611), and San Marcos (3648) islands. Palmer has collected the same at Los Angeles Bay and at Mulegé. On Tortuga Island the plant was common on lava slopes, but at the other stations it was confined to gravelly soil on diluvial plains. It was called "tivinaja" by a native on San Marcos Island who considered a tea made from its roots as very good for the blood. The present variety is the geographical race present in Sonora, Lower California, and in the Colorado Desert of California. It differs from the species only in its uninflated stems and is significant only because of its distinct range.

71. **Eriogonum orcuttianum** Wats.

Eriogonum orcuttianum Wats., Proc. Am. Acad. **20**:371. 1885.—*Type locality:* Cantillas Cañon, Lower California.

This attractive Eriogonum was seen only in the cañon in the hills south of Las Animas Bay (3502) where it was locally very common. It was most abundant in crevices of precipitous cañon sides, forming rounded masses 3 dm. high and 6 dm. broad, but it also occurred on the cañon floor and became 6 dm. high and 12 dm. broad. It is a shrub with a dense canopy of light-green leaves and numerous close clusters of white flowers. Within the dome of the foliage the plant is very dense and has concentric, evenly spaced zones formed by the persistent twiggy remnants of the flowering branches of past seasons. The species is known only from the type collection, from Goldman's collection at the east base of the San Pedro Martir Mountains (Contr. U. S. Nat. Herb. **16**:325. 1916), from Brandegee's collection at Paraiso, and from the Las Animas collection just described. The range is evidently the eastern part of the northern half of the peninsula.

XXV. Chenopodiaceæ

72. **Allenrolfea occidentalis** (Wats.) Kuntze

Allenrolfea occidentalis Kuntze, Rev. Gen. **1**:546. 1891.—*Halostachys occidentalis* Wats., Bot. King Exped. 293. 1871.—*Spirostachys occidentalis* Wats., Proc. Am. Acad. **9**:125. 1874.—*Type locality:* About Great Salt Lake, Utah.

A shrub of slightly alkaline soil, occurring abundantly at intervals in the north gulf province and southward at least to Carmen Island. It is decidedly woody and has a very stiff framework of branches 1-2 m. high. Usually growing in colonies and forming belts along the ocean or bordering lagoons. On San Luis Island (3322) it is particularly abundant, reaching 25 dm. in height and making green large areas near the shore.

73. **Atriplex barclayana** (Benth.) Dietr.

Atriplex barclayana Dietr., Synop. **5**:537. 1852.—*Obione barclayana* Benth., Bot. Sulph. 48. 1844.—*Atriplex palmeri* Wats., Proc. Am. Acad. **11**:146. 1876.—*Atriplex magdalenæ* Brandg., Proc. Calif. Acad. Sci. II, **2**:200. 1889.—*Atriplex dilatata* Greene, Pittonia **1**:264. 1889.—*Atriplex insularis* Rose, Contr. U. S. Nat. Herb. **1**:80. 1890.—*Atriplex rosei* Standley, N. Am. Fl. **21**:60. 1916.—*Atriplex sonoræ* Standley, N. Am. Fl. **21**:62. 1916.—*Type locality:* Magdalena Bay, Lower California.

Present in varying abundance at all stations visited within the gulf area. It is very common and is one of the important floral features especially on some of the more northern islands. On such islands as Patos, Raza, Sal si Puedes, and Santa Inez, all of which are rather level and former bird rookeries, the species is not only dominant but is the plant which is numerically superior in number of individuals as well. Although occurring in greatest profusion on soils rich in the phosphates from guano, the plant is not confined to them, for it is common on the slightly saline gravels and sands on the beaches and in cañon mouths along the gulf shore. Frequently it occurs well back from the ocean, growing in gravelly washes, but nevertheless saline and guano soils are usually associated with the best development of the species. It avoids strongly saline ground and never grows in or on the immediate borders of salt marshes or lagoons. The characteristic habit of the plant is one with decumbent stems that form a depressed rounded growth 5-10 dm. broad and 25-40 cm. high. The common habit of growth, like the other common characters of the species, is frequently departed from and the plant becomes prostrate and as much as 15 dm. broad and only 2-3 dm. high, or becomes stiffly branched, more or less bushy, and a meter high. Natives at Mulegé and San Marcos Island called the plant "chamiso."

The name *A. barclayana* is used in the same broad sense as that adopted by Hall and Clements in their recent monograph of the genus (Carnegie Inst. Wash. Pub. **326**:313. 1923). A number of attempts have been made at segregating this species, but the segregations are all based on characters which are either illusionary or mere extreme variations that later collections have shown to grade off insensibly into other forms. The collected series has been studied and determined by Hall whose comments on them will be found in the monograph referred to. The determinations are as follows:—subsp. *typica*,—Tepoca Bay (3284), Tiburon Island (3259), Patos Island (3242, 3244), San Luis Island (3319, 3221), Isla Partida (3223, 3228, 3229), Los Angeles Bay (3429), Sal si Puedes Island (3525, 3526), South San Lorenzo Island (4191), Isla Raza (3212, 3220), and Ildefonso Island (3750, 3751, 3752); subsp. *sonoræ*,—San Luis Gonzales Bay (3351), Angel de la Guarda Island (4234), San Esteban Island (3189, 3190, 3191, 3192), North San Lorenzo Island (4196), Santa Inez Island (3651); subsp. *palmeri*,—San Luis Island (3320), Patos Island (3241, 3243), Isla Partida (3232), Isla Raza (3210, 3211, 3213, 3214), and Santa Inez Island (3653). The list of localities is not to be considered in its negative aspect, for *A. barclayana* was present at stations as far south as Ceralbo Island, but was not collected at the southern localties, due to the conditions of the plants at the time of the visit.

74. **Atriplex hymenelytra** (Torr.) Wats.

Atriplex hymenelytra Wats., Proc. Am. Acad. **9**:119. 1874. —*Obione hymenelytra* Torr., Pacif. R. R. Rep. **4**:129, t. 20. 1857.—*Type locality:* Along the Williams River, Arizona.

A small colony of this species was found on a west-facing talus slope on a cañon side in the hills back of Los Angeles Bay (3441). It is a diœcious shrub with strictly ascending branches reaching 9-12 dm. in height. The specimens are typical in every respect. The only other collection from Lower California is that of MacDougal in the Cocopah Mountains, a locality not far south of the international boundary.

75. **Atriplex linearis** Wats.

Atriplex linearis Wats., Proc. Am. Acad. **24**:72. 1889.—*Artiplex macropoda* Rose & Standley, N. Am. Fl. **21**:72. 1916.—*Type locality:* Guaymas, Sonora.

A dense, intricately branched, rounded shrub 6-15 dm. high growing in saline soil bordering salt-flats or lagoons. Collected only at Las Animas Bay (3490) and La Paz (3041), but what is probably the same was observed in alkaline soil at Los Angeles Bay and on South San Lorenzo Island. Called "chamiso" at La Paz.

76. **Atriplex polycarpa** (Torr.) Wats.

Atriplex polycarpa Wats., Proc. Am. Acad. **9**:117. 1874. —*Obione polycarpa* Torr., Pacif. R. R. Rep. **4**:130. 1857.—*Atriplex curvidens* Brandg., Proc. Calif. Acad. Sci. II, **2**:201. 1889.—*Type locality:* Gila River Valley, Arizona.

A rather dense shrub 7-13 dm. high which grows in gravelly soil along washes, on dunes, or occasionally on hillsides. Collected on San Esteban (3191) and Angel de la Guarda (3368) islands. Shrubs seen about San Francisquito and San Luis

Gonzales bays are probably the same. The fruit is produced in great abundance and on San Esteban Island was carried away by ants.

77. **Chenopodium murale** L.

Chenopodium murale L., Sp. Pl. 219. 1753.—*Type locality:* Europe.

Growing as a weed about houses at La Paz and Guaymas. The plant is of particular interest, however, as it represents the only phanerogam found on Georges Island (3312). The plant was no doubt introduced on this isolated island by guano gatherers and now forms a few small colonies on talus loosened by blasting. Despite its out-of-way location the plant represents the common door-yard form of the species.

78. **Salicornia europæa** L.

Salicornia europæa L., Sp. Pl. 3. 1753.—*Salicornia herbacea* L., Sp. Pl. ed. 2, 5. 1762.—*Type locality:* Europe.

At Tepoca Bay, San Luis Gonzales Bay, and at the lagoon on Angel de la Guarda Island, there is a rather abundant erect annual Salicornia which probably represents the above species. It grows in salt marshes intermixed with *S. pacifica.* No specimens were taken.

79. **Salicornia pacifica** Standley

Salicornia pacifica Standley, N. Am. Fl. 21:83. 1916.—*Type locality:* Moss Landing, Monterey County, California.

Widely distributed and common in the gulf area. It constitutes the common and characteristic vegetation of salt-marshes over which its clumps of decumbent stems form low even growths 2-3 dm. high. Practically out of flower and only a single collection made (3218).

80. **Suæda ramosissima** (Standley), n. comb.

Dondia ramosissima Standley, N. Am. Fl. 21:91. 1916.—*Type locality:* Lee's Ferry, Arizona.

Common and widely distributed in the gulf area. It forms very dense hedge-like masses of intricately branched stems, and usually gets 6-20 dm. high and 9-12 dm. broad. The plant frequents the less saline borders of salt-marshes and is commonly associated with Maytenus. For the characters of the species see Standley's note (Bull. Torr. Cl. **44**:428. 1917).

XXVI. Amaranthaceæ

81. **Amaranthus fimbriatus** (Torr.) Benth.

Amaranthus fimbriatus Benth. in Wats., Bot. Calif. **2**:42. 1880.—*Sarratia berlandieri* var. *fimbriata* Torr., Bot. Mex. Bound. 179. 1859.—*Type locality:* Along the Gila River, Arizona.

Seen only on Patos Island where common with Atriplex on the low guano flat.

82. **Amaranthus watsoni** Standley

Amaranthus watsoni Standley, Bull. Torr. Cl. **41**:505. 1914. —*Amaranthus torreyi* var. *suffruticosus* Uline & Bray, Bot. Gaz. **19**:272. 1894.—*Type locality:* Guaymas, Sonora.

A frequent plant in the gulf area. On guano-impregnated or weakly saline flats this Amaranthus is the common companion of *Atriplex barclayana.* It was notably abundant on Partida (3225), Sal si Puedes (3527), North San Lorenzo, Santa Inez (3652), Ildefonso (3743), and Pelican islands. According to the sailors these small and apparently barren islands are green during the winter, a condition probably due to the abundance of this Amaranthus. It was also collected at La Paz (3032).

83. **Celosia floribunda** Gray

Celosia floribunda Gray, Proc. Am. Acad. **5**:167. 1861.—*Type locality:* Cape San Lucas, Lower California.

Seen only at Escondido (3845) and Agua Verde (3906) bays, and on Espiritu Santo and Ceralbo (4050) islands. It is a shrub or small tree 15-45 dm. high growing in gravelly soil. Occasionally with several tufted stems, but usually with a simple ascending trunk 1-2 dm. thick. Cattle appear to relish the foliage and but few plants were found which failed to show evidences of browsing. The flowers are borne on sparsely leafy, whip-like branches which commonly lop over and droop due to the weight of the inflorescence.

84. **Iresine angustifolium** Euphr.

Iresine angustifolium Euphr., Beskr. St. Barthel. 165. 1795.—*Type locality:* St. Bartholomew Island, West Indies.

Growing in rocky places in cañons on Santa Cruz, Espiritu Santo (3968), and Ceralbo (4065) islands, and at Escondido and Agua Verde (3891). bays. Stems slender, erectly branched from near the base, and forming bushy growths 6-10 dm. high and 3-5 dm. broad. Not abundant at any locality.

85. **Frœlichia interrupta** (L.) Moq.

Frœlichia interrupta Moq. in DC., Prodr. **13**^{2}:421. 1849.—*Gomphrena interrupta* L., Sp. Pl. 224. 1753.—*Type locality:* America.

Abundant on the dunes near Gordas Point, Ceralbo Island (4029). Forming mats 3-6 dm. broad. In the specimens collected the leaves are obovate or oblong, densely tomentose, and 20-25 mm. long. Brandegee's collections from San José del Cabo have less tomentose oblanceolate leaves which are 4-8 cm. long.

XXVII. Nyctaginaceæ

86. **Abronia maritima** Nutt.

Abronia maritima Nutt. in Wats., Bot. Calif. **2**:4. 1880.—*Type locality:* San Pedro, California.

Trailing over the sand on the beaches and dunes along the gulf shore. Not abundant anywhere although widely distributed. Seen at San Pedro Bay, Kino Point, Tiburon Island (3279), Tepoca Bay (3310), Angel de la Guarda Island (4243), San Francisquito Bay, San Nicolas Bay, Carmen Island, Catalina Island, San Diego Island, San Josef Island, San Francisco Island (3953), La Paz, and Ceralbo Island.

87. Allionia incarnata L.

Allionia incarnata L., Syst. Nat. ed. 10, 890. 1759.—*Wedelia incarnata* Kuntze, Rev. Gen. 2:533. 1891.—*Wedeliella incarnata* Cockerell, Torreya 9:167. 1909.—*Allionia malacoides* Benth., Bot. Sulph. 44. 1844.—*Type locality:* Venezuela.

Collected at Tepoca (3286), San Luis Gonzales (3335), and San Francisquito (3561) bays, growing in well drained soil somewhat back from the gulf. Dried remnants of what were taken to be this were seen at Escondido Bay and on Angel de la Guarda Island.

88. Boerhaavia caribæa Jacq.

Boerhaavia caribæa Jacq., Obs. Bot. 4:5. 1771.—*Boerhaavia sonoræ* Rose, Contr. U. S. Nat. Herb. 1:111. 1891.—*Boerhaavia ixodes* Standley, Contr. U. S. Nat. Herb. 13:423. 1911.—*Type locality:* West Indies.

Collected in sandy soil at Mulegé (3670) and on the rocky slopes directly back of Guaymas (3091). What was taken to be an annual umbellate-flowered species of Boerhaavia was observed in a crisped state on Tortuga, Santa Inez, and Ildefonso islands where it seemed very common.

89. Boerhaavia scandens L.

Boerhaavia scandens L., Sp. Pl. 3. 1753.—*Commicarpus scandens* Standley, Contr. U. S. Nat. Herb. 12:373. 1909.—*Type locality:* Jamaica.

Infrequent in sandy soil near the shore of San Nicolas Bay (3719). Forming a very slender scandent shrub supported by the low bushes up through which it grew. *Boerhaavia elongata* Brandg. (Proc. Calif. Acad. Sci. II, 2:199. 1889) from San Pablo, is very near *scandens* and seems to be no more than a form of it.

90. Mirabilis tenuiloba Wats.

Mirabilis tenuiloba Wats., Proc. Am. Acad. 17:375. 1882.—*Hesperonia tenuiloba* Standley, Contr. U. S. Nat. Herb. 12:363. 1909.—*Hesperonia polyphylla* Standley, Contr. U. S.

Nat. Herb. **12**:364. 1909.—*Mirabilis tenuiloba* var. *polyphylla* Macbride, Contr. Gray Herb. II, **56**:23. 1918.—*Type locality:* Tahquitz Cañon, San Jacinto Mts., California.

Growing on talus slopes at Las Animas Bay (3318) and at Puerto Refugio on Angel de la Guarda Island (3370). A viscid villous shrubby plant growing 2-3 dm. high and frequently over a meter broad.

91. **Pisonia flavescens** Standley

Pisonia flavescens Standley, Contr. U. S. Nat. Herb. **13**:389. 1911.—*Type locality:* San José del Cabo, Lower California.

Frequent in the lower part of the rocky cañon in the Sierra Giganta directly back of Escondido Bay (4134). It is an erectly branched tree 45-90 dm. high, with an open crown of slender horizontal ultimate branches. All the plants seen were conspicuously spurred but were lacking in spines.

XXVIII. Batidaceæ

92. **Batis maritima** L.

Batis maritima L. Syst. Nat. ed. 10, 1289. 1759.—*Type locality:* Not given.

Found only on Angel de la Guarda Island, Isla Raza (3217), Carmen Island, Escondido Bay, San Josef Island, San Evaristo Bay, Espiritu Santo Island, and La Paz (3046). It forms dense mats on the tide flats along with Salicornia and Monathochloë.

XXIX. Phytolaccaceæ

93. **Phaulothamnus spinescens** Gray

Phaulothamnus spinescens Gray, Proc. Am. Acad. **20**:293. 1884.—*Type locality:* Northwest Sonora, probably along the Asuncion River.

Seen only on an islet in Guaymas Harbor (3083), and in a wash at San Pedro Bay (4329). A homely spinescent Lycioid shrub 9-18 dm. high. The fruit is drupaceous and whitish in color.

94. **Stegnosperma halimifolia** Benth.

Stegnosperma halimifolia Benth., Bot. Sulph. 17, t. 12. 1844.—*Type locality:* Cape San Lucas, Lower California.

Widely distributed over the gulf area but not abundant. It was seen at San Pedro, Tepoca (3298), San Luis Gonzales, Los Angeles (3488), Las Animas (3512), San Francisquito, Mulegé, Coyote, San Nicolas, Loreto, Escondido, Agua Verde, San Evaristo, and La Paz bays; and on Tiburon, Angel de la Guarda (3354), San Esteban (3166), South San Lorenzo, Tortuga (3593), Coronados, Carmen (3825), Danzante, Monserrate, Santa Cruz, San Diego, San Josef, Espiritu Santo, and Ceralbo islands. A rather decorative plant with pallid, slightly succulent leaves. It is a self-supporting or semiscandent shrub which commonly grows in gravelly or sandy washes attaining a height between 15 and 25 dm. The fruiting plant is very attractive having elongated spreading or drooping racemes of reddish globose capsules which split stellately at maturity and expose the red aril and later the shiny black seeds. The flowers are pure white.

XXX. Aizoaceæ

95. **Sesuvium sessile** Pers.

Sesuvium sessile Pers., Synop. 2:39. 1807.—*Type locality:* Not given.

Collected only on Isla Raza (3216), but frequent about lagoons and salt-marshes in all parts of the gulf.

96. **Trianthema portulacastrum** L.

Trianthema portulacastrum L., Sp. Pl. 223. 1753.—*Trianthema monogyna* L., Mant. 1:69. 1767.—*Type locality:* Jamaica.

Common on Patos Island growing on the guano flats with Atriplex. At Puerto Ballandra on Carmen Island (3816) it is common about a salt-marsh forming mats 15-25 cm. broad.

XXXI. Portulacaceæ

97. **Portulaca pilosa** L.

Portulaca pilosa L., Sp. Pl. 445. 1753.—*Type locality:* Central America.

Infrequent in slightly saline sandy soil in the gulf area. It was notably common on the mesa-like summit of Ildefonso Island (3749). Elsewhere it was collected only at La Paz (3033, 3057, 3064).

XXXII. Caryophyllaceæ

98. **Achyronychia cooperi** T. & G.

Achyronychia cooperi T. & G., Proc. Am. Acad. **7**:331. 1867.—*Type locality:* Camp Cady, California.

A small colony of this species was found on a silty flat near the south end of Angel de la Guarda Island (4207). On the peninsula, Purpus has taken it at Calmalli, and Brandegee on Magdalena Island.

99. **Drymaria arenarioides** Willd.

Drymaria arenarioides Willd. in R. & S., Syst. **5**:406. 1819. —*Drymaria frankenioides* H.B.K., Nov. Gen.et Sp. **6**:21, t. 515. 1823.—*Type locality:* Pachuca, Hidalgo.

Referred here is a single plant collected from a soil-filled crevice on one of the mesa-like ridge-crests of Espiritu Santo Island (3972). It is half as tall, more dense, has shorter leaves and smaller flowers than the peninsular plants referred to this species. The island plant seems to be undescribed. The Pacific Coast material of *D. arenarioides* has linear leaves the width of which is half that of the linear-lanceolate leaves of material of eastern Mexico, and it too seems without a name.

100. **Drymaria holosteoides** Benth.

Drymaria holosteoides Benth., Bot. Sulph. 16. 1844.—*Drymaria veatchii* Curran, Proc. Calif. Acad. Sci. II, **1**:227. 1888.—*Drymaria pachyphylla* Wooton & Standley, Contr. U.S. Nat. Herb. **16**:121. 1913.—*Type locality:* Given as Cape San

Lucas, but probably from Magdalena Bay (Brandegee, Proc. Calif. Acad. Sci. II, **3**:219. 1892).

Collected on Tiburon (4263) and San Francisco (3949) islands; and at San Luis Gonzales Bay (3329), Mulegé (3690), Coyote Bay (4178), and La Paz (3048). The plant is annual with widely ascending branches and seems to frequent sandy places, especially those with a trace of salinity. *Drymaria crassifolium* (cf. Brandegee, Zoe **2**:68. 1891) is a very closely related form known only from San José del Cabo, and with little more than its perennial habit to distinguish it.

XXXIII. CERATOPHYLLACEÆ

101. **Ceratophyllum demersum** L.

Ceratophyllum demersum L., Sp. Pl. 992. 1753.—*Type locality:* Europe.

Very common and freely fruiting at Mulegé (3688).

XXXIV. PAPAVERACEÆ

102. **Argemone mexicana** L.

Argemone mexicana L. Sp. Pl. 508. 1753.—*Type locality:* Mexico.

An infrequent plant on the gravelly plain back of La Paz (3053). The sap and flowers are yellow.

103. **Argemone platyceras** var. **gracilenta** (Greene) Fedde

Argemone platyceras var. *gracilenta* Fedde, Pflanzenr. 4^{104}:285. 1909.—*Argemone gracilenta* Greene, Pittonia **3**:346. 1898.—*Type locality:* Mulegé, Lower California.

Collected on the beach on Catalina Island (4104), and on the silty river bottom at Mulegé (3665). The plant is rather strict in growth, attaining a height of 9-18 dm. The sap is colorless. This variety is only a small-flowered slender form of *A. platyceras.* Prain (Jour. Bot. **33**:364. 1895) refers isotypes of Greene's species to *A. intermedia* subsp. *parviflora.*

104. **Argemone platyceras** var. **hispida** (Gray) Prain

Argemone platyceras var. *hispida* Prain, Jour. Bot. **33**:367. 1895.—*Argemone hispida* Gray, Pl. Fendler. 5. 1845.—*Type locality:* About Santa Fe, New Mexico.

To this species is doubtfully to be referred a very peculiar collection made at the lagoon on Angel de la Guarda Island (3398). The specimens came from a small colony growing on an outcrop at the edge of an elevated mesa somewhat back from the shore. The plant had a woody caudex 3-6 dm. high upon which were borne the ascending simple stems of the year, these about 6 dm. long. Fruit, but no flowers, was found. The leaves are glaucous, aculeate, with shallow teeth, and are oblong in shape and narrowed towards the base. The shrubby character of the plant is very peculiar, but due to the lack of flowers, the plant is not named here.

XXXV. Cruciferæ

105. **Lepidium lasiocarpum** Nutt.

Lepidium lasiocarpum Nutt., in T. & G., Fl. N. Am. **1**:115. 1838.—*Type locality:* Santa Barbara, California.

Occasional in the cultivated fields at Mulegé (3700).

106. **Sibara palmeri** (Wats.) Greene

Sibara palmeri Greene, Pittonia **3**:12. 1896.—*Cardamine palmeri* Wats., Proc. Am. Acad. **24**:38. 1889.—*Type locality:* Mulegé, Lower California.

What is taken to be a form of this species was collected from the shelter of a bank in a sandy wash at San Nicolas Bay (3704). The plants agree with some collected by Brandegee at Magdalena Island in having the leaves more or less deeply lobed with coarse segments. The type has coarsely toothed leaves.

XXXVI. CAPPARIDACEÆ

107. **Atamisquæa emarginata** Miers

Atamisquæa emarginata Miers in Hook., Bot. Miscl. **3**:143. 1833.—*Type locality:* Chile.

Observed on San Esteban (3176), Tiburon (3278, 4244), Angel de la Guarda, Tortuga (3596), Coronados, Carmen, Danzante, Monserrate, San Josef (3937, 3942), San Francisco, and Espiritu Santo islands; and at San Carlos Bay, San Pedro Bay, Kino Point (4287), Tepoca Bay, Las Animas Bay (3511), San Francisquito Bay, Mulegé, Guadalupe Point, San Nicolas Bay (3706), Loreto, Escondido Bay, San Evaristo Bay, and La Paz. It is a compact, upright, light-green shrub 15-30 dm. high characteristic of sandy or gravelly soil. Occasionally, however, it occurs on hillsides, as for example, on Tortuga Island. It is twiggy with rigid divaricate branches which are very brittle and become much broken in pressing. The flowers, which are produced in great abundance, have white or creamy petals and are quite fragrant. The bush is interesting and seems to have no bad qualities save its brittleness. The author's observations do not agree with those of Brandegee, who wrote that it is an illsmelling and disagreeable plant. Brandegee (Proc. Calif. Acad. Sci. II, **2**:128. 1889) has pointed out a number of supposed differences between the North and South American forms referred to this species, but a careful comparison of material from the Argentine and Lower California revealed the forms indistinguishable.

108. **Forchammeria watsoni** Rose

Forchammeria watsoni Rose, Contr. U. S. Nat. Herb. **1**:302, t. 24-25. 1895.—*Type locality:* Guaymas, Sonora.

This interesting tree was seen at Guaymas (3119), San Carlos Bay (4352), San Pedro Bay (4317), Guadalupe Point in Concepcion Bay (4149, 4405), Escondido Bay, Agua Verde Bay (3872, 3905), San Josef Island (4086), Espiritu Santo Island (3995), and Ceralbo Island (4056). In the Brandegee herbarium there are specimens from San José del Cabo and Purisima. At no place was the tree found to be common over large areas. It usually grows scattered, or as at Guadalupe

Point and Agua Verde Bay, forms small local groves. Most of the plants seen occurred on gravelly plains, but those on Espiritu Santo and Ceralbo islands grew on rocky hillsides while the plants at Escondido Bay grew at 450 m. altitude on a cañon side in the Sierra Giganta.

A tree commonly 30-45 dm. high but frequently attaining 9 m. in height. The trunk averages about 15 dm. high and 15-30 cm. thick, though at times becoming 3 m. high and 30-65 cm. thick. The crown is large and spreading, and formed of heavy branches. The bark is thin, tight, and though appearing smoothish at a short distance, is finally rugose, being covered with numerous crowded tiny plates; it is dark in color with an ashy cast. The bark must be very slow-growing, as some initials dated 1893 were so plain that they appeared as if carved the year previous to our visit. The trees are diœcious with an apparent preponderance of staminate plants. The male aments are produced in tremendous quantities, the ground under the trees being deeply covered with them. The wood is said to be practically useless which must be so, for wood-cutters were seen working among these trees without molesting them. The fruit is more or less pear-shaped and is reddish plum-colored when ripe. The pulp is sweetish and has a peculiar but not a disagreeable flavor. The fruit is structurally two-celled with one cell regularly aborted and represented in the mature fruit by a flattened elongated cavity just under the old stigma. Neither the fruit nor the tree has any suggestion of other Capparidaceæ, and the inclusion of the genus in that family is far from satisfactory. At Agua Verde Bay some boys called the tree "Palo San Juan." The younger trees bear leaves that are conspicuously narrower than those on the old trees.

109. **Wislizenia refracta** Engelm.

Wislizenia refracta Engelm. in Wisliz., Mem. No. Mex. 99. 1848.—*Wislizenia scabrida* Eastw., Bull. Torr. Cl. **30**:490. 1903.—*Wislizenia melilotoides* Greene, Proc. Biol. Soc. Wash. **19**:130. 1906.—*Wislizenia californica* Greene, Proc. Biol. Soc. Wash. **19**:130. 1906.—*Wislizenia divaricata* Greene, Proc. Biol. Soc. Wash. **19**:130. 1906.—*Wislizenia pacalis* Greene

Proc. Biol. Soc. Wash. **19**:131. 1906.—*Wislizenia costellata* Rose, Proc. Biol. Soc. Wash. **19**:132. 1906.—*Type locality:* Near El Paso, Texas.

A bushy herbaceous plant about 9 dm. high, common on the sands along the shore at La Paz (3044). Several small boys called it "Rama Maria." It has been frequently collected at La Paz, a collection by Palmer being the type of *W. pacalis.* While all the segregates, the types of which have been seen, are not exactly like typical *W. refracta,* the differences which characterize them are so trivial or are so blurred by intermediates that segregation seems unwise. The most pronounced of the variants is that named *W. melilotoides.* In its extreme it is characterized by smooth etuberculate carpels and deserves to be called **Wislizenia refracta** var. **melilotoides,** n. comb. It should be noted that in Toumey's Tuscon collection, the original of *W. scabrida,* the old fruits are tuberculate and rugose, whereas the maturing fruit is mainly smooth and etuberculate.

110. **Wislizenia refracta** var. **palmeri** (Gray), n. comb.

Wislizenia palmeri Gray, Proc. Am. Acad. **8**:622. 1873.—*Wislizenia fruticosa* Greene, Proc. Biol. Soc. Wash. **19**:131. 1906.—*Wislizenia mamillata* Rose, Proc. Biol. Soc. Wash. **19**:132. 1906.—*Type locality:* On the lower Colorado River.

Common on the dunes at the head of San Luis Gonzales Bay and at Las Animas Bay (3501). A somewhat shrubby plant with loosely tufted stems 7-11 dm. high. This plant is a good variety of *refracta* but scarcely more. There is a tendency for the leaves to be unifoliate, but they commonly are one, two, and three foliate all on one and the same branch. There is also considerable variation within a single collection as to the frequency of the several leaflet numbers. In the Brandegee specimen of *Palmer 74* from Guaymas, isotype of *W. mamillata,* the leaves are predominately trifoliate and similar to those in the type of *W. refracta.* In foliage there is no break between the completely trifoliate condition present in the type of *W. refracta* and the unifoliate condition in the type of *W. palmeri.* Correlated with the tendency to unifoliate leaves is the tendency to mammillate-tuberculate crests on the carpels.

In their extreme the high tubercules are very characteristic, but like the leaflets they grade off into developments indistinguishable from those of *W. refracta.* Greene's *W. fruticosa* was collected at Calamajuet by Brandegee, but although the base does seem somewhat woody, Mr. Brandegee insists that it was annual like the other forms of the species. Collections of the variety *palmeri,* however, seem slightly more shrubby than the common plants north of the international boundary.

XXXVII. Crassulaceæ

111. **Dudleya albiflora** Rose

Dudleya albiflora Rose, Bull. N. Y. Bot. Gard. **3**:13. 1903. —*Cotyledon albiflorum* Fedde in Just, Jahresb. **31**[1]:826. 1904. —*Type locality:* Magdalena Bay, Lower California.

Locally common on a sheltered basalt cliff in a narrow cañon near the Isthmus on Espiritu Santo Island (3986). The plants were found in a resting condition and only living material was taken, this all sent to Dr. Rose with whom it flowered and by whom it was determined. Previously known only from about Magdalena Bay.

XXXVIII. Krameriaceæ

112. **Krameria canescens** Gray

Krameria canescens Gray, Pl. Wright. **1**:42. 1852.—*Krameria grayi* Rose & Painter, Contr. U. S. Nat. Herb. **10**:108. 1906.—*Type locality:* Prairies near the Pecos River, Texas.

To this species are referred specimens from San Nicolas Bay (3710), San Marcos Island (3638), Las Animas Bay (3497), and Los Angeles Bay (3451). Also of this species are *Palmer 252* from Santa Agueda, and *Purpus 186* from near Calmalli. The plant grows in sandy or gravelly soil forming a flattened, very intricate shrub 5-10 dm. high and 10-18 dm. broad. On San Marcos Island it was called "mesquitilla" and said to be used in dyeing; information similar to that given to Palmer (Contr. U. S. Nat. Herb. **1**:81. 1890) at Santa Agueda.

113. **Krameria canescens** var. **paucifolia** Rose

Krameria canescens var. *paucifolia* Rose, Contr. U. S. Nat. Herb. **1**:66. 1890.—*Krameria paucifolia* Rose, Contr. U. S. Nat. Herb. **10**:108. 1906.—*Type locality:* La Paz, Lower California.

Collected at La Paz (4011), San Evaristo Bay (4095), and San Pedro Bay (4303). The habits are the same as in the species. The variety is not clean cut, but may well be retained for the southern form of *canescens* in which the leaves are small, remote, non-canescent, and oily-glandular. It occurs over the southern quarter of the peninsula and on the mainland from the region of Guaymas southward.

XXXIX. Leguminosæ

114. **Acacia californica** Brandg.

Acacia californica Brandg., Proc. Calif. Acad. Sci. II, **3**:221. 1892.—*Type locality:* La Palma, Lower California.

Frequent along washes at San Pedro Bay (4333) forming upright unarmed trees or large shrubs 18-45 dm. high. The plant flowers profusely as the leaves unfold.

115. **Acacia cymbispina** Sprague & Riley

Acacia cymbispina Sprague & Riley, Kew Bull. **1923**:394. 1923.—*Type locality:* Guaymas, Sonora.

Common on the rocky hillsides about Guaymas (3094) where it forms an open, loosely branched shrub 15-20 dm. high.

116. **Acacia farnesiana** (L.) Willd.

Acacia farnesiana Willd., Sp. Pl. **4**:1083. 1806.—*Mimosa farnesiana* L. Sp. Pl. 521. 1753.—*Vachellia farnesiana* Wigh. & Arn., Prodr. 272. 1834.—*Type locality:* Santo Domingo.

Collected at Guaymas (3105), San Carlos Bay (4368), and at Loreto (3775). At the first two localities it was naturalized, but at Loreto it grew only in fence corners about town and was known as "huizache." It is an open loosely spreading thorny shrub 15-20 dm. high.

117. **Acacia filicioides** (Cav.) Trel.

Acacia filicioides Trel., Rep. Ark. Geol. Surv. **4**:178. 1891. —*Mimosa filicioides* Cav., Icones **1**:55, t. 78. 1791.—*Acacia filicina* Willd., Sp. Pl.**4**:1072. 1806.—*Type locality:* Mexico.

A loosely branched weak shrub 18-27 dm. high which grows in gravelly washes. A few plants were found on Ceralbo Island (4064) and a single one in a cañon back of Escondido Bay (4130).

118. **Acacia greggii** Gray

Acacia greggii Gray, Pl. Wright. **1**:65. 1852.—*Type locality:* Valley west of Patos, Chihuahua.

Seen only on Tiburon (4254, 4278) and Angel de la Guarda (3419) islands where it grows along gravelly cañon floors. It is a very thorny shrub 15-20 dm. high and usually has a clear trunk about 1 m. long and 2-8 cm. thick. The trunk is seldom erect, it being usually bent over and the bushy crown, which is 15-20 dm. wide, supported by other shrubs. The peninsular specimens, notably *Palmer 534* from Los Angeles Bay, show a tendency towards pedicellate flowers and, due to this fact, have been identified as *A. wrightii.*

119. **Acacia sonorensis** Rose

Acacia sonorensis Rose, Contr. U. S. Nat. Herb. **8**:31. 1903. —*Type locality:* Near Guaymas, Sonora.

Referred here is a collection made in a cañon back of Agua Verde Bay (3881). The plant has many widely spreading stems and forms thicket-like growths along the gravelly cañon floor. The determination must remain doubtful as the description of *A. sonorensis* is so brief as to be ambiguous, and as the type has been either lost or misplaced. The Agua Verde collection (similar to the peninsular material identified as *A. amentacea*) differs from the description of *A. sonorensis* in having more numerous (4-6 not 2-3 pairs) and smaller (3-6 not 6-12 mm. long) leaflets, and pubescent (not glabrate) legumes. It may be that *A. sonorensis* is the mainland form of *A. californica* although the spike is described short for that latter species. The peninsular plant, which may be undescribed, is closely related to *A. amentacea* but differs in its more numerous smaller greener pubescent leaflets, and larger darker pubescent fruits.

120. **Acacia willardiana** Rose

Acacia willardiana Rose, Contr. U. S. Nat. Herb. **1**:88. 1890.—*Prosopis heterophylla* Benth., London Jour. Bot. **5**:82. 1846.—*Type locality:* "Sonora alta in Mexico."

A slender, open, very graceful tree 25-90 dm. high, which is common on the rocky hillsides along the Sonoran coast from Willard Point on Tiburon Island (4252) southward to the islands in Guaymas Harbor (3081). The plant was collected on San Pedro Nolasco Island (3125) where it is abundant over the upper slopes, at the south end of Tiburon Island (4271), and at San Pedro (4334) and San Carlos (4376) bays. Brandegee has a collection from the inland locality of Hermosillo. Standley (Contr. U. S. Nat. Herb. **23**:376. 1922) reports the species from Lower California, but it was not seen there by Mr. Brandegee or the author, nor has its occurrence there been elsewhere recorded in the literature; furthermore, there are no peninsular collections of it in the Brandegee, Gray or National herbaria.

The tree is typical of rocky slopes and is a particularly notable feature of the skyline in the region of its occurrence. Its branches are few and strict, but above it is very loosely branched into slender drooping twigs. The trunk becomes 2 dm. thick and like the branches has a smooth tight, white, somewhat glaucous, bark which annually exfoliates in thin papery pieces. The clean white stems, and the airy open crown with its drooping twigs and pendent phyllöidal petioles unite to give the tree a supple grace that is very attractive. The tree is worthy of adoption as an ornamental.

Acacia sp.

A globose shrub 12-25 dm. high, frequent in gravelly soil near the ocean at Candeleros Bay on Espiritu Santo Island (4073). It is a stiff, rough, reddish stemmed plant with many stout, straight, pallid thorns and fine bipinnate leaves. The flowers are yellow or rarely pink, and are in globose heads.

The fruit necessary for positive determination is lacking. The relationships of the plant seem to be with *A. constricta* Benth. It differs from that species in its coarse, rough, reddish bark, and in its stout, short, unbracted peduncles. It probably is the same as the unexamined Bryant plant reported by Brandegee (Proc. Calif. Acad. Sci. II, 3:221. 1892). The island plant is probably an unnamed form.

121. **Desmanthus fruticosus** Rose

Desmanthus fruticosus Rose, Contr. U. S. Nat. Herb. **1**:131, t. 13. 1892.—*Acuan fruticosum* Standley, Contr. U. S. Nat. Herb. **23**:366. 1922.—*Type locality:* Carmen Island.

Frequent in gravelly washes in the gulf area. It is a weak shrub with few erect branches. Its common height is between 10 and 25 dm., but occasionally it becomes 35 dm. high; usually with a clear trunk 6-9 dm. high and 15-25 mm. thick. Collected on Tiburon (4260), Angel de la Guarda (3422), and San Esteban (3196) islands; also at Las Animas (3519), San Nicolas (3724), and Coyote (4169) bays.

122. **Lysiloma candida** Brandg.

Lysiloma candida Brandg., Proc. Calif. Acad. Sci. II, **2**:153. 1889.—*Type locality:* Purisima, Lower California.

A very common and characteristic tree about most of the stations from San Marcos Island (3613) and Mulegé (3680) southward (3459, 3785, 3827, 3880, 4042, 4057). It was not seen on Santa Inez, Ildefonso, Catalina, and San Francisco islands. Indistinguishable plants occur in abundance at San Pedro Bay in Sonora (4294). There is no tree more characteristic of the southern half of the peninsula. It usually occurs in abundance and forms open groves on the cañon floors and washes, and to a less extent also on the rocky hillsides. It is a clean, white-barked, erect-growing tree commonly 3-6 m. high. Though usually small it does become quite large, some trees growing 9-12 m. high and having a clear trunk 10-15 dm. high and 6-9 dm. thick. In very old trees the bark ceases to be smooth and chalky, and becomes dark with thick flakes. The plant is widely known as "palo blanco" and its bark is gathered and sold by the natives for tanning purposes. To a more or less extent all localities show the depredations of bark-hunters, but in some of the more readily accessible localities they have cut the trees even on the steep rocky slopes. Despite the rapacity of bark-hunters the species is in no danger of extermination, as it sprouts readily and produces abundant seeds. The decorticated wood is used for fuel in some localities, but usually it is strewn over the cañon floor and left to decay.

123. **Lysiloma microphylla** Benth.

Lysiloma microphylla Benth., London Jour. Bot. **3**:83. 1844. —*Type locality:* Between Mexico City and Zacatecas.

A dark-barked tree 25-45 dm. high, which is common in the gravelly washes about San Pedro Bay (4313, 4330). Standley (Contr. U. S. Nat. Herb. **23**:390. 1922) considers *L. divaricata* (Jacq.) Benth. identical with the glabrous forms previously referred to *L. microphylla.* If this is correct then the latter must be submerged in the former, as there seem to be all gradations between the glabrous condition and the sparsely puberulent one. The extremes in pubescence do not seem worthy of even minor denominations. As Jacquin's plant is said to have come from the West Indies, and as his plate (Pl. Hort. Schoenbr. **3**: t. 395. 1798) shows a plant twice as robust as any Mexican specimen, Bentham's name is here accepted. Regarding *L. divaricata* see the note by Riley (Kew Bull. **1923**:396. 1923).

124. **Pithecollobium confine** Standley

Pithecollobium confine Standley, Contr. U. S. Nat. Herb. **20**:191. 1919.—*Type locality:* Cape San Lucas, Lower California.

Observed at Los Angeles Bay (3442, 3440), Las Animas Bay (3498), San Francisquito Bay (3565), San Nicolas Bay, Monserrate Island, Catalina Island, Santa Cruz Island (3917), San Diego Island, Espiritu Santo Island, and Ceralbo Island. Brandegee has collections from San José del Cabo, Todos Santos, and San Gregorio. The plant forms a coarse, rigid, tough, thorny shrub 9-30 dm. high. It may be loose and irregularly branched to form a rounded mass, or may, as usual on the islands, form a low, compact, very flat-topped growth. The pods vary considerably in size and weight, even in a single locality.

In the past this species has been mainly referred to *P. flexicaule,* a closely related but quite distinct species of eastern Mexico. Macbride (Contr. Gray Herb. II, **59**:2. 1919) has referred *P. flexicaule* to the genus Samanea, a step which, if proper, would necessitate a similar treatment of *P. confine.* Macbride, however, overlooked the fact that, if *P. flexicaule* and *P. saman* are congeneric, then Small's genus Siderocarpos (Bull. N. Y. Bot. Gard. **2**:91. 1901) would have priority over Merrill's Samanea (Jour. Wash. Acad. Sci. **6**:46. 1916). The type species of Siderocarpos is *P. flexicaule.*

125. **Pithecollobium dulce** (Roxb.) Benth.

Pithecollobium dulce Benth., London Jour. Bot. **3**:199. 1844. —*Mimosa dulcis* Roxb. Corom. Pl. **1**: t. 99. 1795.—*Type locality:* Described from trees cultivated in India but native of Mexico.

Collected in a semi-wild condition at Agua Verde Bay (3903) and Mulegé (3664), and seen in cultivation at La Paz, Loreto, Los Angeles Bay (3433), and Guaymas.

126. **Pithecollobium sonoræ** Wats.

Pithecollobium sonoræ Wats., Proc. Am. Acad. **24**:49. 1889. —*Type locality:* Guaymas, Sonora.

A thorny, erect-growing shrub 15-28 dm. high which is frequent about shallow draws on the slopes about Guaymas (3082, 3110). It is a very disagreeable plant to deal with when occurring in abundance.

127. **Prosopis chilensis** (Molina) Stuntz

Prosopis chilensis Stuntz, U. S. Bur. Pl. Indust., Invent. **31**:85. 1914—*Ceratonia chilensis* Molina, Sagg. Chile 172. 1782.—*Prosopis juliflora* DC., Prodr. **2**:447. 1825.—*Mimosa juliflora* Swartz. Prodr. Veg. Ind. Occ. 85. 1788.—*Prosopis glandulosa* Torr., Ann. Lyc. N. Y. **2**:192. 1828.—*Prosopis* *odorata* Torr. & Frem. in Frem. 2nd Rep. 313, t. 1. 1845.—*Prosopis articulata* Wats., Proc. Am. Acad. **24**:48. 1889.—*Type locality:* Chile.

Frequent in gravelly soil throughout the gulf area (3107, 3434, 3458, 3708, 3784, 3788, 4087, 4137, 4259, 4269). An arborescent tree or large shrub which is usually 3-5 m. high, but which not infrequently becomes 6-9 m. in height. It was particularly abundant about Escondido Bay and on the plains at the south end of Tiburon Island where it formed groves which, in places, excluded all other trees. The peninsular material has leaflets which average half the size of those in the material from Sonora and the northern gulf islands. The small-leaved form also occurs about Guaymas, for the type of *P. articulata* is such a plant. Called "mesquite" at Loreto where the young branches were used for fodder.

128. **Cæsalpinia gracilis** Benth.

Cæsalpinia gracilis Benth. in Hemsley, Diag. Pl. Nov. 9. 1878.—*Type locality:* "Sonora alta."

Found only at San Carlos Bay (4356) where it grew on a gravelly cañon floor forming an open shrub 12-18 dm. high. The flower is bright yellow and is quite odd because of the large, keel-like, coarsely fimbriate, brownish, lower sepal. The plant flowers as the leaves unfold.

129. **Cæsalpinia palmeri** Wats.

Cæsalpinia palmeri Wats., Proc. Am. Acad. **24**:47. 1889.—*Poinciana palmeri* Rose, Contr. U. S. Nat. Herb. **13**:303. 1911.—*Type locality:* Guaymas, Sonora.

A loose, slender-stemmed shrub 12-15 dm. high which was collected on a stony flat at Guaymas (3104), and in a wash at San Carlos Bay (4354).

130. **Cæsalpinia pannosa** Brandg.

Cæsalpinia pannosa Brandg., Proc. Calif. Acad. Sci. II, **2**:150. 1889.—*Poinciana pannosa* Rose, Contr. U. S. Nat. Herb. **13**:303. 1911.—*Cæsalpinia mexicana* var. *californica* Gray, Proc. Am. Acad. **5**:157. 1862.—*Poinciana californica*

Rose, Contr. U. S. Nat. Herb. **13**:303. 1911.—*Type locality:* San Jorge, Lower California.

Seen only at La Paz (3039) and Loreto (3774). At the former station it grew on the bluffs facing the sea and at the latter on a sandy plain where, due to the ravages of cattle, it grew successfully only amongst thorn-thickets or unpalatable shrubs. It is a loose shrub 10-15 dm. high. A very close relative of the Sonoran *C. palmeri* and perhaps not distinct from it.

131. **Cassia confinis** Greene

Cassia confinis Greene, Pittonia **3**:225. 1897.—*Type locality:* Los Angeles Bay, Lower California.

Although collected only at San Francisquito Bay (3573) and on Espiritu Santo Island (3992), the plant was observed on Angel de la Guarda, Tortuga, Carmen, and Ceralbo islands, and at Las Animas Bay, Santa Rosalia, Guadalupe Point, San Evaristo Bay, and La Paz. It is a very villous, suffrutescent plant with few coarse rigid ascending stems. Growing scattered over gravelly washes and commonly becoming 4-6 dm. high.

132. **Cassia crotalarioides** Kunth

Cassia crotalarioides Kunth, Mimos. 132, t. 40. 1823.—*Cassia covesii* Gray, Proc. Am. Acad. **7**:399. 1868.—*Type locality:* Near the city of Guanajuato, Mexico.

Seen only at Guaymas (3102, 4408) where a small colony was found in packed soil at the foot of the hills back of town.

133. **Cercidium microphyllum** (Torr.) Rose & Johnston

Cercidium microphyllum Rose & Johnston, Contr. Gray Herb. II, **70**:66. 1924.—*Parkinsonia microphylla* Torr., Bot. Mex. Bound. 59. 1859.—*Type locality:* Near Fort Yuma, Arizona.

Specimens were taken at Guaymas (3084), San Luis Gonzales Bay (3348), Angel de la Guarda Island (3379), Tortuga Island (4409), Coyote Bay (4172), and near Loreto (3787). Leafless and sterile palo verdes were seen at most of the stations in the gulf area, but while in the field the several species of Cercidium were so confused that trustworthy field determinations are lacking. It seems probable, however, that the palo verde seen on the peninsula north of Loreto was *C. microphyllum.* It also seems likely that much of what Goldman (Contr. U. S. Nat. Herb **16**:335. 1916) refers to *C. torreyanum* is in fact *C. microphyllum,* for it is highly improbable that he could have completely missed so common a tree as is the latter. It is a spreading tree 25-55 dm. high which commonly grows in gravelly soil but which is occasional also on warm hillsides. The petals are all pale yellow with the exception of the standard, which is white. At Loreto it was called "palo de pau" and the stems used for forage.

134. **Cercidium molle,** n. sp.

Tree 6 m. high and nearly as broad; young branches slender, drooping, unarmed, canescent with a fine rather dense strigose pubescence; leaves remote, 1 or 2 in an axil, with fine sparse pubescence; petiole 1-8 mm. long; pinnæ one pair, with 4-6 pairs of leaflets; rachis 12-40 mm. long; leaflets oblong, base narrowed and oblique, apex truncate, 6-10 mm. long, 2.5-4.5 mm. broad; petiolule about 0.5 mm. long; inflorescence a 3-7-flowered raceme, branches with a fine spreading pubescence; sepals yellowish, pubescent, lobes linear-oblong, 7-8 mm. long; petals lemon-yellow, lower one 13 mm. long with a deltoid-ovate blade 7 mm. long and a claw 6 mm. long, four upper ones 10 mm. long with ovate-rhomboid blades 8 mm. long; filaments 1 cm. long, villous near the base; anthers burnt-orange in color; ovary very densely strigose except on upper edge; legume 4-9 cm. long, 6-8 mm. wide, much flattened, 1-4 seeded, margin strongly undulate.

Type: No. 1283, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3877) from a solitary tree in a wash at **Agua Verde Bay, Lower California.**

An exceptionally well-marked, new Cercidium, characterized by its slender drooping unarmed twigs, large multijugate pinnæ, and long, compressed, strongly undulate legumes. It appears to have no close relatives. The new species is a tree with a spreading crown which, due to its slender drooping branches, has much of the general aspect of *Parkinsonia aculeata*. Only a single specimen of this tree was seen, that growing on the gravelly floor of a large cañon which runs southward from Agua Verde Bay (3877).

135. **Cercidium peninsulare** Rose

Cercidium peninsulare Rose, Contr. U. S. Nat. Herb. **8**:301. 1905.—*Type locality:* La Paz, Lower California.

Collected only at La Paz (3038) and on Carmen Island (3802), but it is probably the common palo verde which was seen at most of the stations south of Carmen Island. Goldman (Contr. U. S. Nat. Herb. **16**:336. 1916) has interesting data on this species. It seems to be an endemic peninsular form nearest to *C. floridum* of the southwestern United States from which it differs in its pubescent and duller colored twigs.

136. **Cercidium præcox** (R. & P.) Harms

Cercidium præcox Harms, Engler's Jahrb. **42**:91. 1908.—*Sappania præcox* R. & P., Fl. Peruv. t. 376, ined.—*Cæsalpinia præcox* H. & A., Bot. Miscl. **3**:208. 1833.—*Cercidium spinosum* Tul., Arch. Mus. Hist. Nat. Paris **4**:134. 1845.—*Rhetinophlœum viride* Karst., Fl. Columb. **2**:25, t. 113. 1862-69.—*Cercidium viride* Karst., in Engler, Jahrb. **8**:346. 1887.—*Cercidium plurifoliolatum* Micheli, Mem. Soc. Phys. Nat. Hist. Geneve **34**:269, t. 18. 1903.—*Cercidium goldmani* Rose, Contr. U. S. Nat. Herb. **8**:301. 1905.—*Cercidium unijuga* Rose, Contr. U. S. Nat. Herb. **8**:301. 1905.—*Type locality:* Peru.

Collected on an islet in Guaymas Harbor (3078), on Tortuga Island (3592), and on the exact summit of Ildefonso Island (3753). Some sprawling leafless palo verdes seen at Marquer Bay on Carmen Island are probably the same. Rose (14466) has a collection from San José del Cabo, the only known peninsular collection.

The plant is infrequent but often locally abundant on Tortuga Island. There although the plant has an erect trunk 3-9 dm. high, its branches do not grow erect, but instead spread out horizontally or recline and thereby cover an area all out of proportion to its height. The largest trees seen on Tortuga Island were only 2 m. high although they had a span of 8 m. Even the young plants start to sprawl, the main shoot falling over, lying along the ground, and partially supporting the branches which fall over later. This peculiar habit is not due to exposure, for plants in sheltered situations are similar in habit to those on open slopes. It should be said here that no erect palo verdes were noted on Tortuga Island; as specimens of *Cercidium microphyllum* were mixed in with the Tortuga collection of *C. præcox,* that former species may also have a sprawling habit on Tortuga Island. Sterile leafless Cercidiums seen in the washes at Marquer Bay, Carmen Island, had growth habit identical with the Tortuga plants.

137. **Hæmatoxylon brasiletto** Karst.

Hæmatoxylon brasiletto Karst., Fl. Columb. **2**:27, t. 114. 1862-69.—*Hæmatoxylon boreale* Wats., Proc. Am. Acad. **21**:426. 1886.—*Type locality:* Republic of Colombia.

Frequent along shallow draws on the stony slopes about Guaymas (3080, 3111). Infrequent in a wash at San Pedro Bay (4335). It is a loose thorny shrub 12-20 dm. high. The petals are bright yellow; the standard is lined with carmine.

138. **Hoffmanseggia intricata** Brandg.

Hoffmanseggia intricata Brandg., Proc. Calif. Acad Sci. II, **2**:151. 1889.—*Hoffmanseggia glabra* var. *intricata* Fisher, Contr. U. S. Nat. Herb. **1**:147. 1892.—*Hoffmanseggia microphylla* var. *glabra* Wats., Proc. Am. Acad. **24**:47. 1889. hyponym.—*Hoffmanseggia glabra* Fisher, Contr. U. S. Nat. Herb. **1**:147. 1892.—*Type locality:* Campo Aleman, Lower California.

Seen only at San Francisquito Bay (3586) and on San Esteban Island (3185). At the latter station it was common in a broad gravelly wash forming compact rounded shrubs 3-6 dm. high or scraggly growths 6-9 dm. high. The standard is yellow dotted with brownish red, but the other petals are entirely reddish.

139. Hoffmanseggia microphylla Torr.

Hoffmanseggia microphylla Torr., Bot. Mex. Bound. 58. 1859.—*Type locality:* Colorado Desert, California.

Collected at Tepoca Bay (3281), San Luis Island (3324), San Luis Gonzales Bay (3334), and Angel de la Guarda Island (3381). It grows in gravelly washes and seems to like best the gravelly benches along their borders. A nearly leafless shrub 6-12 dm. high, whose branches are simple below but loosely though strictly branched above. It is usually loosely tufted and upright, but occasionally becomes broadly globular in form. The flowers are yellow with the standard streaked with reddish.

140. Æschynomene nivea Brandg.

Æschynomene nivea Brandg., Proc. Calif. Acad. Sci. II, **2**:150. 1889.—*Type locality:* Purisima, Lower California.

An erect, little-branched, graceful shrub 2-3 m. high which is frequent in washes and on hillsides at San Nicolas Bay (3713), Coyote Bay, Gualalupe Point, Loreto and Escondido Bay; and on Coronados, Carmen, Danzante, Monserrate, Santa Cruz, San Diego, San Josef, Espiritu Santo (3964), and Ceralbo islands. The flowers are yellow with the wings deep yellow, the keel greenish, and the standard yellow with a greenish medial line.

141. Astragalus aridus Gray

Astragalus aridus Gray, Proc. Am. Acad. **6**:223. 1864.—*Astragalus albatus* Shelton, Minn. Bot. Studies **1**:128. 1894. —*Type locality:* Colorado Desert, California.

What is taken to represent a small-leaved form of this species was frequent on the dunes at Tepoca Bay (3306). The stems are silky tomentose, strictly erect, and become 45-50 cm. high.

142. Astragalus coulteri Benth.

Astragalus coulteri Benth., Pl. Hartw. 307. 1848.—*Type locality:* Probably in the Colorado Desert or southwestern Arizona.

Referred here is the small-leaved, silky tomentose Astragalus found so commonly on the dunes at San Francisquito Bay (3552). The stems are strictly ascending.

143. **Astragalus insularis** Kell.

Astragalus insularis Kell., Bull. Calif. Acad. Sci. **1**:6. 1884. —*Type locality:* Cedros Island.

There seems nothing to distinguish the Cedros Island plants from the Astragalus which grows so commonly in a wash on South San Lorenzo Island (3538). The flowers are magenta but dry bluish. The stems are ascending and 1-4 dm. high.

144. **Coursetia glandulosa** Gray

Coursetia glandulosa Gray, Proc. Am. Acad. **5**:156. 1861. —*Type locality:* Cape San Lucas, Lower California.

A weak, erect shrub 25 dm. high, which is frequent in a wash at Guaymas (3112). Standard mainly white, but with tip and back frequently pinkish or red. The wings are yellow. Vasey and Rose (Contr. U. S. Nat. Herb. **1**:88. 1890) have a lengthy note on this species.

145. **Diphysa occidentalis** Rose

Diphysa occidentalis Rose, Contr. U. S. Nat. Herb. **12**:271. 1909.—*Type locality:* Guaymas, Sonora.

A slender, loose shrub 18-24 dm. high, which was found covered with yellow flowers and unfolding leaves. It was frequent along washes at San Pedro (4309) and San Carlos (4361) bays. Perhaps only a good variety of *D. sennoides.*

146. **Errazurizia megacarpa** (Wats.), n. comb.

Dalea megacarpa Wats., Proc. Am. Acad. **20**:359. 1885.—*Parosela megacarpa* Standley, Contr. U. S. Nat. Herb. **23**:460. 1922.—*Psorobatus megacarpus* Rydb. N. Am. Fl. **24**:41. 1919. —*Type locality:* Northwest Sonora near the gulf shore about 150 miles south of the boundary.

This is an ill-smelling shrub whose exceedingly numerous stems form a dense globose bush 8-10 dm. high. It is characteristic of sandy soils, though at San Francisquito Bay it occurs also on a stony mesa. The corolla is gaping and not at all papilionaceous, being composed of thickish subequal yellow petals. It was collected at Tepoca Bay (3294) which is near, if not the actual type locality, and at San Luis Gonzales Bay (3348), San Francisquito Bay (3579), Tiburon Island (3252), and Angel de la Guarda Island (4226). Brandegee has it from Calamujuet and Llanos de San Julian, and Palmer has it from Los Angeles Bay and Santa Rosalia. Nothing more is on record regarding its range.

Although in the past the plant has been usually treated as a member of either Dalea or Parosela, it and its two close relatives seem worthy of special generic recognition. These plants are notable because of their peculiar corollas which are more or less non-papilionaceous, and composed of thickish very firm yellow petals that are entirely distinct, almost clawless, evidently spreading, and scarcely exserted from the calyx. The three species are characterized by a very ramose shrubby habit, a loose spicate inflorescence, and coarse white tomentose stems that are studded with brown tuberculate glands. The associates of *A. macrocarpa* are, **E. benthami** (Brandg.), n. comb., or *Dalea benthami* Brandg. (Proc. Calif. Acad. Sci. II, **2**:148. 1890) a species native to the islands off the west coast of the peninsula, and **E. multifoliolata** (Clos), n. comb., or *Psoralea multifoliolata* Clos (Gay, Fl. Chile **2**:87. 1846) which is known only from northern Chile. Rydberg (loc. cit.) gave the name Psorobatus to the North American species, but the Chilian species was called Errazurizia by Phillipi (Ann. Univ. Chile **1872**:688) nearly 50 years previously. The Chilian species has a more irregular corolla and is hence nearer to Parosela than are the Mexican species, but is evidently congeneric with the latter, and must be associated with them if the genus is to be a natural one.

147. Indigofera argentata, n. sp.

A pallid, erect-growing shrub with strictly ascending subsimple stems, 15-25 dm. high; old stems brownish and glabrous; young stems with terminal decimeter densely white strigose-tomentose and more or less stained by glandular secretions;

below the densely pubescent growing parts the stems clear white with a light thinning silky-strigose pubescence; leaves oddpinnate, unicolored, younger densely silvery silky strigose but older with a thinner pubescence and somewhat greenish; rhachis 4-8 cm. long, quadrangular, densely pubescent, with a circle of deciduous usually subulate glands about the base of petiolules; leaflets opposite, 15-17, linear-oblong to narrowly elliptical, 2-3 cm. long, 4-6 mm. wide, tip rounded and usually apiculate; petiolule 1 mm. long; racemes many-flowered, strictly ascending, 5-15 cm. long; calyx densely silvery strigose, oblique, unequally cleft into linear-oblong lobes; keel 1 cm. long, white, densely strigose in bud; standard and wings pink or rose; connectives brownish, cuspidate-prolonged and tipped by a tuft of short hairs; ovary silky strigose; legumes pendulous on recurved pedicels 3-4 mm. long, brown, canescent with a sparse strigose pubescence, strongly flattened, somewhat curved, 25-40 mm. long, 4-5 mm. wide, valves separating from the replum after maturity; seeds 6-12, rectangular, brown, inconspicuously rugose.

Type: No. 1284, Herb. Calif. Acad. Sci., collected June 6, 1921, by I. M. Johnston (no. 4036) in a wash near Gordas Point on **Ceralbo Island, Gulf of California.**

A very distinct new species of the section Euindigofera and of Baker's (Oliver, Fl. Trop. Africa **2**:68. 1871) group Tinctoræ. It is characterized by its erect, shrubby habit, silvery pubescence, large flowers, narrow leaflets, and manner of fructal dehiscence. It differs from *I. fruticosa* Rose (Contr. U. S. Nat. Herb **5**:140. 1897), the type of which came from San José del Cabo, in its more erect, less branched habit, numerous elongate silvery leaflets, larger flowers, and larger canescent legumes. It was collected at two different localities on Ceralbo Island (4036, 4067) where it grew scattered along gravelly washes, forming loose silvery shrubs about 2 m. tall.

148. **Lotus tomentellus** Greene

Lotus tomentellus Greene, Pittonia **2**:140. 1890.—*Type locality:* Los Angeles Bay, Lower California.

Frequent on a silty flat on Angel de la Guarda Island (4206), forming herbaceous mats 6-12 dm. broad. Observed on San Luis Island and at San Luis Gonzales Bay. The flowers are yellow.

149. **Lupinus arizonicus** var. **barbatulus** Thornb.

Lupinus arizonicus var. *barbatulus* Thornb. in Smith, Bull. Torr. Cl. 47:497. 1920.—*Type locality:* Valley of the Colorado River, Arizona.

In sandy soil at San Luis Gonzales Bay (3341), San Francisquito Bay (3569), and San Marcos Island (3635). The flowers are pinkish.

150. **Olneya tesota** Gray

Olneya tesota Gray, Mem. Am. Acad. II 5:328. 1855.—*Type locality:* Tablelands along the lower part of the Gila River, Arizona.

Widely distributed over the gulf area, being observed at all the peninsular stations and at all the Sonoran stations with the exception of Guaymas (3290, 3444, 3780, 3786). It was seen on the following islands:—Tiburon (3277), Angel de la Guarda, San Esteban (3205), Coronados, Carmen, Danzante, Monserrate, Santa Cruz, San Josef, San Francisco, Espiritu Santo (3969), and Ceralbo (4041). It is a grayish, usually thorny, tree or shrub most characteristic of gravelly benches along washes. It occurs not infrequently on hillsides and in gravelly washes. Usually an upright arborescent shrub 30-45 dm. high, but some very old trees become truly arborescent with a spreading crown and a height of 7-9 m. The bark is dark, furrowed, and loose. The plant is usually viciously thorny, though some individuals, these seemingly most abundant in the south, show a tendency to be unarmed. Some plants are entirely unarmed while others vary from thornless to very thorny even on a single limb. The plant flowers in great profusion, being usually leafless at that time. The standard is rosy, or white with faint markings. The wings and keel are magneta with the latter a trifle lighter in tone. At Loreto the flowering plants were called "palo tinta," but the heavy hard wood, which is widely used as fuel, is well known about the gulf as "palo fierro."

151. **Parosela divaricata** var. **cinerea** (Gray), n. comb.

Dalea divaricata var. *cinerea* Gray, Proc. Am. Acad. **7**:335. 1868.—*Dalea parryi* Gray, Proc. Am. Acad. **7**:397. 1868.—*Parosela parryi* Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea maritima* Brandg., Proc. Calif. Acad. Sci. II, **3**:125. 1891.—*Parosela maritima* Rose, Contr. U. S. Nat. Herb. **8**:304. 1905.—*Parosela oculata* Rydb. N. Am. Fl. **24**:60. 1919.—*Type locality:* Fort Mohave, Arizona.

An inhabitant of sandy or gravelly soil, which was collected at Angel de la Guarda (3387, 3411), San Esteban (3187), Tortuga (3599), and San Francisco (3948) islands; and at San Francisquito Bay (3564). The plant is very variable, being prostrate or strict or bushy, and annual or perennial. The common growth form is strict and tufted, but some of the Angel de la Guarda plants were loosely bushy and 6-9 dm. high. The flowers are a deep rich blue. Material from Magdalena Bay, topotypes of Bentham's *D. divaricata* (with synonyms in *P. variegata* Rydb. and *D. anthonyi* Brandg.), differs from the Academy collections and from Californian material only in the lack of pubescence. A difference in pubescence is scarcely worthy of specific rank and so the northern plant is treated as a variety.

152. **Parosela emoryi** (Gray) Heller

Parosela emoryi Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea emoryi* Gray, Mem. Am. Acad. II, **5**:315. 1854.—*Psorothamnus emoryi* Rydb., N. Am. Fl. **24**:47. 1919—*Dalea tinctoria* Brandg., Proc. Calif. Acad. Sci. II, **2**:147. 1889.—*Psorothamnus tinctorius* Rydb., N. Am. Fl. **24**:47. 1919.—*Parosela tincoria* Standley, Contr. U. S. Nat. Herb. **23**:462. 1922.—*Dalea tinctoria* var. *arenaria* Brandg., Proc. Calif. Acad. Sci. II, **2**:147. 1889.—*Psorothamnus arenarius* Rydb., N. Am. Fl. **24**:47. 1919.—*Parosela arenaria* Standley, Contr. U. S. Nat. Herb. **23**:462. 1922.—*Psorothamnus dentatus* Rydb., N. Am. Fl. **24**:47. 1919.—*Parosela dentata* Standley, Contr. U. S. Nat. Herb. **23**:462. 1922.—*Psorothamnus junceus* Rydb., N. Am. Fl. **24**:48. 1919.—*Parosela juncea*

Standley, Contr. U. S. Nat. Herb. 23:462. 1922.—*Type locality:* Tableland along the Gila River, Arizona.

A low, spreading, flat-topped, loosely intricate, grayish shrub 4-9 dm. high and 9-12 dm. broad. It has a strong odor. The glands of the calyx heavily stain the collecting papers with yellow and orange. It is one of the characteristic shrubs on the dunes in the gulf area, but also occurs frequently in sandy washes back from the coast and, as on Tortuga Island, occasionally occurs even on hillsides. It was collected on Kino Point (4286), Tiburon Island (3247), San Luis Gonzales Bay (3344), Angel de la Guarda Island (3367, 4231), Las Animas bay (3515), San Francisquito Bay (3544), Tortuga Island (3601), San Nicolas Bay (3715), and La Paz (4013).

The plants of this species vary considerably in size and form of leaf, and to a less extent in amount and distribution of pubescence. There seems to be no way by which *P. emoryi* and *P. tinctoria* can be separated, even by characters varietal in importance, for the chief difference seems to be a slight one in the denseness of tomentum. Rydberg's *P. dentatus* is said to differ from *P. tinctoria* in its distinctly dentate leaves despite the fact that the type of the latter has definitely toothed leaflets. Brandegee's variety *arenaria,* characterized by very elongate leaflets and glabrous stem and foliage, seems worthy of varietal rank, and is to be called **Pasosela emoryi** var. **arenaria,** n. comb. *Psorothamnus junceus* Rydb. is a form of *Parosela emoryi* with rigid, naked stems and should be called **Parosala emoryi** var. **juncea,** n. comb.

153. **Parosela mollis** (Benth.) Heller

Parosela mollis Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea mollis* Benth., Pl. Hartw. 306. 1844.—*Parosela pilosa* Rydb., N. Am. Fl. 24:64. 1919.—*Type locality:* Deserts between California and Sonora.

Noted only on Tiburon (3251), San Luis, Angel de la Guarda (4235), and Tortuga (3602) islands. It forms mats which may become a meter broad. Usually growing in sandy soil but on Tortuga Island growing on a barren lava slope.

154. **Parosela spinosa** (Gray) Heller

Parosela spinosa Heller, Cat. N. Am. Pl. ed. 2, 7. 1900.—*Dalea spinosa* Gray, Mem. Am. Acad. II, **5**:315. 1854.—*Asagræa spinosa* Baillon, Adansonia **9**:233. 1870.—*Psorodendron spinosum* Rydb., N. Am. Fl. **24**:45. 1919.—*Type locality:* Along the Gila River, Arizona.

Although in a sterile condition this unmistakable shrub was recognized at San Luis Gonzales Bay, Los Angeles Bay, and on Angel de la Guarda Island. It is a gray, spiny shrub 25-30 dm. high which grows along gravelly washes. Frequent locally at each station.

155. **Phaseolus atropurpureus** var. **sericeus** Gray

Phaseolus atropurpureus var. *sericeus* Gray, Proc. Am. Acad. **5**:156. 1861.—*Type locality:* Cape San Lucas, Lower California.

Climbing along a fence at Mulegé (3687). The flowers are a very dark purple.

156. **Phaseolus filiformis** Benth.

Phaseolus filiformis Benth., Bot. Sulph. 13. 1844.—*Type locality:* Magdalena Bay, Lower California.

As to foliage this species is highly polymorphous, varying from unifoliate to trifoliate and from very broadly to very narrowly lobed. The flowers are pink. It usually grows in sandy soil twining up through low shrubbery. Frequently it forms prostrate matted growths some of which are 15 dm. broad. It was collected at Guaymas (3089), Tiburon Island (3265), Angel de la Guarda Island (4220, 4225), Las Animas Bay (3513), San Francisquito Bay (3554), and Loreto (3794).

157. **Rhynchosia phaseoloides** (Swartz) DC.

Rhynchosia phaseoloides DC., Prodr. **2**:385. 1825.—*Glycine phaseoloides* Swartz, Fl. Ind. Occ. 1248. 1806.—*Dolicholus phaseoloides* Kuntze, Rev. Gen. 3^2:62. 1898.—*Type locality:* Jamaica.

Twining high through shrubs along a roadside in the river bottom at Mulegé (3686). The seeds are entirely red. The flowers have a brownish standard, yellow wings, and a greenish keel. All other peninsular collections have larger bicolored seeds.

158. **Tephrosia purisimæ** Brandg.

Tephrosia purisimæ Brandg., Proc. Calif. Acad. Sci. II, **2**:149. 1889.—*Type locality:* Purisima, Lower California.

Common in washes at San Nicolas Bay (3709). A single plant was found on a rocky hillside at Mulegé (3695). It is a tufted perennial 6 dm. high with numerous ascending stems and pink flowers.

XL. Zygophyllaceæ

159. **Fagonia chilensis** H. & A.

Fagonia chilensis H. & A., Bot. Miscl. **3**:165. 1833.—*Fagonia californica* Benth., Bot. Sulph. 10. 1844.—*Fagonia californica* var. *hindsiana* Benth., Bot. Sulph. 10. 1844.—*Fagonia californica* var. *barclayana* Benth., Bot. Sulph. 10. 1844.—*Fagonia aspera* Gay, Fl. Chile **1**:470. 1845.—*Fagonia palmeri* Vasey & Rose, Contr. U. S. Nat. Herb. **1**:82. 1890.—*Fagonia subaphylla* Philippi, Pl. Itin. Tarapaca 12. 1891.—*Fagonia californica* var. *glutinosa* Vail, Bull. Torr. Bot. Cl. **22**:229. 1895.—*Fagonia viscosa* Rydb., N. Am. Fl. **25**:104. 1910.—*Fagonia pachyacantha* Rydb., N. Am. Fl. **25**:105. 1910.—*Fagonia insularis* Standley, Proc. Biol. Soc. Wash. **24**:247. 1911.—*Fagonia rosei* Standley, Proc. Biol, Soc. Wash. **24**:247. 1911.—*Fagonia lævis* Standley, Proc. Biol. Soc. Wash. **24**:249. 1911.—*Fagonia longipes* Standley, Proc. Biol. Soc. Wash. **24**:250. 1911.—*Type locality:* Chile.

A study of Chilian material, including specimens of the original collection of *F. chilensis,* has shown conclusively that *F. chilensis* is character for character the same as the typical phase of *F. californica.* Since, as pointed out elsewhere (Contr. Gray Herb. II, **70**:72. 1924), the American forms of the genus are separable from the Mediterranean *F. cretica* by efficient fruit-characters, *F. chilensis* is taken up as the proper name for the North American plants current as *F. californica.* Standley (Proc. Biol. Soc. Wash. **24**:243-250.

1911) accredits 13 species of Fagonia to America. Of this number, however, only *F. scoparia* Brandg. seems unquestionably distinct, the remaining 12 appearing to be only intergrading forms of a single variable species. In North America the very variable *F. chilensis* reaches its greatest development in Lower California and areas immediately adjacent. Upon the basis of field-knowledge acquired during the Expedition and upon repeated subsequent herbaria studies, a new classification of the variants of *F. chilensis* is offered here.

The first impression gained upon a casual inspection of herbarium material is that the North American material is extremely and erratically variable. A careful study has shown, however, that there are several geographically correlated tendencies which deserve some minor designation. In his treatment, Standley emphasizes glandularity and pubescence, but these criteria are not as satisfactory in natural primary segregation as is stipular development. The stipules in the South American and Magdalena Island collections, as well as in the bulk of the material from the gulf islands and from California and Lower California, are 1.5-4 mm. long. About the upper part of the gulf there occur forms with stipules 5-12 mm. long. Of both these long and short stipuled forms, there are forms with large and small leaves, and forms with glandular or pubescent or glabrous herbage. The combining of these characters may best be appreciated by the study of the following key to the varieties of *F. chilensis.*

Stipules mostly 1-3 mm. long; plant glabrous to glandular.
  Leaves large and broad, 8-20 mm. long, 3-7 mm. broad.
    Glabrous .... *typica*
    Pubescent .... *barclayana*
    More or less scabrous.. *aspera*
  Leaves small and narrow, 1-8 mm. long, 1-3 mm. broad.
    Glabrate.
      Leaves 2-8 mm. long.. *lævis*
      Leaves 1-2 mm. long.. *rosei*
    Densely glandular.. *insularis*
Stipules mostly 4-12 mm. long; plant glandular.
  Leaves broad, 3-8 mm. wide.. *glutinosa*
  Leaves narrow, 1-2 mm. wide.
    Leaflets 3.. *pachyacantha*
    Leaflets 5.. *palmeri*

The typical, broad-leaved form of the species has synonyms in *F. californica,* and *F. californica* var. *Hindsiana,* and occurs in Chile and the western part of the southern half of the peninsula. **Fagonia chilensis** var. **barclayana,** n. comb., differs from *typica* in its pubescence. It occurs with *typica* in Lower California and apparently in Chile also. **Fagonia chilensis** var. **aspera, n. comb. in its extreme** is very scabrous, but forms of it are frequently distinguishable with difficulty from the var. *typica* and var. *barclayana.* The variety was originally founded on material from Chile, but certain rather scabrous plants from western Lower California seem referable to it. **Fagonia chilensis** var. **lævis,** comb. nov., with glabrate linear-oblong leaves, is the prevailing form of *F. chilensis* in the deserts north of the international boundary and in Lower California south to the area occupied by *typica.* Standley's *F. longipes* is a form of *lævis* with pedicels slightly longer than usual. No material of this, or any of the previously mentioned varieties, were collected on the expedition. In the north middle section of the gulf there is a minute-leaved form of *lævis* which may be called **Fagonia chilensis** var. **rosei,** n. comb. It appears to be indistinguishable from *F. subaphylla* of northern Chile. Specimens were collected on Tiburon Island (3258) and at San Luis Gonzales Bay (3346). **Fagonia chilensis,** var. **insularis,** comb. nov. is simply a densely glandular-villous state of *rosei* which inhabits the southern gulf islands. It was collected on Coronados (3767), Carmen (3806), and San Francisco (3958) islands. **Fagonia chilensis** var. **glutinosa,** n. comb., which has a synonym in *F. viscosa,* has the leaves of typical *chilensis,* and in addition has long stipules and densely glandular stems. It comes from the Colorado Desert, from northwestern Sonora, where it was collected at Tepoca Bay (3297), and from Guadalupe Point in Concepcion Bay (4155), a station quite incongruous with its other distribution. A difference in leaflet-width is all that separates **Fagonia chilensis** var. **pachyacantha,** n. comb., from the var. *glutinosa,* the former having linear and the latter ovate or oblong leaflets. The variety *pachyacantha* appears to range along the east coast of the peninsula from about Santa Rosalia to San Luis Gonzales Bay. It was collected at San Francisquito Bay (3555) and on Angel de la Guarda Island (3385). **Fagonia**

chilensis var. **palmeri,** n. comb., is the best marked of all the varieties accepted. Though the leaflets are always five in *palmeri* and three in *pachyacantha,* that is the only difference, and it seems that the two forms should be closely associated as varieties of the same species. The type of *F. palmeri* came from Santa Rosalia, but indistinguishable material grows on San Marcos Island (3612).

The forms of *F. chilensis* observed on the expedition were all slender, trailing shrubby plants which grew in gravelly washes or on banks, and formed spreading masses 15-20 cm. high and 6-12 dm. broad. The flowers are pink or somewhat magenta. The plant was found abundantly nowhere.

159a. **Fagonia densa,** n. sp.

A dense, compact, upright, globose shrub 15-80 cm. high; stem very woody, becoming 25 mm. thick, branched 2-4 dm. above the ground into closely ascending branches; branches stout, much branched, with numerous slender green terete ultimate branchlets; internodes short, 5-15, but usually about 10 mm. long; leaves and stipules together appearing as whorled acerose leaves, numerous, crowded, in situ completely hiding the rameal skeleton of the plant, glabrous but more or less glandular and glutinous; leaves with acerose petioles 5-10 mm. long and 3 acerose leaflets 1-6 mm. long; stipules acerose, 10-15 mm. long, ascending, exceeding or slightly shorter than the internodes, simulating in form and color the subtended leaves which they commonly exceed in length; pedicels slender, abruptly reflexed, 2-5 mm. long, glandular glutinous; sepals oblong to lance-oblong, obtuse, 3-5 mm. long; petals pink, 7-8 mm. long, spatulate; fruit 4-5 mm. long, glandular and exceedingly glutinous, more or less sparsely villous, beak very slender and 3-4 mm. long; seeds ovate, minutely and shallowly aveolate.

Type: No. 1285, Herb. Calif. Acad. Sci., collected May 9, 1921, by I. M. Johnston (no. 3532) from gypsum soil in a cañon on **South San Lorenzo Island, Gulf of California.**

This plant is locally frequent in gypsum soil in the upper reaches of a small cañon which opens on the anchorage off South San Lorenzo Island (3532). The plants first found were without flowers and fruit and so strange were their habit and appearance that they were generically unrecognizable. They gave not the slightest suggestion of the sprawling lax open habit that characterizes *F. chilensis,* invariably growing in trim close globose very leafy bushes that in form much recalled some of the dwarf lawn conifers. The woodiness, leafiness, and weight of the branches were particularly noticeable and particularly different from those in all forms of *F. chilensis.* Among the American and Old World forms of Fagonia, *F. densa* is characterized by its dense, erect, bushy habit, very woody stems with short internodes, acerose stipules that commonly exceed the leaves, and exceedingly glutinous fruits. It suggests in some respects *F. chilensis* var. *pachyacantha,* but the habit is completely at variance with that as with all other varieties of *chilensis.*

160. **Guaiacum coulteri** var. **palmeri** (Vail), n. comb.

Guaiacum palmeri Vail, N. Am. Fl. **25**:107. 1910.—*Type locality:* Guaymas, Sonora.

Seen only at San Pedro (4326) and San Carlos (4353) bays where it is frequent on gravelly plains and less common on the adjacent hillsides. It is a coarse-stemmed, open shrub 15-30 dm. high and 15 dm. broad, which rarely becomes arborescent, and reaches 4 m. in height. The flowers which appear before the leaves are a rich bluish purple in color and have the petals twisted like propeller blades. Certainly it is one of the most beautiful shrubs in the gulf area. According to Captain Ross it is called "lignum vitæ" and is used by the gulf seamen for the same purposes as the commercial wood.

The variety *palmeri* is characterized by its tomentose ovary. The collections have densely tomentose ovaries, but an isotype of *palmeri* has the ovary only partly tomentose. Perhaps *G. palmeri* is based on characters too unimportant even for a variety.

161. **Larrea divaricata** Cav.

Larrea divaricata Cav., Anales Hist. Nat. Madrid **2**:122, t.19, f.1. 1800.—*Covillea divaricata* Vail. Bull. Torr. Cl. **22**:229. 1895.—*Zygophyllum tridentatum* DC., Prodr. **1**:706. 1824.

—*Larrea tridentata* Cov., Contr. U. S. Nat. Herb. **4**:75. 1893. —*Covillea tridentata* Vail, Bull. Torr. Cl. **26**:302. 1899.—*Larrea mexicana* Moric., Pl. Nouv. Am. 71. 1839.—*Zygophyllum californicum* Torr. & Frem., Rep. 257. 1845.—*Larrea glutinosa* Engelm. in Wisliz., Mem. No. Mex. 93. 1848.—*Covillea glutinosa* Rydb., N. Am. Fl. **25**:108. 1910.—*Type locality:* Between Mendoza and Buenos Aires, Argentina.

Larrea was seen only at the following localities: Tiburon Island, Tepoca Bay (3293), San Luis Island (3323), San Luis Gonzales Bay, Angel de la Guarda Island (3403), San Francisquito Bay, Santa Rosalia, San Marcos Island, and Guadalupe Point. It is a many-stemmed, tufted, resinous shrub 8-20 dm. high. When present it is usually common on gravelly plains and rocky slopes. At Santa Rosalia and San Marcos Island it was called "gobernadora" by the natives. The petals of this plant, both in the gulf area and in the deserts of California, are twisted at the short claw so as to have their faces vertical and not horizontal as all the illustrations, drawn from herbarium material, have shown them. When fresh the twisted petals give the flowers the appearance of miniature waterwheels. If there are any characters by which the Argentine forms of *L. divaricata* can be decisively separated from the North American forms of Larrea, they have yet to be pointed out. Every phase of the North American plant finds its duplication in the material from the continent to the south, and there seems no good reason why Cavanilles' name should not be applied to the northern plant.

162. **Viscainoa geniculata** (Kell.) Greene

Viscainoa geniculata Greene, Pittonia **1**:163. 1888.—*Staphylea geniculata* Kell., Proc. Calif. Acad. Sci. **2**:22. 1859.—*Chitonia simplicifolia* Wats. in Orcutt, West. Am. Sci. **2**:58. 1886. hyponym.—*Type locality:* North of Santa Rosalia Bay nearly opposite Elide Island, Lower California.

One of the most characteristic and widely distributed shrubs in the gulf area. Not observed on San Pedro Martir, San Pedro Nolasco, Raza, Patos, San Marcos, Coronados, or Danzante islands, but seen at all other stations in and about the gulf

(3052, 3208, 3230, 3269, 3338, 3457, 3582, 4194). The plant is a homely, rather dense, pallid evergreen shrub growing 15-25 or 30 dm. high. It is equally abundant on gravelly situations and on rocky hillsides, and appears particularly to like situations on and about cliffs. The petals are white and crepe-like. Goldman (Contr. U. S. Nat. Herb. **16**:346. 1916) and Curran (Proc. Calif. Acad. Sci. II, **1**:228. 1888) both have interesting accounts of this species.

XLI. Rutaceæ

163. **Esenbeckia flava** Brandg.

Esenbeckia flava Brandg., Zoe **1**:378, t.12. 1891.—*Type locality:* San José del Cabo, Lower California.

A strictly branched, erect-growing, deciduous shrub or small tree. It grows 2-4 m. high and frequently has a trunk 1-6 dm. high and 15-20 cm. thick. Observed only on San Josef (4087) and Catalina islands where it is locally common on gravelly plains or gravelly cañon floors.

164. **Thamnosma trifoliata,** n. sp.

A glabrous perennial with prostrate, wiry stems 3-6 dm. long; leaves remote, trifoliate, with slender petioles 1-5 mm. long; leaflets sessile or short petiolate, elliptical or oblong, the outer two more or less oblique, 5-14 mm. long, 3-8 mm. wide, light green above, pale beneath, apex rounded, margins finely crenate; flowers scattered; pedicels 1-4 mm. long; sepals united below, ovate or almost semicircular, 1-1.5 mm. long; flowers unknown; capsules deeply obcordate-lobed, 4-5 mm. high, 4-6 mm. wide, short stipitate or subsessile; ovules about 5 in each cell; seeds 2 in each cell, 2.5 mm. long, a little over 1 mm. in transverse diameter, bent and arched in lateral outline, pallid, densely roughened with uneven coarse fragile tubercules.

Type: No. 1286, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3892) in a gulch in the mountains back of **Agua Verde Bay, Lower California.**

Of this very distinct new species there was found but a single fruiting plant. It grew from a rock crevice and trailed over the bed of a rocky gulch which runs down the side of a huge amphitheater-like cañon in the Sierra Giganta just south of Agua Verde Bay (3892). The trifoliate leaves and prostrate wiry stems give the plant the general appearance of a species of Lotus. When bruised the plant exhaled a rue-like odor.

The nearest relative of *Thamnosma trifoliata* is *T. texana* Gray. It also seems close to *T. africana* Engler. The new species differs from *texana* in its prostrate habit, trifoliate leaves, and fewer, differently-shaped seeds. *Thamnosma africana* has trifoliate leaves but it is an erect plant with linear leaflets, a capsule 8-9 mm. high, and 8 seeds which are reniform and echinate. With the new addition, the genus now has five known species, two African and three American.

XLII. SIMARUBACEÆ

165. **Castela peninsularis** Rose

Castela peninsularis Rose, Contr. U. S. Nat. Herb. **12**:278. 1909.—*Castelaria peninsularis* Small, N. Am. Fl. **25**:231. 1911.—*Type locality:* San José del Cabo, Lower California.

Observed on Catalina, Santa Cruz (3918), San Diego (3928), San Josef (4088), San Francisco, Espiritu Santo (3983), and Ceralbo islands, and at San Evaristo Bay (4090). On San Diego and Santa Cruz islands the plant grows on seaward slopes or about seacliffs forming scraggly flat-topped growths 5-10 dm. high. At other localities it grows in gravelly or rocky soil back from the sea and formed an even, depressed, globose shrub 9-18 dm. high. The fruit is composed of several bright-red, cherry-like drupes which, though appearing appetizing, are in fact very bitter. The pedicels, petals, and sepals are red, but the 8 stamens are yellow. Brandegee (Zoe **2**:147. 1891 and Proc. Calif. Acad. Sci. II, **3**:120. 1891) reports this plant, under the name of *C. tortuosa,* as abundant in the cape region and gives some interesting notes regarding it.

XLIII. Burseraceæ

166. **Bursera cerasifolia** Brandg.

Bursera cerasifolia Brandg., Proc. Calif. Acad. Sci. II, **3**:121. 1891.—*Terebinthus cerasifolius* Rose, Contr. U. S. Nat. Herb. **10**:119. 1906.—*Elaphrium cerasifolia* Rose, N. Am. Fl. **25**:244. 1911.—*Type locality:* San José del Cabo, Lower California.

Referred here is the shiny-leaved copal collected on Espiritu Santo (4080) and observed on Ceralbo Island. The habits were those of *B. rhoifolia* from which it differs chiefly in its glabrous, shiny, simple, usually short-petiolate leaves.

167. **Bursera microphylla** Gray

Bursera microphylla Gray, Proc. Am. Acad. **5**:155. 1861. —*Terebinthus microphyllus* Rose, Contr. U. S. Nat. Herb. **10**:120. 1906.—*Elaphrium microphyllum* Rose, N. Am. Fl. **25**:250. 1911.—*Type locality:* Sierras Tule, Sonora.

A characteristic and ubiquitous tree in the gulf area. It was seen at Guaymas, Guadalupe Point, and La Paz (3042); at San Luis Gonzales, Tepoca (3289), Los Angeles (3482), Las Animas, San Francisquito, Coyote (4168), San Nicolas, Escondido, and San Evaristo bays; and on San Pedro Nolasco (3128), Tiburon (3246, 4273), Angel de la Guarda (3391), San Esteban (3186), San Marcos, Coronados, Carmen, Danzante, Monserrate, Catalina, Santa Cruz, San Diego, San Josef, San Francisco, Espiritu Santo, and Ceralbo islands. This plant, called "torote" by the natives, is a heavy-limbed, strong-scented tree which usually grows in gravel but by no means avoids rocky hillsides. Commonly a stout spreading tree 25 dm. high, but frequently forming a tree 75 dm. high. The older limbs have a yellowish oily papery exfoliating outer bark and a dark maroon inner bark. The odor of the tree is very similar to, but much stronger than, the cultivated *Schinus molle.* The southern plants seem to be larger and to have larger leaflets than do the northern plants.

168. **Bursera rhoifolia** (Benth.), n. comb.

Elaphrium rhoifolium Benth., Bot. Sulph. 10, t.10. 1844.—*Terebinthus rhoifolius* Rose, Contr. U. S. Nat. Herb. **10**:121. 1906.—*Bursera hindsiana* var. *rhoifolia* Engler in DC., Monog. Phan. **4**:59. 1883.—*Elaphrium hindsianum* Benth., Bot. Sulph. 10, t.8. 1844.—*Bursera hindsiana* Engler in DC., Monog. Phan. **4**:58. 1883.—*Terebinthus macdougalii* Rose, Torreya **6**:170, f.5. 1906.—*Elaphrium macdougalii* Rose, N. Am. Fl. **25**:255. 1911.—*Elaphrium epinnatum* Rose, N. Am. Fl. **25**:243. 1911.—*Elaphrium goldmani* Rose, N. Am. Fl. **25**:256. 1911.—*Type locality:* Magdalena Bay, Lower California.

A widely distributed but not an abundant tree in the gulf area. It was seen at Tepoca Bay (3292), San Luis Gonzales, Los Angeles (3484), Las Animas, and San Nicolas bays; and on Tiburon (3271), San Luis, Angel de la Guarda (3382), Tortuga (3597), Carmen, Catalina, and Santa Cruz islands. The tree grows 25-35 dm. high and has spreading heavy, dark-barked limbs.

This species varies in the number of pinnules developed, its leaves being sometimes simple and sometimes ternate. Bentham named the simple *(hindsiana)* and ternate *(rhoifolia)* forms, but as Brandegee (Proc. Calif. Acad. Sci. II, **2**:138. 1889) has remarked the leaf variation in this species seems unworthy of recognition. *Elaphrium epinnatum* Rose, is one of the simple-leaved forms of *rhoifolia,* and is not a relative of *B. cerasifolia* as its author suggests. The type of *E. goldmani* does not show anything which would separate it from forms referred to *rhoifolia,* although Goldman (Contr. U. S. Nat. Herb. **16**:340. 1916) writes that he recognized the plant as different in the field.

XLIV. Malpighiaceæ

169. **Janusia californica** Benth.

Janusia californica Benth., Bot. Sulph. 8, t.4. 1844.—*Type locality:* Magdalena Bay, Lower California.

Infrequent over the higher parts of Tortuga Island (3603) where it forms tangled masses in low shrubs. Flowering specimens were taken from an irrigated garden on Carmen Island (3832).

170. **Janusia gracilis** Gray

Janusia gracilis Gray, Pl. Wright. **1**:37. 1852.—*Type locality:* Mountains east of El Paso, Texas.

A wiry vine that grows in stony ground and twines up through bushes forming tangles in their upper branches. It was collected on San Esteban (3207) and Carmen (3838) islands, and at Guaymas (3109) and Mulegé (3696). The only previous record for the peninsula appears to be that of Goldman (Contr. U. S. Nat. Herb. **16**:340. 1916) from San Matias Pass.

171. **Mascagnia macroptera** (Moc. & Sesse) Niedenzu

Mascagnia macroptera Niedenzu, Gen. Masc. 27. 1908.—*Hiræa macroptera* Moc. & Sesse in DC., Prodr. **1**:586. 1824. —*Type locality:* Near Monterey, Nuevo Leon.

This plant was seen at Guaymas (3096), San Carlos Bay, San Pedro Bay, Santa Rosalia, San Nicolas Bay (3732), Loreto (3773), Carmen Island (3804), Danzante Island, Escondido Bay (3850), Monserrate Island, and Agua Verde Bay. It seems to have no definite habit of growth, appearing in the same locality either as a long trailing or twining vine, or as an erect shrub a meter or less high. It grows most frequently on gravelly soil, especially that of cañon floors, but at Guaymas it grew on a rocky hillside. At Santa Rosalia the plant was notable because of its extreme abundance in the broad rocky wash in the cañon directly back of the town.

172. **Thryallis angustifolia** (Benth.) Kuntze

Thryallis angustifolia Kuntze, Rev. Gen. **1**:89. 1891.—*Galphimia angustifolia* Benth., Bot. Sulph. 9, t.5. 1844.—*Type locality:* Cape San Lucas, Lower California.

Found only at San Nicolas Bay (3736). The plant was frequent locally growing in the shelter of shrubs in a sandy wash. The specimens collected have the oblong leaves of the variety *oblongifolia* Vail (Bull. Torr. Cl. **22**:228. 1895).

XLV. Euphorbiaceæ

173. **Acalypha californica** Benth.

Acalypha californica Benth., Bot. Sulph. 51. 1844.—*Type locality:* Magdalena Bay, Lower California.

Collections of Acalypha were made on Espiritu Santo (3974) and Tiburon (3274) islands, and at Los Angeles (3427), Las Animas (3517), Coyote (4176), Escondido (4127), and San Pedro (4316) bays. The peninsular Acalyphæ, as exemplified by the collected series and by the very large suite accumulated by Mr. Brandegee, show much variation. There are perhaps several different species in the aggregate, but the intricate synonymy and host of close-cut species in the genus, make it inadvisable, at present, to attempt a segregation.

174. **Adelia virgata** Brandg.

Adelia virgata Brandg., Zoe **4**:406. 1894.—*Type locality:* Sierra de la Laguna, Lower California.

Collected at San Pedro Bay (4310) and at Escondido Bay (4135), and recognized at Guadalupe Point, San Nicolas Bay, Loreto, San Evaristo Bay, San Josef Island, Espiritu Santo Island, and Ceralbo Island. Besides the type, Brandegee has collections from San José del Cabo and Comondú. It is infrequent in gravelly washes, becoming a slender shrub 15-25 dm. high with few long usually widely spreading branches. The leaves are borne in loose fascicles on the numerous low woolly spurs studding the branches. *Adelia vaseyi* (Coulter) Pax of western Texas seems to be a very close relative of this species.

175. **Cnidoscolus palmeri** (Wats.) Rose

Cnidoscolus palmeri Rose, Contr. U. S. Nat. Herb. **12**:282. 1909.—*Jatropha palmeri* Wats., Proc. Am. Acad. **24**:76. 1889.—*Type locality:* Mountains about Guaymas, Sonora.

This is a weak, rather open, shrub usually 9-15 dm. high which seems to be restricted to rock crevices, particularly on rocky cañon sides. The leaves are nearly semicircular in outline and light green in color. The stems and leaves of the plant are more or less abundantly provided with long stinging hairs. When coming in contact with the skin these hairs feel like hot needles and later cause an aggravating itch. The calyces are white, tinged with green. The species was collected at Danzante Island (3863), Agua Verde Bay (3886), Santa Cruz Island (3919), Espiritu Santo Island (3996), and Ceralbo Island (4061). Previously known only from the type collection and from Goldman's (Contr. U. S. Nat. Herb. **16**:341. 1916) collections from near San Ignacio. It occurred in fair abundance at every locality where found, but was particularly common about the Isthmus on Espiritu Santo Island.

176. **Croton californica** Muell. Arg.

Croton californica Muell. Arg. in DC., Prodr. **15**^{2}:691. 1862.—*Croton arenicola* Rose & Standley, Contr. U. S. Nat. Herb. **16**:12. 1912.—*Type locality:* Near San Francisco, California.

Found on the dunes and in sandy draws at Tepoca Bay, San Luis Gonzales Bay (3345), Tiburon Island (3261, 4249), Kino Point, San Pedro Bay (4323), Monserrate Island, and La Paz.

177. **Croton magdalenæ** Millsp.

Croton magdalenæ Millsp., Proc. Calif. Acad. Sci. II, **2**:220. 1889.—*Type locality:* Magdalena Island.

An erect, white, tomentose shrub 10-22 dm. high which commonly grows on rocky cañon floors. It was noted on Carmen (3809), Danzante, Monserrate, Santa Cruz, San Diego, San Josef, San Francisco, Espiritu Santo (3970), and Ceralbo (4055) islands; and at Escondido (4125), Agua Verde (3890), and San Pedro (4301) bays.

178. **Ditaxis brandegei** (Millsp.) Rose & Standley

Ditaxis brandegei Rose & Standley, Contr. U. S. Nat. Herb. **16**:13. 1912.—*Argythamnia brandegei* Millsp., Proc. Calif. Acad. Sci. II, **2**:220. 1889.—*Type locality:* San Gregorio, Lower California.

A very open, shrubby plant 10-25 dm. high with but few widely spreading elongate branches. The stems are very coarse, glabrous, pale green, and usually bear foliage only a short distance (10-15 cm.) below the growing tip. The trunk of the plant, which is 1-2 cm. thick and 3-10 dm. high, is decidedly woody, but the coarse rubbery-appearing branches, which are 5-9 mm. thick, are pithy. All parts of the plant turn purplish on drying. The plant usually selects gravelly soil in cañons, but it also grows in gypsum and on rocky hillsides. It was generally common at no locality, usually occurring in varying abundance in small areas at each station. It was seen at the following localities,—Angel de la Guarda Island (3402), San Marcos Island (3628), Mulegé (3693), Guadalupe Point (4157), Coyote Bay (4170), San Nicolas Bay (3733), Coronados Island (3764), Loreto (3794), Carmen Island (3818), Escondido Bay (3847), and Agua Verde Bay (3911). The collections from Guadalupe Point, San Nicolas Bay, Coronados Island, and Carmen Island differ from the others in having the fruit covered with yellowish appressed hispid hairs and in having similar hairs scattered over the foliage. This pubescent form, which may be called **D. brandegei** var. **intonsa** *(type,—Johnston 3764,* No. 1286_a, Herb. Calif. Acad. Sci.), is the only conspicuous variation of the species. The species commonly has 10 stamens placed in two series, and seems clearly to belong near *D. cyanophylla* in the monograph by Pax (Pflanzenr. $\mathbf{4}^{147\,\mathrm{VI}}$:66. 1912), for the flowers are borne in well developed racemes characteristic of the section Serophyton of that work. It should be noted, however, that Pax has reversed the proper application of Aphora and Serophyton, the type species of these sections not occurring under the sections which they typify.

179. **Ditaxis lanceolata** (Benth.) Pax & Hoffm.

Ditaxis lanceolata Pax & Hoffm., Pflanzenr. **4**[147 VI] :71. 1912.—*Serophyton lanceolatum* Benth., Bot. Sulph. 52. 1844. —*Argythamnia sericophylla* Gray in Wats., Bot. Calif. **2**:70. 1880.—*Ditaxis sericophylla* Heller, Cat. N. Am. Pl. 5. 1898. —*Argythamnia sericophylla* var. *verrucosemina* Millsp., Proc. Calif. Acad. Sci. II, **2**:221. 1889.—*Type locality:* Magdalena Bay, Lower California.

This is a monœcious perennial with a coarse taproot, a twiggy caudex, and a crown of numerous slender subsimple silky branches. It grows selfsupporting or up through other plants, and though occasionally widely spreading or subprostrate it is usually strictly or ascendingly branched and 2-9 dm. high. It grows usually in gravelly or sandy washes but occasionally also on rocky hillsides. Collections were made at Angel de la Guarda Island (3390, 4209), San Esteban Island (3206), San Francisquito Bay (3578), Mulegé (3698), San Nicolas Bay (3726), Espiritu Santo Island (3973, 4008), and La Paz (3036). A study has been made of a photograph of the type of *Serophyton lanceolata* and of topotype material, and it is found that these differ from *Argythamnia sericophylla,* the type of which has been seen, only in a slightly greater breadth of leaf. This sole difference is entirely obliterated by perfect intergradation in the suite of specimens studied.

180. **Ditaxis serrata** (Torr.) Heller

Ditaxis serrata Heller, Cat. N. Am. Pl. 5. 1898.—*Aphora serrata* Torr., Bot. Mex. Bound. 197. 1858.—*Argythamnia serrata* Muell. Arg., Linnæa **34**:147. 1865.—*Ditaxis odontophylla* Rose & Standley, Contr. U. S. Nat. Herb. **16**:12. 1912. —*Argythamnia serrata* var. *magdalenæ* Millsp., Proc. Calif. Acad. Sci. II, **2**:221. 1889.—*Type locality:* Near Fort Yuma, Arizona.

Forming prostrate growths in gravelly or sandy places, and frequently also on rocky hillsides. It is usually annual, but not infrequently becomes perennial. As treated here the species is probably an aggregate. The material from San Luis Gonzales Bay (3332), Angel de la Guarda Island (3356, 4217, 4240, 4410), San Esteban Island (3180), Tiburon Island (4266), South San Lorenzo Island (3531), Tortuga Island (3595), San Marcos Island (3643), Mulegé (3697), and Guadalupe Point (4156), all seem to be quite similar to the Californian plants. Most of the material from California has subentire, acute, oblong-lanceolate, or -oblanceolate leaves, developments which the cited material shows. Among the plants mentioned the material from Angel de Guarda, San Esteban, and South San Lorenzo islands seems to be perennial, to grow larger, and to have narrower leaves. The specimen from San Marcos Island has a notably dense pubescence. Plants collected along the Sonoran coast at Tepoca Bay (3291), Tiburon Island (3255), and Kino Point (4289) show a tendency to be sparsely pubescent and to have the leaves obtuse and drying reddish. Specimens from San Francisquito Bay (3553) have obtuse leaves which are serrate on the end, and have seeds with granulate surfaces. As to seeds, leaf-margin, and leaf-shape, this latter collection is *Ditaxis serrata* var. *magdalenæ,* but the type of that variety has green, very large (25-40 mm. long), sparsely pubescent leaves, whereas the San Francisquito plant has leaves half as large, canescent, and densely pubescent. The meagre material at hand seems to show that most of the plants in the south of the peninsula have obtuse leaves with terminal serrations. These southern plants, however, vary considerably in pubescence, size of leaf, and marking of the seed. Completing the collected series is a form from La Paz (3073) with reddish lanceolate leaves and dense long spreading hispid pubescence.

181. **Euphorbia arizonica** Engelm.

Euphorbia arizonica Engelm. in Torr., Bot. Mex. Bound. 186. 1859.—*Euphorbia bartholomæi* Greene, Pittonia **1**:290. 1889.—*Chamæsyce bartholomæi* Millsp., Pub. Field Mus. Bot. **2**:408. 1916.—(?) *Euphorbia pondii* Millsp., Contr. U. S. Nat. Herb. **1**:12. 1890.—*Type locality:* Sierra Yanos, Sonora.

This species, characterized by its loose habit, sparse spreading pubescence, and large white or frequently pink involucral appendages, is very frequent on a broad cañon floor at Agua Verde Bay (3878). Brandegee has collections from the Sierra de la Laguna, and from Natividad Island. *Euphorbia pediculifera* var. *minor* Millsp. (Proc. Calif. Acad. Sci. II, **2**:227. 1889) has the habits of this species but its appendages are much reduced. It does not, however, have anything to do with *E. pediculifera.*

182. **Euphorbia capitellata** Engelm.

Euphorbia capitellata Engelm. in Torr., Bot. Mex. Bound. 188. 1859.—*Chamæsyce capitellata* Millsp., Pub. Field Mus. Bot. **2**:408. 1916. — *Euphorbia capitellata* var. *laxiflora* Wats., Proc. Am. Acad. **24**:74. 1889.—*Type locality:* Valley of San Bernardino, Sonora.

Very common and erect-growing on the rocky hills about Coyote Bay (4173). At San Carlos Bay (4369) it was infrequent and prostrate in a wash. A small colony was also found on a railroad enbankment at Guaymas (3120).

183. **Euphorbia carmenensis** Rose

Euphorbia carmenensis Rose, Contr. U. S. Nat. Herb. **1**:133. 1892.—*Chamæsyce carmenensis* Millsp., Publ. Field Mus. Bot. **2**:408. 1916.—*Type locality:* Carmen Island.

Apparently most at home in decomposed granite on hillsides and on benches, but also occurring in washes and on dunes. It is a plant with a depressed shrubby base and forms flat circular growths 8-30 cm. broad and 3-8 cm. high. Collected on Carmen (3800, 3842), Catalina (4103), Santa Cruz (3921), and San Diego (3925) islands. At all localities the plant was heavily infested with cecidomyid galls. The San Diego collections have evident white involucral appendages; the others are unappendaged. The species has a distinct aspect but is hard to separate from some forms of *E. polycarpa,* the best characters being the occurrence of galls, island range, small oblong leaves, and a peculiar flattened shrubby habit.

184. **Euphorbia ceroderma,** n. sp.

A leafless, yellow-green perennial forming broad dense erect clumps 5-10 dm. high; stems numerous, 4-6 mm. thick, covered with a thick wax coat, with one or two strictly ascending branches; involucres in small subsessile glomerules borne along the stem, yellow, unisexual by abortion, turbinate, glabrate, about 1 mm. high, lobes none, with 5 transversely oblong conduplicate yellow glands which have evident yellow acute ovate or cordate irregularly-margined appendages 1-1.5 mm. long; female involucres few, with small appendages and pedicels with 3 conspicuous slender reddish compressed whip-like bracts 12-18 mm. long; ovary glabrous; style divided.

Type: No. 1287, Herb. Calif. Acad. Sci., collected July 7, 1921, by I. M. Johnston (no. 4304) from rocky cañon sides at **San Pedro Bay, Sonora.**

Apparently related to *E. antisiphylitica* with which it agrees in habit, but from which it differs in its wax-coated stems, much smaller glomerate glabrous involucres, and in its widely separated range. The filiform bracts are similar to those in the very different *E. dioscoreoides* while the habit suggests that of a slender plant of *Pedilanthus macrocarpus.* The new species is common on the rocky cañon sides about San Pedro Bay (4304), and is very abundant on the rocky volcanic slopes about San Carlos Bay.

185. **Euphorbia chamberlini,** n. sp.

A perennial 10-15 cm. high with erect or ascending slender herbaceous stems which are mainly branched below, young parts sordid with a dense oily villous pubescence, old parts sparsely short-villous; leaves opposite, ovate, entire, apex obtuse, base rounded or slightly cordate, old leaves becoming roseate glabrate and a little glaucous, blade 5-8 mm. long and 4-6.5 mm. wide, petiole 0.5-2.0 mm. long; stipules united to form a deltoid scale which is frequently bifid with acuminate lobes; involucres aggregated into close very leafy capitate clusters terminating branches or branchlets, turbinate, pubescent outside, 1.2 mm. long, with 5 linear lobes and 4 appendaged glands; glands reddish-brown, rather small, short-oblong; involucral appendages white, less than 3 mm. long and

1 mm. wide, deeply lobed; capsule pubescent, spherical-ovate, about 1.2 mm. long, obtusely 3-angular; seeds ashy, prismatic, 1 mm. long, smooth or the faces transversely wrinkled.

Type: No. 1288, Herb. Calif. Acad. Sci., collected June 14, 1921, by I. M. Johnston (no. 4136) on an alluvial plain at **Escondido Bay, Lower California.**

Frequent in gravelly soil among bushes on the detrital plain near the foot of the Sierra Giganta back of Escondido Bay (4136). This is a well-marked species whose outstanding characters are its lobed involucral appendages and capitate inflorescence. It suggests *E. pycnanthema,* but differs in its smaller, entire leaves and lobed appendages. From *E. capitellata,* which is probably its nearest relative, it differs in habit, pubescence, shape of leaves, and smaller lobed appendages. The species is named for Joseph Chamberlin, companion of the author when the type was collected while tramping boatward after an eventful day spent high in the Sierra Giganta.

186. **Euphorbia eriantha** Benth.

Euphorbia eriantha Benth., Bot. Sulph. 51. 1844.—*Poinsettia eriantha* Rose & Standley, Contr. U. S. Nat. Herb. **16**:13. 1912.—*Type locality:* Magdalena Bay, Lower California.

Collected in washes at Angel de la Guarda Island (4208), Tiburon Island (4255), Los Angeles Bay (3478), and San Francisquito Bay (3576). It was noted as very common on the rocky hillsides about Coyote Bay. The plant was very common at Coyote Bay and at the south end of Angel de la Guarda Island, but elsewhere only a few scattered plants were seen. It is an annual with one to several strict stems 2-3 dm. high or occasionally even 8 dm. in height.

187. **Euphorbia hypericifolia** L.

Euphorbia hypericifolia L., Sp. Pl. 454. 1753.—*Chamæsyce hypericifolia* Millsp., Pub. Field Mus. Bot. **2**:302. 1909. —*Type locality:* West Indies.

A common weed in the cultivated fields at Mulegé (3673). Brandegee has collections from Purisima, west side of Cape

Region, Todos Santos, and Cañon San Bernardo. Narrow-leaved plants referable to *E. brasiliensis,* have been repeatedly collected about San José del Cabo.

188. **Euphorbia incerta** Brandg.

Euphorbia incerta Brandg., Proc. Calif. Acad. Sci. II, **3**:171. 1891.—*Chamæsyce incerta* Millsp., Pub. Field Mus. Bot. **2**:409. 1916.—*Type locality:* El Mogote opposite La Paz, Lower California.

Collected on San Francisco Island (3944) where frequent on a sand-beach forming a narrow belt along the high-tide line, and at La Paz (4010) where a populous colony was found on the dunes of El Mogote. It is a coarse herbaceous plant of variable habit. On the island the stems were prostrate and buried in the sand with only the foliage and branchlets exposed, but at La Paz the stems were strict or ascending and unburied. The stems are covered with a thick even coat of gluten which is usually holding sand grains to its full capacity.

189. **Euphorbia leucophylla** Benth.

Euphorbia leucophylla Benth., Bot. Sulph. 50. 1844.—*Chamæsyce leucophylla* Millsp., Pub. Field Mus. Bot. **2**:410. 1916.—*Euphorbia velutina* Greene, Bull. Calif. Acad. Sci. **2**:57. 1886.—*Euphorbia biserrata* Millsp., Zoe **1**:347. 1891.—*Type locality:* Cape San Lucas, Lower California.

Seen only at Kino Point (4283), Tiburon Island (4246), La Paz (4009), and Ceralbo Island (4021), at all of which stations it was locally common on dunes along the ocean. The plant is perennial and forms circular mats 2-6 dm. broad. The stems are widely ascending and the plant may become 15 cm. high, but usually the stems are buried in the sand and the plant is only a few centimeters in height. Brandegee (Proc. Calif. Acad. Sci. II, **3**:168. 1891) has very full notes on this species.

190. **Euphorbia magdalenæ** Benth.

Euphorbia magdalenæ Benth., Bot. Sulph. 50. 1844.—*Chamæsyce magdalenæ* Millsp., Pub. Field Mus. Bot. **2**:410. 1916.—*Euphorbia blepharostipula* Millsp., in Vasey & Rose, Contr. U. S. Nat. Herb. 1:77. 1890.—*Euphorbia watsoni* Millsp., Zoe 1:347. 1891.—*Chamæsyce watsoni* Millsp., Pub. Field Mus. Bot. 2:412. 1916.—*Type locality:* Magdalena Bay, Lower California.

A dense, slender-stemmed shrub forming globose bushes 4-10 dm. high. It grows most commonly in gravelly soil, but is not infrequent on rocky hillsides. The involucres are frequently deformed to form elongate cylindrical structures. According to Mr. Van Duzee these are characteristic cecidomyid galls. On Ceralbo Island the plants were so browsed that they formed prostrate mats. The plant was seen on San Marcos (3647), Coronados, Carmen (3819, 3828), Danzante, Monserrate, Santa Cruz, San Diego (3931), San Josef, San Francisco (3960), Espiritu Santo (3997), and Ceralbo (4047, 4061) islands; and at Mulegé (3661), Coyote Bay, Guadalupe Point (4153), San Nicolas Bay, Loreto, Escondido Bay, Agua Verde Bay, and La Paz (3035). It was also seen at San Pedro Bay in Sonora. *Euphorbia blepharostipula* from La Paz, and *E. watsoni* from Todos Santos are practically identical with material from Magdalena Bay.

191. **Euphorbia misera** Benth.

Euphorbia misera Benth., Bot. Sulph. 51. 1844.—*Tricherostigma miserum* Kl. & Garcke, Abh. Akad. Berlin 1859[1]:41. 1860.—*Euphorbia benedictum* Greene, Pittonia 1:263. 1889. —*Tricherostigma benedictum* Millsp., Addisonia 2:3, t.42. 1917.—*Type locality:* San Diego, California.

A stout, rather flexible-stemmed, erect-growing, very lactiferous shrub 6-12 dm. high. It was seen only at Tepoca Bay (3308) where it was common on the stony gently sloping plain back of the beach, and on San Marcos Island (3624) where it was frequent in a gypsum ravine. *Euphorbia misera* differs from *E. californica* Benth., the type of which came from Magdalena Bay, only in its pubescence, usually coarser stems, and generally more northerly range. The habit-difference is not always positive and some pubescent plants are slender-stemmed. Brandegee has a specimen, definitely referred to *E. hindsiana* by Millspaugh (Zoe 1:348. 1891), which comes from Magdalena Island and which is as pubescent as topotypes of *E. misera* from San Diego. Furthermore the original plate of *E. californica* (Bot. Sulph. t. 23b) shows pubescence on the leaves and involucres. It is evident, therefore, that satisfactory characters for the differentiation of *E. misera* and *E. californica* have yet to be pointed out.

192. **Euphorbia pediculifera** var. **involuta** (Millsp.), n. comb.

Euphorbia involuta Millsp., Proc. Calif. Acad. Sci. II, **2**:227. 1889.—*Chamæsyce involuta* Millsp., Pub. Field Mus. Bot. **2**:410. 1916. — *Euphorbia conjuncta* Millsp., Proc. Calif. Acad. Sci. II, **2**:227. 1889.—*Chamæsyce conjuncta* Millsp., Pub. Field Mus. Bot. **2**:408. 1916.—*Type locality:* Comondú, Lower California.

This variety was collected at San Luis Gonzales Bay (3331), Angel de la Guarda Island (4216), Tiburon Island (4265), San Marcos Island (3641), Coyote Bay (4412), Agua Verde Bay (3879), and Espiritu Santo Island (3991a). It is a canescent prostrate herbaceous plant usually growing in sandy washes. At San Marcos Island it was called "golondrina". Millspaugh's two species are evidently the same, and at best represent a small narrow-leaved form of *pediculifera*. Watson's variety *linearifolia* (Proc. Am. Acad. **24**:76. 1889) from Guaymas, differs from *involuta* in its much larger leaves, glabrate stems and foliage, and much more open habit of growth. The variety *involuta* seems to be the peninsular form of *E. pediculifera*, and, like the typical form, is characterized by cylindrical seeds with several strong encircling ridges.

193. **Euphorbia polycarpa** Benth.

Euphorbia polycarpa Benth., Bot. Sulph. 50. 1844.—*Chamæsyce polycarpa* Millsp., Pub. Field Mus. Bot. **2**:411. 1916.—*Euphorbia purisimana* Millsp., Proc. Calif. Acad. Sci. II, **2**:225. 1889.—*Chamæsyce purisimana* Millsp., Pub. Field Mus. Bot. **2**:411. 1916.—*Euphorbia brandegei* Millsp., Proc. Calif. Acad. Sci. II, **2**:226. 1889.—*Chamæsyce brandegeei* Millsp., Pub. Field Mus. Bot. **2**:408. 1916.—(?) *Euphorbia pediculifera* var. *minor* Millsp., Proc. Calif. Acad. Sci. II, **2**:227. 1889.—*Type locality:* Magdalena Bay, Lower California.

The satisfactory delimitation of this species is extremely difficult, and, though the present treatment is the result of several days' study, it is far from satisfying. The species is highly variable, presenting forms that vary from small to large, herbaceous to shrubby, slender to stout, and glabrous to variously pubescent, and have involucres varying from appendaged to unappendaged. It is evident that either a host of trivial "new species" should be described or that the accepted concept should be broadened to allow for more variation. The latter course is chosen.

Typical *E. polycarpa,* judging from topotypes accumulated by Mr. Brandegee, is an open, very slender, almost delicate, prostrate, herbaceous, glabrous plant with evident white involucral appendages. Millspaugh's *E. brandegei,* from the type locality of *E. polycarpa,* seems to be exactly typical *E. polycarpa,* and the same seems also true of *E. purisimana. Euphorbia pediculifera* var. *minor* has nothing to do with *pediculifera,* but appears rather to be a *polycarpa* ally. It differs from the slender forms of *polycarpa* in its short-villous vegetative parts.

As here taken, *E. polycarpa* is not restricted to the slender form mentioned, which seems to occur only on and about the Magdalena Plain, but also includes the stouter forms common in the cape region as well as indistinguishable plants from southern California. These plants are glabrous or practically so, sometimes inconspicuously glandular, and frequently glaucous. In the gulf area this type of plant was found only south of Tortuga Island (3594), the region north of that point being occupied by forms which are quite pubescent. The series collected is very uniform. The most outstanding variation being a collection from Carmen Island (4148) which grew on the dunes at the Saltworks and became shrubby, forming rounded growths 37 cm. high and 5 dm. broad. Two collections from a hillside on Espiritu Santo Island (3977, 4005) have become somewhat shrubby below and simulate, if, indeed, they do not actually approach, *E. carmenensis.* The common forms found in the gulf area grew in sandy or gravelly soil producing herbaceous mats 5-35 cm. broad. (3056, 3072, 3594, 3666, 3679, 3717, 3792, 3867, 3945, 3991, 4022, 4044, 4082, 4088, 4152, 4166, 4325.)

194. **Euphorbia polycarpa** var. **hirtella** Boiss.

Euphorbia polycarpa var. *hirtella* Boiss. in DC., Prodr. **15²**:44. 1862.—*Chamæsyce polycarpa* var. *hirtella* Millsp. in Parish, Carnegie Inst. Wash. Pub. **193**:110. 1913. —*Chamæsyce tonsita* Millsp., Pub. Field Mus. Bot. **2**:412. 1916. —*Type locality:* Given as "California", but probably along the Gila River in Arizona.

Perhaps this variety is restricted unduly in making it include only those non-insular plants of the northern gulf region which have a more or less dense spreading grayish pubescence. As here taken, the variety *vestita* differs only in its more densely appressed white pubescence, and the variety *petrina* differs only in its generally brown color and lack of involucral appendages. The varietal name "*hirtella*" is with doubtful propriety applied to the present concept. The type of the variety *hirtella* is the Emory collection (cf. Bot. Mex. Bound. 186. 1858) given as having come from the Gila River Valley, a locality from which only material of the variety *vestita* has been seen. At any rate, the plants referred to *hirtella* are similar to those of the species in habits, affecting sandy or gravelly soil and forming prostrate mats. Material was collected at San Marcos (3639, 3642, 4180), San Luis (3316), and Tiburon (3262, 4264) islands; and from San Francisquito (3567), Las Animas (3495), Los Angeles (3447), San Luis Gonzales (3330), and Tepoca (3307) bays. Parish (10830) has similar material from Cottonwood Springs in the Colorado Desert.

195. **Euphorbia polycarpa** var. **petrina** (Wats.), n. comb.

Euphorbia petrina Wats., Proc. Am. Acad. **24**:75. 1889.—*Chamæsyce petrina* Millsp., Pub. Field Mus. Bot. **2**:411. 1916. —*Type locality:* San Pedro Martir Island.

The claim of this form to the rank of variety, to say nothing of species, is very weak. The only characters by which it can be separated from the variety *hirtella* are its small unappendaged involucres and brown instead of grayish color of the whole plant. These characters, particularly the first mentioned, separate the plants from San Pedro Martir (3155), South San Lorenzo (3531), Angel de la Guarda (3363, 3404, 4213, 4239, 4417), San Esteban (3169), Partida (3237), and

Sal si Puedes (3524) islands and as well a peninsular specimen collected by Brandegee at San Esteban. The segregation, however, is not always sharp and the characters not always concomitant; for example, in the Sal si Puedes specimens, the appendages are lacking and the leaves are grayish instead of brown in color. With two exceptions (4213, 4417) the specimens from San Esteban, South San Lorenzo, and Angel de la Guarda islands all hugged the ground very closely and have stiff absolutely prostrate stems and minute crowded brown leaves. The variety commonly grows in rocky ground on hillsides.

The following synopsis shows the relations and characters of the peninsular Euphorbias constituting the section Anisophyllum:

Leaf margins serrate, crenate, or at least not entire.
  Annual herbs.
    Plants prostrate; leaves small, 4-8 mm. long............. *E. hirtula*
    Plants erect or ascending; leaves 8-40 mm. long.
      Involucres few, appendages lacerate; leaves 8-14 mm. long.. *E. dentosa*
      Involucres glomerate, appendages entire; leaves 15-40 mm. long.
        Leaves oblong, 8-17 mm. broad................. *E. hypericifolia*
        Leaves linear or falcate, 4-6 mm. broad.......... *E. brasiliensis*
  Perennials.
    Involucres conspicuously appendaged, loosely arranged in axils of upper leaves; canescent seashore plants with decumbent or widely spreading herbaceous stems................................ *E. leucophylla*
    Involucres inconspicuously appendaged, in definite capitate clusters; brownish hillside plants with erect or ascending branches.
      A small shrub 2-8 dm. high; inflorescence loose; plant not simulating a labiate.................. *E. tomentulosa*
      A tufted plant 1-2 dm. high; inflorescence very dense; plant simulating a labiate............... *E. pycnanthema*
Leaf margins entire.
  A bushy dense shrub 4-10 dm. high..................... *E. magdalenæ*
  Lowly herbaceous annuals or perennials, only occasionally woody below.
    Seeds globose, smooth; stems coarse, decidedly glutinous; seashore.................................. *E. incerta*

Seeds prismatic or cylindrical, usually definitely rugose; stems slender, not glutinous.
Seeds cylindrical, completely encircled by 4 strong grooves .... *E. pediculifera*
Seeds prismatic, not completely encircled by grooves.
Leaves large, 8-28 mm. long, 4-12 mm. wide...... *E. peninsularis*
Leaves small to middle-sized, always less than 1 cm. long and 8 mm. wide.
Involucres in capitate clusters.
Plants glabrate, slender; leaves oblong; appendages entire............................ *E. capitellata*
Plants hirsute, stouter; leaves ovate; appendages lobed.......................... *E. chamberlini*
Involucres loosely arranged, not crowded into capitate clusters.
Annuals; appendages lacerate........................ *E. schizoloba*
Perennials; appendages entire.
Leaves oblong, 2-6 mm. long, 1-2 mm. wide; plants usually with cecidomyid galls... *E. carmenensis*
Leaves ovate to oblong-ovate, 2-11 mm. long, 1.5-8 mm. wide; plants uninfested by cecidomyids.
Pubescence rather sparse, spreading; appendages large, usually colored......... *E. arizonica*
Pubescence if present rather short and dense.
Plant glabrate .... *E. polycarpa*
Plant evidently pubescent.
Pubescence appressed, clean and white... *E. p. vestita*
Pubescence spreading, sordid or dark.
Appendages evident; plant ashy....... *E. p. hirtella*
Appendages lacking; plant brownish .. *E. p. petrina*

196. **Euphorbia tomentulosa** Wats.

Euphorbia tomentulosa Wats., Proc. Am. Acad. **22**:476. 1887.—*Chamæsyce tomentulosa* Millsp., Pub. Field Mus. Bot. **2**:412. 1916.—*Type locality:* Rosario, Lower California.

A small, erect-growing, flat-topped, rather open bush 2-8 dm. high, which is of infrequent occurrence on hillsides, rocky benches, and gravelly washes. It was seen on Tiburon (4276), Carmen (3801, 4147), and Espiritu Santo (3993) islands; and at San Carlos (4371), San Pedro (4324), Coyote (4174, 4175), San Nicolas (3727), Loreto (3783), and San Evaristo (4094) bays.

197. **Euphorbia xanti** Engelm.

Euphorbia xanti Engelm. in Boiss., DC., Prodr. **15**²:62. 1862.—*Euphorbia gymnoclada* Engelm., Proc. Am. Acad. **5**:171. 1861.—*Aklema xanti* Millsp., Pub. Field Mus. Bot. **2**:417. 1916.—*Type locality:* Cape San Lucas, Lower California.

Collected only at San Francisquito Bay (3551, 3559) and on Tortuga Island (3609), where at the former station it was infrequent and local along a shallow sandy draw near the shore, and at the latter very abundant on lava slopes about the east rim of the crater. A few bushes were seen in sandy soil at San Nicolas Bay and some on a cañon side in the Sierra Giganta back of Escondido Bay. It is usually a more or less erectly-branched, broom-like shrub 15-25 dm. high, but at times divaricately branched and forming low rounded bushes, or more frequently supported by brush or cacti and forming intricate globose masses a meter or more above ground. The leaves are glabrous, ternate, early deciduous, and vary from linear to ovate in outline. The involucral appendages are white at first, but later turn pink.

198. **Jatropha canescens** Muell. Arg.

Jatropha canescens Muell. Arg. in DC., Prodr. **15**²:1079. 1866.—*Mozinna canescens* Benth., Bot. Sulph. 52, t. 25. 1844. —*Type locality:* Magdalena Bay, Lower California.

A shrub or small tree with ascending branches, 15-35 dm. high. The plant is typical of sandy soils. Its rather flexible branches appear to drop their leaves during the summer months. On the peninsula it was frequent northward at least to Loreto (3782). In Sonora it was seen at Kino Point (4288), San Pedro Bay, San Carlos Bay (4355), and Guaymas.

199. **Jatropha spathulata** var. **sessiliflora** (Hook.) Muell. Arg.

Jatropha spathulata var. *sessiliflora* Muell. Arg. in DC., Prodr. **15**²:1082. 1866.—*Mozinna spathulata* var. *sessiliflora* Hook., Icones **4**: t. 357. 1841.—*Type locality:* Zacatecas.

Ubiquitous in the gulf area, growing with equal frequency in alluvial soils and on hillsides. It is an open shrub 14-18 dm. high composed of rather numerous ascending stems which are loosely branched and form a flat top. The limbs are quite flexible and the twigs are heavily spurred. The juice is brownish. The leaves being shed after the growing season, only naked plants were found. A few flowers were seen at San Pedro Bay (4328) where they had appeared following a light shower that had occurred a week previous. The shrub was usually common at each station, but was not found on the following islands,—San Pedro Nolasco, San Pedro Martir, Patos, Georges, San Luis, Raza, Sal si Puedes, North San Lorenzo, Santa Inez, and Ildefonso.

200. **Manihot angustiloba** (Torr.) Muell. Arg.

Manihot angustiloba Muell. Arg. in DC., Prodr. 15^2:1073. 1866.—*Janipha manihot* var. *angustiloba* Torr. Bot. Mex. Bound. 199. 1857.—*Type locality:* Santa Cruz, Sonora.

A lactiferous, weak, very openly and little branched shrub 9-12 dm. high. A few plants were found growing on the bed of a narrow cañon at San Carlos Bay (4738).

201. **Pedilanthus macrocarpus** Benth.

Pedilanthus macrocarpus Benth., Bot. Sulph. 49, t. 23a. 1844.—*Hexadenia macrocarpa* Kl. & Garcke, Abh. Akad. Berlin 1859^1:107. 1860.—*Type locality:* Magdalena Bay, Lower California.

A coarse-stemmed leafless plant which forms rank clumps 6-12 dm. high. It occasionally grows in sandy soil but appears to prefer rocky hillsides. The plant is very milky and is difficult to dry. The involucres and fruit are bright red. It was noted at La Paz, Espiritu Santo Island, San Evaristo Bay, San Nicolas Bay, San Francisquito Bay (3549), and San Pedro Nolasco Island (3124).

202. **Sapium biloculare** (Wats.) Pax

Sapium biloculare Pax in Engler, Pflanzenr. **4**[147V]:153. 1912. —*Sebastiana bilocularis* Wats., Proc. Am. Acad. **20**:374. 1885. —*Type locality:* Between Rayon and Ures, Sonora.

Found at Guaymas (3098), San Carlos Bay, San Pedro Bay (4332), and Tiburon Island (4277). At Guaymas growing on a steep hillside, but at the other stations on gravelly washes. It is an upright shrub or small tree 17-30 dm. high, and seemed to be nowhere abundant.

203. **Sapium biloculare** var. **amplum,** n. var.

Leaves large, blade 4-7 cm. long and 1-3 cm. wide; spikes usually longer than in the species.

Type: No. 1289, Herb. Calif. Acad. Sci., collected May 19, 1921, by I. M. Johnston (no. 3772) on a sandy plain at **Loreto, Lower California.**

This plant was seen only at Guadalupe Point (4161), Loreto (3772), and Agua Verde Bay where it grew on gravelly plains and formed a large shrub or small tree 25-45 dm. high. At Loreto it was called "yerba de flecha" and was the only green tree left untouched by woodcutters and cattle. This variety includes all the peninsular plants formerly referred to the species, and of which Goldman (Contr. U. S. Nat. Herb. **16**:343. 1916) has given interesting data. It differs from the Sonoran plant in having leaves at least twice as large and proportionately much broader, and in having its spikelets averaging a little longer.

XLVI. Buxaceæ

204. **Simmondsia chinensis** (Link) Schneider

Simmondsia chinensis Schneider, Ill. Handb. Laubholzk. **2**:141. 1907.—*Buxus chinensis* Link, Enum. Pl. **2**:386. 1822. *Simmondsia californica* Nutt., London Jour. Bot. **3**:400, t. 16. 1844.—*Brocchia dichotoma* Mauri, Cat. Ort. Napol. 80. 1845. —*Simmondsia pabulosa* Kell., Proc. Calif. Acad. Sci. **2**:21. Jan. 1860.—*Galphimia pabulosa* Kell., Hesperian **4**: plate facing p. 392. Nov. 1860.—*Type locality:* Given as doubtfully from China, but probably from San Diego, California.

A common and wide-spread, but not very conspicuous, shrub 10-15 dm. high. It frequents gravelly cañon floors and rocky slopes. On the peninsular side of the gulf (3580, 4403) it was seen at practically every station south of Los Angeles Bay, and on the Sonoran side at Guaymas, San Pedro Nolasco Island (3129), San Pedro Bay, Kino Point, and Tiburon Island (3275).

Link's misleading name unmistakably applies to our plant and as it is over 20 years older than Nuttall's there seems to be no other course than to accept it. Link described his plant as having solitary female flowers with lanceolate sepals, characters which exclude it from Buxus and clearly show its application to Simmondsia. Further proof of its identity is found in the fact that Mueller (DC., Prodr. **16**^{1}:23. 1869), who saw authentic material pronounced *S. chinensis* and *S. californica* to be the same.

XLVII. ANACARDIACEÆ

205. **Cyrtocarpa edulis** (Brandg.) Standley

Cyrtocarpa edulis Standley, Contr. U. S. Nat. Herb. **23**:659. 1923.—*Tapirira edulis* Brandg., Zoe **5**:78. 1900.—*Type locality:* San José del Cabo, Lower California.

A heavy-limbed, spreading tree which is most common on sandy or gravelly plains, but which is not infrequent on rocky hillsides. It was observed at San Josef Island (3938, 3939), San Evaristo Bay, Espiritu Santo Island, La Paz (4016), and Ceralbo Island (4034). The framework of the tree suggests that of a Bursera or a Veatchia. It has a smooth yellowish papery bark. The common height of the tree is 12-25 dm., and the usual breadth is twice that much. Large trees, like those seen on San Josef Island, become 3-6 m. high. The flowers are polygamo-diœcious and usually appear before the leaves. At La Paz and San Evaristo the tree was called "ciruela."

206. **Veatchia discolor** (Benth.) Brandg.

Veatchia discolor Brandg., Proc. Calif. Acad. Sci. II, **2**:140. 1889.—*Schinus discolor* Benth., Bot. Sulph. 11, t. 9. 1844.—*Pachycormus discolor* Cov. in Goldman, Contr. U. S. Nat. Herb. **16**:344. 1916.—*Type locality:* Magdalena Bay, Lower California.

A small colony of this species was found in the Sierra Giganta back of Escondido Bay (4129) where it was growing on a rocky cañon side at about 540 m. altitude. The trees were similar in form and habit to those found further north, but had milky instead of brownish juice. The collection agrees in size, pubescence of flower, and in size of leaf with those found about Magdalena Bay, but differs in having a more ample inflorescence.

In the past only a single form of Veatchia has been recognized, but it is quite evident that there are three geographical variants included in the old *V. discolor*. One of the important characters of the restricted *V. discolor* is its comparatively large leaves. In typical *discolor* well developed leaves, which Bentham's type apparently does not show, are 6-8 cm. long and 25-35 mm. wide, or in other words a third larger than in any other Veatchia variant. The corolla is a little larger than in the variety *pubescens* and conspicuously smaller than the reddish pubescent corolla of the variety *veatchiana.* The restricted *discolor* is known only from Santa Margarita and Magdalena islands on the west coast, and from slopes of the Sierra Giganta near the east coast of the peninsula. The range is therefore south of N. lat. 26°. Brandegee's description (loc. cit.) only partly concerns the delimited *discolor,* the larger part, especially the floral structure, being based on specimens of var. *pubescens.* The name *Pachycormus discolor* was first published in the Century Dictionary (rev. ed. **10**:6708. 1911), but as no authority is given there for the new generic name or for the combination that publication can hardly be accepted.

207. **Veatchia discolor** var. **pubescens** (Wats.), n. comb.

Bursera pubescens Wats., Proc. Am. Acad. **24**:44. 1889.—*Type locality:* Los Angeles Bay, Lower California.

Seen only on Angel de la Guarda Island (3362, 3366, 3400) and at Los Angeles Bay (3432). This tree was one of the most striking of the floral features on the northern part of Angel de la Guarda Island, forming groves on the north-facing slopes where the white-barked individual trees—leafless during our visit—were sharply contrasted against the brown volcanic rocks and conspicuous for some distance off shore. At Los Angeles Bay it was frequent on the gravelly plain facing the bay, and somewhat less common on the slopes of the near-by mountains.

The plant is diœcious and is deciduous. It is leafless, though frequently flowering, during the dry seasons. The tree is weird and interesting. Its trunk is stout and the limbs very heavy for their length, commonly crooked, and widely spreading. Nelson (Nat. Geogr. Mag. 22:463. 1911) has applied to the tree the adjective "dropsical" which most aptly conveys the impression of weird massiveness so characteristic of the plant. The wood is very brash, limbs a full decimeter thick being easily broken. Upon the death of the tree the wood quickly softens and decays within the more persistent bark, and the whole tree, with all its limbs attached, sinks to the ground and flattens out as if deflated. According to Rose (Contr. U. S. Nat. Herb. 1:318. 1895) the bark is used for tanning, but certainly the wood is too soft and ephemeral for much use. A hard stick may be thrust into a limb for a depth of 15 mm. All the old wood is covered with a tight, white, smooth, papery bark that annually peels off in large parchment-like pieces. Injury to the tree results in the flow of a reddish-brown sap which, when coming from a smooth, plump, white-skinned branch, makes the whole startlingly like a bleeding human limb. The average height of the tree is between 3 and 5 m., with the average breadth slightly less. The largest tree seen (source of number 3366) was 7 m. high and 9 m. broad; the trunk was 6 dm. in diameter near its top about 3 dm. above the ground.

Veatchia discolor var. *pubescens* was first described by Watson who mistook sterile specimens for an undescribed Bursera. It is the most widely distributed of the varieties of *V. discolor* and is probably the best known. It ranges over the north middle segment of the peninsula between N. lat. 27°

and 30°, and is characterized by its very loose deltoid inflorescence of small flowers, by its rather small leaves, and perhaps also by its brownish sap. The plates and most of the notes given by Goldman (Contr. U. S. Nat. Herb. **16**:344, t. 118. 1916) refer to the variety *pubescens.*

208. **Veatchia discolor** var. **veatchiana** (Kell.), n. comb.

Rhus veatchiana Kell., Proc. Calif. Acad. Sci. **2**:24. 1860.—*Veatchia cedrosensis* Gray, Bull. Calif. Acad. Sci. **1**:4. 1884. —*Type locality:* Cedros Island, off west coast of Lower California.

This variety is definitely known only from Cedros Island, but the Veatchia that Brandegee (Zoe **5**:24. 1900) reports from Natividad Island may be the same. Veatch gave an interesting account of the plant in the Hesperian (p. 50) for April, 1860 (Brandegee, Proc. Calif. Acad. Sci. II, **2**:141. 1889 makes the article more accessible by copying it nearly verbatim); and Greene (Pittonia **1**:198. 1888) gives more interesting details in his account of Cedros Island. The Cedros Island plant has large flowers (6 mm. long) which surpass the largest flowers on peninsular material by nearly 2 mm. The flowers are also very much coarser, more colored, and conspicuously more pubescent than in the other forms of *Veatchia discolor.* The inflorescence seems to be quite dense and oblong in outline, while the leaves are very small, the largest being only 15 mm. wide and 5 cm. long. Comments by Greene and Veatch indicate that the juice is milky and that perhaps the bark is more darkly colored than in *pubescens,* but a piece of wood on a sheet (Rose 16105) in the National Herbarium has contrary indications. Although exact dates can not be given, it seems quite certain that the publication of *Rhus veatchiana* in the Proceedings of the California Academy of Sciences antedates by several months the publication in the Hesperian. It should be noted in this variety, as in the other forms of the species, that the petals are erect and not spreading as shown in Kellogg's plate in the Hesperian (duplicated in Bull. Calif. Acad. Sci. **1**: t. 10. 1885) or in Bentham's plate in the Botany of the Voyage of the Sulphur (t. 9. 1844).

XLVIII. Celastraceæ

209. **Maytenus phyllanthoides** Benth.

Maytenus phyllanthoides Benth., Bot. Sulph. 54. 1844.—*Type locality:* Magdalena Bay, Lower California.

A very common and characteristic shrub of alkaline or subalkaline soils. It usually grows about saltflats or on beaches a short distance above high tide. Along the Sonoran coast it was observed at the south end of Tiburon Island (4279), Kino Point, San Pedro Bay, and San Carlos Bay. On the peninsular side of the gulf it occurred at every one of the stations, excepting only Santa Inez and Ildefonso islands, south of Tortuga Island (3049, 3656, 4139). On Tortuga Island it formed a small colony on a barren lava slope a short distance below the west crater-rim. The plant is a thick-leaved, very dense shrub which is usually about 2 m. high but which sometimes attains 3 m. in height. The bark is rather smooth, dark, and conspicuously glaucous. The flowers are inconspicuous and greenish, but when the numerous greenish-red capsules are mature the exposed red aril makes the plant very striking. It was called "mangle" at La Paz.

XLIX. Sapindaceæ

210. **Cardiospermum corindum** L.

Cardiospermum corindum L., Sp. Pl. ed. 2, 526. 1762.—*Cardiospermum palmeri* Vasey & Rose, Proc. U. S. Nat. Mus. **13**:147. 1890.—*Type locality:* Brazil.

This is a frequent vine which trails over shrubbery growing in washes. Collections were made at Guaymas (3108), Tiburon Island (3248, 4262), San Francisquito Bay (3558), Carmen Island (3824), Escondido Bay (4138), and Ceralbo Island (4063). With the exception of the Guaymas and the first cited Tiburon collection which are merely puberulent, and the Ceralbo collection which has pubescent fruit, the collections represent typical *C. palmeri.* Radlkofer (Martius, Fl. Brasil. **13**:447. 1897) refers *palmeri* to *C. corindum* forma *loxense.* The peninsular plants are very variable as Brandegee (Proc. Calif. Acad. Sci. II, **3**:122. 1891) has pointed out.

211. **Cardiospermum halicacabum** L.

Cardiospermum halicacabum L., Sp. Pl. 366. 1753.—*Type locality:* Jamaica.

An herbaceous vine growing in gravelly soil and climbing over shrubs. It was collected at San Nicolas Bay (3703) and Guadalupe Point (4159). Referred to the species also is a collection from Magdalena Bay by Lung, and a Brandegee collection from San Gregorio. The four collections mentioned are glabrous or practically so. Radlkofer (Martius, Fl. Brasil. **13**:432. 1897) keys *C. halicacabum* from *C. corindum* by giving the former as herbaceous and with seeds which have a large cordate-bilobed hilum, and the latter as being shrubby and with seeds which have a small suborbicular or emarginate hilum. The habit and seed characters do not vary together, and furthermore fail to show a decided tendency to be extreme and positive. It would seem that *corindum* is only a pubescent phase of *halicacabum.*

212. **Dodonæa viscosa** (L.) Jacq.

Dodonæa viscosa Jacq., Enum. Pl. Carib. 19. 1760.—*Ptelea viscosa* L., Sp. Pl. 118. 1753.—*Type locality:* West Indies.

Collected at San Pedro Bay (4319) where a single plant was found in a cañon, and at Escondido Bay (3849) where it is frequent on a diluvial plain at the foot of the Sierra Giganta. It is a resinous glutinous shrub 15-20 dm. high, with rather close erect branches. The Escondido Bay collection, apparently like all other peninsular material, represents the broad-leaved variety *spathulata* Benth., whereas the San Pedro Bay collections agree with the Arizonian and Sonoran material in being the narrow-leaved variety *angustifolia* Benth.

213. **Paullinia spinosa** (Radlk.), n. comb.

Cardiospermum spinosum Radlk., Contr. U. S. Nat. Herb. **1**:368. 1895.—*Type locality:* La Paz, Lower California.

A low, rounded, compact, spinescent shrub 6-9 dm. high, which is rather common on the rocky hillsides near the ocean at La Paz (3047). This plant was doubtfully referred to *P.*

tortuosa by Vasey and Rose (Contr. U. S. Nat. Herb. **1**:68. 1890). Brandegee (Proc. Calif. Acad. Sci. II, **3**:123. 1891) recognized its true generic relations, but ventured no specific determinations. The shrub is undoubtedly a Paullinia and nearest to, but quite distinct from, *tortuosa,* from which it differs conspicuously in its stouter, more thorny stems and larger ternate leaves.

There is another bushy Paullinia in Lower California. It was first collected by Xantus and was indicated as "Cardiospermum ? sp. nov." by Gray (Proc. Am. Acad. **5**:155. 1861). Watson (Bibl. Index 79. 1878) referred the plant to *"Cardiospermum tortuosum,"* but Radlkofer (Sitzungbr. Bayer. Akad. München **8**:222. 1878) considered it a Serjania and described it as *S. californica.* In 1890 the plant was collected at San José del Cabo by Brandegee who, like Xantus, found it only in flower. A study of the Brandegee and the Xantus collecitons seems to show that the plant is definitely a Paullinia, for the habit, foliage, and range all indicate a close relative of *P. tortuosa* and *P. spinosa,* whereas its association under Serjania is based only on the resemblance of some scraps of the Xantus collection to a species of Serjania which is geographically much removed. It is proposed, therefore, that the plant be called **Paullinia californica,** n. comb. The nearest relative of *P. californica* is *P. spinosa,* from which it differs in its 5 leaflets and much looser and less stiff habit. From *P. tortuosa* it differs notably in its less deeply cut glabrate leaves.

214. **Paullinia tortuosa** (Benth.) Brandg.

Paullinia tortuosa Brandg., Zoe **2**:74. 1891.—*Cardiospermum tortuosum* Benth., Bot. Sulph. 8, t. 6. 1844.—*Type locality:* Magdalena Bay, Lower California.

Typical representatives of this species were found in a gravelly wash on Ceralbo Island (4031) where it formed an open bush 6-9 dm. high. The only previous collections are from San José del Cabo and from Magdalena Island. The sterile bushy and uncollected Paullinia observed in the rocky draws on Espiritu Santo Island is probably this species, but may be *P. spinosa.*

215. Sapindus saponaria L.

Sapindus saponaria L., Sp. Pl. 367. 1753.—*Type locality:* Brazil.

Locally frequent on a gravelly cañon floor at the head of San Carlos Bay (4346). It is a tree 3-6 m. high with rather stout trunk and strictly ascending branches. The vigorous shoots have simple lanceolate leaves, and not pinnate ones as have the older branches. Although the plant is usually described as evergreen, the plants seen were certainly deciduous, for only a few stray branches had adhering leaves at the time of collecting.

L. Rhamnaceæ

216. Colubrina californica, n. sp.

A rather dense shrub about 2 m. high with intricate and rigidly divaricate terete gray-tomentose branches; leaves fascicled, oblong-obovate to obovate, 10-17 mm. long, 8-11 mm. wide, margin entire, base rounded or broadly cuneate, tip obtuse to broadly mucronate, veining pinnate, dull in color due to a short appressed pubescence which is most abundant on veins and midrib; petioles 1-1.5 mm. long, densely pubescent; flowers in dense axillary clusters crowded on the younger twigs to form a close narrow leafy thryse 2-5 cm. long and about 1 cm. wide; pedicels less than 1.5 mm. long and densely tomentose in flower, in fruit becoming stouter and about 2 mm. long; calyx tomentose without, lobes broadly deltoid, widely spreading and tardily deciduous; tube adherent to ovary and filled by the broad disk; expanded calyx about 4.5 mm. wide; petals clawed, yellowish, 1 mm. long, a little exceeding the stamens; anthers shielded by cucullate blade of petal; capsule strongly depressed, obovate, 6 mm. high, 1 cm. broad shallowly grooved; seeds brown, 6 mm. long, smooth.

Type: No. 1290, Herb. Calif. Acad. Sci., collected May 8, 1921, by I. M. Johnston (no. 3496) on a gravelly cañon floor at **Las Animas Bay, Lower California.**

This is an infrequent shrub on the gravelly floor of a large cañon in the hills just south of Las Animas Bay (3496) where only a single plant was seen in flower. It is otherwise known only from a specimen in the National Herbarium *(Nelson & Goldman 7197)* from "Aguajé de San Esteban, 25 miles N. of San Ignacio." The plant forms a dense intricately branched shrub with stiff, almost spinose branches, and is dull in color, globose in shape, and 15-25 dm. high. Its relationships appear to be with *C. texana* Gray, and with *C. glabra* Wats., but it differs from both in its inflorescence, short pedicels, persistent style, and more compact habit of growth. From *C. texana,* which ranges east of the continental divide, it differs in its smaller, entire-margined, less venose, not 3-nerved leaves; and from *C. glabra,* which grows in the same region, it differs in its pubescence, its rigid habit, and in its very much larger fruit. The white tomentum which clothes the stems of *C. californica* at once distinguishes it from all of the other known Colubrinas of the gulf area.

217. **Colubrina glabra** Wats.

Colubrina glabra Wats., Proc. Am. Acad. **24**:44. 1889.—*Type locality:* Ravines about Guaymas, Sonora.

A common, but unobtrusive, shrub in the gulf area which was rarely collected due to its sterile and almost leafless condition during the summer months. It was collected at San Pedro Nolasco Island (3136), Tiburon Island (3273), San Esteban Island (3197), San Francisquito Bay (3583), and Ceralbo Island (4045). It was recognized on the following islands: Angel de la Guarda, Tortuga, San Marcos, Carmen, Catalina, Santa Cruz, San Josef, and Espiritu Santo and at the following bays: San Pedro, Las Animas, San Nicolas, Coyote, Escondido, and Agua Verde. The plant frequents cañons, grows in gravelly or rocky soil, and usually forms an open bush about 25 dm. high. The Ceralbo plant was a very compact, twiggy globose mass about a meter high, probably due to the cattle which were ubiquitous in the particular locality.

218. **Condalia globosa,** n. sp.

Shrub 12-24 dm. high, with intricate and very sharply pungent branches; younger branches reddish, pruinose; older branches grayish or brownish; leaves narrowly spatulate, fasciculate, broadly acute to emarginate, entire, short petiolate, glabrous, 7-14 mm. long, 2-3 mm. wide, with a few broad prominent veins below; pedicels solitary or geminate, slender, 4-7 mm. long; sepals deciduous, flowers otherwise as in *C. spathulata;* fruit more or less spherical, black, juicy, 4-5.5 mm. broad.

Type: No. 1291, Herb. Calif. Acad. Sci., collected April 11, 1921, by I. M. Johnston (no. 3028) on a gravelly beach at **La Paz, Lower California.**

The typical glabrous form of this new species was taken only at La Paz (3028), San Josef Island (3941), and Guaymas (3106), but the plants observed at San Evaristo Bay and on Ceralbo Island are probably the same. Brandegee has collections from San Luis, San Sebastian, Purisima, and Montecito; and Purpus has taken it at Arroyo Calmalli (77) and San José del Cabo (468). The plant is infrequent and forms intricate very spinescent upright shrubs about 15 dm. high. It grows in sandy or gravelly soil. The shrub is extremely prolific and is usually covered with myriads of black juicy fruits. The rigid spines make the collecting of the plant a very disagreeable, not to say painful, task. It is very closely allied to *C. spathulata,* with which the peninsular material has been confused, but differs in its black juicy globose fruit, longer pedicels, deciduous sepals, and glabrous usually larger leaves.

219. **Condalia globosa** var. **pubescens,** n. var.

Leaves as in the species but densely short pubescent.

Type: No. 1292, Herb. Calif. Acad. Sci., collected April 19, 1921, by I. M. Johnston (no. 3201) in a sandy wash on **San Esteban Island, Gulf of California.**

This variety is only the northern pubescent phase of the species, and seems to grow in the territory which is geographically intermediate between that occupied by *C. globosa* and *C. spathulata.* Collections of the variety were made at San Esteban Island (3201, 4404), San Francisquito Bay (3585), and Tepoca Bay.

There is a very different species of Condalia which Brandegee collected at San Pablo and at San Julio Cañon, and which Trelease (Syn. Fl. N. Am. 1:403. 1897) referred to as an atypical form of *C. mexicana.* The plant in question is very distinct from *mexicana,* which has smaller fasciculate pubescent leaves, a more compact habit, and smaller fruit. The peninsular plant may therefore be called **Condalia brandegei,** n. sp. Its relations seem to be definitely with *C. obovata,* but it differs in having larger oblong long-pedicellate fruit, fewer firmer leaves, and a widely separated range. *C. brandegei* also suggests *C. parryi,* but differs in the texture of its leaves, and in the smaller short-pedicellate more juicy fruit.

220. **Condalia lycioides** var. **canescens** (Gray) Trel.

Condalia lycioides var. *canescens* Trel. in Gray, Syn. Fl. N. Am. **1**:403. 1897.—*Zizyphus lycioides* var. *canescens* Gray in Rothrock, Rep. U. S. Geol. Surv. w. 100th Merid. **6**:82. 1878.—*Condalia divaricata* Nels., Bot. Gaz. **47**:427. 1909.—*Type locality:* Gila River Valley, Arizona.

This homely, spinescent shrub was collected at La Paz (3025), San Esteban Island (3202), Tiburon Island (3256, 4272), and Tepoca Bay (3305). It grows on dry rocky benches or along gravelly cañons, forming a loosely, intricate upright shrub 10-18 dm. high. At La Paz it was called "fachada" by a small boy.

221. **Gouania mexicana** Rose

Gouania mexicana Rose, Contr. U. S. Nat. Herb. **3**:314. 1895.—*Type locality:* Culiacan, Sinaloa.

Locally frequent and loosely scandent over large shrubs in a cañon at the head of San Carlos Bay (4375).

222. **Karwinskia humboldtiana** (R. & S.) Zucc.

Karwinskia humboldtiana Zucc., Abh. Akad. München **1**:353. 1832.—*Rhamnus humboldtiana* R. & S., Syst. **5**:295. 1819.—*Karwinskia pubescens* Standley, Contr. U. S. Nat. Herb. **23**:716. 1923.—*Type locality:* Mexico.

Collected on Espiritu Santo (3961) and Ceralbo (4068) islands, and at Agua Verde (3889) and Escondido (4109) bays. It is usually a loose erect-growing shrub or small tree

20-25 dm. high, which grows in gravelly ground along cañons, but on Espiritu Santo Island it occurred also on the exposed mesa-like ridges and formed compact, unkempt, twiggy masses 10-15 dm. high. The bark is furrowed.

223. **Zizyphus sonorensis** Wats.

Zizyphus sonorensis Wats., Proc. Am. Acad. **24**:44. 1889. —*Type locality:* Guaymas, Sonora.

Common about the margins of salt marshes at Guaymas (3116) and San Carlos Bay, forming small scattered thickets 18-20 dm. high. At San Pedro Bay (4311) a single colony was found growing under the shelter of a cliff in a cañon well back from the ocean.

LI. VITACEÆ

224. **Vitis girdiana** Munson

Vitis girdiana Munson, U. S. Dept. Agr. Div. Pomol. Bull. **3**:10. 1890.—*Type locality:* Southern California.

The grape doubtfully referred to this species grew in great profusion over the trees and rocks in the large cañon in the Sierra Giganta back of Escondido Bay (4121). It grew on the cañon floor along a small stream which ran down to about 350 m. altitude. Brandegee's collections from the cape region appear to represent a form with smaller, less dentate and more pubescent leaves, but his Comondú collection, while more pubescent, has leaves of similar size and shape. The collection is in full fruit, whereas Brandegee's are in flower only.

LII. MALVACEÆ

225. **Abutilon lemmoni** Wats.

Abutilon lemmoni Wats., Proc. Am. Acad. **20**:357. 1885. —*Type locality:* Santa Catalina Mountains, Arizona.

Doubtfully referred here are plants from San Francisquito Bay (3584) and from Freshwater Bay on Tiburon Island (3272).

226. **Abutilon nuttallii** T. & G.

Abutilon nuttallii T. & G., Fl. N. Am. **1**:231. 1838.—*Type locality:* On the Red River.

A few plants apparently of this species were observed on Tortuga Island (4189). They formed rounded, rather dense growths 5-12 dm. high and grew on a dry lava slope.

227. **Abutilon palmeri** Gray

Abutilon palmeri Gray, Proc. Am. Acad. **7**:289. 1870.—*Abutilon aurantiacum* Wats., Proc. Am. Acad. **20**:357. 1885. —*Abutilon macdougalii* Rose & Standley, Contr. U. S. Nat. Herb. **16**:13, t. 4. 1912.—*Type locality:* Yaqui River, Sonora.

One of the common plants in rocky ground over the higher parts of San Pedro Martir Island (3158) where it grows as a loosely branched perennial, 7-12 dm. high. It is also frequent in washes at Puerto Ballandra on Carmen Island (3831) where it becomes 9-15 dm. high. The flowers are orange. *Abutilon palmeri* seems identical with *A. macdougalii.* The seed and inflorescence developments which characterize *A. aurantiacum,* seem to be influenced by age and are therefore valueless.

228. **Gossypium barbadense** L.

Gossypium barbadense L.,Sp. Pl. 693. 1753.—*Type locality:* Barbados.

A common cultivated tree in the patios at Mulegé (3699) and to some extent naturalized in the meadows along the river. It is a large very floriferous shrub or small tree 25-45 dm. high. Upon opening, the petals are creamy yellow with a maroon spot near the base, but after anthesis they become rose-colored.

229. **Gossypium davidsonii** Kell.

Gossypium davidsonii Kell., Proc. Calif. Acad. Sci. **5**:82. 1873.—*Type locality:* San José del Cabo, Lower California.

Collected only at San Pedro Bay (4321) where it is frequent on the gravelly plain fronting the ocean. The pubescent cotton plants observed on Ceralbo Island are no doubt the same. Watt (Cotton Pl. World 66. 1907) suggests that the Sonoran plant is distinct from the one on the peninsula, as his specimen of *Palmer 244* has smaller bracts and frequently toothed leaves. The specimen of *Palmer 244* in the Herbarium of University of California actually has larger bracts than has any of the five collections from San José del Cabo, the type locality of the species, and is entire margined, whereas two of the San José del Cabo collections show inclinations toward a coarsely three-toothed condition. According to Goldman (Contr. U. S. Nat. Herb. **16**:348. 1916) the species is common at low elevations in the cape region, and from there it extends, according to Brandegee (Proc. Calif. Acad. Sci. II, **2**:136. 1889), northward along the Pacific shore to San Gregorio. Watson (Bot. Calif. **1**:82. 1876) reports the species from Cedros Island, but the record is to be doubted for there is no Cedros Island material in the Gray Herbarium and none of the later collectors on Cedros Island has found it. There is in the Gray Herbarium a collection of *G. harknessii* from Carmen Island which, through miscitation, probably is the basis for the Cedros Island record. San Pedro Bay and Guaymas are the only known stations for the species in Sonora.

230. **Gossypium harknessii** Brandg.

Gossypium harknessii Brandg., Proc. Calif. Acad. Sci. II, **2**:136. 1889.—*Type locality:* Santa Margarita Island.

Cotton of this species was seen on San Marcos (3645), Coronados, Carmen (3805, 4144), and Monserrate islands; and at San Nicolas Bay, Loreto (3789), and Escondido Bay. It forms a flat-topped, loosely intricate shrub about 9 dm. high and 10-15 dm. broad. Common on rocky benches and particularly on gravelly washes. The bush has a clean glabrous and frequently glaucous foliage, and an abundance of bright yellow flowers. It is a very ornamental shrub and is much more handsome than *G. davidsonii.* The corolla is lemon-yellow with a maroon spot above the claw on each petal and with the outer petals more or less maroon flushed. Old withered flowers are rose-colored. Bruised flowers become greenish when dried. On Carmen and San Marcos islands the plant is called "algodon cimarron". Away from the gulf shore of the peninsula the plant is known only from about the type locality on Santa Margarita Island.

Gossypium sp.

Specimens of an undetermined cotton were collected from a few bushes growing on a sandy clearing at La Paz (3065). The plants were shrubby with strict tufted stems 12-24 dm. high, and were pointed out by a small boy as "algodon". The petals are cream-colored and non-spreading. The striking features of the plant are its 1- to 3-lobed leaves, very large (4-6 cm. long) deeply lacerate bracts, and large corollas (petals 35-50 mm. long). It resembles certain Mexican species; e.g., *G. palmeri* Watt, *G. fruticulosum* Tod., *G. schottii* Tod., and *G. lanceolatum* Tod. These species are given by Watt (Cotton Pl. World 164. 1907) as having free bracts whereas the La Paz collection has definitely united bracts. It should be noted, however, that the type collection of *G. palmeri* has the bracts somewhat united.

231. **Hibiscus denudatus** Benth.

Hibiscus denudatus Benth., Bot. Sulph. 7, t. 3. 1844.—*Type locality:* Magdalena Bay, Lower California.

Common and widely distributed over the peninsula. Collections were made on Tiburon (4261), San Esteban (3173), and Angel de la Guarda (3416) islands, and at Tepoca Bay (3280). The plant was recognized at San Luis Gonzales, Los Angeles Bay, Las Animas, San Nicolas, and Agua Verde bays, and on Tortuga, San Marcos, Coronados, and Carmen islands. It is characteristic of gravelly washes and rocky hillsides, and forms tufted growths 3-6 dm. high. The petals are white or pinkish with a red or purplish claw.

232. **Horsfordia alata** (Wats.) Gray

Horsfordia alata Gray, Proc. Am. Acad. **22**:297. 1886.—*Sida alata* Wats., Proc. Am. Acad. **20**:356. 1885.—*Horsfordia palmeri* Wats., Proc. Am. Acad. **24**:40. 1889.—*Type locality:* Northwestern Sonora.

Collected at Freshwater Bay on Tiburon Island (3253) and at Los Angeles Bay (3480). At the former locality the plant grew 25 dm. high and formed a small colony along the edge of a sandy draw. At the latter station it grew only 9 dm. high and was rare, only a few plants being observed at the foot of a rocky slope. The plant is strictly and sparingly branched, and has pink flowers (which dry bluish) 2 cm. broad. Other collections have been examined from Sierra de la Trinidad, La Paz, and San Gregorio. The specimen reported by Brandegee (Proc. Calif. Acad. Sci. II, **2**:135. 1889) from Llano de Santana, appears to be *H. newberryi*. *Horsfordia alata* is nearest to *H. newberryi* but differs in its large pink, instead of small orange, flowers, less conspicuously winged carpels, looser, more branching habit, broader, more cordate leaves, and looser, less abundant dull sordid, instead of bright yellowish, tomentum. *Horsfordia rotundifolia* Wats. (Proc. Am. Acad. **24**:40. 1889), the other species of the genus, is at once recognized by its fine close pubescence, low slender stems, cordate leaves, and naked inflorescence. It has a synonym in *H. purisimæ* Brandg. (loc. cit.).

233. **Horsfordia newberryi** (Wats.) Gray

Horsfordia newberryi Gray, Proc. Am. Acad. **22**:297. 1886. —*Abutilon newberryi* Wats., Proc. Am. Acad. **11**:25. 1876.— *Type locality:* Canebrake Cañon on the lower Colorado River, Arizona.

Taken on San Esteban (3177) and Angel de la Guarda (3392) islands, and at Los Angeles (3486) and San Francisquito (3557) bays. A strictly erect perennial 6-15 dm. high, either simple or compactly branched above. The flowers are orange and small, being about 1cm. broad. It is characteristically a plant of gravelly washes and was nowhere observed to be common.

234. **Sida spinosa** var. **angustifolia** (Lam.) Griseb.

Sida spinosa var. *angustifolia* Griseb., Fl. Brit. W. Indies 74. 1859.—*Sida angustifolia* Lam., Dict. **1**:4. 1789.—*Type locality:* "Indies".

A single plant of this variety was found growing in a wet meadow that bordered on a Typha thicket at Mulegé (3691).

235. Sphæralcea ambigua Gray

Sphæralcea ambigua Gray, Proc. Am. Acad. 22:292. 1887. —*Type locality:* Grand Cañon, Arizona.

Collected at Las Animas (3506) and San Francisquito (3556) bays, and on San Pedro Martir (3145), San Esteban (3172) and Angel de la Guarda (3415, 4214) islands. The species seems to occur only on the northern third of the peninsula and on the adjacent islands. It is most frequent in gravelly washes, but on San Pedro Martir Island it occurs in great abundance on rocky ground in the cactus forest which crowns the island. The plant is perennial, with a shrubby caudex and virgate branches 3-12 dm. high. The flowers are orange. The reference to *S. ambigua* is unsatisfactory although precedent sanctions the present use of the name. Due to the great confusion in the genus, a satisfactory determination can not be made short of a generic revision. Suffice to say, that the peninsular plant is the same as that common in the deserts of California. Typical *S. ambigua,* judging from material collected in the Grand Cañon and adjacent area, seems to be the flat-leaved, lightly-tometose plant which, in the Southwest, has been largely referred to *S. munroana.*

236. Sphæralcea coulteri (Wats.) Gray

Sphæralcea coulteri Gray, Proc. Am. Acad. 22:291. 1887.—*Malvastrum coulteri* Wats., Proc. Am. Acad. 11:125. 1875.—*Malveopsis coulteri* Kuntze, Rev. Gen. 1:72. 1891.—*Sphæralcea californica* Rose, Contr. U. S. Nat. Herb. 1:66. 1890. —*Malvastrum multiflorum* Greene, Fl. Francis. 108. 1891.—*Sphæralcea margaritæ* Brandg., Zoe 5:156. 1903.—*Type locality:* "Southern California," but probably from Arizona or Sonora.

Forming a large colony in a sandy clearing at La Paz (3067), and frequent along the silty river bottoms at Mulegé (3667). The plants are annual or biennial, and may persist even longer; they are branched at the base with many ascending wand-like branches which reach a meter in length. The flowers are a bright orange. Called "chuale" by a small boy at La Paz. The types of all the proposed segregates of this species have been examined and found to be indistinguishable.

237. **Sphæralcea hainesii** Brandg.

Sphæralcea hainesii Brandg., Proc. Calif. Acad. Sci. II, **2**:136. 1889.—*Type locality:* Jesus Maria, Lower California.

A single plant found in a willow thicket at Mulegé (3675) is referred to this species. It has orange flowers and grew 18 dm. high. The leaves are a full decimeter long. The collected specimens are atypical in their insufficiently developed bractlets and sparsely pubescent calyx. The species seems to grow in that section of the peninsula lying between 25° and 27° N. lat. In the region it is recognized by its non-crisped, flat, oblong, rather large leaves.

238. **Sphæralcea macdougalii** Rose & Standley

Sphæralcea macdougalii Rose & Standley, Contr. U. S. Nat. Herb. **16**:13, t. 5. 1912.—*Type locality:* Papago Tank in Pinacate Mountains, Sonora.

Collected at Tepoca Bay (3296) where it grew on a stony slope and became 2-4 dm. high with strictly ascending stems from a shrubby caudex. In flowers and inflorescence the collected plant resembles the type, but it differs in having considerably smaller curled leaves. The species probably ranges over northwestern Sonora and can be recognized by its few large flowers.

239. **Sphæralcea axillaris** Wats.

Sphæralcea axillaris Wats., Proc. Am. Acad. **24**:41. 1889.—*Sphæralcea violacea* Rose, Contr. U. S. Nat. Herb. **1**:81. 1890. —*Type locality:* Mulegé, Lower California.

Frequent along the silty bottoms at Mulegé (3669) and on the talus footing gypsum cliffs on San Marcos Island (3616). The plant has an erect axis 10-25 dm. high. with many ascending laterals. It is very weak and commonly the axis and laterals tend to droop. The petals are pink. The plant was called "malva rosa" on San Marcos Island. This pink-flowered plant is common about San José del Cabo and is the one reported by Gray (Proc. Am. Acad. **5**:154. 1861) as *S. incana.* The type of *S. axillaris* is in advanced maturity and is peculiar in having the flowers in close node-like clusters. It seems evident that it is a peculiar variation of the widely distributed plant here referred to it.

LIII. Sterculiaceæ

240. **Ayenia pusilla** L.

Ayenia pusilla L., Syst. Nat. ed. 10, 1247. 1759.—*Type locality:* Caribbean Region.

Common in a sandy wash on San Esteban Island (3184) where it forms suffrutescent mats 3-6 dm. broad. This is a narrow-leaved form, similar to that growing in Arizona and California and which seems never to have been named.

241. **Melochia tomentosa** L.

Melochia tomentosa L., Syst. Nat. ed. 10, 1140. 1759.—*Moluchia tomentosa* Britt., Mem. Brooklyn Bot. Gard. **1**:69. 1918.—*Type locality:* Jamaica.

Widely distributed but not common in the gulf area. Growing on Tortuga, Carmen, San Pedro Nolasco, Espiritu Santo (4077, 3962), and Ceralbo (4033) islands; and at Guaymas (3093), at Guadalupe Point (4160), and at San Carlos (4400), San Pedro (4299), San Francisquito (3568), San Nicolas (3734), Escondido (3853), and Agua Verde (3909) bays. San Francisquito Bay appears to be the northern-most station on the Pacific Coast. The plant is a loose, erect, little-branched shrub 15-25 dm. high, growing scattered in gravelly washes or less commonly on rocky hillsides. The flowers are magenta and appear to be present throughout the year. The peninsular material has larger, thicker, and more densely tomentose leaves, stouter branches, and a closer, more floriferous inflorescence than the material from Sonora. The Sonoran plants seem to be referable to *M. speciosa* Wats. (Proc. Am. Acad. **24**:42. 1889), the type of which came from Guaymas. The type of *M. arida* Rose (Contr. U. S. Nat. Herb. **8**:321. 1905), a critical species, also came from Guaymas.

242. **Waltheria americana** L.

Waltheria americana L. Sp. Pl. 673. 1753.—*Type locality:* Bahama Islands.

Found in a gravelly wash in a cañon back of San Carlos Bay (4401). A prostrate shrubby plant with stems 1-4.5 dm. long.

LIV. VIOLACEÆ

243. **Hybanthus fruticulosus** var. **flavescens** (Dowell), n. comb.

Calceolaria fruticulosa var. *flavescens* Dowell, Bull. Torr. Cl. **35**:551. 1906.—*Type locality:* Guaymas, Sonora.

Locally common in gravelly washes at San Pedro (4297) and San Carlos (4366) bays. The plants are densely tufted, 15-20 cm. high, have many persistent dead stems, and are slightly suffrutescent below. The Sonoran material differs from **Hybanthus fruticulosus,** n. comb. *(Ionidium fruticulosum* Benth.), the peninsular plant, in having yellowish-green glabrous foliage.

LV. FRANKENIACEÆ

244. **Frankenia grandifolia** C. & S.

Frankenia grandifolia C. & S., Linnæa **1**:35. 1826.—*Type locality:* San Francisco Bay, California.

Sterile plants of what is believed to represent this species are common in the salt marsh at Tepoca Bay.

245. **Frankenia palmeri** Wats.

Frankenia palmeri Wats., Proc. Am. Acad. **11**:124. 1876. —*Type locality:* "Gulf shore of Lower California."

Seen at the north and south ends of Tiburon Island (3263, 4280), Tepoca Bay (3285), San Luis Gonzales Bay (3352), all stations on Angel de la Guarda Island (3396), Los Angeles Bay, and Las Animas Bay. It is one of the most characteristic coastal shrubs in the northern part of the gulf area. The plant grows in saline soil about salt flats and lagoons, on dunes, and on loamy bluffs and plains, but always confined to a belt near saltwater. It does not seem to demand saline soil, but merely an exposure to salt air. Its surface is covered with salt which renders drying difficult in a moist atmosphere. It forms a compact globose shrub 6-9 or 12 dm. high. Usually well spaced, but frequently it is aggregated to form dense low hedge-like belts many square meters in extent. The corolla is white and the exserted anthers are a pinkish orange in color. The type locality has not been definitely determined. Palmer, who is said to have collected the type, is not known to have been within the range of the species previous to its publication. It may have been collected by Pringle and incorrectly attributed to Palmer.

LVI. Fouquieriaceæ

246. **Fouquieria burragei** Rose

Fouquieria burragei Rose, Jour. N. Y. Bot. Gard. **12**:267. 1911.—*Type locality:* Pichilinque Island.

Arborescent, 3-4 m. high, with the habit of *F. peninsularis* Nash, having a short trunk 3-6 dm. high and many crooked spreading branches; spines 15-25 mm. long; inflorescence racemose-paniculate, 12-20 cm. long, 2-3 cm. wide, sparsely flowered, the strictly ascending branches usually 5 mm. long but becoming rarely 15 mm. long; sepals oval or orbicular, 4-5 mm. long, old-rose above but nearly white below; corolla 10-12 mm. long, salverform; corolla-tube ca. 8 mm. long, 4 mm. wide, very pale salmon-pink outside; corolla lobes spreading, salmon-pink in bud but lighter upon expansion, 2-4 mm. long, orbicular to triangular-ovate; stamens conspicuously exserted; filaments 8-16 mm. long, flattened, white, glabrous above, included portions coarsely villous, unappendaged; anthers dark yellow, more or less tinged with blood-orange, triangular oblong, base deeply cordate, apex acuminate; style divided halfway or almost to base; capsule about 18 mm. long.

The remarkable Fouquieria, which is above briefly described from new material, was collected on the low hills lying just east of La Paz (4015) and again on Ballena Island (4074), an islet off the west coast of Espiritu Santo Island. Previously it has been known only from collections made by Rose at

Pichilinque Island and La Paz. In selection of habitat and in habit this species seems almost identical with the quite distantly related *F. peninsularis.* All the known stations for the plant are near La Paz.

247. **Fouquieria peninsularis** Nash

Fouquieria peninsularis Nash, Bull. Torr. Cl. **30**:455. 1903. —*Type locality:* La Paz, Lower California.

In the gulf area this species is one of the most common trees, and to list the places at which it was observed would practically amount to listing all the stations within the area (3050, 3130, 3436, 3546, 3936, 4357). On the peninsula it was seen at every station, but on the mainland only at San Pedro Bay, San Carlos Bay, and Guaymas. It grows on all the gulf islands with the following exceptions,—San Pedro Martir, Tiburon, Patos, Pelican, Georges, San Luis, Sal si Puedes, Ildefonso, and Santa Inez. These insular exceptions are mainly low and alkaline, or whitened bird rocks. The tree seems to grow with equal vigor in sandy washes, on sandy or gravelly plains, or on rocky or scoriæ-covered hillsides. It is almost universally associated with *Bursera microphylla* and *Jatropha spathulata* to form one of the most characteristic climax associations of the region.

The plant forms a very open irregular tree 15-30 or rarely 60 dm. high, with a clear trunk 2-8 dm. high and 15-25 dm. in diameter. The branches are spreading, crooked, and loosely branched. Not only is the general habit very different from *F. splendens,* but the bark also. In *splendens* the stems increase but little in girth and the epidermal plates (morphologically the decurrent bases of the spines, i.e., petioles) are but little separated, the stems becoming at most merely furrowed. In *peninsularis,* due to the great expansion in girth, the epidermal plates are widely and very irregularly separated, very unequally distributed over the trunk, and utterly lacking in a definite lineate arrangement. In *splendens* the trunk and lower limbs are gray, but in *peninsularis* they are brown, due to the great exposure of the smooth papery bark that underlies the epidermal plates. The exposed bark is papery and resinous, and suggests that of Bursera. The flowers of *peninsularis* are quite different from those of *splendens*. *Fouquieria peninsularis* has dark red or cardinal corollas with erect lobes, the style is shorter, the stamens unappendaged, and the flowers are arranged in a panicle which is triangular or lanceolate in outline. It should be noted that the photograph of *F. peninsularis* given by Goldman (Contr. U. S. Nat. Herb. **16**: t. 120. 1916) does not show a typical specimen of the species, the figured plant being too tall, too dense, too regular, and too erect in its branching.

248. **Fouquieria splendens** Engelm.

Fouquieria splendens Engelm. in Wisliz., Mem. No. Mex. 98. 1848.—*Type locality:* Jornada del Muerto, New Mexico.

Collected on Tiburon Island (4258), at Tepoca Bay (3309), and at San Francisquito Bay (3545), and observed at San Luis Gonzales Bay. Goldman's observations (Contr. U. S. Nat. Herb. **16**:349. 1916) and the author's, indicate that the species reaches south on the peninsula to about N. lat. 28° 30′. At San Francisquito Bay it is common on the shell-covered mesa back from the beach and grows intermixed with *F. peninsularis,* but at the other localities it grows alone on hillsides or rolling gravelly plains. The growth-habit of this species is very characteristic, being branched at the ground, appearing tufted, and consisting of long usually simple (rarely forked at tip) strict or ascending whip-like stems. The stems are usually gracefully recurved near the end and bear at their tips elongated unilateral racemose clusters of salmon-red flowers. The common height of the plant is 33-45 dm., but it not infrequently attains 6 m. in height.

LVII. Koeberliniaceæ

249. **Koeberlinia spinosa** Zucc.

Koeberlinia spinosa Zucc., Abh. Akad. München **1**:359. 1832.—*Type locality:* Mexico.

Seen only at Tepoca Bay (3282) where colonies are frequent along sandy draws. It grows in small groups forming thickets of loosely interlaced, spinescent branches 9-12 dm. high and

2-5 m. broad. The collected material is in fruit only and has more slender branches than have the average specimens from north of the international boundary.

LVIII. PASSIFLORACEÆ

250. **Passiflora arida** (Masters & Rose) Killip

Passiflora arida Killip, Jour. Wash. Acad. Sci. **12**:256. 1922.—*Passiflora fœtida* var.*arida* Masters & Rose, Contr. U. S. Nat. Herb. **5**:182. 1899.—*Type locality:* Guaymas, Sonora.

Collected at San Pedro Bay (4298), San Esteban Island (3200, 4402), San Francisquito Bay (3544), Tortuga Island (3598, 4200), Guadalupe Point (4158), La Paz (3069), and Ceralbo Island (4043). It is a trailing or climbing vine whose stems are lax, remotely branched, and woody only near the base. It is conspicuously different from *P. palmeri,* with which it grew on San Esteban Island and at Guadalupe Point, in its elongated viny herbaceous stems, non-glandular and scarcely oily herbage, and much smaller differently proportioned flowers. The petals are white on both surfaces, but the sepals are greenish below. The corona is a light violet-blue and the staminal tube is marked with purple or magenta oblong dots. It was commonly found in washes, but it also occurs on hillsides. A boy at La Paz wrote its name as "mata de collote."

251. **Passiflora fruticosa** Killip

Passiflora fruticosa Killip, Jour. Wash. Acad. **12**:256. 1922. —*Type locality:* Santa Maria Bay, Lower California.

A plant with a very loose upright shrubby caudex 2-4 dm. high, and a few rather short (3-6 dm. long), sprawling stems that show a slight inclination to climb. It was found only on San Francisco (3951) and Espiritu Santo (3978) islands. It is apparently most nearly related to *P. arida* from which it differs in its very oily and somewhat glandular foliage, its shrubby, bushy base, and short non-climbing stems. The plant is a smaller, very much looser, and much less woody plant, and has less glandular herbage and very much smaller flowers, than *P. palmeri.* It was found only on hillsides.

252. **Passiflora gossypiifolia** Ham.

Passiflora gossypiifolia Ham., Prodr. Fl. Ind. Occ. 48. 1825. —*Passiflora fœtida* var. *gossypiifolia* Masters in Martius, Fl. Brasil. 13^1:582. 1872.—*Type locality:* West Indies.

Mr. Killip, who determined all the Passifloræ, refers here the single plant found climbing through the lower branches of a willow at Mulegé (3660). The same has been collected at Comondú by Brandegee and at Arroyo San Pablo by Purpus. It is a herbaceous vine which, among the peninsular species, is characterized by the brassy color of its foliage.

253. **Passiflora palmeri** Rose

Passiflora palmeri Rose, Contr. U. S. Nat. Herb. 1:131, t. 14. 1892.—*Type locality:* Carmen Island.

Common and frequently even abundant in gravelly washes in the gulf area. Only occassionally found on hillsides. It was seen on Angel de la Guarda (3397, 3406), San Esteban (3167), South San Lorenzo (3536), San Marcos (3640), Coronados (3759), and Carmen (3823) islands; at Mulegé (3659) and Guadalupe Point; and at Las Animas (3500), San Nicolas (3721), Escondido (3848), and Agua Verde (3882) bays. The only previous collections appear to be Palmer's type collection from Carmen Island, and a collection from the head of Concepcion Bay made by Rose. The range of the species is therefore the western islands and western shore of the gulf between lat. 25° 30′ and 29° 30′ N.

Passiflora palmeri is not a vine, but a shrub with a flattened, loosely intricate, woody framework of branches over which are toppled the numerous short (1-3 dm.) leafy stems. The bushes are commonly about 5 dm. high and 8-12 dm. broad. They are entirely self-supporting, the branches making no effort to climb even when the opportunity is offered. The herbage is glandular and very oily, and heavily stains the collecting papers between which it is dried. When in full flower, it is very pretty, being literally covered with hundreds of large white flowers. The petals and sepals are pure white inside, but are, especially the latter, greenish outside. The staminal tube is violet at the base, but white for most of its length.

The corona is light blue to purple, fading upwardly towards the pale tips. The fruit is a sickly yellowish when ripe and at first has a sweetish but not very positive taste that later takes on an unpleasant flavor suggestive of green plums. On San Marcos Island and at Mulegé it is called "sandia de la passion." The species is very constant in its characters and among the peninsular species is characterized by its extremely large (about 7 cm. broad) flowers, and comparatively short (less than 1 mm.) outer crown segments.

LIX. Loasaceæ

254. **Eucnide cordata** Kell.

Eucnide cordata Kell. in Curran, Bull. Calif. Acad. Sci. **1**:137. 1885.—*Mentzelia cordata* Kell., Proc. Calif. Acad. Sci. **2**:33. 1860.—*Type locality:* Cedros Island.

A frequent plant in well-drained soil. It is a coarse perennial 3-9 dm. high with a few ascending branches. The lower parts of the branches, and particularly the main stem, become hard and woody. The plant was collected at San Luis Island (3314), Angel de la Guarda Island (3410), Escondido Bay (4133), San Francisco Island (3957), and La Paz (3070).

255. **Mentzelia adhærens Benth.**

Mentzelia adhærens Benth., Bot. Sulph. 15. 1844.—*Type locality:* Magdalena Bay, Lower California.

Collected on San Pedro Martir (3156), Tortuga (3604), and Tiburon (4257) islands; and at Coyote (4171), and San Luis Gonzales (3337) bays. It was seen at several other localities, but always in a condition too advanced for collecting. It is not an uncommon plant in the gulf area. It was found to be most common about Coyote Bay and along the summit of San Pedro Martir Island, at both of which stations it grew in every sheltered place. The plant is usually more or less prostrate, forming loose growths 1-2 dm. high and 5-10 dm. broad. It commonly affects rocky or gravelly situations. The collected plants have small, scarcely lobed leaves, thereby differing from the most of Brandegee's collections.

256. Mentzelia hirsutissima var. stenophylla (Urb. & Gilg.) Johnston

Mentzelia hirsutissima var. *stenophylla* Johnston, Univ. Calif. Pub. Bot. 7:443. 1922.—*Mentzelia stenophylla* Urb. & Gilg., Nov. Act. Deuts. Akad. 76:80. 1900.—*Type locality:* San Quentin, Lower California.

Referred here is the single plant found growing on a silty flat near the south end of Angel de la Guarda Island (4229). A similar plant was also seen at the north end of the island on a sandy plain at Puerto Refugio. Other collections of this variety have been made at Los Angeles Bay *(Palmer 591)*, Calamujuet and Cajon de Santa Maria *(Brandegee)*, and San Quentin *(Orcutt 1357)*. The characters of the filaments used by Johnston(loc. cit.) to separate the variants of *M. hirsutissima* do not hold, and *stenophylla* is here retained solely as the small-flowered form of the species. The typical form of the species remains known only from the type collection which was made in 1876 on Angel de la Guarda Island.

257. Petalonyx linearis Greene

Petalonyx linearis Greene, Bull. Calif. Acad. Sci. 1:188. 1885.—*Type locality:* Cedros Island.

Seen only on San Luis (3317), Angel de la Guarda (3399), San Pedro Martir (3164), and Tortuga (3605) islands. The species ranges over the northern half of the peninsula and finds its eastern outposts in the islands mentioned. It is a weak bushy shrub which is commonly globose and 3-6 dm. in diameter. On Tortuga Island, where it was found most abundantly, it became 14 dm. high and 18 dm. broad. The plant has light-green leaves and white or pale floral bracts which render it very conspicuous against the dark rock upon which it grows. The large imbricated floral bracts are very numerous, but drop when the bush is shaken or when specimens are pressed. There appears to be considerable variation in the size of flowers, even in a single locality. The plant is characteristic of rocky ground and is usually found on hillsides.

258. **Petalonyx thurberi** Gray

Petalonyx thurberi Gray, Mem. Am. Acad. II, **5**:319. 1854. —*Type locality:* Gila River Valley, Arizona.

Locally frequent in a broad sandy wash back of San Luis Gonzales Bay (3328) where it forms rounded clumps 3-6 dm. high. It is not typical as to foliage, for the leaves are small (5 mm. long) and all about equal length.

259. **Sympetaleia aurea** Gray

Sympetaleia aurea Gray, Proc. Am. Acad. **12**:161. 1877.—*Type locality:* Pulpito Point, Lower California.

Collected at San Nicolas Bay (3728) within a mile of Pulpito Point, on Ildefonso Island (3741), near Loreto (3796), on Danzante Island (3856), and in a cañon back of Escondido Bay (4110). It was recognized, but not collected, at Agua Verde Bay, Puerto Ballandra on Carmen Island, and at Coyote Bay and Guadalupe Point in Concepcion Bay. The Sympetaleia observed in a sterile condition on San Marcos Island probably also belongs here. Brandegee has collections from Comondú and Purisima. From these records, representing nearly if not all the collections of the species, it seems that the plant is restricted to that segment of the peninsula lying between 25° 30′ and 27° N. lat.

Like its congeners the species is a cliff plant, and if not actually growing in crevices on the cliff-face, at least grows among the rocks at its base. It is an annual usually forming depressed rounded growths 8-10 cm. high and 1-2 dm. broad, but not infrequently becoming globose in outline, bushy, and 6 dm. in height. It is very striking when in full bloom it then being entirely covered with innumerable salverform vermilion or dilute-yellow flowers. About the type locality, in fact in all but the southern localities, the corollas are vermilion and not golden-yellow as described by Gray. The plant is covered with long sharp hispid hairs that make the handling of it very disagreeable.

260. **Sympetaleia rupestris** (Baill.) Gray

Sympetaleia rupestris Gray in Wats., Proc. Am. Acad. **24**:50. 1889.—*Loasella rupestris* Baill., Soc. Linn. Paris **1**:650. 1887.—*Type locality:* Guaymas, Sonora.

Collections of this species were made on San Pedro Nolasco Island (3143), Isla Partida (3227), Sal si Puedes Island (3522), and an islet in Guaymas Harbor (3077). The characteristic herbage was seen at Los Angeles Bay, San Francisquito Bay, Angel de la Guarda Island, and Tiburon Island. On the peninsula Brandegee made collections from Cajon de Santa Maria on the north to San Pablo on the south. Rose and Standley (Contr. U. S. Nat. Herb. **16**:15. 1912) report it from the Pinicate Mountains of northwestern Sonora. The range is hence in the gulf area and north of lat. 28°. It is a sticky cliff plant forming depressed rounded clumps which are usually about 2 dm. in diameter and 1 dm. in height. The leaves are shiny bright green and more or less glutinous above, and dull and non-glutinous below. The flowers are not conspicuous, though the plant itself is, especially when growing against dark lava rock.

261. **Sympetaleia tenella,** n. sp.

A prostrate annual herb, somewhat viscid, branched from the base with the pale branches narrowly winged and sparsely short villous; leaves palmately 5-lobed with unequal lobes and crenate or toothed margins, base truncate or reniform, blade commonly about 15 mm. long and 13 mm. wide on a petiole 1 cm. long but becoming 25 mm. long and 27 mm. wide on petioles 25 mm. long, short villous-hispid with an admixture of a few pustulate-based hairs; flowers axillary; pedicels about 5 mm. long in flower but becoming much elongated (5-7 cm. long) reflexed and tortuous; corolla 5-merous. 4-5.5 mm. long, yellow upon opening but becoming ochroleucous, setose-hispid without and with one particularly long subapical pustulate-based hirsute hair on each lobe, with a distinct tube 1-1.5 mm. long; corolla-lobes spreading, oblong, 3.5-4 mm. long, 2-2.2 mm. wide;

stamens 15-25, in two rows the lower of which is the larger, fixed at the middle of the tube and below, free, divergent; filaments filiform, 4-6 mm. long; anthers single-celled, reniform, attached medially below, dehiscent along a longitudinal groove with the margins reflexed; staminodia none; hypanthium depressed globose, hispid, 2 mm. wide, 1.5 mm. high; sepals oblong, about 1.75 mm. long; capsule 5-valved; ovules in 6 or more series on the parietal placentæ; style filiform without any dilated stigmatic area, about 2.5 mm. long; seeds oblong, spirally grooved, apiculate, about 0.3 mm. long.

Type: No. 1293, Herb. Calif. Acad. Sci., collected May 26, 1923, by I. M. Johnston (no. 3901) in an empty tinaja in a cañon back of **Agua Verde Bay, Lower California.**

This most interesting plant was seen only in a large amphitheater-like cañon in the Sierra Giganta a few kilometers southeast from Auga Verde Bay (3901). It was locally common on the rock-hewn floor of the cañon where due to the lateness of the season only a single green plant was found, in a sheltered nook on the floor of a large dry tinaja. It is a rather pretty little plant, covered, as it is, with many small, star-like flowers and recalling some of the Phacelias.

The plant represents a remarkably distinct new species in that anomalous loasaceous genus, Sympetaleia, which has previously had but two known species. *Sympetaleia tenella* differs from its congeners in its very short corolla-tube, few biseriate stamens, and long filaments. It is evidently less evolved than its relatives, showing affinities with Eucnide, which it approaches in its long filaments and short corolla-tube. With the addition of *tenella* the crucial characters of Sympetaleia become,—stamens with single-celled anthers and inserted in 2 or more rows on the sympetalous corolla. It is highly interesting that the peninsula should have produced three such well-marked species in this peculiar genus. Although *rupestris* and *aurea* seem to range apart, *tenella* appears to find a congenial home within the same area as *aurea*. It seems probable that the new species will be found along the Sierra Giganta when that range has been explored.

LX. Cactaceæ

262. **Bartschella schumannii** (Hildm.) Britt. & Rose

Bartschella schumannii Britt. & Rose, Cactaceæ **4**:58. 1923. —*Mamillaria schumannii* Hildm., Monatsschr. Kakteenk. **1**:125. 1891.—*Mamillaria venusta* K. Brandg., Zoe **5**:8. 1900. —*Type locality:* Not given, but doubtlessly from Lower California.

Infrequent on rocky hillsides at La Paz (4017) forming very flat clusters of 35 or less subglobose unequal heads.

263. **Carnegiea gigantea** (Engelm.) Britt. & Rose

Carnegiea gigantea Britt. & Rose, Jour. N. Y. Bot. Gard. **9**:188. 1908.—*Cereus giganteus* Engelm. in Emory, Notes Mil. Recon. 159. 1848.—*Type locality:* Along the Gila River, Arizona.

Seen at Tepoca Bay, Patos Island (3238), Tiburon Island (4281), Pelican Island, and San Pedro Bay. The plants grew on the lower slopes of the rocky hill and were uncommon. Mainly simple and 20-35 dm. high, but the single plant on Patos Island is over 12 m. high and has a single large branch.

264. **Cochemiea poselgeri** (Hildm.) Britt. & Rose

Cochemiea poselgeri Britt. & Rose, Cactaceæ **4**:22. 1923.—*Mamillaria poselgeri* Hildm., Gartenzeitung **1885**:559. 1885. —*Mamillaria roseana* K. Brandg., Zoe **2**:19. 1891.—*Type locality:* "Süd-Californien," but certainly from Lower California.

Observed on the peninsula and on the adjacent islands at every locality from Ildefonso Island and San Nicolas Bay southward. It forms loose circular patches about 5 dm. broad and 8-15 cm. high. The stems are 2-4 dm. long and have the terminal decimeter ascending with the remaining portion prostrate. The stems are usually rose-colored. (3760, 4083, 4100).

265. **Echinocereus brandegei** (Coult.) Schumann

Echinocereus brandegei Schumann, Gesamtb. Kakteen 290. 1898.—*Cereus brandegei* Coult., Contr. U. S. Nat. Herb. **3**:389. 1896.—*Type locality:* El Campo Allemand, Lower California.

Usually growing on rocky hillsides but frequently also on gravelly benches. It forms dense masses 6-9 dm. broad, composed of 40 or less cæspitose heads. It was seen at Mulegé, Coyote Bay (4164), Escondido Bay, Agua Verde Bay, San Evaristo, and La Paz; and on Carmen, Danzante (3858), Santa Cruz (3913), Espiritu Santo, and Ceralbo islands.

266. **Echinocereus engelmanni** (Parry) Rümpler

Echinocereus engelmanni Rümpler in Förster, Handb: Cact. ed. 2. 805. 1885.—*Cereus engelmanni* Parry, Am. Jour. Sci. II, **14**:338. 1852.—*Type locality:* About San Felipe, California.

In cæspitose masses on gravelly benches or on hillsides at Tepoca, Los Angeles (3445), Las Animas, and San Francisquito bays. Doubtfully referred here are similar plants from San Pedro Bay (4374) which have very slender light-colored spines.

267. **Echinocereus grandis** Britt. & Rose

Echinocereus grandis Britt. & Rose, Cactaceæ **3**:18. 1922. —*Type locality:* San Esteban Island.

An insular species seen only on San Pedro Nolasco (3137), San Esteban (3199), North San Lorenzo (4198), and South San Lorenzo (3541) islands where it grows scattered over rocky slopes. The plant is cylindrical, with one or two branches, and has short yellowish-green spines. The flowers are white with the outer segments sometimes tinged lightly with pink.

268. **Echinocereus scopulorum** Britt. & Rose

Echinocereus scopulorum Britt. & Rose, Cactaceæ **3**:30. 1922.—*Type locality:* Near Guaymas, Sonora.

Frequent on the hills about Guaymas (3103), San Carlos Bay (4344), and San Pedro Bay (4291). Usually simple and about 2 dm. high. The flowers are very large, and are pink, turning magenta.

Echinocereus sp.

A peculiar species of this genus was found growing in crevices on the cañon walls in the hills back of Los Angeles Bay (3446). Its 3-6 stems were 20-35 cm. long and 4-5 cm. thick, and hung down with their tips ascending. The plants had branches which were loosely affixed, and always produced rootlets about their point of attachment. The spines are acicular and 1-2 cm. long. Dr. Rose believes the plant to be undescribed.

269. **Ferocactus alamosanus** Britt. & Rose

Ferocactus alamosanus Britt. & Rose, Cactaceæ **3**:137. 1922.—*Echinocactus alamosanus* Britt. & Rose, Contr. U. S. Nat. Herb. **16**:239, t. 66. 1913.—*Type locality:* Alamos Mountains, Sonora.

Occasional on the hillsides at the head of San Carlos Bay (4348) where the huge plants became 15 dm. high and 5 dm. broad. The flowers are a clear lemon yellow.

270. **Ferocactus diguetii** (Weber) Britt. & Rose

Ferocactus diguetii Britt. & Rose, Cactaceæ **3**:131. 1922.—*Echinocactus diguetii* Weber, Bull. Mus. Hist. Nat. Paris **4**:100. 1898.—*Type locality:* Catalina Island.

Occurring on Coronados, Carmen, Danzante, Catalina (4098), San Diego, and Ceralbo (4037) islands, growing on rocky hillsides or on gravelly benches. Frequent on Carmen and Ceralbo islands, but abundant on Catalina Island where it is the most characteristic plant. The largest plants were seen on Catalina Island where plants over 3 m. high were not uncommon and the average measurements were 10-15 dm. high and 4-5 dm. broad. The number of ribs varies from 24 to 37. The flowers are reddish.

271. **Ferocactus johnstonianus** Britt. & Rose

Ferocactus johnstonianus Britt. & Rose, Cactaceæ 4:287. (1923).—*Type locality:* Lagoon on Angel de la Guarda Island.

This species is known only from collections made back of the lagoon on the east shore of Angel de la Guarda Island (3394, 3395). About 50 plants were observed growing on a gravelly plain. The species is obviously related to *F. diguetii,* of the southern gulf islands, but is clearly distinct in its small size, much more numerous spines and yellow flowers.

272. **Ferocactus wislizeni** (Engelm.) Britt. & Rose

Ferocactus wislizeni Britt. & Rose, Cactaceæ 3:127. 1922. —*Echinocactus wislizeni* Engelm. in Wisliz., Mem. No. Mex. 96. 1848.—*Type locality:* Near Dona Ana, New Mexico.

Barrel-cacti of the *F. wislizeni* group are frequent in the gulf area. Spines are very variable in length and breadth, even in a single colony (3453, 3454, 4085a, 4162, 4163, 4190). The plants on San Josef Island (3935, 4084) are similar in general habit but are unique in the possession of a distinct central woody core. The plants on Tiburon Island (4251, 4270) have notably stout terete spines.

Ferocactus sp.

A ponderous species, which becomes 15 dm. high and 7 dm. broad, is frequent on the hillsides about San Pedro Bay (4292). It belongs to the same immediate group as *F. digueti* and much resembles that species in habit.

273. **Lemaireocereus thurberi** (Engelm.) Britt. & Rose

Lemaireocereus thurberi Britt. & Rose, Contr. U. S. Nat. Herb. 12:426. 1909.—*Cereus thurberi* Engelm., Am. Jour. Sci. II, 17:234. 1854.—*Type locality:* Near Bachuachi Pass, Sonora.

On the peninsular side of the gulf this species was present on every island, with the sole exception of Catalina Island, and at every peninsular station south of Mulegé. On the Sonoran side of the gulf it was seen at Tepoca Bay, Tiburon Island, San Pedro Bay, San Pedro Nolasco Island (?), and Guaymas. It is branched at the base with numerous ascending branches that become 2-4 m. high. It grows scattered over gravelly benches and rocky hillsides. There is considerable variation as to the time of opening and closing of flowers. On Carmen Island the flowers opened after dark and closed before 8 o'clock in the morning. On Ceralbo Island flowers in full sunlight were noted as open at 10:30 a.m. and at 2:30 p.m. At San Evaristo Bay open flowers were seen as late as 4 p.m.

274. **Lophocereus schottii** (Engelm.) Britt. & Rose

Lophocereus schottii Britt. & Rose, Contr. U. S. Nat. Herb. **12**:427. 1919.—*Cereus schottii,* Engelm., Proc. Am. Acad. **3**:288. 1856.—*Type locality:* Near Magdalena, Sonora.

Seen on Tiburon, Partida, Tortuga, San Marcos, Inez, Ildefonso, Coronados (3763), Carmen, Danzante, Monserrate, San Diego, Santa Cruz, San Josef, and San Francisco islands; and at Tepoca Bay, Los Angeles Bay, Las Animas Bay, San Francisquito Bay, Santa Rosalia, Guadalupe Point, San Nicolas Bay, Loreto, Escondido Bay, San Evaristo, and La Paz. It is a light-green, stout, usually 5-ribbed cactus with only a few ascending stems 1-3 m. high. It reaches its best development in gravelly soil, but also occurs on hillsides. Called "garambullo" or "hombre viejo."

275. **Machærocereus gummosus** (Engelm.) Britt. & Rose

Machærocereus gummosus Britt. & Rose, Cactaceæ **2**:116. 1920.—*Cereus gummosus* Engelm. in Brandg., Proc. Calif. Acad. Sci. II, **2**:162. 1889.—*Cereus cumengei* Weber, Bull. Mus. Hist. Nat. Paris **1**:317. 1895.—*Type locality:* Northwestern Lower California, probably about Ensenada.

One of the most common and characteristic cacti on the peninsula. It was seen at all stations in Lower California from Los Angeles Bay southward (3797, 4141, 4188), and on Tiburon, San Esteban, and Angel de la Guarda islands southward on all the islands along the peninsular shore. Growing on alluvial plains and on gravelly benches, and occurring, but less abundant, on rocky hillsides. It usually forms erect loose growths 1-2 m. high. At most localities it grew in scattered though frequent groups and did not form such a formidable barrier as on the slightly elevated bench just north of Loreto where an area several square kilometers in extent would be impenetrable were it not traversed by sinuous cattle trails. The flowers are white within and a deep rose-color outside. They close before noon. The plant is well known under the name of "pitahaya agre." It may be questioned whether *C. gummosus* is actually described at the reference given. If a hyponym then Weber's name must be accepted.

276. **Neomammillaria albicans** Britt. & Rose

Neomammillaria albicans Britt. & Rose, Cactaceæ 4:138. 1923.—*Type locality:* Santa Cruz Island.

Frequent on the rocky slopes of Santa Cruz (3912) and San Diego (3923) islands. The plants are simple or occasionally with a single branch. The stems are 5-8 cm. high and 20-25 mm. thick.

277. **Neomammillaria cerralboa** Britt. & Rose

Neomammillaria cerralboa Britt. & Rose, Cactaceæ 4:116. 1923.—*Type locality:* Ceralbo Island.

This is a tawny plant with mainly unhooked spines, and is frequent on the hillsides and in gravelly washes on Ceralbo Island (4038, 4053). It is cylindrical, solitary or with one branch, and is 10-15 cm. high.

278. **Neomammillaria evermanniana** Britt. & Rose

Neomammillaria evermanniana Britt. & Rose, Cactaceæ 4:97. 1923.—*Type locality:* Ceralbo Island.

Small and depressed globose, and found growing wedged in crevices of a rocky cliff along the cañon-side on Ceralbo Island back of El Mastrador (4058). Other lactiferous species closely related to *N. evermanniana* were collected on Espiritu Santo Island (3985) and in the mountains back of Escondido Bay (4142).

279. **Neomammillaria johnstonii** Britt. & Rose

Neomammillaria johnstonii Britt. & Rose, Cactaceæ 4:80. 1923.—*Type locality:* San Carlos Bay, Sonora.

Frequent on the barren volcanic hillsides at San Carlos (4373) and San Pedro (4342) bays, forming coarse depressed-globose heads 15 cm. broad.

280. **Neomammillaria slevinii** Britt. & Rose

Neomammillaria slevinii Britt. & Rose, Cactaceæ 4:139. 1923.—*Type locality:* San Josef Island.

A pallid, simple or rarely branched plant 5-8 cm. high and 20-25 mm. thick. It is frequent on the rocky slopes of San Francisco Island (3943). Rose collected the species on San Josef Island.

281. **Neomammillaria swinglei** Britt. & Rose

Neomammillaria swinglei Britt. & Rose, Cactaceæ 4:158. 1923.—*Type locality:* Guaymas, Sonora.

Very common on a scoriæ-covered islet in Guaymas Harbor (3086). It is commonly simple but occasionally produces as many as six very unequal heads.

Neomammillaria sp. or spp.

A group of mamillarias, related to or perhaps to be included in *N. armillata* (K. Brandg.) Britt. & Rose, or *N. fraileana* Britt. & Rose, is represented on nearly all the gulf islands and at many points on the peninsula and mainland. In the large series of specimens collected there is considerable diversity in stoutness, length, color, and number of the spines, as well as in the stoutness of the habit, and so it seems not improbable that there are several species represented. The plants grow on rocky slopes and gravelly benches and are very similar in habit, forming cylindrical or clavate growths 5-30 cm. high and 3-6 cm. thick. They are simple or occasionally have one or two strict branches. (3198, 3369, 3542, 3543, 3589, 3738, 3746, 3761, 3812, 3833, 3834, 3862, 3864, 3924, 3933, 3934, 3941, 3988, 4000, 4018, 4039, 4059, 4086b, 4099, 4183, 4186, 4187, 4230, 4290, 4339, 4381, 4418).

Neomammillaria sp.

Much branched, forming loose cæspitose masses of 40 or fewer stems. The stems are 5-8 cm. long and 20-25 mm. thick. Frequent on the rocky slopes of San Pedro Nolasco Island (3112). Related to *N. albicans* and *N. slevenii.*

Neomammillaria sp.

Infrequent in rock-crevices along the crest of San Pedro Nolasco Island (3121). The plants are depressed globose and are single or are compactly cæspitose with 4-5 heads. The flowers are magenta and the stamens are yellow. A very neat lactiferous species with tomentose upper tubercules.

282. **Opuntia bigelovii** Engelm.

Opuntia bigelovii Engelm., Proc. Am. Acad. **3**:307. 1856. —*Type locality:* Big Williams River, Arizona.

Growing at Kino Point and Tepoca Bay, and on Tiburon and San Esteban (?) islands. Not particularly common.

283. **Opuntia burrageana** Britt. & Rose

Opuntia burrageana Britt. & Rose, Cactaceæ **1**:70, t. 14, f. 1. 1919.—*Type locality:* Near Pichilinque Island, Lower California.

This species, and probably several related ones of similar aspect, are common on the islands and gulf shore from Ceralbo to San Pedro Martir, San Esteban, and San Luis islands. The cylindropuntias in question were not seen on Catalina, Inez, or Tortuga islands, but were rather common elsewhere within the range mentioned. The plants usually grow with *O. cholla* but are less stout, of a different green, grow less tall, and have lower more close-set tubercules.

284. **Opuntia cholla** Weber

Opuntia cholla Weber, Bull. Mus. Hist. Nat. Paris **1**:320. 1895.—*Type locality:* Lower California.

This is the common cylindropuntia on every island and about every peninsular locality from San Marcos Island and Mulegé southward. The species reaches its best development on sandy plains where it frequently forms large thickets. It grows 1-2 m. high and usually has one to several trunks. A plant seen at San Francisquito Bay may be this or a closely related species.

285. **Opuntia ciribe** Engelm.

Opuntia ciribe Englem. in Coult., Contr. U. S. Nat. Herb. **3**:445. 1896.—*Type locality:* Lower California.

What is probably this species was observed at San Francisquito, Las Animas, and Los Angeles bays; and on Angel de la Guarda, Smiths, Partida, San si Puedes (?), South San Lorenzo, Tortuga, and Santa Cruz (?) islands. The stems are stout and tawny and suggest those of its near relative, *O. bigelovii,* from which it differs conspicuously in its open habit of growth and elongate lateral branches.

286. **Opuntia clavellina** Engelm.

Opuntia clavellina Engelm. in Coult., Contr. U. S. Nat. Herb. **3**:444. 1896.—*Type locality:* Near Purisima, Lower California.

Doubtfully referred here are cylindropuntias from Tortuga (4184), Santa Cruz (3914), and Ceralbo islands. The Tortuga plants are stout-spined, self-supporting, widely branched, and 4-9 dm. high, but the other plants have slender spines and are usually partially supported by bushes.

287. **Opuntia comonduensis** (Coult.) Britt. & Rose

Opuntia comonduensis Britt. & Rose, Smiths. Miscl. Coll. **50**:519. 1908.—*Opuntia angustata* var. *comonduensis* Coult., Contr. U. S. Nat. Herb. **3**:425. 1896.—*Type locality:* Comondú, Lower California.

Seen on the peninsula only at La Paz, but present on all the western gulf islands, except Catalina, from Espiritu Santo to Coronados (3762). It is a yellowish-green plant with long, slender, deflexed spines, which grows singly and forms growths about a meter high. It is the only platyopuntia on the islands off the peninsular shore.

288. **Opuntia gossiliniana** Weber

Opuntia gossiliniana Weber, Bull. Soc. Acclim. France **49**:83. 1902.—*Type locality:* Coast of Sonora probably from Guaymas.

This purplish jointed platyopuntia is common on the rocky slopes about San Carlos Bay and over the slopes of the islands in Guaymas Harbor.

289. **Opuntia invicta** Brandg.

Opuntia invicta Brandg., Proc. Calif. Acad. Sci. II, **2**:163. 1889.—*Type locality:* San Juanico, Lower California.

Observed only at San Francisquito (3550) and San Nicolas bays where it grows on hillsides or gravelly benches, and forms dense colonies about a meter broad. In habit and spines the plant bears little resemblance to the common types of Opuntia, most resembling Echinocereus, having oblong joints about 1 dm. long and 5-8 cm. thick which are covered with very coarse, straight, angled spines that much resemble those of *Machærocereus gummosus.* The joints are the erect green portion of trailing stems. The stems die back of the growing parts. They are constantly dichotomously branching and by the dying of the common stems forming new plants.

290. **Opuntia leptocaulis** DC.

Opuntia leptocaulis DC., Mem. Mus. Hist. Nat. Paris **17**:118. 1828.—*Type locality:* Mexico.

Rare on a gravelly plain at San Pedro Bay (4341) forming bushy masses 6-9 dm. high.

Opuntia sp.

A cylindropuntia apparently related to *O. cholla* is common on Raza and Pond islands. It is characterized by the habit of bearing enormous amounts of pendent many-jointed fruit.

Opuntia spp.

Unknown platyopuntias were seen at Escondido Bay (4140), and on Pelican and San Pedro Nolasco islands. There are three different species.

291. **Pachycereus pringlei** (Wats.) Britt. & Rose

Pachycereus pringlei Britt. & Rose, Contr. U. S. Nat. Herb. **12**:422. 1909.—*Cereus pringlei* Wats., Proc. Am. Acad. **20**:368. 1885.—*Type locality:* South of the Altar River, Sonora.

This is one of the most characteristic plants of the gulf area, and is one of the feature-forming elements of nearly every landscape. With the exception of Georges Island and Tepoca Bay (?) the plant was present in varying abundance at every station in the area. It grows with equal abundance on gravelly plains and on rocky hillsides. There is considerable variation in habit of growth. The common form is one with a distinct trunk 1-2 m. high which supports a crown of very thick upright branches. The whole plant is 3-9 m. high. In some localities the plants are simple. The most pronounced variation in habit is that characteristic of the plants on San Pedro Martir Island (3160). These are trunkless or nearly so, the branches starting from near the ground and making the plant appear like monstrous specimens of *Lemairocereus thurberi.* This trunkless form was seen on most of the northern gulf islands. The fruit is usually dry, but on Catalina it splits at maturity in an irregular stellate manner and discloses a purplish-pink fleshy inner layer of tissue. The young plants are commonly covered with spines 1-3 cm. long, but as the stems get older they tend to lose their armature. The plants on Espiritu Santo and Ceralbo islands seem to have exceptionally long spines, these becoming over a decimeter in length on the trunks of young plants.

292. **Pilocereus johnstonii** Britt. & Rose

Pilocereus johnstonii Britt. & Rose, Jour. Wash. Acad. Sci. **12**:329. 1922.—*Type locality:* San Josef Island.

Known only from a few plants found growing in sandy soil at San Nicolas Bay (3737) and on San Josef Island (3940, 4085). It usually grows up through Olneya, partially supported by it, and very much simulating the dead branches of that spiny tree.

293. **Rathbunia alamosensis** (Coult.) Britt. & Rose

Rathbunia alamosensis Britt. & Rose, Contr. U. S. Nat. Herb. **12**:415. 1919.—*Cereus alamosensis* Coult., Contr. U. S. Nat. Herb. **3**:406. 1896.—*Type locality:* Near Alamos, Sonora.

Locally common on a gravelly cañon floor at the head of San Carlos Bay (4347). It much resembles *Machærocereus gummosus* in form and general habit, but is more slender and lighter green. The plants grow 9-12 dm. high with many weak differently appearing trailing stems about the base of the stout erect flowering ones. The flowers are scarlet.

294. **Wilcoxia striata** (Brandg.) Britt. & Rose

Wilcoxia striata Britt. & Rose, Contr. U. S. Nat. Herb. **12**:434. 1909.—*Cereus striatus* Brandg., Zoe **2**:19. 1891.—*Cereus diguetii* Weber, Bull. Mus. Hist. Nat. Paris **1**:319. 1895.—*Type locality:* San José del Cabo, Lower California.

Frequent on the rocky benches bordering the salt-lagoon on Carmen Island (4146). A single large plant was found on a gravelly bench in a cañon on San Marcos Island (4179). The roots which radiate from the plant less than a decimeter under the ground, are thickened about 1-3 dm. from the plant to form large fusiform tubercules. These tubercules vary considerably in abundance, for some plants have only one or two while others have as many as 50. In size the tubercules vary from 5-20 cm. in length and from 5-60 mm. in thickness. It is estimated that the large plant taken on San Marcos Island had 5 kg. of tubercules. The average plant has about 1 kg. The plant grows 3-6 dm. high and has an erect stem 15-20 cm. high which is branched above into horizontal or arcuately recurved branches 15-20 cm. long and of the thickness of a lead pencil. It is a difficult plant to find, due to its small size and general resemblance to a dead leafless shrub. It was called "tracamatraca" by a worker at the saltworks, "matraca" by one of the sailors, and "caramatraca" by a native on San Marcos Island. The tubercules are cut in two and applied over the lungs for ailments of those organs. Rose collected the species on San Josef Island.

LXI. Rhizophoraceæ

295. **Rhizophora mangle** L.

Rhizophora mangle L., Sp. Pl. 443. 1753.—*Type locality:* Caribbean Sea.

The mangrove was noted in the still waters of esteros and bays at Las Animas Bay (3492), Mulegé (3657), Coyote Bay, Puerto Ballandra on Carmen Island (3822), Danzante Island, Escondido Bay, San Josef Island, Espiritu Santo Island, and La Paz on the peninsula side of the gulf; and at San Carlos Bay and Guaymas on the mainland. The Las Animas station, where a single puny bush was found, probably represents the northernmost station on the Pacific Coast; the locality is at about 28° 50′ N. lat. The finest plants were seen at Coyote Bay where they became arborescent and over 9 m. in height.

LXII. Combretaceæ

296. **Laguncularia racemosa** (L.) Gaertn.

Laguncularia racemosa Gaertn., Fruct. et Sem. **3**:209, t. 217, f. 3. 1805.—*Conocarpus racemosus* L., Syst. ed. 10, 930. 1759.—*Type locality:* Not given.

Seen only at Mulegé (3658), Coyote Bay, Carmen Island, Danzante Island, Escondido Bay, Agua Verde Bay (3908), San Josef Island, Espiritu Santo Island (4071), La Paz, and San Carlos Bay. The most northern observed station is San Carlos Bay where it is common at 28° N. lat. It was most common at Mulegé and La Paz where it grows with Rhizophora on shallowly submerged land along esteros. A small tree 24-45 dm. high.

LXIII. Onagraceæ

297. **Œnothera angelorum** Wats.

Œnothera angelorum Wats., Proc. Am. Acad. **24**:49. 1889. —*Type locality:* Los Angeles Bay, Lower California.

Referred here are the common yellow-flowered annuals that grow on the sands at San Francisquito Bay (3572). The plant has strict or ascending stems 3-6 dm. long which were leafless at the time of collecting. An erectly growing annual seen on San Luis Island may also be referable here.

Young plants of *O. angelorum* superficially resemble *O. leptocarpa (Eulophus californicus)*, but the contorted fruit which commonly occurs near the base of the plant, the laxer habit of growth, and the longer hypanthium, all amply distinguish *angelorum*. The closest ally of the latter species seems to be *O. sceptrostigma* Brandg. (Proc. Calif. Acad. Sci. II, **2**:156. 1889) which comes from the western middle section of the peninsula. Brandegee's species seems to differ only in habit, being acaulescent or having a few short trailing stems. The petals on the type of *sceptrostigma* are 15 mm. long, but in some other collections the petals are only 6 mm. long and well within the size of *angelorum*. *Œnothera crassiuscula* Greene (Pittonia **1**:290. 1889) from San Bartolomé Bay belongs to the same immediate group of species and may be the same as *sceptrostigma*, although the habit is not correctly described for that species.

298. **Œnothera cardiophylla** Torr.

Œnothera cardiophylla Torr., Pacif. R. R. Rep. **5**:360. 1856. —*Chylisma cardiophylla* Small, Bull. Torr. Cl. **23**:193. 1896. —*Type locality:* Near Fort Yuma, California.

Seen only at San Luis Gonzales Bay (3339), and on San Luis (3318), Angel de la Guarda (4232), San Pedro Martir (3147), and San Marcos (3636) islands. It was collected from gravel, silt, and gypsum. It tends to become perennial and to be as much as 9-12 dm. high. The southern limit for the species appears to be about lat. 27° N.

LXIV. UMBELLIFERÆ

299. **Eryngium nasturtiifolium** Juss.

Eryngium nasturtiifolium Juss. in Delar., Eryng. 46, t. 17. 1808.—*Type locality:* Central America.

A few plants were found growing in gravelly soil about some dried springs in the cañon at the head of San Carlos Bay (4359). It is prostrate and becomes as much as 7 dm. broad.

LXV. Theophrastaceæ

300. **Jacquinia pungens** Gray

Jacquinia pungens Gray, Mem. Am. Acad. II, **5**:325. 1855. —*Type locality:* Hills between Rayon and Ures, Sonora.

Growing on alluvial plains at Guaymas (3113), San Pedro Bay (4295), and on the south end of Tiburon Island (4274). At Guaymas it formed only shrubby hedge-like growths 15-25 dm. high, but elsewhere it commonly formed a very dense tree 6-8 m. high. The trunk and limbs of the plant are ponderous, covered with dark, thin, rather smooth bark, and composed of a very weak brash wood. The trees seen were covered with nuts and the ground under them littered with shells left by rodents.

LXVI. Primulaceæ

301. **Samolus ebracteatus** H.B.K.

Samolus ebracteatus H.B.K., Nov. Gen. et Sp. **2**:223, t. 129. 1817.—*Type locality:* Cuba.

On San Marcos Island (3631) this plant was often locally abundant about moist, salt-incrusted areas on the bottom of gypsum ravines. A few plants were found at Loreto (3799) growing in a saline spot near the ocean. The flowers are a definite pink in color.

LXVII. Sapotaceæ

302. **Bumelia occidentalis** Hemsley

Bumelia occidentalis Hemsley, Biol. Centr. Amer. Bot. **2**:298. 1881.—*Bumelia fragrans* Brandg., Zoe **5**:106. 1901. —*Bumelia brandegei* Blake, Contr. Gray Herb. II, **52**:76. 1917.—*Type locality:* "Sonora Alta".

Referred here are collections from Agua Verde (3904), San Pedro (4296), and San Carlos (4367) bays. The plants are large, upright, very spinescent shrubs 25-30 dm. high, which commonly form colonies in alluvial soil. The flowers, which are produced in great abundance, are pale yellow and strongly fragrant with a honey-like odor. The fruit is oblong with a light-colored, sweetish flesh, and a black, slightly glaucous skin.

The determination is not entirely satisfactory. The Agua Verde plants have very large flowers, long acuminate anthers, and other minor floral differences; whereas the San Pedro collection has smaller flowers, truncate staminodia, and subequal petals and appendages. A study of the material in the Brandegee collection shows so much variation, and so little uniformity in corolla structures that one can justly question their value for specific differentiation. The type of *B. fragrans* and a Purpus collection (319) seem to agree, particularly so in the brown, lightly pubescent sepals. Future collections may validate *fragrans,* but at present it should not be recognized when better marked forms go unnamed.

303. **Sideroxylon leucophyllum** Wats.

Sideroxylon leucophyllum Wats., Proc. Am. Acad. **24**:59. 1889.—*Type locality:* Los Angeles Bay, Lower California.

Trees representing this species were found on Angel de la Guarda Island (3365, 3409), Los Angeles Bay (3438, 3485), and Las Animas Bay (3507). Previously it has been known only from the original collection at Los Angeles Bay *(Palmer 516)* and from about 115 km. farther north at Cañon de Santa Maria *(Brandegee)*. The plant varies considerably in habit and habitat. On the peninsula, it was found only on dry rocky mountain sides, usually in open gulches and forming an erect, very heavy-trunked, scraggly tree 30-45 dm. high. On Angel de la Guarda Island, where it was collected at the north and south ends, it grew on rocky mountain sides but occurred as well along the borders of gravelly washes and formed a widely spreading, open tree 6 m. in height. The bark on the trunk is thick, furrowed, and fibrous. The milky sap quickly solidifies upon exposure to air into hard masses and forms good chewing gum. On trees growing on hillsides there is a striking dimorphism in foliage. The leaves on the lower branches are only 15-30 mm. long and 6-8 mm. wide, and are commonly lightly tomentose; whereas the leaves on the vigorous long flowering stems are 5-9 cm. long, 2-4 cm. broad, and white with a close, dense tomentum. No mature fruit was collected, but, judging from pieces picked up from under the trees, it must be globular, tomentose, 18-22 mm. broad, and only two-seeded. The ovary is densely tomentose and 5-celled.

LXVIII. Ebenaceæ

304. **Maba intricata** (Gray) Hiern

Maba intricata Hiern, Trans. Cambr. Philos. Soc. **12**:126. 1872.—*Macreightia intricata* Gray, Proc. Am. Acad. **5**:163. 1862.—*Type locality:* Cape San Lucas, Lower California.

On Ceralbo Island (4048, 4054) this plant is the prevailing and characteristic shrub along the cliffs and on the steep slopes near or facing the shore. While most abundant along the shore it is not confined there, for at El Mastrador it extends inland along a steep cañon wall for a half kilometer. The plant is a dense, pale-barked shrub 3-25 dm. high and 1-2 m. broad. When growing in exposed situations it assumes a flat-topped, hedge-like habit, but when sheltered it forms a comparatively loose growth and has a rounded crown. The ground beneath the plant is deeply covered with old leaves. The fruit seems to be a rich reddish brown and is glabrous when mature; it appears to be relished by rodents. This Maba is treated as *Diospyros texana* by Goldman (Contr. U. S. Nat. Herb. **16**:359. 1916. Brandegee (Proc. Calif. Acad. Sci. II, **3**:150. 1891) has given a detailed redescription of the species with which the collected material fully accords.

It can be noted here that the persimmon of the Cape region is not closely related to *Diospyros texana*. The plant that Brandegee first (Zoe **4**:404. 1894) called *D. texana,* and later designated as the variety *californica* (Zoe **5**:164. 1903), should be dissociated from *D. texana* and called **Diospyros californica,** n. comb. The relationships of the plant are with the trees of western Mexico recently described by Standley (Contr. U. S. Nat. Herb. **18**:119-121. 1916.). The peninsular material consists of a glabrate form and one that is brownish with a dense villous tomentum. Brandegee has indicated a tomentose specimen from the "cape region" as the type of his *californica*. The glabrate form, represented by his collection from San Bernardo, may be called **Diospyros californica** var. **tonsa,** n. var.

LXIX. Oleaceæ

Forestiera sp.

An indeterminable species of Forestiera was found to be infrequent on the rocky bed of a cañon at the head of Candeleros Bay on Espiritu Santo Island (4078). It formed a large green shrub 18-24 dm. high. The collected material seems similar to topotypic material of *F. phillyreoides* (Benth.) Torr.

LXX. Apocynaceæ

305. **Macrosiphonia hesperia,** n. sp.

A shrub 7-10 dm. high, with numerous widely-branched, very loosely-tufted stems; younger parts with a dense brownish pubescence; leaves opposite, ovate or orbicular-ovate, white-tomentose below, green and velvety hirsute above, blade 2-3 cm. long, 18-24 mm. wide, base obtuse or rounded, apex short mucronate, petioles about 4 mm. long; flowers terminal, solitary or frequently geminate, on stoutish pedicels 4-17 mm. long; calyx oblong or oblong-spathulate, about 8 mm. long at anthesis, densely brownish hirsute outside, inside glabrous and below with pectinately arranged glands (ca. 8-10 per sepal); flowers 6-7 cm. long, glabrous, tube slender being 1-1.5 mm. wide and 4-5 cm. long, throat cylindrical 8 mm. long and 3-4 mm. wide, lobes obliquely cuneate-obovate and about 13 mm. long and 1 cm. wide; follicles usually 10-12 cm. long, somewhat torose, canescent with a fine antrorse pubescence, with 5 erect plate-like glands arranged about base; seeds oblong or linear, wrinkled, 5-8 mm. long; coma copious, equalling or shorter than the seed.

Type: No. 1294, Herb. Calif. Acad. Sci., collected May 21, 1921, by I. M. Johnston (no. 3807) from about cliffs back of **Puerto Ballandra, Carmen Island, Gulf of California.**

This shrub appears to have a wide range along the southern part of the gulf shore of the peninsula. It was noted on Carmen (3807), Catalina, Santa Cruz, Espiritu Santo (3984), and Ceralbo islands; and at Escondido and Agua Verde (3888) bays. The only previous record is that regarding Palmer's collection on Carmen Island (Contr. U. S. Nat. Herb. **1**:132. 1892). The plant affects rocky ground and usually grows where sheltered by cliffs. It is a true shrub, commonly having many very loosely tufted stems which are frequently coarse and very twiggy. The species is most closely related to *M. macrosiphon,* but differs in having a widely-separated range, much smaller, glabrous flowers, and shrubby habit.

306. **Vallesia glabra** (Cav.) Link

Vallesia glabra Link, Enum. Pl. 1:207. 1821.—*Rouwolfia glabra* Cav., Icones 3:50, t. 297. 1795.—*Type locality:* "Nova Hispania".

At Mulegé (3694), Loreto, Carmen Island, Escondido Bay, and La Paz (3026) this shrub was noted on subalkaline sandy soil. It produces hundreds of slender stems and forms a dense erect tufted growth 18-26 dm. high. The fruits and flowers are white, but the latter dry a bright orange. Several different people at La Paz called the plant "otatabe".

LXXI. Asclepiadaceæ

307. **Asclepias albicans** Wats.

Asclepias albicans Wats., Proc. Am. Acad. 24:59. 1889.—*Type locality:* Ravine near Los Angeles Bay, Lower California.

Collected on Tortuga (3608), South San Lorenzo (4193), San Esteban (3181), and Angel de la Guarda (3389, 4222) islands; also at San Luis Gonzales Bay (3350). The plant has a few strict branches which are distinctly woody below and as much as 35-40 mm. thick, 3 dm. above ground. The long, very glaucous whip-like branches are usually drooping at the apex, so that, although the stems may become 18-36 dm. high, the actual length of the plant is frequently much greater. No particular habitat seems favored, the plant growing in sandy washes, on gravelly benches, or on scoriæ-covered hillsides. In the Brandegee collection there are collections from La Paz and Magdalena Bay. The species is most nearly related to *A. subulata* from which it conspicuously differs in flowers, the bud being obovate instead of globose in shape, and the hoods twice exceeding the stamens instead of exceeded by them. *Asclepias albicans* frequently has ternate leaves but *subulata* has them consistently opposite. The strict little-branched woody habit seems to be characteristic of the species, but observations are not complete enough to warrant such a statement as an established fact. Future collectors may well keep this point in mind.

308. **Asclepias leptopus,** n. sp.

Loosely much-branched from a suffrutescent base, 4-6 dm. high; stems slender, glabrous, green or lightly glaucous about the nodes; leaves all opposite, filiform with revolute margins, attenuate below, 4-7 cm. long, 0.7-1.5 mm. wide, deciduous; umbels 3-8 flowered, usually terminal in groups; peduncles 0-2 cm. long; pedicels slender, villous-puberulent, 9-15 mm. long; sepals 1.9 mm. long, linear-oblong, not firm; petals reflexed, nearly white, oblong, 5 mm. long, about 2 mm. wide; column evident, higher (by 1.0-1.1 mm.) than broad (0.7-0.9 mm.); hood broadly ovate when flattened out but appearing oblong in position, 3 mm. long, exceeding the stamens by 0.3-1 mm. entire, orange with a broad maroon medial line marking the insertion of the horn; horn adnate to the hood for about ⅔ length of latter and slightly exceeding it, claw-like, incurved and arching over stamens, about 2 mm. long; folicles ascending or arrect (at least not erect), smooth, glabrous, linear-lanceolate, 3.5-4 cm. long, about 3.5 mm. wide; seeds light brown, about 2 mm. long, with a coma 1 cm. long.

Type: No. 1295, Herb. Calif. Acad. Sci., collected July 8, 1921, by I. M. Johnston (no. 4377) from crevices of a tufa cliff at the head of **San Carlos Bay, Sonora.**

Found locally common in crevices on a tufa cliff that overhangs the mangrove lagoon at the head of San Carlos Bay (4377). It grows in loose, leafless clumps and suggests a very slender form of *A. albicans.* In the National Herbarium there is a very good match for the type of *A. leptopus* in a specimen which was collected near Nacapuly, 15 miles west of Guaymas *(Palmer 256,* determined as *A. galioides).* Two Sinaloan collections by Brandegee seem referable to the species; one from Cerro Colorado seems to be typical *A. leptopus,* but was referred by its collector to *A. mexicana* (Zoe **5**:216. 1905), while the second, from Altata, is atypical and larger in all its parts and was referred to *A. albicans* (loc. cit.). The new species has the aspect and habit of *A. macrotis* Torr., but has very different floral structures. It seems related to *A. albicans,* but Watson's species is a large, very glaucous plant with quite different corona. The outstanding features of *leptopus* are its habit, opposite leaves, and coronal development.

309. **Asclepias subulata** Decaisne

Asclepias subulata Decaisne in DC., Prodr. **8**:571. 1844.—*Type locality:* "Nova Hispania?".

Collected at La Paz (3060), Mulegé (3689), and Kino Point (4284). It is a very densely tufted plant becoming 3-12 dm. high and always growing in sandy or gravelly soil. At Kino Point it grows on the dunes along the beach. It was called "jumente" at La Paz and its diluted milk reputed to be a violent cathartic. *Asclepias subulata* seems to be more abundantly lactiferous than *A. albicans,* and to have a less thick waxy glaucous coating on the stems. The two species were not found growing together, though they must do so at La Paz where Brandegee and Palmer collected the latter and I the former. The species is known only from Sonora, Lower California, Arizona, and California, and so could hardly have been collected by Pavon as originally given. Although this fact raises a doubt as to the proper application of the name to our plant, *A. subulata* is here taken up with some assurance due to Decaisne's faithful, albeit brief description of the plant in mind.

310. **Cynanchum palmeri** (Wats.) Blake

Cynanchium palmeri Blake, Contr. Gray Herb. II, **52**:83. 1917.—*Pattalias palmeri* Wats., Proc. Am. Acad. **24**:60. 1889.—*Cynanchum peninsulare* Blake, Contr. Gray Herb. II, **52**:83. 1917.—*Type locality:* Mulegé, Lower California.

Climbing up through, and forming tangles in, shrubs at San Marcos Island (3620) where it grew on talus footing gypsum cliffs, at Mulegé (3685) where a single plant was found at the foot of a bare rocky over-grazed hill, and at Espiritu Santo Island (3965) where it grew in rocky gulches. The plant is perennial from a taproot and produces a number of stems, the lower meter of which is covered with a deeply and irregularly much-furrowed, thick, pale corky bark. The peculiar corky bark is by far the most conspicuous feature of the plant. The follicles are smooth, shiny, and have a purplish brown mottling on a whitish ground color. The petals are wholly greenish yellow or in the southern plants sometimes margined with brownish. Blake has proposed a species to include the coarser plants from the cape region, but that development is better called **Cynanchum palmeri** var. **peninsulare,** n. comb. The Espiritu Santo collection is referable to the variety. Brandegee (Zoe **5**:165. 1903) has a note on the plant of the cape region.

311. **Marsdenia edulis** Wats.

Marsdenia edulis Wats., Proc. Am. Acad. **24**:61. 1889.—*Type locality:* On sandy saline mesas near saltwater at Guaymas, Sonora.

This coarse twiner was collected at Guaymas (3118), San Carlos Bay (4370), and San Pedro Bay (4306). It is not restricted to saline soils, as Watson's statement would suggest, for it grows over shrubs (usually armed) in gravelly washes and in cañons well back from the ocean. The plant forms a very open network of stems and not the matted tangled masses so characteristic of some other asclepiads. The fruit is elliptic-oblong, 7 cm. long and 3 cm. wide, with a horny peridium whose surface is smooth and light brown. At Guaymas it was called "tallote."

312. **Funastrum lineare** var. **heterophyllum** (Engelm.) Macbr.

Funastrum lineare var. *heterophyllum* Macbr. Contr. Gray Herb. II, **49**:50. 1910.—*Philibertia linearis* var. *heterophylla* Gray, Syn. Fl. N. A. **2**:88. 1878.—*Sarcostemma heterophylla* Engelm. in Torr., Pacif. R. R. Rep. **5**:362. 1857.—*Philibertella hartwegii* var. *heterophylla* Vail, Bull. Torr. Cl. **24**:308. 1897.—*Philibertella heterophylla* Cockerell, Bot. Gaz. **26**:279. 1898.—*Type locality:* Near Fort Yuma, Arizona.

Growing abundantly on the moist cultivated bottom-lands at Mulegé (3684) and draping the shrubbery with masses of foliage and white flowers. The leaves become very large, some reaching 11 cm. in length and 35 mm. in width; the average measurements, however, are considerably smaller.

LXXII. Convolvulaceæ

313. **Cressa truxillensis** H.B.K.

Cressa truxillensis H.B.K., Nov. Gen. et Sp. **3**:119. 1818. —*Cressa cretica* var. *truxillensis* Choisy in DC., Prodr. **9**:440. 1845.—*Type locality:* Truxillo, Peru.

Seen on Sal si Puedes Island growing near the shore, on Raza Island (3209) growing on a silty flat used as a nesting site by gulls, and on Santa Inez Island (3655) along a cobblestone beach just above the high-tide line. This Cressa probably is represented by the two unrecognizable scraps that Vasey and Rose (Contr. U. S. Nat. Herb. **1**:80. 1890) mention in their account of Isla Raza.

314. **Cuscuta americana** var. **congesta** (Benth.) Progel

Cuscuta americana var. *congesta* Progel in Martius, Fl. Brasil. **7**:376. 1871.—*Cuscuta congesta* Benth., Bot. Sulph. 138. 1844.—*Type locality:* Acapulco, Guerrero.

Growing on low shrubs in a sandy wash at Guaymas (3117) where it has also been collected by Palmer and Brandegee.

315. **Cuscuta corymbosa** var. **stylosa** (Choisy) Engelm.

Cuscuta corymbosa var. *stylosa* Engelm., Trans. Acad. St. Louis **1**:484. 1859.—*Cuscuta stylosa* Choisy, Mem. Soc. Phys. et Hist. Nat. Geneve **9**:283, t. 5, f. 2. 1841.—*Type locality:* Mexico.

Growing in large tangled masses on Vaseyanthus and Hofmeisteria in the steep draws that cut the high seaward cliffs of Isla Partida (3222). A similar plant was growing upon Bebbia on Ceralbo Island (4070). The latter collection varies considerably in size of flower, ranging between 4 and 6 mm. in length, and may represent another species. *Cuscuta corymbosa,* or its varieties, has not previously been reported from the gulf area. It is readily distinguished from *C. patens* Benth. (Bot. Sulph. 35. 1844), the common coarse-stemmed, large-flowered species of the cape region, by its narrower non-imbricate sepals. Bentham's description and discussion clearly show that *patens* is identical with *C. macrocephala* Schaffner (Yuncker, Univ. Ill. Biol. Monog. **6**:126. 1919). Yuncker incorrectly lists *patens* in the synonymy of *C. corymbosa* var. *grandiflora.*

316. **Cuscuta leptantha** var. **palmeri** (Wats.) Yuncker

Cuscuta leptantha var. *palmeri* Yuncker, Univ. Ill. Biol. Monog. **6**:136, f. 34f, 91. 1919.—*Cuscuta palmeri* Wats., Proc. Am. Acad. **24**:64. 1889.—*Cuscuta polyanthemos* Schaffner in Yuncker, Univ. Ill. Biol. Monog. **6**:136, f. 31, 92. 1919.—*Type locality:* On Euphorbia at Los Angeles Bay, Lower California.

Collected on species of Euphorbia at Las Animas Bay (3494) and San Nicolas Bay (3707). Two collections from La Paz and one from Los Angeles Bay also have been studied. All the collections examined, including the type of *C. palmeri,* and all collections seen and cited by Yuncker (l.c.), have uniformly four-parted flowers with lobes frequently recurved. The appendage developments characteristic of *C. leptantha* and *C. palmeri,* if ever distinct, at times certainly are indistinguishable, and so, if the latter is to be kept up, it must be on the grounds of its distinct range and the tendency for its corolla-lobes to reflex. It might be noted that, in the suite of specimens studied, *leptantha* seemed to have more slender flowers and to dry a darker color than *palmeri.* Both species and variety grow usually, if not invariably, on Euphorbia. *Cuscuta polyanthemos* seems to be merely a large-flowered phase of *palmeri.*

317. **Cuscuta umbellata** H.B.K.

Cuscuta umbellata H.B.K., Nov. Gen. et Sp. **3**:95. 1818.—*Type locality:* Between Queretaro and Salamanca, Mexico.

Growing over Boerhaavia, Portulaca, and Amaranthus at Coyote Bay (4177), and primarily over Amaranthus at Marquer Bay on Carmen Island (3837). The material may be referable to Yuncker's variety *reflexa,* but it is very mature and there is no certainty even of the specific determination. Brandegee has several collections from the cape region, and Palmer has one from Guaymas.

318. **Cuscuta veatchii** Brandg.

Cuscuta veatchii Brandg., Proc. Calif. Acad. Sci. II, **2**:189. 1889.—*Type locality:* Ubi, Lower California.

Seen only at Los Angeles Bay (3430, 3439) where local infestations were frequent on trees of Veatchia. It is a very peculiar species, forming net-like growths that drape the uppermost branches of large trees. In one instance the parasite came within 15 dm. of the ground, but in all others it grew in a belt, well over 3 m. above the ground. Brandegee has remarked concerning the improbability of terrestrial seed germination and has suggested that probably the seeds germinate in the crotches of the branches. His hypothesis, however, does not allow for the infestation of new trees nor does it take account of the fact that the bark of the host is smooth and is annually exfoliated. The life history of this species presents an interesting subject for future observation and study. The species has been previously known only through Brandegee's three original collections from Ubi, San Enrique, and Santa Maria; all stations between 29° and 30° N. lat. The Academy collection comes from about 75 km. east southeast of Ubi, the most southern of Brandegee's localities.

Yuncker (Ill. Biol. Monog. **6**:159. 1919) has referred to *C. veatchii* certain collections from San Diego County, California, and The Needles, Arizona. Even though the writer has not examined these specimens, he feels that the reference should be strongly questioned, for *C. veatchii* is so striking in its habit and so restricted to Veatchia where it has been seen by Mr. Brandegee or the author, that a reference of Californian material to it seems incongruous. It is also significant that Yuncker's *C. Veatchii* var. *apoda* apparently represents a specifically distinct unit most nearly related to *C. salina*. Three of the four collections that Yuncker refers to his variety *apoda* (loc. cit.) have been examined. These collections differ from *C. veatchii* in their larger flowers, subsessile anthers, longer acute (not rounded) corolla-lobes, and more elongate floral appendages which reach just to, and not beyond, the point of staminal insertion. It is indeed strange that Yuncker should consider the Nevadan plants, which grow on Atriplex and other chenopods, as specifically identical with the Veatchia-infesting peninsular plant. The Nevadan plants referable to Yuncker's *C. veatchii* var. *apoda* should be dissociated from *C. veatchii* and called **Cuscuta nevadensis,** n. sp.

319. **Ipomœa aurea** Kell.

Ipomœa aurea Kell. in Curran, Bull. Calif. Acad. Sci. **1**:143. 1885.—*Aneisia aurea* Kell., Proc. Calif. Acad. Sci. **5**:83. 1873.—*Operculina aurea* House, Muhl. **5**:68. 1909.—*Type locality:* San José del Cabo, Lower California.

A very beautiful vine that is frequent from Loreto southward. It climbs trees of Lysiloma which grow along gravelly washes, and produces its strikingly beautiful bright yellow flowers in abundance. In certain localities some flowers have ten magenta spots low in the tube, whereas other flowers are entirely yellow. The plant was seen at the following localities: Loreto (3779, 3795), Escondido Bay, Agua Verde Bay (3875), San Evaristo Bay, San Josef Island, Espiritu Santo Island, Ceralbo Island (4027), and La Paz.

320. **Ipomœa pes-capræ** (L.) Roth

Ipomœa pes-capræ Roth, Nov. Sp. Pl. 109. 1821.—*Convolvulus pes-capræ* L., Sp. Pl. 159. 1753.—*Type locality:* India.

This rankly growing, coarse plant creeps over the sand and forms broad patches on the beach at La Paz (3074) where it is known as "tripa de aura". Elsewhere it was seen only at San Nicolas Bay where a few small plants grew on the dunes. This latter station, about 26° 30′ N. lat., is the northernmost recorded station on the Pacific shore of North America. The plant is reported as common on the beaches south of La Paz.

321. **Jacquemontia eastwoodiana,** n. sp.

Perennial, shrubby near the base, canescent with a dense close tomentum; stems 6-9 dm. long with short (1 dm. or less) laterals, usually non-twining; leaves orbicular-ovate to oblong-ovate, base cordate, tip mucronate, blade 1-2 or rarely 3 cm. long, 10-18 or rarely 25 mm. wide; petioles 2-4 or at times 8 mm. long; peduncles cymosely 1-3-flowered, upper ones 1-3 cm. long, lower at times 5-6 cm. long; bracts subulate, deciduous, 1-4 mm. long, inconspicuous; pedicels 1-3 mm. long; sepals very unequal; outer sepals broadly ovate, short-acuminate, 6-9 mm. long, 5-6 mm. broad; corolla bright blue, funnelform, 12-15 mm. long, limb 12-16 mm. broad; capsule ovate or orbicular-ovate, 4-5 mm. long, the 4 valves divided; seeds black, closely and minutely papillate, 2-2.5 mm. long.

Type: No. 1296, Herb. Calif. Acad. Sci., collected May 17, 1921, by I. M. Johnston (no. 3742) on the summit of **Ildefonso Island, Gulf of California.**

Collected on Tortuga (3591) and Ildefonso (3742) islands, and at Mulegé (3662) and San Nicolas Bay (3722). What is no doubt the same was seen on all the large islands from Carmen Island southward. The plant is quite variable as to habit, for it is either a small bush 4-5 dm. high covered with lax branches, or it trails and occasionally twines through large shrubs, or, as on Ildefonso Island, forms large prostrate mats. It is a pretty and very attractive plant when covered with its myriads of small bright blue flowers.

The nearest relative of *J. eastwoodiana* is *J. abutiloides* Benth. (Bot. Sulph. 34. 1844), but it differs from the latter species in its denser pubescence, smaller and shorter petioled leaves, shorter branches, fewer (1-3 instead of 3-5 flowered and shorter peduncles, smaller flowers, broader sepals with short (not prolonged) acuminate tips, and shorter deciduous inconspicuous bracts. *Jacquemontia abutiloides* ranges over the western part of the cape region extending from Magdalena Bay, the type locality, southward to San José del Cabo. On the other hand, *J. eastwoodiana* ranges from San José del Cabo northward, primarily along the gulf shore, to at least Calmalli *(Purpus 205)* and Tortuga Island. The notes on Jacquemontia given by Goldman (Contr. U. S. Nat. Herb. **16**:361. 1916) probably refer partially to the new species, but those by Brandegee (Zoe **2**:148. 1891) are based entirely upon *J. abutiloides.*

This new species is named in honor of Miss Alice Eastwood, curator department of botany, California Academy of Sciences.

LXXIII. Polemoniaceæ

322. **Gilia palmeri** Wats.

Gilia palmeri Wats., Proc. Am. Acad. **24**:61. 1889.—*Type locality:* Near Los Angeles Bay, Lower California.

Found in a condition fit for collecting only at San Luis Gonzales Bay (3327) where it was very common on the broad sandy plain that heads the bay. It was noted as frequent over the higher parts of San Luis Island, as infrequent on Angel de la Guarda Island, but as extremely abundant on Pond Island where, at the time of our visit, the dried plants gave a straw-color to many slopes. A few dried plants were seen at Los Angeles Bay. Watson gives the color of the corolla as violet, but on all the plants seen by me the corollas were pink and the anthers bluish. The plant, which is very open in its growth, is branched from the base with many widely ascending laterals, and usually grows 3-6 dm. high. The base of the stem is woody and the root is persistent. Vasey and Rose (Proc. U. S. Nat. Mus. **11**:536. 1890) give similar observations based on specimens from back of Lagoon Head.

LXXIV. Hydrophyllaceæ

323. **Nama coulteri** Gray

Nama coulteri Gray, Proc. Am. Acad. **8**:283. 1870.—*Nama hispidum* var. *coulteri* Brand Pflanzenr. $\mathbf{4}^{251}$:154. 1913.—*Type locality:* "California", perhaps Lower California.

A few specimens of this Nama were taken from the edge of a cornfield that bordered on the tule-lined reservoir in the cultivated bottoms at Mulegé (3674). The plant appears to be frequent over the southern two-thirds of the peninsula, for it has been collected at Santa Agueda *(Palmer 240),* Magdalena Bay *(Lung),* San Gregorio *(Brandegee),* La Paz *(Brandegee),* and San José del Cabo *(Anthony 348, Brandegee).* This peninsular plant has been confused with *N. demissum* Gray, even by Brand (op. cit. 159) who cites under that name the Brandegee collections just mentioned. The Santa Agueda collection of Palmer was distributed as *N. hispidum,* but reported as *N. demissum* (Contr. U. S. Nat. Herb. **1**:85. 1890). *Nama coulteri* and its near relative *N. hispidum* are readily distinguished from all forms of *N. demissum* by the shape of the leaves, insertion of the stamens, and polyspermous capsules.

The closest relatives of *N. coulteri* are those broad-leaved plants which Brand referred to *N. hispidum* var. *mentzelii* and *N. hispidum* var. *coulteri*. From *N. hispidum* var. *mentzelii* Brand, which properly includes the broad-leaved form of *hispidum* usually called *coulteri*, true *coulteri* differs in its more diffuse habit, very slender, sparsely pubescent, loosely branched stems, usually shorter, and proportionately broader, thinner leaves, looser, few-flowered inflorescence, and filiform not flattened filaments. Typical *N. hispidum*, as exemplified by the type series of specimens, is the slender, usually erect-growing plant with small narrow linear leaves which is most common in western Texas.

It is a remarkable fact that this seemingly endemic peninsular species is exactly represented in the type of *Nama coulteri*. Its presence in Coulter's collections suggests that he may have visited some of the ports of Lower California and that others of his collections labeled "California" may also have come from the peninsula.

324. **Phacelia scariosa** Brandg.

Phacelia scariosa Brandg., Proc. Calif. Acad. Sci. II, 2:185. 1889.—*Type locality:* Magdalena Island.

Two collections of this species were made, both on gravelly floors of cañons in the Sierra Giganta; one from back of Escondido Bay (4111), and the other from near Agua Verde Bay (3884). The specimens closely match the type.

LXXV. BORAGINACEÆ

325. **Bourreria sonoræ** Wats.

Bourreria sonoræ Wats., Proc. Am. Acad. 24:62. 1889. —*Type locality:* Mountains about Guaymas, Sonora.

Frequent over the southern and eastern parts of the peninsula, and on the adjacent islands. Due to the unfavorable season at the time of our visit, the plant was collected only at La Paz (3051), Carmen Island (3813), and Ceralbo Island

(4060), but the unmistakable herbage and habit were recognized at San Carlos, San Pedro, San Nicolas, Agua Verde, Escondido, and San Evaristo bays; at Guadalupe Point, and Loreto; and on Monserrate, Danzante, San Diego, Santa Cruz, San Josef, San Francisco, and Espiritu Santo islands. It was nowhere abundant, usually occurring sparingly in gravelly washes intermixed with Lysiloma or less frequently on rocky hillsides with Fouquieria and Bursera. It is a weak, open, erect-growing irregular shrub 1-3 m. high. On Carmen Island it was much browsed by cattle.

326. **Coldenia canescens** var. **subnuda,** n. var.

Nutlets nude or merely pubescent towards the apex, not long silky over most of the back.

Type: No. 1297, Herb. Calif. Acad. Sci., collected May 16, 1921, by I. M. Johnston (no. 3731) on a stony bench at **San Nicolas Bay, Lower California.**

Common on rocky mesas at San Nicolas Bay (3731) where it forms flat-topped, shrubby growths 15-25 cm. high and 3-5 dm. broad. Also locally common on the benches that top the sea-cliffs at Marquer Bay on Carmen Island (3839). The only other collections from the region are those made by Brandegee at San Gregorio and Calamajuet. The plant has probably migrated into the peninsula from extreme southern California into which it has come from Arizona and New Mexico. The variety here proposed includes those forms of *canescens* that occur in southwestern United States and Lower California, and which differ from the plants of eastern Mexico in their nude or merely slightly pubescent (not densely long silky) nutlets.

327. **Coldenia cuspidata** n. sp.

A dichotomous perennial, forming matted growths 1-4 dm. broad, usually closely prostrate but occasionally depressed bushy and 1-2 dm. high; stem shrubby, young branches brittle, white with a dense villous-tomentum, the tomentose bark peeling off, leaving older stems with a rough exfoliating brown papery bark; leaves crowded in flat fascicles; leaf-blade ovate to lance-ovate, cuspidate-acute, 2-6 mm. long, 1-4 mm. wide, margins entire and strongly revolute, hirsute, mid-rib pronounced, veins few and faint; petioles triangular, dilated towards the base, 1-2 mm. long, densely white villous; flowers axillary, rather few; calyx sessile, crowded in among the leaves and hard to distinguish from them, densely villous-hirsute; sepals oblanceolate, obtuse or acutish, about 2 mm. long, joined by a membrane for over half their length and thereby forming a tube, sinuses rounded or even square, lobes occasionally unequal; corolla pale bluish, salverform, 3-4 mm. long, tube 2.5-3 mm. long and exceeding the calyx, lobes imbricate and half again as wide as long, unappendaged; stamens unequal, insertion slightly unequal and usually 0.9-1.1 mm. above the base of the corolla-tube; filaments linear-filiform, practically undilated; anthers with the oblong cells deeply grooved and therefore appearing as if 4-celled; pistil 2.5-3.5 mm. long; style 2-parted, lobes 0.8-3 mm. long; ovules 2, usually one aborted; nutlets adnate to style for about 4/5 of former's length, dark brown, about 1-1.3 mm. long, oblong-ovate or globose, surface covered with fine close-set lineately-arranged granulations, when solitary the ventral face somewhat flattened and bearing the elevated oblong pallid basal remnant of the style, when both ovules develop the ventrally flattened nutlets detaching from the cuneate gynobase by a low-placed circular scar.

Type: No. 1298, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3617) in gypsum soil on **San Marcos Island, Gulf of California.**

Collections of this species were made on San Marcos Island (3617), and at Loreto (3778), Mulegé (3678), and San Nicolas Bay (3712). It usually grows in sandy or gravelly places, commonly in washes, but about the type locality it grows on talus footing gypsum cliffs. It is not a new discovery, for Palmer collected it in 1889 at Santa Rosalia (195), and soon after Brandegee found it near Magdalena Bay. The plant appears to range over the southern middle segment of the peninsula. According to field notes, the San Marcos plants have "very faded bluish", and the Mulegé plants "pale rose-color" corollas. Palmer (Contr. U. S. Nat. Herb. 1:85. 1890) notes that the Santa Rosalia plants have "rose-colored" flowers.

The proposed new species unquestionably belongs to Gray's section Eddya, and among North American species is nearest to *C. hispidissima. Coldenia cuspidata,* however, can be distinguished at once from its relative by its 2 ovules, smaller and more finely marked nutlets, smaller corollas, differently shaped leaves, united sepals, and undilated filaments. Not only is *cuspidata* morphologically distinct, but it is separated from the nearest stations of *hispidissima* by half the length of the peninsula, by the gulf, and by all of Sonora. The peninsular form is certainly distinct, but why it has remained so long unpublished is puzzling. Perhaps this is due to the small size and foliage-simulating nature of the calyx; a fact which might cause fruiting specimens to be passed by as sterile.

Coldenia cuspidata appears to have its closest relative in *C. darwini* of the Galapagos Islands, but is readily separated from that species by its united calyx-lobes, larger nutlets, and smaller corollas. The northern plant is also notable because of its two ovules. As pointed out in the study on South American Coldenias (Contr. Gray Herb. **70**:58. 1924), *C. dichotoma* and *C. grandiflora* regularly mature only two nutlets, but this is due to the regular abortion of two of the four ovules developed. *Coldenia cuspidata* produces only two ovules. The relationship of *C. cuspidata* to the other North American species may be appreciated by a study of the following natural key.

Nutlets not distinct in situ, when all developed the flattened inner faces closely appressed against one another to form a lobed or unlobed fruit. (Stegnocarpus, Ptilocalyx, Lobophyllum) §Eucoldenia DC.
- Inflorescence capitate; only one nutlet developing; sepals subulate; a low bushy shrub .... *C. greggi* (Torr.) Gray
- Inflorescence axillary; 4 nutlets commonly developing; sepals narrowly lanceolate; prostrate shrubby plant.
  - Nutlets densely villous on back.......... *C. canescens* DC.
  - Nutlets sparsely if at all villous.......... *C. c. subnuda* Johnston

Nutlets distinct in situ, without flattened proximate inner faces, the fruit 4-parted when all nutlets develop.

Corolla-appendages present; petioles long, never villous; leaf blade with evident impressed veining above. §TIQUILIOPSIS Gray.

Annuals; corolla pink or white; sepals with pungent bristles, not densely villous; style surpassed by calyx; cotyledons horseshoe-shaped.................. *C. nuttallii* Hook

Perennials; corolla bluish; sepals villous; style exceeding calyx; cotyledons suborbicular or ovate, at most nicked and never horseshoe-shaped.

Leaves with about 6 pairs of deeply impressed veins; corolla 4.5 mm. long, with weakly developed appendages; cotyledons oblong; nutlets oblong-ovate, cuneate in transverse cross-section, usually black, smooth and shiny...................... *C. plicata* (Torr.) Cov.

Leaves with only 3 or 4 shallowly impressed veins; corollas 4.5-6 mm. long, with well developed appendages; cotyledons orbicular; nutlets nearly spherical, brown or plumbeous, usually granulate and dull .... *C. palmeri* Gray

Corolla-appendages wanting; petioles short or long, frequently villous; leaf blades usually without evident impressed veining. (Galapagoa, Eddya) §EDDYA Gray.

Ovules 2; sepals joined for about half their length; nutlets granulate; leaves cuspidate .... *C. cuspidata* Johnston

Ovules 4; sepals distinct; nutlets coarsely papillose; leaves not cuspidate.

Petioles triangular, indurated.

Blade 1-1.5 mm. wide, narrower than petiole; Tex., N. M., and n. e. Mex. .... *C. hispidissima* (Torr.) Gray

Blade 1.5-3 mm. wide, twice width of petiole; Nev. to Utah and Ariz......... *C. h. latior* Johnston

Petioles linear, herbaceous.
  Petiole short, a third or less the length of blade; leaves crowded.......... *C. tomentosa* Wats.
  Petiole long, half longer than blade; leaves not crowded.
    Plant canescent, more or less tomentose; petioles sparsely if at all villous-cilliate; leaves orbicular-ovate or ovate, veining obscure; sepals villous-tomentose .... *C. mexicana* Wats.
    Plant green, sparsely long appressed hispid; petioles with a dense conspicuous villous-ciliation; leaves lance-ovate, acute, veining evident; sepals hispid .... *C. purpusii* Brandg.

328. **Coldenia palmeri** Gray

Coldenia palmeri Gray, Proc. Am. Acad. **8**:292. 1870.—*Triquiliopsis palmeri* Rydb., Fl. Rocky Mts. 711. 1917.—*Coldenia angelica* Wats., Proc. Am. Acad. **24**:62. 1889.—*Coldenia brevicalyx* Wats., Proc. Am. Acad. **24**:62. 1889.—*Type locality:* "Lower Colorado River", probably from extreme western Arizona.

Collected at San Luis Gonzales Bay (3343), Angel de la Guarda Island (4210), Los Angeles Bay (3426), San Francisquito Bay (3571), Tiburon Island (4248), and Kino Point (4287). Apparently the only other Mexican collections of this species are Palmer's from Los Angeles Bay (type collection of *C. angelica)*, and Brandegee's from Calamujuet. At Kino Point and on Tiburon Island the plant grew in the dunes along the ocean, but usually it grew in sandy washes or on the alluvial plains back from the shore. It forms a shrubby subprostrate mat-like growth 1-2 dm. high and 3-9 dm. broad. It appears to be perennial, the stems becoming very woody and attaining 3-8 mm. diameter. A stem 4 mm. thick had nine growth rings. With such desert plants, however, it is difficult to say whether or not it is perennial or merely a long-lived annual that has grown more or less continuously throughout the year. The flowers are a faded light-blue or almost purple, and remain closed until after the middle of the forenoon.

It should be noted that in the present paper the name "*Coldenia palmeri*" is not used in the current sense, but is applied to that concept which has almost universally been called *C. brevicalyx*. This new usage has resulted from a study of the sheet which is the dual type of *C. palmeri* Gray, and *C. brevicalyx* Wats. The sheet mentioned consists of a single mounted plant and a large pocket containing some scraps. With the exception of a small twig in the pocket (hardly 1% of the total material) the plant represented is clearly that current under the name of *C. brevicalyx*. The small twig in the pocket is the plant usually called *C. palmeri*. Gray apparently never distinguished between the species which Watson called *C. brevicalyx* and *C. palmeri*. Watson, after a study of Gray's type of *Coldenia palmeri*, limited the name *C. palmeri* "to the one of Palmer's original specimens which has the leaves plicate-lineate by about 6 pairs of straight and strong veins", or in other words to the tiny scrap in the attached pocket. He then proceeded to describe the remaining material as *C. brevicalyx*. Watson's interpetation of *C. palmeri* is unjustifiable. Gray naturally would, and evidently did, consider the mass of the material in the Palmer collection as typical of his *C. palmeri*, for it was the atypical scrap in the pocket that was the basis of his supplementary statement that the leaf-surface in the younger specimens was "strongly and beautifully plicate". In comparing his species with *C. fusca* and *C. nuttallii*, and in citing Watson's King's Expedition specimen (which is typical *C. nuttallii*,), Gray further showed that in his mind the name *C. palmeri* was coupled with the plant which had shallowly and remotely nerved leaves, and which simulates *C. nuttallii* and *C. fusca*, or in other words with the major portion of Palmer's specimen and that called *C. brevicalyx* by Watson. There seems no other recourse, therefore, than to consider *C. brevicalyx* Wats. as synonymous with *C. palmeri* Gray. The plant with conspicuous plicate nerves and that which has been usually called *C. palmeri* should be called *C. plicata* Cov. *Coldenia brevicalyx* is supposed to have smaller flowering parts than *C. angelica*, but as these developments are not geographically correlated the recognition of the two species is inadvisable, especially as material from Los Angeles Bay (type locality of *C. angelica)* is indistinguishable from typical *brevicalyx. Coldenia angelica* has priority of position over *C. brevicalyx.*

329. **Coldenia plicata** (Torr.) Cov.

Coldenia plicata Cov., Contr. U. S. Nat. Herb. **4**:163. 1893. *Coldenia brevifolia* var. *plicata* Torr., Bot. Mex. Bound. 136. 1859.—*Coldenia palmeri* of Wats. and recent authors, not of Gray.—*Type locality:* Colorado Desert, California.

Frequent on the dunes at Tepoca Bay (4407). Quickly recognized by its deeply veined, densely pubescent leaves.

330. **Cordia brevispicata** M. & G.

Cordia brevispicata M. & G., Bull. Acad. Brux. **11**^{2}:331. 1844.—*Cordia palmeri* Wats., Proc. Am. Acad. **24**:62. 1889. —*Cordia socorrensis* Brandg., Erythea **7**:5. 1899.—*Type locality:* Tehuacan, Puebla.

Collected at San Carlos (4364), San Pedro (4319), and Agua Verde (3873) bays, and on Espiritu Santo (3967, 4075), and Ceralbo (4049) islands. Usually only a few plants were seen at each locality, but at San Carlos Bay and at Candeleros Bay on Espiritu Santo Island the plant was rather frequent. It appears to affect gravelly situations, usually occurring in cañons and particularly about large rocks. It has exceedingly numerous, strictly ascending stems which form a dense domed growth 1-2 m. high. The plant has a peculiar odor which suggests that of the drug, coltsfoot. The corolla is creamy yellow and has more or less recurved lobes. The species is not frequent over the southern portions of the peninsula but ranges as far north as San Pablo where Purpus collected it in 1898.

331. **Cryptantha angelica** n. sp.

A rather dense depressed rounded plant 15-25 cm. high; stems spreading, branched from the base with numerous rebranched laterals, brown and glabrous below, canescent and strigose above; leaves linear, 8-24 mm. long, 1-2 mm. wide, conduplicate, strigose and densely pustulate below, very sparsely strigose and sparingly pustulate above, not particularly numerous; inflorescence of numerous biserial unilateral naked very floriferous spicate-racemes that occur in groups of 1-3 on short peduncles nearly throughout the plant; corolla white, very inconspicuous, about 1 mm. long, lobes about 0.25 mm. long, tube shorter than sepals; fruiting calyx about 2 mm. long, strictly ascending, subsessile or on pedicels 0.5 mm. long, lobes linear-lanceolate ribbed and conspicuously hirsute, axial lobe the shortest the least pubescent and least evidently ribbed; nutlets 4, heteromorphous with the nutlet adjacent the abaxial sepal the largest and most persistent, all nutlets narrowly ovate, sharp-margined and dark with pallid tubercules, odd nutlet (about 0.7 mm. long) exceeding the gynobase by 0.2 mm., homomorphous nutlets (about 0.6 mm. long) exceeding gynobase by 0.1 mm.; style about 0.5 mm. long, exceeding odd nutlet by about 0.4 mm.; groove of nutlets usually closed above but lower third usually dilated to form a shallow triangular areola.

Type: No. 1299, Herb. Calif. Acad. Sci., collected June 30, 1921, by I. M. Johnston (no. 4221) on a silty flat near the south end of **Angel de la Guarda, Gulf of California.**

A few plants of this species were collected on a silty flat on Angel de la Guarda Island (4221) at a point just opposite Pond Island. The relations of the plant are with *C. inæquata,* but this plant differs from that species in its denser inflorescence and much smaller calyces and nutlets. The related species, those with sharp or beveled or wing-edged nutlets, may be distinguished by the following key:

Nutlets inconspicuously roughened, plano-convex in cross-section, face flat, back rounded. (*C. seorsa* Macbr.)........................*C. costata* Brandg.

Nutlets conspicuously roughened, not plano-convex in cross-section.

Calyx evidently pedicelled; long-lived annuals.

Nutlets homomorphous; calyx persistent...........*C. holoptera* Gray

Nutlets heteromorphous; calyx deciduous ....*C. racemosa* (Wats.) Greene

Calyx sessile or subsessile; short-lived annuals.
Style exceeding the nutlets.
Nutlets heteromorphous; calyx moderately broad.
Inflorescence dense; fruiting calyx about 2 mm. long; nutlets 0.6-0.7 mm. long............................*C. angelica* Johnston
Inflorescence loose; fruiting calyx 2.5-3.0 mm. long; nutlets 1.7 mm. long..............................*C. inæquata* Johnston
Nutlets homorphous; calyx very broad...*C. pusilla* (T.&G.) Greene
Style shorter than nutlets.
Nutlets 4-3, usually broadly winged...*C. pterocarya* (Torr.) Greene
Nutlets 1-2, narrowly winged........ *C. utahensis* (Gray) Greene

332. **Cryptantha angustifolia** (Torr.) Greene

Cryptantha angustifolia Greene, Pitt. **1**:112. 1887.—*Eritrichium angustifolium* Torr., Pacif. R. R. Rep. **5**:363. 1856. —*Krynitzkia angustifolia* Gray, Proc. Am. Acad. **20**:272. 1885.—*Type locality:* Fort Yuma, Arizona.

Collected on Tiburon (4390), San Luis (4391), and Angel de la Guarda (4227) islands. What was probably the same was noticed on the dunes at Tepoca Bay. Known on the peninsula only through collections of Palmer, who collected it at Los Angeles Bay (606) and at Santa Agueda (241).

333. **Cryptantha grayi** var. **cryptochæta** (Macbride), n. comb.

Cryptantha micromeres var. *cryptochæta* Macbride, Contr. Gray Herb. II, **48**:46. 1916.—*Cryptantha filiformifolia* Macbride, Contr. Gray Herb. II, **48**:45. 1916.—*Type locality:* San José del Cabo, Lower California.

Collections representing this small-flowered southern form of *C. grayi* were made on a sandy clearing at La Paz (3055, 3071). *Cryptantha grayi* (Vasey & Rose) Macbride (op. cit. 43) is a well-marked species related to *C. angustifolia* and to *C. micromeres,* but readily distinguished from each by its homomorphous nutlets and southern range. In having the style much exceeding the nutlets it agrees with *C. angustifolia* but differs from *C. micromeres,* for the latter plant has the style and largest nutlet subequal. Macbride has described several forms in this group apparently because he confused *C. micromeres* and *C. grayi*. One of his names, however, can be used to designate the small-flowered plant that replaces the large-flowered typical form in the cape region of the peninsula.

334. **Cryptantha grayi** var. **nesiotica,** n. var.

Nutlets etuberculate or with only a few pallid tubercules, surface usually wrinkled and unicolored; stems stouter and more or less densely villous-strigose.

Type: No. 1300, Herb. Calif. Acad. Sci., collected May 30, 1921, by I. M. Johnston (no. 3947) on the dunes on **San Francisco Island, Gulf of California.**

This is a frequent plant on the dunes on Coronados (3947), San Francisco (3766), and Espiritu Santo (3994) islands. It represents a small-flowered insular development of the species characterized by its coarser, villous-strigose stems and by its etuberculate nutlets. The root frequently contains a purple dye which stains the collecting papers.

335. **Cryptantha maritima** Greene

Cryptantha maritima Greene, Pitt. **1**:117. 1887.—*Krynitzkia maritima* Greene, Bull. Calif. Acad. Sci. **1**:204. 1885.—*Krynitzkia ramosissima* of Greene, Bull. Calif. Acad. Sci. **1**:203. Aug. 1885. not Gray Jan. 1885.—*Type locality:* Guadalupe Island off west coast of Lower California.

Common on a silty flat on Angel de la Guarda Island (4237). Rare on the sandy plain at San Francisquito Bay (4394). A very common plant on the western part of the peninsula and on the islands off that shore. On the gulf side it appears to be largely replaced by the following variety:

336. **Cryptantha maritima** var. **pilosa** Johnston

Cryptantha maritima var. *pilosa* Johnston, Univ. Calif. Pub. Bot. **7**:445. 1922.— *Type locality:* About Los Angeles Bay, Lower California.

On San Luis Island (4392) this is frequent in sheltered places, particularly among rocks. It was seen at no other point. The only peninsular material seen is that collected by Palmer at Los Angeles Bay (551) and at Santa Agueda (242). The Santa Agueda collection is a mixture, for the Gray Herbarium material was correctly determined by Macbride (Contr. Gray Herb. II, **56**:58. 1918) as *C. echinosepala,* whereas the material in the University of California herbarium is clearly the pilose form of *C. maritima. Cryptantha echinosepala* Macbride is a very distinct peninsular species which is most closely related to *C. angustifolia,* but which is readily distinguished from the latter by its commonly reddish stems, shorter style, and by its peculiar calyx whose axial (instead of abaxial) lobe is the the longest and most hispid. At present *C. echinosepala* is known only from about Magdalena Bay, La Paz, and Santa Agueda.

337. **Cryptantha racemosa** (Wats.) Greene

Cryptantha racemosa Greene, Pittonia **1**:115. 1887.—*Eritrichium racemosum* Wats. in Gray, Proc. Am. Acad. **17**:226. 1882.—*Krynitzkia racemosa* Greene, Bull. Calif. Acad. Sci. **1**:208. 1885.—*Krynitzkia ramosissima* Gray, Proc. Am. Acad. **20**:277. 1884.—*Cryptantha suffruticosa* Piper, Proc. Biol. Soc. Wash. **32**:42. 1919.—*Type locality:* Mesquite Cañon near Mesquite Station, Imperial County, California.

Collected at Las Animas Bay (3505), and on Angel de la Guarda (3374, 4204), San Esteban (3171, 3175), Tiburon (4255), South San Lorenzo (4192), and San Marcos (3621) islands. On the gulf islands known otherwise only from Carmen Island (Contr. U. S. Nat. Herb. **1**:133. 1892). The plant affects rocky ground, usually growing on cañon sides. It varies much in habit of growth, having a single, subsimple, stiffly erect stem, or several widely spreading branches that produce many long, strict, subsimple branches, or one or two repeatedly and loosely branched bushy stems. The growth is usually irregular and the appearance decidedly unkempt. It is commonly 3-6 dm. high, but occasionally the virgate branches become close to a meter in length. The collections are very constant and check closely with typical material. The only notable atypical development is that in number 4204 where the calyces are almost bare of spreading hirsute bristles.

This species is usually said to be perennial, but observations do not bear out that statement. It seems probable that it is merely a persistent annual that flowers continuously throughout the year and becomes more or less suffruticose. No plants were seen that produced shoots from the year-old indurated base. It is a notable fact that dead wood is conspicuously rare even in large thriving plants of *C. racemosa,* close observation showing that all growth on the plant is less than a year old and that when part dies all usually dies. The condition in *C. holoptera* is probably the same. If the persistence of these two species is to be emphasized it is best stated by terming them "long-lived" annuals. The more evanescent species, which form the bulk of the genus Cryptantha, may be termed "short-lived" annuals.

338. **Heliotropium inundatum** Swartz

Heliotropium inundatum Swartz, Prodr. Veg. Ind. Occ. 40. 1788.—*Type locality:* West Indies.

Collected in an empty tinaja in the mountains back of Agua Verde Bay (3883) and in moist sand near a spring in the hills back of San Pedro Bay (4327).

LXXVI. Labiatæ

339. **Hyptis emoryi** Torr.

Hyptis emoryi Torr., Bot. Ives Rep. 20. 1860.—*Mesosphærum emoryi* Kuntze, Rev. Gen. Pl. 2:526. 1891.—*Type locality:* "Upper Colorado" River, Arizona.

Referred to this species are the collections from Tepoca Bay (3304), Tiburon Island (3257, 4253), San Esteban Island (3165), and South San Lorenzo Island (3539). These specimens all agree in having the foliage about 2 cm. long, ovate, and densely tomentose. They are much more tomentose than are average specimens from Arizona and California. The plant usually grows on gravelly cañon floors and is a strictly though openly branched upright shrub 15-25 dm. high. *Hyptis emoryi* is very close to *H. albida* H.B.K., of which it is perhaps only a form.

340. **Hyptis emoryi** var. **amplifolia,** n. var.

Leaves ample, blade becoming 85 mm. long and 35 mm. wide, green above and frequently green also below.

Type: No. 1301, Herb. Calif. Acad. Sci., collected May 24, 1921, by I. M. Johnston (no. 3852) in a wash at **Escondido Bay, Lower California.**

Of this variety only a single collection was made, and that the type. The plant was very common on the diluvial plain at the foot of the Sierra Giganta back of Escondido Bay. It formed an erect-growing open shrub nearly 3 m. high. It is apparently common over the southern portions of the peninsula and includes the plants referred to *M. palmeri* by Goldman (Contr. U. S. Nat. Herb. **16**:363. 1916). It differs from *palmeri* in range and in its larger leaves. Some plants of *amplifolia* have the leaves glabrous on both surfaces, but in others, as the type specimen, they are closely tomentose beneath. Two sheets collected by Brandegee at Magdalena Bay and on Margarita Island are referred to *amplifolia* with doubt. The specimens are more woody, and due to the excessively woolly calyces and long peduncles, have an inflorescence very similar to that in *H. laniflora.*

341. **Hyptis emoryi** var. **palmeri** (Wats.), n. comb.

Hyptis palmeri Wats., Proc. Am. Acad. **24**:68. 1889.—*Mesosphærum palmeri* Goldman, Contr. U. S. Nat. Herb. **16**:363. 1916.—*Type locality:* Arroyos about Guaymas, Sonora.

To this variety, which is a very poor one, are referred the collections from Guaymas (3101) and Angel de la Guarda Island (3359, 3401). Also referable to it are Palmer's collections at Guaymas (278), and Los Angeles Bay (573), and Brandegee's from Guaymas. The type collection, which is more luxuriant than other collections from about Guaymas, probably came from a sheltered place and so is not typical of the common plant about the type locality. As here interpreted, *palmeri* is the form of *emoryi* with leaves commonly 2-3 cm. long, frequently deltoid-ovate, and usually bicolored with the upper surface green and the lower face usually pallid with a close tomentum. Some plants are at first tomentose and later become glabrate.

342. **Hyptis laniflora** var. **insularis** (Standley & Goldman), n. comb.

Mesosphærum insulare Standley & Goldman, Contr. U. S. Nat. Herb. **13**:375. 1911.—*Type locality:* Espiritu Santo Island.

This form is frequent in the gravelly washes on Espiritu Santo (4072) and Ceralbo (4030, 4040) islands. It forms a loose shrub 10-25 dm. high. The original description gives the height as 3-6 m., but these measurements must be incorrect, for, though many plants were seen at the type locality and elsewhere, none even approached that height. At Ruffo's Ranch on Ceralbo Island the plant was browsed down to a compact twiggy mass about a meter high.

The insular plants are frosty white with a close tomentum. This departure from the green and glabrous condition, typical of the species in its strict sense, is here treated as the variety *insularis.* Standley and Goldman emphasize the leaf-shape as the crucial character, but plants with obtuse or rounded or retuse leaves come even from San José del Cabo, the probable type locality of *H. laniflora.* Sinuate and entire leaf-margins also occur on the peninsular material. Furthermore, the insular plants appear to go through the same gamut of variation in leaf-shape as does the material from the peninsula. It is evident that leaf-shape can not be used as a diagnostic character, and so the geographically linked variation is better as the variety *insularis.*

343. **Salvia californica** Brandg.

Salvia californica Brandg., Proc. Calif. Acad. Sci. II, **2**:197. 1889.—*Type locality:* Calmalli, Lower California.

Locally very abundant in a broad sandy draw at Los Angeles Bay (3428). It is a shrub 10-15 dm. high with very numerous tufted stems and an extremely large amount of dead wood. The dense, almost solid, mass of tufted stems is not infrequently over 6 dm. broad at the base. The corolla is blue with an oblong yellow mark on the lower lip. Although the habit and peculiar foliage make the plant very interesting, it is nevertheless utterly lacking in æsthetic qualities. The collection at Los Angeles Bay extends the known range of the species. Since its discovery in 1889 the plant has been known only from the two stations, Calmalli and Cordon Grande, given by Brandegee under the original description. Goldman (Contr. U. S. Nat. Herb. **16**:363. 1916) reports it from near San Pablo, but that is essentially the same as Cordon Grande. The new station is about 100 km. north of Calmalli. The range of the species is therefore that part of the peninsula between 28° and 29° N. lat. The four known collections are remarkably constant in characters.

344. **Salvia platycheila** Gray

Salvia platycheila Gray, Proc. Am. Acad. **8**:292. 1870.—*Type locality:* Carmen Island.

This species is quite common in a narrow cañon back of Puerto Ballandra on Carmen Island (3810) where it forms an open, erectly branched shrub 1-2 m. high. The plant is usually scraggly and asymmetrical, and grows in crevices in steep gulches or on talus footing cliffs. Previously the species has been known only from collections made on Carmen Island by Palmer (Contr. U. S. Nat. Herb. **1**:133. 1892). Its occurrence can now be reported on Santa Cruz Island (3920) where it is common in rock crevices in rocky cañons and becomes 2 m. high. Both collections are sterile, but are identical in vegetative characters.

LXXVII. Verbenaceæ

345. **Avicennia nitida** Jacq.

Avicennia nitida Jacq., Enum. Pl. Carib. 25. 1760.—*Type locality:* Isle of Martinique.

Noted at San Carlos Bay, Tepoca Bay (3288), Guadalupe Point Coyote Bay, Coronados Island (3758), Carmen Island (3821), Escondido Bay (4393), Danzante Island, San Evaristo Bay (4089), San Josef Island, Espiritu Santo Island, and La Paz (3045). Brandegee has collections from Guaymas, La Paz, and Magdalena Bay. The northernmost known station for the Pacific coast of North America seems to be Tepoca Bay in almost 30° N. lat.

The tree is frequent along the southern coast of the peninsula and is usually associated with Rhizophora and Laguncularia. It differs from Rhizophora in its selection of habitat, growing usually on the saline tide-flats or on the less deeply submerged land close to the high-tide line, and on the shore just back of the Rhizophora-thickets. Usually it is an upright shrub 25-30 dm. high, but at times it becomes a widely branched tree nearly 75 dm. in height. The flowers are creamy-yellow and very pleasantly fragrant. The foliage of Avicennia is frequently covered with a layer of salt. Although many insects are attracted to the flowers the entomologist found that beating yielded more salt-flakes than insects. At La Paz and on Carmen Island the plant was pointed out as "mangle."

346. **Citharexylum flabellifolium** Wats.

Citharexylum flabellifolium Wats., Proc. Am. Acad. **24**:67. 1889.—*Type locality:* Ravines about Guaymas, Sonora.

Locally frequent in the gulches and about the summits of the bluffs along the ocean at Marquer Bay on Carmen Island (3840). An intricately though openly branched shrub 1-2 m. high with coarse, short, more or less spinescent branches. The fruit is black and somewhat baccate. On the peninsula it has been collected only at Comondú.

347. **Lippia palmeri** Wats.

Lippia palmeri Wats., Proc. Am. Acad. **24**:67. 1889.—*Type locality:* Arroyos about Guaymas, Sonora.

This is a frequent plant about Willards Point (4267) and along the southeast shore on Tiburon Island. It is a characteristic shrub on rocky benches and on the drier, lower slopes of the hills, and forms a rounded bushy mass of many slender twiggy stems 6-10 dm. high. The collected specimens seem to have slightly smaller, less rugose, and less crenate leaves than do the other available collections of this species.

LXXVIII. Solanaceæ

348. **Datura discolor** Bernh.

Datura discolor Bernh., Trommed. N. Jour. Pharm. **26**:149. 1838.—*Datura thomasii* Torr., Pacif. R. R. Rep. **5**:362. 1856. —*Type locality:* West Indies.

Collected on Isla Partida (3226) where confined to talus slopes on the cliffs facing the ocean, and at Freshwater Bay on Tiburon Island (3260) where a single colony was noted in a sandy draw.

349. **Lycium richii** Gray

Lycium richii Gray, Proc. Am. Acad. **6**:46. 1862.—*Lycium palmeri* Gray, Proc. Am. Acad. **8**:292. 1870.—*Lycium hassei* Greene, Pittonia **1**:222. 1888.—*Type locality:* La Paz, Lower California.

This is the common species of Lycium in the gulf area, and, according to Goldman (Contr. U. S. Nat. Herb. **16**:364. 1916), the common one on the peninsula. Collections were made only at La Paz (3027, 3061) and Los Angeles Bay (3425), and on San Pedro Martir (3154), Raza (3215), Partida (3233), and Ildefonso (3747) islands. The plant, however, was present at nearly every station in the gulf area. Brandegee has a collection from San José del Cabo, and Palmer (71, 230) has collections from Guaymas. From these stations it extends northward to the Channel Islands off the coast of California.

The plant is usually a rigid, divaricately branched, open shrub 9-12 dm. high, but at La Paz it grows partially supported by other shrubs and becomes 25 dm. high. The flowers are lilac or violet, and are either 4- or 5-merous. The calyx varies considerably and it is quite evident that the elongated sepals must now be considered as merely indicative when present, and not the sine qua non of the species. Flowers with long sepals frequently occur on the same branch as other flowers with short sepals. It is not at all difficult to find specimens which are clearly of the same species, yet which could by the stressing of sepal length be violently and unnaturally dissociated. Short sepals appear erratically and in all degrees in peninsular material, a fact which indicated that sepal developments are not fixed in *L. richii* and so not worthy of taxonomic consideration. The plant from the Channel Islands (Catalina Island) which has long gone under the name of *L. richii,* seems best designated as **Lycium richii** var. **hassei,** n. comb. These plants have exceptionally long oblanceolate sepals.

Lycium richii seems to be nearest to *L. californicum* (which has a synonym in *L. carinatum* Wats.), from which it differs in somewhat larger, more tubular flowers, frequently lanceolate sepals, and oblanceolate to cuneate-obovate, broader, thicker leaves. The foliar difference between the two species is by far the most striking and satisfying.

A small-flowered Lycium grows in the cape region which Brandegee (Univ. Calif. Pub. Bot. **6**:359. 1916) has named *L. peninsulare.* Though it is quite distinct from *richii* it is too close to *L. parvifolium* Gray (Proc. Am. Acad. **6**:48. 1862) and seems better called **Lycium parvifolium** var. **peninsulare,** n. comb. The reflexed corolla lobes and protruding stamens, emphasized by Brandegee, are not always present even in his suite of specimens from the Cape region.

350. **Lycium umbellatum** Rose

Lycium umbellatum Rose, Contr. U. S. Nat. Herb. **1**:74. 1890.—*Type locality:* La Paz, Lower California.

Collected at La Paz where it is infrequent on the low bluffs along the ocean and along the shallow arroyos near the shore. It forms rather open bushes 20-35 dm. high. The fruit is red and 8-10 mm. in diameter. This species seems to differ from *L. brevipes* Benth. (Bot. Sulph. 40. 1844), which originally came from Magdalena Bay, and from *L. fremonti* Gray (Proc. Am. Acad. **6**:46. 1862) chiefly in its broader leaves. The species is densely villous glandular and more densely so than *fremonti. Lycium brevipes* is glabrate. The latter species has been greatly misunderstood or neglected. It is the same as *L. cedrosense* Greene (Pittonia **1**:268. 1889) and is very close to *L. fremonti.* The original description of *brevipes* is meagre, but that diagnosis supplemented by Mier's description and plate (Ill. So. Amer. Pl. 2:117, t. 69c. 1857) and by a fine series of specimens collected about the type locality by Brandegee, make the present use of the name practically certain. The Lycium species now known from the peninsula may be distinguished by the following key:

Corolla small, 4-7 mm. long, rarely 7-8 mm., but then usually with lanceolate sepals.
- Corolla 4-5 mm. long, lobes usually recurved; stamens and style frequently conspicuously exserted; cape region.................................. *L. parviflorum*
- Corolla 5-7 mm. long, lobes spreading; stamens and style not conspicuously exserted.
  - Leaves linear-oblanceolate, 1-2 mm. wide; sepals always short and broad; corolla averaging smaller and shorter than next; mainly near the ocean.... *L. californicum*
  - Leaves oblanceolate to cuneate-obovate, commonly 4 mm. wide; sepals commonly lanceolate; not restricted to proximity of ocean.................. *L. richii*

Corolla large, 8-12 mm. long; sepals always short.
- Corolla cut halfway to base, tube 2 mm. long, lobes much exceeding the throat; San José del Cabo in salt marshes.................................... *L. carolinianum*
- Corolla cut less than one-fourth to base, tube 3-5 mm. long, lobes much shorter than throat.
  - Leaves small, becoming 2-4 mm. wide; fruit 4-5 mm. broad; corolla slender; slender bushy shrub 1-2 m. high; northern part of peninsula.............. *L. andersonii*
  - Leaves large, becoming 8-14 mm. wide; fruit 8-14 mm. broad; corolla coarser; stout open shrub 1-4 m. high.
    - Leaves glabrate, usually less than 8 mm. wide; western part of peninsula..................... *L. brevipes*
    - Leaves glandular-villous, usually 1 cm. wide; known only from La Paz............................ *L. umbellatum*

351. **Nicotiana clevelandi** Gray

Nicotiana clevelandi Gray, Syn. Fl. N. A. 2:242. 1878.—*Type locality:* Chollas Valley near San Diego, California.

Locally common on a dry shell-beach at La Paz (3029). Apparently a very common species in the western portions of the peninsula and on the adjacent islands.

352. **Nicotiana trigonophylla** Dunal

Nicotiana trigonophylla Dunal in DC., Prodr. 13[1]:562. 1852. *Type locality:* Aguas Calientes, Mexico.

Referred here are collections from Guaymas (3090), San Pedro Martir Island (3150), Pelican Island (4282), Isla Partida (3234), Angel de la Guarda Island (3358), Sal si Puedes Island (3523). The material is not uniform, but contains two forms with very different pubescence. One, represented by the first four collections cited, has short glandless hairs and is only clammy viscid; the other, represented by the last two collections, is densely glandular villous-tomentose and is so oily that it heavily stains the collecting papers. The two forms deserve some nomenclatural recognition, but at present it seems impossible to determine which is the typical form. *Nicotiana palmeri* Gray (Syn. Fl. N. A. **2**:242. 1878) of Arizona seems intermediate in its characters, but nearest to the eglandulose form. Though usually herbaceous in California the plants in the gulf area evince a tendency to persist more than a year. They even develop a ligneous base. The plants on Angel de la Guarda Island are especially notable for their rank growth, dense oily pubescence, and woody basal development.

353. **Physalis crassifolia** Benth.

Physalis crassifolia Benth., Bot. Sulph. 40. 1844.—*Physalis muriculata* Greene, Bull. Calif. Acad. Sci. **1**:209. 1885.—*Type locality:* Magdalena Bay, Lower California.

A small collection of the typical phase of this species was made at San Francisquito Bay (3577). The species is widely distributed, extending from the Magdalena plain northward into California, Arizona and Nevada. The peninsular plants are certainly perennial. The corolla is rotate in typical material, but in the northeast part of the peninsula it varies into the funnelform shape characteristic of the following variety:

354. **Physalis crassifolia** var. **infundibularis,** n. var.

As in the species but corolla funnelform and as long or longer than wide.

Type: No. 1302, Herb. Calif. Acad. Sci., collected June 30, 1921, by I. M. Johnston (no. 4203) on a gravelly beach near the south end of **Angel de la Guarda Island, Gulf of California.**

Collected at San Luis Gonzales Bay (3325), Angel de la Guarda Island (3380, 4203), San Esteban Island (3174), and Los Angeles Bay (3483). Brandegee has collections from Calamujuet and Cajon de Santa Maria. The variety apparently replaces the species in that part of the peninsula, particularly the eastern part, lying between latitude 29° and 31° N. Certain collections from California (e.g., *Hall & Chandler 6809* from the Ord Mts.) may also be referable to the variety. The habits of the species and variety are similar, both being found in gravelly or sandy places, both having perennial roots and usually bushy or globose tops 1-6 dm. high. The surface of the plants may be glabrate, or as in the type of the variety, densely oily villous. There is no correlation between pubescence and flower form.

355. **Physalis versicolor** var. **microphylla** Rydb.

Physalis versicolor var. *microphylla* Rydb., Bull. Torr. Cl. **22**:307. 1895.—*Type locality:* Guaymas, Sonora.

Frequent on San Francisco Island (3952) where it grows among small cobblestones on an elevated beach and forms bushy growths 2-4 dm. high. It is perennial and is heavily oily glandular-villous. The flowers are white with a sordid mustard-colored center. The plant also grows on San Diego Island, and the same or a very similar plant grows at El Mastrador on Ceralbo Island. The variety may represent an ecological form, but it appears very different from the ample and thin-leave typical plant. The island collections agree very closely with isotypes of the variety.

There are seven species of Physalis on the peninsula. *Physalis æquata* and *P. angulata* were reported with doubtful determinations by Brandegee (Proc. Calif. Acad. Sci. II, **3**:156. 1891) from San José del Cabo. The bases for these records appear to have been specimens of *P. pubescens* and *P. filipendula.* As Brandegee (Zoe **5**:166. 1903) has pointed out, *P. hastata* Rydb. (Mem. Torr. Cl. **4**:363. 1896) is synonymous with *P. glabra* Benth. *Physalis filipendula* Brandg.

(Univ. Calif. Pub. Bot. **10**:187. 1922) is the peninsular representative of the wide-spread *P. philadelphica* group. It differs from *P. philadelphica* chiefly in its long pedicels which equal, instead of being much exceeded by, the petioles; it may be only a variety. The peninsular species of Physalis may be distinguished by the following key:

Plant annual.
  Pedicels less than half the length of petioles.
    Plants large, over 1 m. high; fruiting calyx very sharply angled, 4-6 cm. long, conspicuously subulate-acuminate .... *P. nicandroides*
    Plants small, under 5 dm. high; fruiting calyx more rounded, 20-25 mm. long, not conspicuously acuminate .... *P. pubescens*
  Pedicels equalling or exceeding petioles.
    Anthers purplish or bluish; fruiting calyx 35 mm. long; leaves 5-14 cm. long; sepals at anthesis acuminate; pedicels filiform; plant simple below, branched above; cape region.......... *P. filipendula*
    Anthers yellow; fruiting calyx 20-25 mm. long; leaves 3-4 cm. long; sepals at anthesis deltoid; pedicels coarser; bushy plants, branched from base; northern Lower California.......... *P. greenei*
Plant perennial.
  Leaf blade lanceolate; stems very elongate, prostrate or clambering .... *P. glabra*
  Leaf blade ovate-deltoid or cordate; bushy tufted erect-growing plants.
    Leaves all conspicuously crenate and usually thin; corolla with dark center, usually small, turning purplish in drying.......... *P. versicolor*
    Leaves entire or mostly so, usually thickish; corolla yellow, usually large, not turning purplish in drying.
      Corolla rotate .... *P. crassifolia*
      Corolla funnelform .... *P. c. infundibularis*

356. **Solanum hindsianum** Benth.

Solanum hindsianum Benth., Bot. Sulph. 39. 1844.—*Type locality:* Magdalena Bay, Lower California.

A common shrub in the gulf area. Collections were made at La Paz (3060), San Estebán Island (3178), Ángel de la Guarda Island (3421, 4201), and Tepoca Bay (3302). It was observed on South San Lorenzo, Santa Cruz, San Josef, San Francisco, Espiritu Santo, and Ceralbo islands; and at Santa Rosalia and San Francisquito Bay. According to Goldman (Contr. U. S. Nat. Herb. **16**:364. 1916) the plant is common on the peninsula between the towns of San Francisquito and San Ignacio. The most northern collection seems to have been made at San Quintin by Orcutt. It appears to be rare in the cape region, La Paz and San José del Cabo being the only reported stations there. Much less is known of its distribution in Sonora. It must be wide-spread for Palmer collected it at Guaymas and MacDougal is accredited (Contr. U. S. Nat. Herb. **16**:17. 1912) with a collection in the Pinacate Mountains in the northern part of the state.

The plant is a shrub 10-25 dm. high with a few long branches which are usually spreading though not infrequently strict. Gray refers the species to *S. elæagnifolium,* but the two species seem amply distinct. They differ in habit of growth, root, size of flower, direction and length of pedicels, size, thickness and margin of leaves, and in distribution.

LXXIX. SCROPHULARIACEÆ

357. **Antirrhinum cyathiferum** Benth.

Antirrhinum cyathiferum Benth., Bot. Sulph. 40, t. 19. 1844.—*Antirrhinum chytrospermum* Gray, Proc. Am. Acad. **12**:81. 1876.—*Type locality:* Magdalena Bay, Lower California.

Collected at the north (3386) and south (4202) ends of Angel de la Guarda Island, at the north end of Tiburon Island (4414), at San Francisquito Bay (3575), and at San Nicolas Bay (3730). There are specimens in the Brandegee collection from Magdalena Island, Calmalli, and Santa Gertrudis. It is apparently widely distributed over the peninsula. An unattractive, glandular annual herb with coarse, erect stems, a very floriferous habit, and very peculiar seeds that strongly suggest those of Mohavea. A study of the type of *A. chytrospermum* reveals no characters by which it can be separated from Bentham's species. Regarding this relation, see the notes by Curran (Proc. Calif. Acad. Sci. II, **1**:234. 1888), and Vasey and Rose (Contr. U. S. Nat. Herb. **1**:74. 1890).

358. **Bacopa monniera** (L.) Wetts.

Bacopa monniera Wetts., in E. & P., Nat. Pflanzenf. **4^{3b}**:77. 1891.—*Gratiola monniera* L. Syst. Nat. ed. 10, 851. 1759.—*Herpestis monniera* H.B.K., Nov. Gen. et Sp. **2**:366. 1817.—*Type locality:* Jamaica.

Forming mats on wet, weakly alkaline soil at Loreto (3798) and San Evaristo Bay (4092). The only other peninsular collections are those by Brandegee from Todos Santos and San José del Cabo.

359. **Conobea intermedia** Gray

Conobea intermedia Gray in Torr., Bot. Mex. Bound. 117. 1859. *Stemodia polystachya* Brandg., Proc. Calif. Acad. Sci. II, **2**:191. 1889.—*Conobea polystachya* Minod, Bull. Soc. Genève, II, **10**:226 (1918).—*Type locality.* About the Copper Mines, New Mexico.

Found only on Espiritu Santo Island (3976) where it grows in dirt-filled crevices on the mesa-like summits of the basalt ridges near the crest of the island just north of the Isthmus. It is a perennial, prostrate herb. The plants from New Mexico seem to be annuals and it is possible that Brandegee's name may be used for the peninsular form. Brandegee (Zoe **5**:168. 1903) has reduced his own species to synonymy. The genus Conobea is very close to Stemodia, but, as sessile anther-cells and divided leaves seem to run constant through the former, it probably is distinct.

360. **Galvezia juncea** (Benth.) Gray

Galvezia juncea Gray, Proc. Am. Acad. **22**:311. 1887.—*Maurandia juncea* Benth., Bot. Sulph. 41. 1844.—*Antirrhinum junceum* Gray, Proc. Am. Acad. **7**:377. 1868.—*Saccularia veatchii* Kell., Proc. Calif. Acad. Sci. **2**:17. 1860.—*Type locality:* West coast of Lower California, probably at San Quintin.

The typical form of the species is, as pointed out by Brandegee(Zoe. **5**:167. 1903), the glabrate plant with reduced leaves. It appears to range over the western part of the peninsula, particularly in the middle and northern portions. There are collections in the Brandegee herbarium from Cedros Island, Salado Cañon, San Julio Cañon, and Calmalli. The collections mentioned by Goldman (Contr. U. S. Nat. Herb. **16**:364. 1916) are probably also referable here. No collections were made of this plant.

361. **Galvesia juncea** var. **foliosa,** n. var.

Galvesia glabrata Brandg., Zoe **5**:167. 1903.—*Type locality:* San Felipe, Lower California.

Collected on San Pedro Nolasco Island (3133), on South San Lorenzo Island (3530), and at Las Animas Bay (3510). In the Brandegee collections there are specimens from San Felipe and Saucito. The type is a very slender form in which the branches have a suggestion of the prehensile nature characteristic of Antirrhinum. In other than its slenderness, the type is identical with our specimens, having the same glaucous stems and large glabrous leaves. The variety differs from the species only in its well-developed foliage.

The plant always occurred about cliffs where it either grew on the talus or on ledges on the cliff-face. It is commonly a loose, erectly branched, weak-stemmed shrub. Usually it is 9-12 dm. high but, when supported, it frequently attains twice that height. The corolla is scarlet outside and pallid inside, bearing tawny bristles on the strongly embossed insect-guides of the palate. The four stamens are flattened and densely villous below.

362. **Galvesia juncea** var. **pubescens** (Brandg.), n. comb.

Galvesia speciosa var. *pubescens* Brandg., Zoe **5**:167. 1903. —*Galvesia rupicola* Brandg., Univ. Calif. Pub. Bot. **6**:360. 1916.—*Type locality:* On the rocks of Cape San Lucas, Lower California.

Specimens of this variety were collected on Angel de la Guarda (3420) and Espiritu Santo (3980) islands. The specimens from Angel de la Guarda presents one of those sad cases where two forms grow from one root, for part of the plant, the most in fact, has the characters of the variety *pubescens* while certain branches and leaves are typical of the variety *foliosa*. The specimen which is the common type of Brandegee's species and variety, and a collection from Saucito have been also studied. Brandegee (Proc. Calif. Acad. Sci. II, 3:225. 1892) admits that the cape plant approaches *juncea* even about its type locality. The variety is evidently only the pubescent state of the variety *foliosa*.

363. **Maurandya flaviflora,** n. sp.

Perennial (?) forming loose mat-like growths 2-5 dm. broad and about 1 dm. high; clammy-oily villous throughout; stems slender, branched mainly near base; leaves bright green, thin, numerous, alternate, very broadly cordate or reniform, coarsely serrate, 20-25 mm. long, 25-40 mm. wide; petioles slender, non-tortuous, 1-3 cm. long; flowers axillary; pedicels slender 20-25 mm. long, in fruit becoming coarse contorted and 5-10 cm. long; calyx 5-parted, in flower 11-12 mm. long with lobes foliaceous and the upper the longest (9 mm. long), accrescent in fruit becoming firmer with lobes ovate and tube more developed; corolla pale yellow, cylindrical, glabrate outside, 25-28 mm. long; corolla-tube 4-5 mm. long, 4 mm. broad, glabrous within, stamens attached at about the middle and adnate to beginning of throat; corolla-throat ampliated, 7-8 mm. wide at the middle, about 15 mm. long, within the lower part pubescent with numerous short flat yellow hairs (as is also the lower part of the filaments); corolla lobes broadly ovate or orbicular, not spreading, upper pair longest and united for about a third their length, lower lobes 3-4 mm. long with middle one the shortest; stamens 4, protruding 2-6 mm., fifth represented by small appendage near middle of corolla tube and between shorter pair of filaments; filaments flat, upper pair shortest being only 25 mm. long, lower pair about 28 mm. long; anther-sacs about 1.25 mm. long, circular, discrete, divergent, dehiscent about margins; pistil filiform, equalling or longer than stamens; fruit a turgid laterally compressed many-seeded capsule about 1 cm. broad; valves short-acuminate, above forming 2 crest-like apices in whose sinus is borne the subpersistent style; seeds brown with high irregular coarse corky longitudinal ridges, oblong, almost 2 mm. long.

Type: No. 1303, Herb. Calif. Acad. Sci., collected May 8, 1921, by I. M. Johnston (no. 3504) from the walls of a narrow cañon in the hills near **Las Animas Bay, Lower California.**

This remarkable species was seen but once, in a very interesting little gorge in the hills about 3 km. south from the head of Las Animas Bay at an altitude of about 250 m. It grew from crevices on a sheltered cliff at the head of the gorge and was locally rather common. It differs from all other members of its genus in having tortuous pedicels, crested capsules, protruded stamens, and yellow corollas with non-spreading lobes. It appears to be separated by part of the Sierra Madre and over 7 degrees of longitude from its closest congener. The nearest relative seems to be *M. geniculata* Robins. & Fern., a form which may be only the apterous phase of *M. erecta* Hemsley. By Hemsley's revision of the genus (Gard. Chron. II, 17:22. 1882) the new species would fall with *M. barclayana* and *M. scandens,* but most decidedly its relations are not there. It seems quite evident that the past treatments of Maurandya, based, as they mainly are, on seeds, are unnatural, and that they separate species which are certainly related. A much better treatment can be made by the use of other characters and with only subsidiary use of seed developments; for example, the following synopsis:

Body of seed flat; sepals thick, gibbose below, midrib and reticulate veining very evident. Subgenus **Epixiphium**.......................... *M. wislizeni* Engelm.

Body of seed circular in cross-section, thick; sepals foliaceous, not evidently ribbed or veined, not at all gibbose. Subgenus **Eumaurandya.**

Anther-sacs oblong, confluent or in contact; clayx parted, lobes lanceolate; leaves deltoid, glabrous; vines. §Usteria.

Calyx conspicuously long glandular pubescent ....*M. barclayana* Lindl.

Calyx glabrate...................................*M. scandens* (Cav.) Pers.

Anthers-sacs circular, discrete; calyx cleft, lobes ovate; leaves circular or cordate or reniform, pubescent; erect or prostrate or climbing. §Lophospermum.

Stems short (1-4 dm. long), not climbing; sepals not imbricate.
Corolla yellow, lobes erect; stamens exserted; pedicels tortuous; leaves thin, obtusely pointed, coarsely dentate; seeds apterous .... *M. flaviflora* Johnston
Corolla purplish, lobes spreading or reflexed; stamens included; pedicels straight or geniculate; leaves firm, rounded, sinuate.
Seeds apterous; fruiting pedicels thickened, geniculate .... *M. geniculata* Robins. & Fern.
Seeds alate; fruiting pedicels spreading or ascending .... *M. erecta* Hemsley
Stems elongate and climbing; sepals conspicuously imbricate.
Plant densely soft pubescent, grayish; sepals oblong-ovate .... *M. erubescens* (Don) Gray
Plant glabrate, green.
Sepals ovate- or cordate-oblong. (*M. purpusii* Brandg.) .... **M. e.** var. **purpusii** (Brandg.)
Sepals lanceolate. (*M. lophospermum* Bailey) .... **M. e.** var. **glabrata,** n. name

364. **Mimulus dentilobus** Robins. & Fern.

Mimulus dentilobus Robins. & Fern., Proc. Am. Acad. **30**:120 (1894).—*Type locality:* Nacory, Sonora.

A diminutive plant, which Mrs. Adele Grant questionably refers to the above species, was frequent at about 400 m. altitude in a large cañon back of Escondido Bay (4113). It is yellow-flowered and forms matted, herbaceous growths along seeps and in moist sand.

365. **Mohavea confertiflora** (Benth.) Heller

Mohavea confertiflora Heller, Muhl. **8**:48. 1912.—*Antirrhinum confertiflorum* Benth. in DC., Prodr. **10**:592. 1846.—*Mohavea viscida* Gray, Pacif. R. R. Rep. **4**:122. 1857.—*Type locality:* Doubtfully Californian.

Collected on a silty flat near the south end of Angel de la Guarda Island (4228) and observed on the gravelly plain back of Puerto Refugio at the north end of the island. The specimens represent the linear-leaved form of the species. It grew as a rank, coarse-stemmed, very glandular annual 45 cm. high with long widely ascending branches.

366. **Penstemon clevelandi** var. **angelicus,** n. var.

Differing from species in narrow sub-racemose inflorescence, oblong or lanceolate sepals, beardless sterile stamen, and cuneate-obovate upper leaves.

Type: No. 1304, Herb. Calif. Acad. Sci., collected May 3, 1921, by I. M. Johnston (no. 3413) from a sheltered ledge in Palm Cañon on **Angel de la Guarda, Gulf of California.**

A few plants of this new variety were found about 3 km. from shore on a sheltered ledge of a basaltic cliff in a short, gorge-like, constriction of Palm Cañon on Angel de la Guarda Island (3413). When collected the plant was in an advanced state of fruiting, but flowers were found on the ground. It is a short-lived perennial with several erect stems 6-12 dm. high. The variety is certainly a close relative of *P. clevelandi,* but further collections may justify its treatment as a distinct species. Its unique development is its racemiform inflorescence, the pedicels of which are much reduced, being only about 2 mm. long and much exceeded by the subtending bracts. The other characters of *angelicus* are individually approached by variations in typical *P. clevelandi,* but in no specimen have they been found in the combination characteristic of the type of *angelicus.* The narrow sepals are not absolutely constant even in the type of the variety, some of the calyx-lobes near the base of the inflorescence being ovate and having nearly the size and shape of those in typical *clevelandi.* The bearding of the sterile filament in *P. clevelandi* seems to be uncertain, as Brandegee's Ubi collection, which is otherwise good *clevelandi,* has naked filaments, and a dubious collection from near Campo *(Abrams 3619)* also has them bald. The leaves in *angelicus* are always largest above the middle, but even that condition is approached by a very mature collection made by Brandegee on April 1, 1896, at Agua Caliente in San Diego County, California. Most of the leaves in the Agua Caliente collection are withered, and it can not be definitely determined whether or not all the leaves are cuneate like the single flattened one.

367. **Russelia verticellata** H.B.K.

Russelia verticellata H.B.K., Nov. Gen. et Sp. **2**:360. 1817. —*Type locality:* Puento de la Madre de Dios, Mexico.

On Ceralbo Island (4062), in a cañon back of El Mastrador, this shrub forms junciform tufts in rock crevices on the cañon side. It was locally abundant, but at the time of collecting was nearly leafless and with very mature capsules. It grows a meter high. The plants are glabrate and readily fall into *verticellata* of Robinson's synopsis (Proc. Am. Acad. **35**:320. 1900). It appears to range over the cape region and to vary greatly in pubescence; some plants, because of their pubescence, falling into *R. polyhedra* of the synopsis. Regarding this variability, see the note by Brandegee (Proc. Calif. Acad. Sci. II, **3**:156. 1891).

368. **Stemodia durantifolia** (L.) Swartz

Stemodia durantifolia Swartz, Observ. Bot. 240. 1791.—*Capraria durantifolia* L., Syst. Nat. ed. 10, 1116. 1759.—*Type locality:* Jamaica.

A single plant was found at about 300 m. altitude on moist gravel on a cañon floor in the Sierra Giganta back of Escondido Bay (4112). Though not particularly common, the species ranges widely over Lower California. The present collection has a dark purplish-brown corolla whose lower lobe is folded inwardly to form a knife-like plait about 0.33 mm. high which runs the length of the corolla throat. This plicate condition is contrary to the generic diagnosis, but the plant evidently belongs to the species indicated. A hasty examination has not revealed similar developments in any other material of *S. durantifolia* available.

LXXX. Bignoniaceæ

369. **Tecoma stans** (L.) Juss.

Tecoma stans Juss., Gen. Pl. 139. 1774.—*Bignonia stans* L., Sp. Pl. ed. 2, 871. 1763.—*Stenolobium stans* Seem., Jour. Bot. **1**:88. 1863.—*Type locality:* "Insulis antillis."

Collected at Agua Verde Bay (3876) and at Escondido Bay (3846), and noted under cultivation on the plazas at Loreto and Guaymas. All the plants seen were shrubs growing 20-35 dm. high but usually averaging about 25 dm. in height. The sterile bush most strikingly simulates a young ash. Growing naturally in gravel in open cañons or on the alluvial fans at their mouth. Brandegee (Zoe 2:148. 1891) reported wild plants only from the cape region, but the above mentioned collections were taken over 170 km. north of that region.

LXXXI. Martyniaceæ

370. **Proboscidea altheæfolia** (Benth.) Decaisne

Proboscidea altheæfolia Decaisne, Ann. Sci. Nat. V. Bot. 3:324. 1865.—*Martynia altheæfolia* Benth., Bot. Sulph. 37. 1844.—*Martynia palmeri* Wats., Proc. Am. Acad. 24:66. 1889.—*Type locality:* Magdalena Bay, Lower California.

A single flowering plant was found in a wash back of San Luis Gonzales Bay (3366), but fruit was collected at San Francisquito Bay (3590) and on San Francisco Island (3959). The plant was most abundant on the dunes about the landing on Ceralbo Island near Gordas Point, for there the dried fruit was so abundant as to become entangled in large masses and to be blown about by the wind.

LXXXII. Acanthaceæ

371. **Anisacanthus thurberi** Gray

Anisacanthus thurberi Gray, Syn. Fl. N. Am. 2:328. 1878. —*Drejera thurberi* Torr., Bot. Mex. Bound. 124. 1859.—*Type locality:* Las Animas, Sonora.

Frequent on a gravelly cañon floor at the head of San Carlos Bay (4360). It is a shrub 10-18 dm. high formed of strict, tufted, slender stems. The bark is white, the internodes long, and the leaves few in the plants seen. This collection sets the southern limit for the species. It differs from more northern material only in its slightly less pubescent foliage.

372. **Beloperone californica** Benth.

Beloperone californica Benth., Bot. Sulph. 38. 1844.—*Type locality:* Cape San Lucas, Lower California.

Collected on Tiburon (3250, 4245), San Esteban (3188), and Espiritu Santo (4079) islands. The latter collection is atypical in having a glandular open inflorescence composed of numerous slender branches.

373. **Berginia virgata** Harv.

Berginia virgata Harv. in Benth. & Hook., Gen. Pl. **2**:1097. 1876.—*Pringleophytum lanceolatum* Gray, Proc. Am. Acad. **20**:293. 1884.—*Type locality:* "California," probably from Sonora.

Collected in a large wash at Guaymas (3114), in a cañon at Las Animas Bay (3509), in a wash at San Nicolas Bay (3729), and in a dry stream-way on Carmen Island (3820). It is a loosely branched shrub 8-20 dm. high. The two erect upper lobes and the throat of the corolla are white. The lower corolla lips are pink with a medial white area bordered by ciliate lines. The material from San Nicolas Bay and Carmen Island has glandular calyces.

374. **Carlowrightia californica** Brandg.

Carlowrightia california Brandg., Zoe **5**:172. 1903.—*Type locality:* Comondú, Lower California.

On Ceralbo Island (4052) this is very common on the broad gravelly floor back of Ruffo's ranchhouse. The locality is overgrazed and the plants growing in the open were browsed down to flattened, very twiggy mats, whereas those growing in the shelter of cacti produced long loosely branched open growths 3-6 dm. high. The locality was visited in early June when all the leaves were shed. Lacking leaves the determination can not be positively made.

A collection made on a rocky slope of the ridge directly back of Guaymas seems to be referable to *californica.* It is an open, irregularly branched undershrub 6 dm. high or less, growing self-supported or supported by other shrubs up through which it grows. The leaves are a trifle small, but otherwise it seems to agree with Brandegee's type.

The species is probably nearest to *C. cordifolia* Gray, if, indeed, it is distinct. In this regard, compare the notes by Vasey and Rose (Contr. U. S. Nat. Herb. **1**:75. 1890) and by Brandegee (Proc. Calif. Acad. Sci. II, **3**:159. 1891).

375. **Carlowrightia californica** var. **pallida,** n. var.

As in the species, but stems pallid with a close minute canescent tomentum.

Type: No. 1305, Herb. Calif. Acad. Sci., collected April 20, 1921, by I. M. Johnston (no. 3195) in a wash on **San Esteban Island, Gulf of California.**

This is a very brittle intricately branched, rounded shrub 3-6 dm. high which is very common on a broad gravelly cañon floor on San Esteban Island (3195). All the plants seen had very pallid stems and appeared very different from *C. californica.*

376. **Carlowrightia pectinata** Brandg.

Carlowrightia pectinata Brandg., Proc. Calif. Acad. Sci. II, **3**:160. 1891.—*Carlowrightia fimbriata* Brandg., Proc. Calif. Acad. Sci. II, **3**:161. 1891.—*Type locality:* Shaded hillsides at San José del Cabo, Lower California.

A very poor specimen of apparently this species was collected on a gravelly cañon floor at San Carlos Bay (4388). It appears to be a strictly branched winter annual or, possibly, a short-lived perennial. Its larger cauline leaves are lacking, the only leaves present being those borne on short axillary shoots. It agrees with the type in essentials, possessing a similar habit and floral developments, as well as the same shreddy papery bark.

377. **Dicliptera resupinata** (Vahl.) Juss.

Dicliptera resupinata Juss., Ann. Mus. Hist. Hat. Paris **9**:268. 1807.—*Justicia resupinata* Vahl., Enum. Pl. **1**:114. 1804.—*Type locality:* "Nova Hispania."

Not infrequent in gravelly ground about San Pedro and San Carlos (4363) bays. It is a loosely branched herb which grows up through shrubbery and becomes 3-6 dm. high. The flowers are pinkish.

378. **Elytraria squamosa** (Jacq.) Lindau

Elytraria squamosa Lindau, Anal. Inst. Fis. Geogr. Costa Rica **8**:299. 1896.—*Verbena squamosa* Jacq., Pl. Hort. Schonbr. **1**:3, t. 5. 1797.—*Tubiflora squamosa* Kuntze, Rev. Gen. **2**:500. 1891.—*Elytraria tridentata* Vahl., Enum. Pl **1**:107. 1804.—*Type locality:* Not given.

Growing among rocks in the hills back of Guaymas (3092) and San Carlos Bay (4389), and in a similar situation in a cañon in the Sierra Giganta back of Agua Verde Bay (3897). It was fairly common at the former stations, but rare at the last mentioned.

379. **Jacobinia ovata** var. **subglabra** Wats.

Jacobinia ovata var. *subglabra* Wats., Proc. Am. Acad. **24**:67. 1889.—*Type locality:* Near Guaymas, Sonora.

Collected in a steep draw on the east side of the ridge directly back of Guaymas (3095). The shrub was 9-12 dm. high and formed a small local colony. At San Pedro Bay (4312) the plant grew from crevices on a cañon wall forming a weak, open shrub 6-12 dm. high.

380. **Justicia insolita** Brandg.

Justicia insolita Brandg., Proc. Calif. Acad. Sci. II, **2**:195. 1889.—*Type locality:* San Gregorio, Lower California.

Collected at San Nicolas Bay (3702) where a single dense globose bush was found in a gravelly wash. It formed a compact, very twiggy and intricately branched growth about 1 m. in height. It has a very clean appearance and has closely tomentose snow-white stems which contrast sharply against the light green of the foliage. The lower lips of the corolla are violet, but the upper lips are white. This species seems to be rare north of the cape region, for, besides the present collection, the only ones north of that region are the type collection from San Gregoria and the one from between San Ignacio and Santa Rosalia reported by Goldman (Contr. U. S. Nat. Herb. **16**:366. 1916).

381. **Ruellia californica** (Rose), n. comb.

Calophanes californica Rose, Contr. U. S. Nat. Herb. 1:85. 1890.—*Type locality:* Santa Rosalia, Lower California.

Collected at Mulegé (3681), San Nicolas Bay (3725), Loreto (3781, 3793), Carmen Island (3808, 3830), Tiburon Island (4268), and Guaymas (3088). A globose bush about 1 m. high which is very pretty when covered with its large, fragrant, purple blossoms. A pink-flowered form was collected on Carmen Island. It is most abundant in gravelly washes, but is frequently quite common on rocky hillsides.

This species has a very close relative in *R. peninsularis,* but differs in having dull oily glandular-pubescent foliage and not glabrate foliage which is glutinous and somewhat shiny. The original collection of *R. californica* had extremely large flowers, but that character varies and Rose (Contr. U. S. Nat. Herb. 1:133. 1892) later admitted small-flowered plants to his species with only a passing comment. The calyx is the only other structure in which there is a notable interspecific difference. Very generally it can be said that *R. peninsularis* has shorter calyces than *R. californica,* but this is only a tendency and the calyx-size does not always run parallel with the conspicuous and geographically-linked difference in pubescence. *Ruellia californica* and *R. peninsularis* are kept apart solely on a difference in pubescence, a difference which seems to be unmarred by intergrades.

Rose referred this species to Calophanes, but its whole appearance is strange in that genus, whereas it is closely approximated in Ruellia. The reason for considering the species a Calophanes seems to be that, "though it resembles very much certain species of Ruellia" it "has the mucronate anthers and four-seeded capsules of Calophanes." Anthers have been examined from 17 collections representing this species and *R. peninsularis,* and only anthers with blunted bases can be found. None of the anthers present a sharpened or mucronate condition; in fact they appear less sharp than do those in *R. tuberosa,* the type of the genus Ruellia. Although the capsules usually have four seeds, five, or much less rarely six, ovules or seeds occur in some capsules. The reference to Ruellia is further strengthened by the fact that both of Rose's species have the alveolate roughened pollen grains of Ruellia, rather than the grooved grains characteristic of Calophanes.

382. **Ruellia peninsularis** (Rose), n. comb.

Calophanes peninsularis Rose, Contr. U. S. Nat. Herb. **1**:75. 1890.—*Type locality:* Mesas about La Paz, Lower California.

Collected only on the low bluffs that face the sea just east of La Paz (3037). It is a compact, twiggy shrub somewhat under 1 m. high. The corolla is purple with a yellowish throat, and drops very readily when the plant is handled. This is the common violet-flowered Ruellia of the cape region and in part the "Ruellia sp." mentioned by Goldman (Contr. U. S. Nat. Herb. **16**:366. 1916.). The species also occurs across the gulf about Guaymas, for *Palmer 196* (cf. Wats., Proc. Am. Acad. **24**:66. 1889) and Brandegee's collection of 1893 seem to be the same.

Besides *R. peninsularis* and *R. californica,* there are two other Ruellias known from the peninsula: viz., *R. leucantha* Brandg. (Zoe **5**:109. 1901) which is known only from the cape region where it is reported common, and *R. cordata* Brandg. (Zoe **5**:173. 1903), which is known only from the type collection made at Comondú. The peninsular Ruellias may be distinguished as follows:

Leaves cordate; sepals spathulate; calyx borne on long pedicels (8-20 mm. long) and closely subtended by conspicuous foliaceous bracts..............................*R. cordata*

Leaves ovate, acuminate; sepals linear-lanceolate; calyx borne on very short (1-3 mm. long) pedicels and subtended by inconspicuous subulate bractlets.

  Flowers white, 5-6.5 cm. long; plant densely pubescent with non-glandular hairs; leaves becoming 45-65 mm. long and 25-35 mm. wide; capsule obovate, canescent, 8-9 ovuled..............................*R. leucantha*

  Flowers purple, 3-5 cm. long; plant glabrate to densely glandular pubescent; leaves becoming 20-45 mm. long and 25-35 mm. wide; capsule oblanceolate, glabrate, 4-6 ovuled.

    Foliage glabrate, glutinous, rather shiny.............*R. peninsularis*

    Foliage densely glandular-pubescent, dull..............*R. californica*

LXXXIII. Plantaginaceæ

383. **Plantago minima** Cunningham

Plantago minima Cunningham, Proc. Indiana Acad. **1896**:202. 1897.—*Plantago insularis* Eastw., Proc. Calif. Acad. Sci. III, **1**:112. 1898.—*Plantago brunnea* Morris, Bull. Torr. Cl. **27**:115. 1900.—*Plantago fastigata* Morris, Bull. Torr. Cl. **27**:116. 1900.—*Plantago scariosa* Morris, Bull. Torr. Cl. **27**:117. 1900.—*Type locality:* Lincoln, Nevada.

A very abundant annual in sandy ground at Puerto Refugio on Angel de la Guarda Island (3384). This plant represents the common form of the patagonica-group present on the deserts and islands off southern California. It ranges south of the international boundary and is apparently the only "species" of the group present on the peninsula. In its extremes it differs from *P. erecta* in its silky-villous herbage and in its proportionately longer floral bracts, but intergrades seem to occur, and perhaps *minima* is no more than a variant of *erecta,* and the latter only a form *P. patagonica.*

LXXXIV. Rubiaceæ

384. **Coutarea pterosperma** (Wats.) Standley

Coutarea pterosperma Standley, N. Am. Fl. **32**:127. 1921. —*Portlandia pterosperma* Wats., Proc. Am. Acad. **24**:52. 1889.—*Type locality:* Cañons near Guaymas, Sonora.

About a dozen trees were found in a steep rocky gulch on the east slope of the ridge just back of Guaymas (3099). Only a single tree was in leaf, the others being naked but in full fruit. They grew 25-35 dm. high and had comparatively few ascending branches. The species was again seen in a rocky cañon at San Carlos Bay (4358) where it was infrequent on the gravelly cañon floor and formed an erect little-branched shrub 18-24 dm. high.

385. **Houstonia brevipes** Rose

Houstonia brevipes Rose, Contr. U. S. Nat. Herb. **1**:83. 1890.—*Type locality:* Near Santa Rosalia, Lower California.

Collected at Las Animas Bay (3499), South San Lorenzo Island (3540), San Marcos Island (3619), Coyote Bay

(4167), San Nicolas Bay (3723), near Loreto (3790), Carmen Island (3811), Escondido Bay (3851, 4132), and Ceralbo Island (4028). Although collected on the beach at Coyote Bay, the plant is characteristic of, and more common in gravelly cañons away from the influence of the ocean. It is a more or less shrubby herbaceous perennial with erect-growing tufted glaucous stems 2-6 dm. high. The corolla is pink with the tube less dark than the lobes. The collection from Carmen Island is very slender, but appears to be otherwise typical. Referable to *H. brevipes* are San Gregorio collections of Brandegee and a Purpus collection (164) from Calmalli. The plant reported from the cape region by Brandegee (Proc. Calif. Acad. Sci. II, 3:142. 1891) as *H. brevipes* in fact represents the very distinct *H. australis*. The range of *H. brevipes* is the middle part of the peninsula and south along the gulf to Ceralbo Island.

386. **Houstonia gracilenta**, n. sp.

A decumbent shrub forming a depressed growth about 2 dm. high and 8 dm. broad, inconspicuously glandular or glabrous throughout; old stems woody with a roughened grayish or brownish bark, not stout; leaf-bearing branches erect, 8-10 cm. long, more or less shiny, angled, slender, internodes 1-2 cm. long; leaves opposite, sessile, frequently fascicled in the axils, linear-filiform, acute, about 1 cm. long, 0.75 mm. wide, flattened, coriaceous; stipules triangular or minute, bearing 1-2 gland-tipped prolongations; flowers in loose few-flowered terminal cymes; peduncles about 1 cm. long; hypanthium 0.5-0.66 mm. high at anthesis; sepals lanceolate, slightly over 1.5 mm. long, scarcely accrescent; corolla 12 mm. long, salverform, tube pink, 5.5-6 mm. long; throat cylindrical, 3 mm. long, pink with 5 rose-colored lines extending down upon it from the corolla lobes; lobes oblong, acutish, rose-colored, about 2 mm. long; style and stamens included; mature fruit oblong-globose, slightly less than 2 mm. long, less than 1.5 mm. wide, ⅔-¾ inferior; seeds unknown.

Type: No. 1306, Herb. Calif. Acad. Sci., collected May 27, 1921, by I. M. Johnston (no. 3927) on a rocky hillside of **San Diego Island, Gulf of California.**

Though this plant superficially much resembles *H. brevipes,* it is in fact a very close relative of *H. mucronata.* The first impression gained upon comparing the plant with *mucronata* is that of utter dissimilarity, but a close analytical study shows that the different aspect of *gracilenta* results from the relative slenderness that pervades all its structures. The only notable differences possessed by *gracilenta* seem to be the smaller capsules and a laxer habit of growth. *Houstonia gracilenta* is proposed as a distinct species only because *mucronata* is so constant throughout its range and so characteristic in its habits and aspect. The new species presents such a violent departure from the reoccurring growth form of *mucronata* that its description as new can be justified on that ground alone. In the field it was mistaken for *brevipes,* but a study of the material soon showed that the specimens had woody, angled, non-glaucous stems and very long sepals; characters which plainly allied it with *H. mucronata.* As an ally of *mucronata* the rocky seaward island slopes are not extraordinary habitats, for typical *mucronata* was collected in exactly similar situations in other parts of the gulf. The differences that characterize *H. gracilenta* are not to be explained away as of ecologic origin.

387. **Houstonia mucronata** (Benth.) Robinson

Houstonia mucronata Robinson, Proc. Am. Acad. **45**:401. 1910.—*Hedyotis mucronata* Benth., Bot. Sulph. 19. 1844.—*Houstonia fruitcosa* Rose, Contr. U. S. Nat. Herb. **1**:132. 1892.—*Type locality:* Magdalena Bay, Lower California.

Observed on the beach at Coronado Island (3755), Carmen Island (3836) Danzante Island (3859), Monserrate Island, Agua Verde Bay (3895), San Diego Island, San Francisco Island (3954), and Ceralbo Island (4035). The plant was usually abundant where found, growing primarily on beaches or on dunes, though not infrequently extending onto seaward cliffs and slopes. It is a distinctly shrubby bush 2-9 dm. high. The corolla is white, with the tube and the lobes rose-colored outside; in drying all color is lost. The specimens of this species from the west coast of the peninsula differ from the gulf collections in being more slender, less woody, and in having leaves that are perceptibly narrowed at the base. If these differences hold the gulf plant may deserve varietal rank. The plant of the Pacific shore perhaps is uncommon, for Mr. Brandegee knows it solely on Magdalena Island where he succeeded in finding only one small colony.

The relations of the peninsular species of Houstonia may be seen from the following key. *Houstonia brandegeana* Rose (Contr. U. S. Nat. Herb 1:70. 1890) can scarcely be distinguished from Bentham's *H. asperuloides* (Bot. Sulph. 19, t. 13, 1844). The characters given by Rose are not correlated and are not decisive, while at least in flower measurements *brandegeana* has the characters of the older *asperuloides*. *Houstonia prostrata* Brandg. (Zoe 5:105. 1901), *H. arenaria* Rose (Contr. U. S. Nat. Herb. 1:70. 1890), *H. peninsularis* Brandg. (Zoe 5:160. 1903), and *H. australis* Johnston (Univ. Calif. Pub. Bot. 7:446. 1922) all seem very distinct species:

Plant annual.
- Capsules on recurved pedicels, bilobed, 3 mm. broad, less in length; prostrate .... *H. prostrata*
- Capsules erect, unlobed, 1-2 mm. broad, more in length; erect.
  - Flowers all on long (1-3 cm.) filiform pedicels; leaves small, narrow, 3-20 mm. long, 0.5-1.5 mm. wide; stems terete, erect; fruit globose .... *H. asperuloides*
  - Flowers nearly all sessile; leaves comparatively large, 2-6 cm. long, 2-8 mm. wide; stems quadrate with spreading branches; fruit usually ovate or oblong .... *H. arenaria*

Plant perennial.
- Stems angled, shrubby nearly throughout; coastal.
  - Plant stout, bushy; annual growths 6-8 cm. long, internodes 5-10 mm. long; leaves linear, about 1 mm. wide; capsule 2-2.5 mm. long, over 2 mm. wide; widely distributed .... *H. mucronata*
  - Plant slender, spreading; annual growth 8-10 cm. long, internodes 1-2 cm. long; leaves linear-filiform, about 0.75 mm. wide; capsule 2 mm. long, less than 1.5 mm. wide; endemic on San Diego Island .... *H. gracilenta*
- Stems terete, shrubby if at all only near the base; mainly back from coast.
  - Plant densely hirtellous; flowers pubescent outside, in close cymes .... *H. peninsularis*

Plant glabrous; flowers glabrous, in open cymes.
Corolla 7-9 mm. long; sepals 1.5-2 mm. long; leaves short-petiolate, 1-2 mm. wide; stems usually simple, not glaucous............................*H. australis*
Corolla 9-15 mm. long; sepals 0.5-1 mm. long; leaves sessile, 0.5-1 mm. wide; stems usually much branched, glaucous.................................*H. brevipes*

388. **Mitracarpus linearis** Benth.

Mitracarpus linearis Benth., Bot. Sulph. 20. 1844.—*Type locality:* Cape San Lucas, Lower California.

Found on the mesa-like summits of the basaltic ridges which rise about the Isthmus on Espiritu Santo Island (3975). It was uncommon, growing in soil-filled crevices along with *Conobea intermedia.* While evidently referable to Bentham's species the specimens have shorter leaves and a more spreading habit than do other collections of the species. The atypical developments are probably ecologic in origin.

389. **Randia megacarpa** Brandg.

Randia megacarpa Brandg., Zoe 5:257. 1908.—*Type locality:* Comondú, Lower California.

To this species are referred the sterile, leafy branches collected in a cañon back of Agua Verde Bay (3896). The collection is from erect shrubs 18-27 dm. high that were frequent on steep talus slopes. Its leaves closely match those of the type in size and shape, but differ in having a slightly less dense pubescence. A very similar plant was seen on the cañon side in the Sierra Giganta back of Escondido Bay.

What is apparently the same plant was again collected near the Isthmus on Espiritu Santo Island (3982). There it grew in rocky places in the upper reaches of gulches and on the mesa-like ridge-crests. In the gulches it had several strict stems 9-15 dm. high, but on the ridges it formed a twiggy rough scraggly divaricately branched shrub only 6-9 dm. high. The fruit on the island plant became 25 mm. broad, which is slightly smaller than that (30 mm.) in the type of *R. megacarpa.* The type has fruit evidently 10-12 ribbed, whereas the fruit of the island plant is indistinctly ribbed. The fruit seems to persist on the plant for some time after the leaves are shed, and to be more or less imperfectly equatorially circumscissile. Rodents appear to relish it. The flowers of this species have never been collected.

LXXXV. CUCURBITACEÆ

390. **Cucurbita cordata** Wats.

Cucurbita cordata Wats., Proc. Am. Acad. **24**:50. 1889.—*Type locality:* Sandy plain near Los Angeles Bay, Lower California.

A single plant was found in a sandy wash at Agua Verde Bay (3902). The habit and fruit are those of *C. palmata,* the chief difference residing in its dissected leaves.

391. **Maximowiczia sonoræ** Wats.

Maximowiczia sonoræ Wats., Proc. Am. Acad. **24**:51. 1889.—*Ibervillea sonoræ* Greene, Erythea **3**:75. 1895.—*Type locality:* About Guaymas, Sonora.

The plants with the peculiar bottle-shaped epigeous roots which were observed at San Pedro and San Carlos bays are no doubt to be referred to this species. In its typical form the species is restricted to the mainland, ranging from middle western Sonora southward into Sinaloa. It is characterized by its long stems and dissected leaves. The leaves are twice three-parted with more or less lobed divisions.

392. **Maximowiczia sonoræ** var. **peninsularis,** n. var.

Leaves with broad lobes, these with broad irregular lobules or with the margin merely sinuate; stems very long, 2-4 m.

Type: No. 1307, Herb. Calif. Acad. Sci., collected June 6, 1921, by I. M. Johnston (no. 4026) on a sandy point just north of Gordas Point, **Ceralbo Island, Gulf of California.**

At the southern-most station on Ceralbo Island (4026), on a sandy point less than 1 km. north of Gordas Point, this plant vied with *Ferocactus diguetii* in the interest it aroused. It was very abundant, the sandy point being dotted with the weird large white epigeous roots. The body of the root, which is much depressed and seated in a shallow depression in the ground, averaged about 65 cm. in diameter but not infrequently attains twice that measurement. From the body of the root there usually projects one, but not uncommonly two or three, coarse tapering necks which either stand erect or are bent over. The complete root averages 3-6 dm. high. Each neck produces one elongate main branch 3-4 m. long, as well as a few short branched stems 4-5 dm. long. At the time the plants were seen they were practically leafless. In looking over the colony one could not help but liken it to some out-of-place electrical development, the long bare trailing stems being the cables and the large white roots the huge insulators up through which the high tension current was conducted from the subterranean power station. The roots though exposed are unmolested by animals, no doubt due to the excruciatingly bitter taste. Goldman (Contr. U. S. Nat. Herb. **16**:367, t. 133. 1916) has an excellent picture of a single plant, probably a member of the large colony described.

This variety includes all the plants collected in the cape region by Brandegee. At first it was made to include all the peninsular plants formerly referred to *M. sonoræ,* but which differ from the latter in having less-cut, more ample leaves. Brandegee (Univ. Calif. Pub. Bot. **6**:361. 1916. and Proc. Calif. Acad. Sci. II, **3**:139. 1891), however, has pointed out that the peninsular plants differ in cauline development, those of the cape region having stems 2-4 m. long whereas those further north have stems less than 1 m. long. The variety *peninsularis* is therefore defined so as to include only the long-stemmed plant of the cape region. The less robust and short-stemmed northern plant being the following variety.

393. **Maximowiczia sonoræ** var. **brevicaulis,** n. var.

Maximowiczia insularis Brandg., Univ. Calif. Pub. Bot. **6**:361. 1916.—*Type locality:* Magdalena Bay, Lower California.

Sterile and usually leafless plants of this variety were noted at San Francisquito Bay (apparently the northern-most station), Escondido Bay, and Catalina, Santa Cruz, San Diego, San Josef, and Espiritu Santo islands. Brandegee (loc. cit.) reports it from Magdalena Bay, and Goldman (Contr. U. S. Nat. Herb. **16**:367. 1916) has a collection from Pozo Altamirano south of Calmalli. The plant has a bottle-shaped root 15 cm. in diameter and about 25 cm. high. The stems are less than 1 m. long. This variety may not be entirely distinct from *peninsularis,* but as it represents a tendency correlated with geography it seems worthy of some minor designation.

394. **Vaseyanthus insularis** (Wats.) Rose

Vaseyanthus insularis Rose, Contr. U. S. Nat. Herb. **5**:120. 1897.—*Echinopepon insularis* Wats., Proc. Am. Acad. **24**:51. 1889.—*Echinopepon palmeri* Wats., Proc. Am. Acad. **24**:52. 1889.—*Brandegea palmeri* Rose, Contr. U. S. Nat. Herb. **5**:120. 1897.—*Type locality:* San Pedro Martir Island.

In one or another of its several forms this cucurbit was common at nearly every station in the gulf area. It was most common in the cañons and on the slopes back from the beach where it climbed in tangled masses over the shrubbery and rocks, or festooned the trunks of the columnar cacti. It not infrequently, however, occurred along cobblestone beaches growing in such abundance as completely to cover large areas of rocks, thereby making walking in such areas not only difficult but dangerous. The whole plant, particularly the fruit, is extremely astringent.

All forms of the species are excessively variable in foliage, even in a single locality. At the type locality of the species, for example, the leaves vary from sparsely and inconspicously strigose to very densely short-hirsute, from green to canescent, from thin to thick, from ample (5-7 cm. broad) to small (under 5 cm. broad), and from shallowly 5-lobed with broad triangular lobes to 5- or 7-cleft with oblong or lanceolate lobes. It is quite evident that foliage is too variable to furnish diagnostic characters. The plant is usually a long trailing vine, but occasionally it loses its viny habit and forms small selfsupporting globose masses 3-6 dm. high, a development of habit similar to that characterizing the "Cupid" sweet peas. The floral structures seem quite constant.

The fruit consists of a globose body and a conical caducous hollow cap. The body consists of a single-seeded cell that is surrounded by an indurate wall strengthened by a tough vescicular layer. The surface of the body of the fruit is usually covered with stiff, coarse spines, but it may be naked. At some localities, as the type locality of the species, all stages can be found between densely echinate fruit and that with few or no spines. At other stations, as on Nolasco and Tortuga islands, plants with naked fruit and plants with spiny fruit grow even intertwined and yet keep perfectly distinct. As the smooth-fruited plants occur only in the northern parts of the gulf, the geographical correlation seems to justify the treatment of them as at least varietally distinct. There is also a difference in the degree of spininess in the echinate forms. The more southern forms seem to have the longest and most abundant spines. These latter are here treated as constituting the variety *brandegei.* The plant of the middle gulf has spines less developed than in the variety *brandegei* and represents the typical form of the species. While there are several pronounced tendencies exhibited in fructal variation the presence of abundant intergrades makes it best that these be treated as varieties. All the described forms of Vaseyanthus are accordingly reduced to one species and two varieties.

In his synopsis of the Echinopepon allies, Rose (Contr. U. S. Nat. Herb. **5**:114-121. 1897) has referred Watson's *E. palmeri* to the genus Brandegea. This step must have been based on a study of poor or meager material, for that species is most positively congeneric with the type *(V. rosei)* of the genus Vaseyanthus. The genus Brandegea is very different from Echinopepon and Vaseyanthus, differing in its persistent (nonarticulate and noncaducous) beak and in the thin-walled (not indurate vescicular) fruit. The fruit of Vaseyanthus, particularly of the smooth-fruited slightly asymmetrical variety *inermis,* superficially suggests that of Brandegea, but in fact it is structurally much closer to Echinopepon. From Echinopepon, Vaseyanthus is to be distinguished by its tall, unarmed, conic beak surmounting an indehiscent, (usually) single-seeded, vescicular-walled, globose fruit. Echinopepon has an elliptical, 2-celled, thin-walled fruit that dehisces irregularly near the summit or by the falling away of a broad shallow echinate calyptra.

Collections representing the moderately armed, typical form of the species are at hand from San Pedro Martir (3146, 4387), San Pedro Nolasco (3132), Pond (4241), San Esteban (3183), North San Lorenzo (4197, 4195), South San Lorenzo (3537), and Tortuga (3607) islands.

395. **Vaseyanthus insularis** var. **brandegei** (Cogn.), n. comb.

Echinocystis brandegei Cogn., Proc. Calif. Acad. Sci. II, **3**:59. 1890.—*Vaseyanthus brandegei* Rose, Contr. U. S. Nat. Herb., **5**:119. 1897.—*Vaseyanthus rosei* Cogn., Zoe **5**:368, t. 11. 1891.—*Type locality:* Todos Santos, Lower California.

Collections referable to this variety were made on San Marcos Island (3626), San Nicolas Bay (3705), Monserrate Island (3871), Agua Verde Bay (3894), San Diego Island (3929), and San Francisco Island (3955, 3956). In the Brandegee herbarium the variety is represented by collections from Espiritu Santo Island, La Paz, Guadalupe, and San José del Cabo.

396. **Vaseyanthus insularis** var. **inermis,** n. var.

As in the species, but fruit absolutely unarmed.

Type: No. 1308, Herb. Calif. Acad. Sci., collected April 22, 1921, by I. M. Johnston (no. 3224) on steep slopes on **Isla Partida, Gulf of California.**

Collections of this smooth-fruited northern form were made on San Pedro Nolasco (3131), San Pedro Martir (4386), Tortuga (3606), South San Lorenzo (3535), Partida (3224, 3231), San Esteban (3182), Angel de la Guarda (4223), and Mejia (3355, 3360) islands.

LXXXVI. Campanulaceæ

397. **Lobelia laxiflora** H.B.K.

Lobelia laxiflora H.B.K., Nov. Gen. et Sp. **3**:311. 1818.—*Type locality:* Between Quaxiniquilapa and Acaguisotla, Guerrero.

Found only in the large cañon in the Sierra Giganta back of Escondido Bay (4114) where it grows in wet seepage-crevices and along the stream-edge at an altitude of about 500 m. It is locally very common, forming rank herbaceous tufts 5-15 dm. high. The plants have broadly lanceolate leaves, and as far as foliage is concerned, are best referred to the typical form of the species. Brandegee's collections from the cape region, over 200 km. south of Escondido Bay, have linear-lanceolate leaves and have been referred to the variety *angustifolia* (Proc. Calif. Acad. Sci. II, **3**:149. 1891). All the peninsular material seems to have a close, very floriferous inflorescence with the pedicels strictly ascending instead of widely spreading as in much of the mainland material.

LXXXVII. Compositæ

398. **Brickellia brandegei** Robinson

Brickellia brandegei Robinson, Mem. Gray Herb. **1**:106. 1917.—*Type locality:* La Paz, Lower California.

This plant, previously known only from the type collection made at La Paz, was collected in the area back of the pearl-culture plant on Espiritu Santo Island (4004). In a ravine, where sheltered, it became a loosely branched rounded shrub 1-2 m. high, but on the crests of some basaltic ridges, where it was seen most abundantly, it formed a very compact growth about 1 m. high. In all respects the collection remarkably matches the type. As far as similarity is concerned it might well be part of the type collection, for the specimens agree with the type even in their unkempt appearance and mature state of fruiting.

399. **Brickellia peninsularis** Brandg.

Brickellia peninsularis Brandg., Zoe **5**:160. 1903.—*Type locality:* La Chuparosa, Lower California.

Collected at about 500 m. altitude in the Sierra Giganta back of Escondido Bay (4126), where a few shrubs, 9-12 dm. high, were noted on the side of a narrow cañon. This collection compares well with the series of specimens collected in the cape region by Brandegee. Most of the series, like the plant from Escondido Bay, has a more grayish pubescence and more conspicuously veined leaves than does the La Chuparosa collection which Brandegee has indicated as the type of his species. Up to the present time the species has been known only from the cape region.

400. **Eupatorium sagittatum** Gray

Eupatorium sagittatum Gray, Pl. Wright. **1**:88. 1852.—*Type locality:* "California"; probably from Sonora.

This plant is common at San Pedro Bay (4320) and frequent about San Carlos Bay (4382). It forms large, dense, very intricately branched, hedge-like masses 1-2 m. high on saline flats, where it commonly grows with Suaeda and Maytenus. The flowers are lilac.

401. **Hofmeisteria crassifolia** Wats.

Hofmeisteria crassifolia Wats., Proc. Am. Acad., **24**:53. 1889. *Type locality:* High mountains about Guaymas, Sonora.

This species was found on San Pedro Nolasco Island (3142) growing in dense masses on sea-cliffs, at San Pedro Bay (4307) occurring on cliffs in a cañon near the ocean, and at Kino Point growing on a rocky promontory. The plant has a branched woody caudex covered with an abundance of brittle stems, and forms a dense rounded mass 7-25 cm. high. The lobes of the succulent leaves are terete and pallid. The stigmas are pink; the corolla is the same color or a shade lighter.

402. **Hofmeisteria fasciculata** (Benth.) Walp.

Hofmeisteria fasciculata Walp., Rep. **6**:106. 1847.—*Helogyne fasciculata* Benth., Bot. Sulph. 20. t. 14. 1844.—*Type locality:* Magdalena Bay, Lower California.

Collections of this species were made at Los Angeles Bay (3456), Las Animas Bay (3493), San Francisquito Bay (3574), Tortuga Island (3600), Tepoca Bay (3303), Isla Partida (3221), and near the south end of Angel de la Guarda Island (4233). A collection from Carmen Island (3814) has the foliage of the species, but the pubescence of the variety *pubescens*. The plants from Tortuga Island grew on the walls of a volcanic crater, those from Los Angeles Bay on cañon-walls in hills back from the coast, but the remainder came from elevated beaches or cliffs facing the sea. The plant forms dense rounded clumps 2-6 dm. high. The flowers are very numerous and vary from flesh-colored to lilac. The leaves are green, flattened, and slightly succulent.

403. **Hofmeisteria fasciculata** var. **pubescens** (Wats.) Robinson

Hofmeisteria fasciculata var. *pubescens* Robinson, Proc. Am. Acad. 47:192. 1911.—*Hofmeisteria pubescens* Wats., Proc. Am. Acad. 24:54. 1889.—*Type locality:* Mulegé, Lower California.

This variety ranges along the west side of the gulf from the vicinity of Mulegé southward at least to Catalina Island. It is characterized by its glandular-villous, succulent foliage. Collections were made at San Nicolas Bay (3714), Ildefonso Island (3744), Coronados Island (3765), Puerto Ballandra, Carmen Island (3814), and western shore of Catalina Island (3765). At all the stations it grew on elevated beaches or on cliffs facing the sea. It forms dense globose or hemispherical clumps 3-6 dm. high. Its stems, like those of the species, are excessively brittle. The old plants have a rather heavy woody caudex. The flowers are lilac.

404. **Hofmeisteria filifolia,** n. sp.

An herbaceous perennial forming dense rounded clumps 1-6 dm. high; stems commonly numerous, simple below, with a few strict branches above, striate, slender, densely stipitate-glandular; leaves numerous, alternate, 4-7 cm. long, 3-6 cm. wide, glandular, not at all fleshy, lower leaves palmately 3-parted or pinnately 5-parted the filiform or dilated lobes simple or 3-parted, upper leaves simply 3-parted with filiform spreading lobes; peduncles slender with scattered setaceous bracts, 5-9 cm. long; heads narrowly campanulate, 8 mm. high, 4-5 mm. wide, many-flowered, with numerous narrow acuminate bracts and naked receptacles; corolla pale pink, very narrow, 3.5-4 mm. long, lobes rounded and broader than long; pappus of 3 antrorsely barbed awns (these either shorter or longer than the corolla) and 3 alternating broad lacinate white paleæ; achenes black, usually with 2 of the 5 angles strigose, callous-tipped below.

Type: No. 1309, Herb. Calif. Acad. Sci., collected May 3, 1921, by I. M. Johnston (no. 3418) from partially shaded rock-crevices in Palm Cañon, **Angel de la Guarda Island, Gulf of California.**

Three collections of this species were made. A colony of three plants was found on a lava cliff in a narrow cañon on Mejia islet (3364), and many plants were discovered growing in dense masses in crevices of sunny south-facing breccia cliffs in the rocky hills back of Puerto Refugio (3377). The plant was found to be most abundant along the walls of Palm Cañon (3418). These stations are all on or near Angel de la Guarda Island.

The new species is most closely related to *H. fasciculata,* but is distinguished from all phases of that polymorphous species by its more slender habit, smaller heads, shorter and rounded corolla-lobes, filiform non-succulent leaves, and pappus of 3 setæ and 3 lacinate paleæ. *Hofmeisteria fasciculata* is a much coarser, more juicy, plant and is less distinctly tufted than *H. filifolia,* and its leaves are never so narrow, nor so elongate.

405. **Hofmeisteria pluriseta** Gray

Hofmeisteria pluriseta Gray, Pacif. R. R. Rep. **4**:96, t. 9. 1857.—*Type locality:* Cañon of the Williams River, Arizona.

Two typical collections of this species were made, one from a populous local colony growing on a north-facing lava cliff in the hills back of San Luis Gonzales Bay (3326), and the other from rock crevices in the cañons back of Puerto Refugio on Angel de la Guarda Island (3376). The latter collection seems to set the southern limit for the species. The plant forms an intricately-branched bush 3-6 dm. high. Brandegee has a collection from Santa Maria, but the other collections reported by him (Proc. Calif. Acad. Sci. II, **2**:167. 1889) belong to the following varieties:

406. **Hofmeisteria pluriseta** var. **laphamioides** (Rose), n. comb.

Hofmeisteria laphamioides Rose, Contr. U. S. Nat. Herb. **1**:79. 1890.—*Type locality:* Summit of San Pedro Martir Island.

This plant commonly grows on cliffs, forming rounded shrubby growths 3-6 dm. high. On San Pedro Martir Island it is most abundant in the cactus forest crowning the island and forms an erect-growing shrub 5-10 dm. high. The flowers are pleasantly though not strongly fragrant. No soil preferences are shown by the plant, it being collected from lava, tufa, and gypsum. Collections were made on San Pedro Martir (3157, 3162), Sal si Puedes (3521), San Marcos (3630), and Tiburon (3266) islands. The characteristic foliage was recognized on Tortuga Island where it occurred on the crater-walls, on Carmen Island where infrequent on cliffs back of Puerto Ballandra, and on Pelican Island where it grew commonly in sheltered rock crevices. Palmer has collections from Santa Rosalia, and Brandegee has material from San Ignacio and San Bartolomé Bay. The range of the variety is therefore the gulf islands and the peninsula between latitudes 26° and 29° N.

Hofmeisteria laphamioides can not be maintained as a distinct species, as it lacks decisive floral or foliar characters. A collection made at Las Animas Bay (3516), while nearest *laphamioides,* is intermediate between it and *pluriseta.* *Hofmeisteria pluriseta* usually has slender flexuous stems and small leaves, but the character of growth is not constant even in Californian specimens while the leaves vary so in size and form that no line can be drawn between the small leaves of *pluriseta* and the larger ones characteristic of *laphamioides.* The plate given by Gray shows leaves fully as large as those in the Las Animas Bay collection, the pictured foliage differing only in their more jagged toothing. It seems that *laphamioides* is only a geographical form of *pluriseta* occurring in the region immediately to the south of the latter.

407. **Hofmeisteria pluriseta** var. **pauciseta,** n. var.

Pappus setæ 5, alternated by 5 obtuse oblong scales.

Type: No. 1310, Herb. Calif. Acad. Sci., collected April 17, 1921, by I. M. Johnston (no. 3134) from a cliff on **San Pedro Nolasco Island, Gulf of California.**

Superficially, this variety seems identical with the variety *laphamioides,* but differs from that plant in conspicuous pappus developments. In *pluriseta* and the variety *laphamioides* the pappus consists of 5-15 setæ and usually 10 scales, whereas in the variety *pauciseta* there are but 5 setæ and 5 scales. The variety *pauciseta* is less evolved in its pappus developments than *pluriseta* and *laphamioides,* for these latter forms reveal the consummation of a tendency for the scales to be deeply bifid or cleft and transmuted into bristles or awned scales. In *pauciseta* the scales are erose or truncate, but in *pluriseta* and *laphamioides* the scales are bifid or divided, producing awns from their sinuses and frequently from their apices as well. There appears to be an unequal development of this tendency to awn, as one side of the achene produces longer awns than the other.

The variety *pauciseta* was collected only on San Pedro Nolasco Island (3134) where it was frequent on sheltered cliffs and ledges near the sea. It formed dense rounded growths about 5 dm. high and 5-7 dm. broad. Rose (16868) collected it on Espiritu Santo Island, and Brandegee (Proc. Calif. Acad. Sci. II, 2:167. 1889) has a similar plant from Purisima. All three collections are along the southern limits of the variety *laphamioides*.

408. **Hofmeisteria tenuis** (Wats.), n. comb.

Malperia tenuis Wats., Proc. Am. Acad. 24:54. 1889.—*Type locality:* Stony ridges near Los Angeles Bay, Lower California.

Collected at San Francisquito Bay (3563) where fairly common on a shell-covered ridge back from the bay, and on the south end of Angel de la Guarda Island (4205) where a few plants were seen on a silty flat. The island collection is diffusely branched, 38 cm. high and nearly as broad, and has three pappus bristles as described in the original diagnosis. The San Francisquito plants were eaten down, probably by rodents, and are low and spreading in consequence; dissection reveals that flowers with three or four pappus setæ are borne in the same head. Brandegee has a collection from San José de Garcia (Proc. Calif. Acad. Sci. II, 2:167. 1889) that bears flowers with five pappus bristles. It is evident, therefore, that in this species no importance can be attached to the number of pappus setæ.

The floral and fruit structures of this plant are evidently those of Hofmeisteria. Its claim for generic distinctness lies wholly in its annual habit and sessile linear leaves. When referred to Hofmeisteria, the diversity of foliage which it brings to that genus is no greater than that already existing between *H. pluriseta* and *H. crassifolia,* while the diversity in habit, hardly more than a specific character, can be reconciled with analogous cases in Brickellia, Stevia, and Eupatorium. Malperia is practically unknown in the literature; hence little support can be drawn from precedent or usage. The genus may be judged on its intrinsic characters which seem insufficient for the maintaining of a monotypic genus.

Hofmeisteria tenuis is a near relative of *H. pluriseta,* nearer in fact than the latter species is to the others of the genus. The most satisfactory treatment seems to demand the recognition of three sections made up as follows:—Euhofmeisteria, composed of *H. fasciculata, H. crassifolia, H. filifolia;* Brickelliopsis, with only *H. pluriseta*; and Malperia, also with a single species, namely, *H. tenuis.* The species may be distinguished by aid of the following key:

Heads cylindric in cymes or corymbs; bracts 18-25; peduncles usually short; loosely branched plants with entire or toothed leaves.
  Plant annual; leaves sessile, entire, linear or lance-linear; §Malperia .... *H. tenuis*
  Plant perennial; leaves petioled, crenate or toothed, with a broad blade; §Brickelliopsis .... *H. pluriseta*
Heads campanulate, solitary on long peduncles; bracts 50 or more, compactly branched plants with dissected or rarely crenate leaves; §Euhofmeisteria.
  Pappus setæ 5 or more; plant glabrous, glaucous; leaf-lobes terete .... *H. crassifolia*
  Pappus setæ fewer than 5; plant more or less pubescent, never glaucous; leaf-lobes always flattened.
    Setæ 2 (very rarely 3); paleæ oblong, entire; leaves somewhat fleshy, crenate to dissected, when dissected the lobes oblong; heads 1 cm. high; corolla-lobes triangular .... *H. fasciculata*
    Setæ 3, paleæ lacinate; leaves not fleshy, divided into long filiform lobes; heads 8 mm. high; corolla lobes rounded .... *H. filifolia*

409. **Aplopappus spinulosus** var. **scabrellus** (Greene) Blake

Aplopappus spinulosus var. *scabrellus* Blake, Contr. U. S. Nat. Herb. 52:24. 1917.—*Eriocarpum scabrellum* Greene, Erythea 2:108. 1894.—*Type locality:* Los Angeles Bay, Lower California.

This is the peninsular variant of the widely distributed *A. spinulosus.* It comes only from the northern part of Lower California. Collections were made only on Angel de la Guarda Island (3378, 3417), but these compare well with material collected by Palmer at Los Angeles Bay, and by Brandegee at San Sebastian and San Enrique.

410. **Aplopappus arenarius** Benth.

Aplopappus arenarius Benth., Bot. Sulph. 24. 1844.—*Type locality:* Cape San Lucas, Lower California.

Collected on San Diego (3930), Santa Cruz (4096), Carmen (3817, 3854), and Coronados (3754) islands, where it grew on dunes or on slopes near the sea. It is a suffruticose plant with a few widely spreading branches. These specimens, like most of those collected away from the immediate vicinity of Cape San Lucas, have the leaves sharply serrate, frequently aristate, and comparatively narrower and thinner than do specimens taken at the cape. In general the specimens from the sea-shore about Cape San Lucas have the leaves broadly spathulate or oblanceolate and the toothing so shallow and remote that the general impression given is that of entire margins These southern plants are covered with a short, stiffish, usually glandular pubescence which makes the foliage seem thicker than it is in fact. *Aplopappus arenarius* ranges over the southern two-thirds of the peninsula, and while related to *A. spinulosus,* is readily distinguished from that species by its bushy fruticose habit. *Aplopappus spinulosus* and its varieties at most have a short close prostrate caudex and erect herbaceous stems.

411. **Aplopappus arenarius** var. **incisifolius,** n. var.

As in the species, but leaves pinnately parted with remote narrow lobes.

Type: No. 1311, Herb. Calif. Acad. Sci., collected May 9, 1921, by I. M. Johnston (no. 3529) on a rocky bench on **South San Lorenzo Island, Gulf of California.**

An endemic, or at least an uncommon leaf-form of *A. arenarius,* characterized by its pinnately parted foliage. Seen only on South San Lorenzo Island (3529) where quite conspicuous, growing abundantly on a gravel beach among plants of a cactus thicket and forming compact shrubby globular masses 15-60 cm. high. It is very abundantly floriferous. The leaves are sparsely glandular and have aristate lobes.

412. **Aplopappus arenarius** var. **rossii,** n. var.

Slender erect-growing plants 5-10 dm. high.

Type: No. 1312, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3627) on margin of a gypsum mesa on **San Marcos Island, Gulf of California.**

This plant grew on a gypsum mesa on San Marcos Island (3627). It has little resemblance to other forms of *A arenarius;* in fact, suggests *A. juncea* in general contour and habit. It is referred to *arenarius* because of its branched bushy caudex. The plant is named for Captain John Ross, captain of the vessel chartered for the expedition.

413. **Ericameria diffusa** Benth.

Ericameria diffusa Benth., Bot. Sulph. 23. 1844.—*Solidago diffusa* Gray, Proc. Am. Acad. **5**:159. 1861.—*Bigelovia diffusa* Gray, Proc. Am. Acad. **8**:640. 1873.—*Chrysoma diffusa* Greene, Erythea **3**:10. 1895.—*Linosyris sonoriensis* Gray, Proc. Am. Acad. **8**:291. 1870.—*Aster sonoriensis* Kuntze, Rev. Gen. **1**:317. 1891.—*Type locality:* Magdalena Bay, Lower California.

This is a very common plant in slightly alkaline ground at Los Angeles Bay and at Loreto (3777). It was noted in less abundance at Agua Verde Bay (4385), Escondido Bay, and La Paz. It occurred in abundance on San Marcos Island (4181), but the only other insular colony seen was that on the summit of Ildefonso Island (3748). It was frequent on the Sonoran coast about San Pedro and San Carlos (4384) bays. The plant forms a shrub 8-24 dm. high which is branched from the base and rather loose in growth. The leaves are resinous-glutinous.

414. **Aster spinosus** Benth.

Aster spinosus Benth., Pl. Hartw. 20. 1839.—*Leucosyris spinosa* Greene, Pittonia **3**:244. 1897.—*Aster spinosus* var. *spinosissimus* Brandg., Univ. Calif. Pub. Bot. **6**:375. 1917.—*Type locality:* To the north of Mexico City.

A very common and annoying plant in the large cañon in the Sierra Giganta back of Escondido Bay (4122). It grows in moist sand, apparently spreads by rhizomes, and forms dense spiny thickets 15-25 dm. high. The stems are strictly erect with many ascending pungent branches. The variety *spinosissimus* appears to be merely a coarse-stemmed form. Its occurrence is sporadic and its origin is probably ecologic. The collected material is not referable to it.

415. **Aster frutescens** Wats.

Aster frutescens Wats., Proc. Am. Acad. **24**:55. 1889.—*Xylorrhiza frutescens* Greene, Pittonia **3**:48. 1896.—*Type locality:* Stony ridges near Los Angeles Bay, Lower California.

A frequent plant on Angel de la Guarda Island (4224) and on the islets near its shore. It is particularly common on Pond Island (4238, 4242) where it grows on rocky hillsides and benches, forming very loosely and ascendingly branched shrubs 5-10 dm. high. The vegetative portions of the plant, which much suggest that of a Hazardia, were noted on Mejia islet and at Puerto Refugio. The rays are lilac. The relationship of the plant is clearly with those of the section Megalastrum, but it is quite distinct from all species of that group in its smaller heads, different habit, glandularity, and smaller strongly veined leaves. There is a suggestion about the plant of some of the coarser species of Machæranthera.

416. **Baccharis sarothroides** Gray

Baccharis sarothroides Gray, Proc. Am. Acad. **17**:211. 1882. —*Type locality:* Near Old Mission station, San Diego County, California.

Occasional in draws on San Pedro Martir Island (3159) where it forms a bright-green, compact shrub 12-15 dm. high.

It is reported (Proc. Am. Acad. 24:55. 1889) as growing only 6 dm. high on the island, but all plants seen there were considerably taller.

417. **Pelucha trifida** Wats.

Pelucha trifida Wats., Proc. Am. Acad. 24:55. 1889.—*Type locality:* San Pedro Martir Island.

This plant, forming a well-marked monotypic genus, has until the present been known only through the collections made by Palmer on San Pedro Martir Island. During the expedition it was collected on San Pedro Martir Island (3151), at Palm Cañon on Angel de la Guarda Island (3412), and in a cañon back of Las Animas Bay (3508). It is definitely to be removed from the lists of insular endemics.

On San Pedro Martir Island the plant is very common in rocky ground along the crest of the island, growing most abundantly on those slopes most exposed to the sea breezes. It is an open, irregularly branched shrub 7-10 dm. high whose younger stems are white with a thin, rather easily removed, oily tomentum. The plant is strongly aromatic and scents its immediate neighborhood upon the slightest bruising. The odor is peculiar and hardly that of cloves and cinnamon as suggested by Vasey and Rose (Contr. U. S. Nat. Herb. 1:79. 1890). On Angel de la Guarda Island only a small colony of the plant was found, that occurring on a protected cliff in a cañon. At this locality the shrubs were scraggly and spreading, becoming only 6 dm. high. No flowers were obtainable. At Las Animas Bay the plant grew in crevices on a steep, rocky west-facing wall of a narrow cañon in the hills just south of the bay. It was locally common, forming a depressed, irregularly branched shrub 3-8 dm. high. The odor and other characters were identical with those of the plants at the type locality.

The flowers in *P. trifida* are essentially homogamous, but in some heads there appears to be a slight tendency for the peripheral (perfect) flowers to be zygomorphous. The corolla is glabrous within and oily-tomentose outside. The style-branches are very slender and glabrous, undivided or as much as 3 mm. long. The pappus-bristles are numerous, antrorsely scabrous, and in 3 or 4 notably unequal series. The mature achene is about 3 mm. long, a little over 1 mm. wide, and covered with a dense white hispid-villous coat that contrasts with the dull color of the pappus. Under the pubescence the achenes are 10-11-ribbed. The species seems very constant in its floral development.

418. **Pluchea odorata** (L.) Cass.

Pluchea odorata Cass., Dict. Sci. Nat. **42**:3. 1826.—*Conyza odorata* L., Syst. Nat. ed. 10, **2**:1213. 1759.—*Type locality:* Jamaica.

Frequent on San Marcos Island (3632), where it grows in colonies about pools in gypsum ravines. It usually forms rank growths 12 dm. high, but occasionally becomes small trees 4 m. high. A native called it "conolon." A few plants were also noted at a stream-edge in the cañon back of Escondido Bay.

419. **Acanthambrosia bryantii** (Curran) Rydb.

Acanthambrosia bryantii Rydb., N. Am. Fl. **33**:22. 1922.—*Franseria bryantii* Curran, Proc. Calif. Acad. Sci. II, **1**:232. 1888.—*Type locality:* Vicinity of Magdalena Bay, Lower California.

At San Francisquito Bay (3548) this remarkable shrub was locally abundant on a sandy stretch of wash about 1 km. back from the ocean. It is a compact, rounded, light-green shrub 3-9 dm. high, and is notable because of its large burs. The burs are pallid and are strongly contrasted against the green of the herbage. They are persistent, adhering even to the dead wood within the plant. None was seen about the plants, so that their means of dissemination is obscure, especially as weevils seem to have attacked a large proportion of the persistent burs of previous seasons. The staminate flowers are borne in short, close racemes. With the exception of the San Francisquito Bay collection it is known in the gulf area only from a collection made by Rose on San Josef Island.

As to habit of growth, this plant is a Franseria, but as Rydberg has indicated, it has the technical bur-characters of

Ambrosia. The peculiar bur is anomalous in both genera and so there seems good reason for maintaining the plant, on grounds largely of convenience, as a monotypic genus.

420. **Franseria ambrosioides** Cav.

Franseria ambrosioides Cav., Icones **2**:79, t. 200. 1793.—*Gærtneria ambrosioides* Kuntze, Rev. Gen. **1**:339. 1891.—*Type locality:* Mexico.

A few plants were found on a sandy clearing at La Paz (3066). It grew as a viscid-glandular, shrubby perennial with ascending or widely spreading stems, and became 10-15 dm. high. Two small boys called it "chicura."

421. **Franseria arborescens** Brandg.

Franseria arborescens Brandg., Zoe **5**:162. 1903.—*Franseria carduacea* Greene, Leaflets **2**:156. 1911.—*Franseria sanctæ-gertrudis* Rydb. N. Am. Fl. **33**:35. 1922.—*Type locality:* Ascension, Lower California.

Seen only in the large cañon in the Sierra Giganta back of Escondido Bay (4131). It is common at about 150 m. altitude, growing usually about large rocks where it forms either very rank tufts of subsimple stems, or produces one or two stems with ascending branches. It becomes nearly 3 m. tall and is distinctly woody.

422. **Franseria dumosa** Gray

Franseria dumosa Gray in Frem., 2nd Rep. 316. 1845.—*Gærtneria dumosa* Kuntze, Rev. Gen. **1**:339. 1891.—*Type locality:* Mohave Desert, California.

Frequent on the dunes at San Luis Gonzales Bay (3353) where, during the visit late in April, only a single plant was found in fruit.

423. **Franseria ilicifolia** Gray

Franseria ilicifolia Gray, Proc. Am. Acad. **11**:77. 1876.—*Gærtneria ilicifolia* Kuntze, Rev. Gen. **1**:339. 1891.—*Type locality:* Cantillas Cañon, Lower California.

Noted on South San Lorenzo, San Esteban (3204), and Angel de la Guarda (3361, 4219) islands. It was common in well-drained, gravelly soils, usually in washes, where the numerous spreading, subsimple, tufted stems formed depressed rounded growths 3-6 dm. high and 9-12 dm. broad. The gentlest wind causes the harsh stiff leaves to rub against each other and produce an almost constant grating sound.

424. **Hymenoclea pentalepis** Rydb.

Hymenoclea pentalepis Rydb., N. Am. Fl. **33**:14. 1922.—*Type locality:* Pima Cañon, Arizona.

Forming an intricate shrub 9-12 dm. high in sandy washes at Freshwater Bay on Tiburon Island (3249). The plant has the habit of *H. salsola,* but though the wings of the involucre are almost as large and as erose as in the common plant of the Mohave Desert, they are in a single series and not spirally alternate. *Hymenoclea monogyra* has been distinguished by its uniserial wings, but *H. pentalepis* makes it necessary to stress the smaller involucres and more slender erect leafy habit.

425. **Bebbia juncea** (Benth.) Greene

Bebbia juncea Greene, Bull. Calif. Acad. Sci. **1**:180. 1885.—*Carphephorus junceus* Benth., Bot. Sulph. 21. 1844.—*Type locality:* Magdalena Bay, Lower California.

Growing on Tiburon (3267), San Esteban (4380), Partida (3236), and Angel de la Guarda islands; and at Tepoca and San Luis Gonzales bays. It is a shrub 8-12 dm. high with a dense crown of intricately branched, nearly leafless stems. It affects rocky soil, usually in washes, but not infrequently, as on Isla Partida, it occurs on talus. The original description calls for leaves 25-50 mm. long, but the collected material, like most of the specimens from California, has leaves only about 25 mm. long. Brandegee has collected at Magdalena Island and Comondú specimens with leaves like those in the type. All peninsular plants have smooth stems.

426. **Bebbia juncea** var. **atriplicifolia** (Gray), n. comb.

Carphephorus atriplicifolia Gray, Proc. Am. Acad. **5**:159. 1861.—*Bebbia atriplicifolia* Greene, Bull. Calif. Acad. Sci. **1**:181. 1885.—*Type locality:* Cape San Lucas, Lower California.

In habit this form is somewhat different from its congener, for instead of forming globose masses, it forms dense, intricate, depressed, flat-topped growths 6-12 dm. high and 10-25 dm. broad which are either self-supporting or supported 1-2 m. above the ground by other shrubs up through which the plant has grown. The stems are quite brittle. The inflorescence projects from the main mass of the plant and on an average is more dense than in the species, the pedicels being usually much under 3 cm. and not so elongated as in *B. juncea.* Although the two forms seemed distinct in the field, a study of the material in the Brandegee herbarium has seemed to substantiate Mr. Brandegee's statements (Proc. Calif. Acad. Sci. II, **2**:180. 1889, and Zoe **1**:271. 1890) that the forms approach each other too closely. *Bebbia atriplicifolia* is accordingly reduced to varietal rank and is taken as the southern form with hastate or triangular leaves. The variety was seen at Agua Verde Bay (3900), San Diego Island (3926), at the Isthmus on Espiritu Santo Island (3963), and at all the stops on Ceralbo Island (4026, 4051, 4069). It usually grows in gravelly soils, but on San Diego Island occurred on a hillside. The variety appears to be not uncommon in the cape region and characteristic specimens have been taken as far north as Comondú.

427. **Coreocarpus arizonicus** (Gray) Blake

Coreocarpus arizonicus Blake, Proc. Am. Acad. **49**:344. 1913.—*Leptosyne arizonica* Gray, Proc. Am. Acad. **17**:218. 1882.—*Coreopsis arizonica* Hoffm. in E. & P., Nat. Pflanzenf, 4^5:243. 1890.—*Type locality:* Near Fort Lowell, Arizona.

On San Pedro Nolasco Island (3144) this species is frequent on rocky slopes and on cliffs near the sea and forms bushy growths 3-5 dm. high. The rays are white with several brownish lines. The plant collected is unquestionably one of the variants of *arizonicus,* as its simply pinnate leaves, pectinately-margined achenes, and pallid rays indicate. It is, however, very much more slender than the Arizona plant and perhaps is referable to the variety *filiformis* (Blake, loc. cit.).

A peculiar form of this species was found at San Pedro Bay (4293) growing high up on a gravelly beach and forming depressed spreading masses 15-25 cm. high and 5-6 dm. broad. The floral and fruit characters are those of true *arizonicus* but not only are the plants different in habit, but the leaves are thicker, much shorter (20-35 mm. long), and have short oblong lobes. These differences may be due to the beach habitat.

428. **Coreocarpus dissectus** (Benth.) Blake

Coreocarpus dissectus Blake, Proc. Am. Acad. **49**:344. 1913. —*Acoma dissecta* Benth., Bot. Sulph. 29, t. 17. 1844.— *Leptosyne dissecta* Gray, Syn. Fl. N. A. **1**:301. 1884.— *Coreocarpus dissectus* var. *longilobus* Blake, Proc. Am. Acad. **49**:345. 1913.—*Type locality:* Magdalena Bay, Lower California; not Cape San Lucas as given! See notes by Blake (Contr. Gray Herb. II, **52**:56. 1917) and Brandegee (Proc. Calif. Acad. Sci. II, **3**:224. 1890).

Collected on San Marcos Island (3623) where common in gypsum soil in ravines and on talus at foot of cliffs, on Carmen Island (3829) where found only in shelter of cliffs, and on Danzante Island (3860) where common on bluffs facing the sea. It is a slender-stemmed shrub forming a rounded bush 3-6 dm. high.

429. **Encelia farinosa** var. **phenicodonta** (Blake), n. comb.

Encelia farinosa f. *phenicodonta* Blake, Proc. Am. Acad. **49**:362. 1913.—*Type locality:* Near San Quentin, Lower California.

Flowering material of this variety was found only on Tiburon (3254) and Patos (3236) islands. Plants in a sterile condition, and hence not positively of this variety, were noted at Tepoca Bay and on Angel de la Guarda, Tortuga, and San Marcos islands. It is very abundant on Tortuga Island, giving a pallid tone to that lava island.

430. **Encelia palmeri** Vasey & Rose

Encelia palmeri Vasey & Rose, Proc. U. S. Nat. Mus. **11**:535. 1889.—*Type locality:* Lagoon Head, Lower California.

Frequent in a sandy wash near La Paz (3062). It is a low shrub with ascending branches and becomes 6 dm. high. Called "mirasol" by small boys.

431. **Helianthus niveus** (Benth.) Brandg.

Helianthus niveus Brandg., Proc. Calif. Acad. Sci. II, **2**:173. 1889.—*Encelia nivea* Benth., Bot. Sulph. 27. 1844.—*Viguiera nivea* Gray, Bot. Calif. **1**:354. 1876.—*Helianthus dealbatus* Gray, Syn. Fl. N. A. **1**:271. 1884.—*Viguiera sonoræ* Rose & Standley, Contr. U. S. Nat. Herb. **16**:20, t. 16.1912.—*Type locality:* San Quentin, Lower California.

A very common and conspicuous plant on the dunes at Kino Point (4285), and at Willards Point on Tiburon Island (4247). It is a beautiful species with clean white strigose decumbent stems and very numerous yellow flowers. It forms a loose growth 3-6 dm. high. The species is not known from the east shore of the peninsula. Along the Sonoran coast it is known from the stations mentioned, and from collections made at Guaymas by Brandegee, from an unspecified locality by Pringle, and from one made by MacDougal somewhat back from the shore near the head of the gulf.

432. **Coulterella capitata** Vasey & Rose

Coulterella capitata Vasey & Rose, Contr. U. S. Nat. Herb. **1**:71, t. 1. 1890.—*Type locality:* La Paz, Lower California.

For over 30 years this very distinct species has been represented in herbaria by only two collections. These were taken by Palmer and Brandegee from a small colony of the bush which grew on the beach just to the east of La Paz. According to Mr. Brandegee, this small type colony has been long since washed away by storm water. The plant can now, however, be reported from two new locations. It is very common on San Francisco Island (3950), and is present, but much less common, on Espiritu Santo Island where it was observed at the Isthmus (3981) and again about Candeleros Bay.

The species seems to do best when growing close to the ocean, particularly on an old beach above the height of storm water. On Espiritu Santo Island a few plants were observed even on the high dividing ridge at an altitude of considerably over 300 m. The plant has numerous stems with loosely ascending or horizontal branches which form a flattened shrubby mass 3-9 dm. high and 6-11 dm. broad. All the plants seemed to have much dead wood. The very succulent opposite leaves are 2-4 mm. thick. They fall very readily when the green plant is handled, but appear to dry up and remain attached for some time if left undisturbed. The involucre is a juicy, accrescent, thickly 3-4 winged, calyx-like structure that is transparent, greenish-yellow in color, and turns a greenish-blue when bruised. It usually bears but a single flower, but in one case two achenes were found in a single involucre. The corolla-lobes are lemon-yellow, recurved, and about as long as the tube. The achenes remain enclosed by the receptacle and fall when the latter does after drying. The plants observed were covered with undisturbed clusters of dried involucres, so that it is apparent that the succulence of the involucre plays no part in the dissemination of the species. The whole plant has a very strong odor that much suggests that of Dyssodia.

433. **Verbesina oligocephala,** n. sp.

Small shrub 6-12 dm. high with few ascending opposite branches; younger twigs white tomentose, older stems grayish and tending to be lightly glaucous; leaves opposite, light green, scabrous, the minute pustulate bases of hairs commonly with a tiny mass of resin; blade ovate or lance-ovate, acute, 4-7 cm. long, base rounded or cuneate, narrowed into a winged petiole 5-8 mm. long; heads comparatively small, 2-4 in terminal corymbose cymes; inflorescence not conspicuous; peduncles rather slender, 4-11 mm. long, covered with short but copious hairs; involucre campanulate, 3-4 mm. high, 4.5-7.5 mm. wide, much surpassed by flowers; bracts biseriate, ovate-oblong, a dull mustard-color with rounded recurving green tips; rays orange-yellow, neutral, about 12, tube pubescent and 2-2.5 mm. long, ligule oblong and 5.5-6 mm. long, achenes epappose; disk-flowers yellow, perfect, 20-30, tube about 1 mm. long, throat 4.5 mm. long, the lance-triangular lobes 1 mm. long; receptacle low convex; paleæ oblong-linear, acute, pubescent, deciduous, 6 mm. long, closely enfolding the disk-flowers whose color they simulate and whose length they exceed; style 2 mm. long, tips acute; immature achenes cuneate, flat, 4.5 mm. long, 1 mm. wide, silky with hairs longest and densest above, lateral edges acute; pappus of 2 ciliate awns, these nearly as long as achenes.

Type: No. 1313, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3899) on a rocky slope in the mountains back of **Agua Verde Bay, Lower California.**

This plant was collected on a steep rocky slope in a huge amphitheater-like cañon in the Sierra Giganta just south of Agua Verde Bay (3899). It is an erect growing, little-branched shrub about 1 m. high. Only a few plants were seen, and these, with one exception, were out of flower. The plant is most nearly allied to *V. palmeri* Wats. from Los Angeles Bay, but differs in habit, canescent twigs, smaller heads, and in its few-headed inflorescence hidden among the foliage. It evidently belongs to the section Sonoricola in the revision by Robinson and Greenman (Proc. Am. Acad. **34**:542. 1899), but is atypical in its habit and in its small heads.

434. **Viguiera deltoidea** Gray

Viguiera deltoidea Gray, Proc. Am. Acad. **5**:161. 1861.—*Type locality:* Cape San Lucas, Lower California.

The typical form of this polymorphous species was collected at La Paz (3034), and on San Pedro Nolasco (3127) and San Esteban (4379) islands. At La Paz it grew on the low bluffs along the ocean and formed an open scraggly shrub 15 dm. high. On Nolasco Island it grew in narrow rocky draws forming very broad clumps 10-15 dm. high. The collection at La Paz and the mentioned (3127) collection from Nolasco match in leaf-shape and pubescence several of Brandegee's collections from the cape region. The San Esteban collection has smoother subentire and less pronouncedly veined leaves, and came from plants growing in an open wash. Similar to this last in foliage is collection number 3141, also gathered on

San Pedro Nolasco Island. The latter plant grew with number 3127, but appeared quite different in the field. The atypical form (3141) has smaller heads in closer corymbs, and leaves narrower, smoother and lighter in color.

435. **Viguiera deltoidea** var. **chenopodina** (Greene) Blake

Viguiera deltoidea var. *chenopodina* Blake, Contr. U. S. Nat. Herb. **54**:91. 1918.—*Viguiera chenopodina* Greene, Leaflets **2**:154. 1911.—*Viguiera microphylla* Vasey & Rose, Proc. U. S. Nat. Mus. **11**:535. 1890.—*Type locality:* Between San Domingo and Matancita, Lower California.

This variety, characterized by its firm pallid leaves, appears to be the prevailing Viguiera over the middle portion of the peninsula. It was collected in a cañon back of Guadalupe Point (4154), from hills back of Agua Verde Bay (3898), and from Carmen Island (3826). Bryant collected it on San Josef Island in 1892. The plant affects gravelly washes forming large clumps 15 dm. high. *Viguiera microphylla* seems to be merely a form of *chenopodina* with somewhat smaller leaves.

436. **Palafoxia linearis** var. **leucophylla** (Gray), n. comb.

Palafoxia leucophylla Gray, Proc. Am. Acad. **8**:291. 1870. —*Palafoxia arenaria* Brandg., Proc. Calif. Acad. Sci. II, **2**:178. 1889.—*Type locality:* Carmen Island.

Typical collections of this variety were made at San Nicolas Bay (3716), San Pedro Bay (4322), San Francisquito Bay (3588), Loreto (3776), and Monserrate Island (3866). The plant grows on the sand along the ocean, forming dense bushy growths 4-9 dm. high. Gray gives the height of the plant as 10 ft., but that measurement is unquestionably incorrect. Brandegee's collections from Boca de Las Animas, La Paz, and Guadalupe, coupled with the expedition material above cited form a rather uniform series agreeing in shrubby habit, densely strigose obtuse linear leaves (about 25 mm. long), and near lack of glutinous indument. Forms intermediate between *P. linearis* and the variety *leucophylla* were collected at Las Animas Bay (3514) and on Tiburon Island (3264).

Palafoxia linearis differs from its variety in having lance-linear, usually non-strigose, acute leaves, annual or biennial root, erect stems 2-5 dm. high, and by being covered and darkened by glands. These characters distinguish only the extremes, and furthermore are not always concomitant. The bushy habit of *leucophylla* seems merely a response to a longer growing season. The young plants of the variety are tufted and indistinguishable in habit from the species. The Las Animas Bay collection has the bushy habit of the variety, but is glandular throughout and though the leaves suggest *leucophylla* they are more elongate and less strigose than usual. The Tiburon Island plant grew in rounded bushy masses 6-9 dm. high, but has much elongated glutinous leaves that closely approach those of *linearis*. Obtuse strigose leaves are found on a simple-stemmed annual plant collected at Guaymas by Brandegee. Gray (Proc. Am. Acad. **19**:31. 1883) reduced *P. leucophylla* outright, but it would seem better to retain it as a geographical variety, inasmuch as it becomes stable in its characters and entirely replaces *P. linearis* on the shores of the southern parts of the peninsula.

437. **Perityle aurea** Rose

Perityle aurea Rose, Contr. U. S. Nat. Herb. **1**:84. 1890.—*Type locality:* Santa Rosalia, Lower California.

Found only on San Marcos Island (3614) where it grows in small colonies about moist salt-incrusted area in deep ravines cut into gypsum. It occurs with *P. emoryi* and is usually much branched from the base, becoming 4 dm. high and nearly as broad. The flowers are light yellow. It has been previously known only from the original collections made at Santa Rosalia.

438. **Perityle californica** Benth.

Perityle californica Benth., Bot. Sulph. 23, t. 15. 1844.—*Perityle deltoidea* Wats., Proc. Am. Acad. **24**:57. 1889.—*Type locality:* Magdalena Bay, Lower California.

Of this species a single plant was found growing among the poppies on an opium plantation at Mulegé (3677). *Perityle californica* and *P. deltoidea* are essentially the same. The former has slightly larger pappus squamulæ, but that is a small difference and one frequently done away with by intergradiation. Rydberg (N. Am. Fl. 34:13. 1914) separates the plants on their leaf-shape, a character even less satisfactory than the pappus difference. *Perityle deltoidea* was no doubt proposed because its author misapplied the name *"P. californica"* to forms of *P. emoryi*. He was certainly not attempting to segregate a critical species.

There are five yellow-flowered species of Perityle known from the peninsula. *P. californica, aurea,* and *lobata* are discussed and their synoymy indicated under separate headings. The others are *P. microglossa* and *P. cuneata*. *Perityle microglossa* Benth. (Bot. Sulph. 119. 1844) is a widely ranging species known on the peninsula only about San José del Cabo. It is characterized by its biaristate pappus, small heads, and short rays. *Perityle cuneata* Brandg. (Zoe 1:54. 1890) is as yet known only from the cape region and is characterized by its medium-sized heads and well developed rays. The pappus when present consists of short awns. *Perityle cuneata* stands in the same relation to *P. microglossa* that *P. robusta* does to *P. emoryi*. *Perityle marginata* Rydb. (N. Am. Fl. 34:14. 1914) differs form *cuneata* only in the broad callous margins of its achenes, and seems better named **Perityle cuneata** var. **marginata** (Rydb.), n. comb. It is apparently not uncommon at low altitudes in the southern parts of the cape region. The yellow-rayed peninsular species may be distinguished as follows:

Throat of disk-flowers much exceeding tube.....................*P. lobata*
Throat of disk-flowers about equalling tube.
  Awn one, equalling or exceeding the achene.
    Achenes callous-margined; leaves longer than broad....*P. californica*
    Achenes not callous-margined; leaves broader than long ....*P. aurea*
  Awns two or rarely none, usually unequal and shorter than achene.
    Head 3-5 mm. high, 4-6 mm. broad; rays 1-2 mm. long, inconspicuous............................ .*P. microglossa*
    Head 6-8 mm. high, 7-11 mm. broad; rays 3-5 mm. long, conspicuous.
      Achenes with narrow callous margin...................*P. cuneata*
      Achenes with very broad callous margin...........*P. c. marginata*

439. **Perityle emoryi** Torr.

Perityle emoryi Torr. in Emory, Notes Mil. Recon. 142. 1848.—*Laphamia emoryi* Benth & Hook. in Jacks., Index Kew. **3**:30. 1894.—*Perityle nuda* Torr., Pacif. R. R. Rep. **4**:100. 1857.—*Perityle emoryi* var. *nuda* Gray, Bot. Calif. **1**:397. 1876.—*Perityle californica* var. *nuda* Gray, Syn. Fl. N. A. **1**:321. 1884.—*Laphamia nuda* Benth. & Hook. in Jacks., Index Kew. **3**:30. 1894.—*Perityle fitchii* var. *palmeri* Gray, Syn. Fl. N. A. **1**:321 . 1884.—*Perityle grayi* Rose, Bot. Gaz. **15**:118, t. 13, f. 8. 1890.—*Perityle greenei* Rose, Bot. Gaz. **15**:117, t. 13, f. 7. 1890.—*Perityle emoryi* var. *orcuttii* Rose, Bot. Gaz. **15**:117. 1890.—*Type locality:* Carrizo Creek, San Diego County, California.

Nine collections (3148, 3240, 3268, 3287, 3235, 3388, 3566, 3622, 4236) of this polymorphous species were made at various localities in the gulf area north of San Marcos Island. It was frequent, growing mainly back from the coast and on cliffs, in sandy draws, or about moist places. Though the species varies much in leaf-form and habit, segregation seems impractical. Intermediates are so numerous that the few typical representatives of a segregated variant are found to be lost among the host of atypical cognate forms. The important characters of *P. emoryi* are its medium- sized heads, white rather short inconspicuous rays, and villous- but not callous-margined achenes. The leaves may be suborbicular, ovate, or triangular-ovate in outline and have a base that is truncate, cordate, or reniform. The leaf margins are either coarsely toothed, or variously palmately lobed or cleft with the lobes crenate or serrate.

440. **Perityle lobata** (Rydb.), n. comb.

Leptopharynx lobata Rydb., N. Am. Fl. **34**:23. 1914.—*Type locality:* Comondú, Lower California.

Rather common between 100 and 300 m. altitude in a deep cañon in the Sierra Giganta back of Escondido Bay (4115). The plant trailed over moist gravel on the cañon floor forming depressed growths 5-10 cm. high and 1-2 dm. broad. The leaf-blades are palmately cut with irregularly toothed lobes and are a trifle smaller than in the type, being scarcely 15 mm. long.

In duration the plant is definitely annual. Rydberg describes the species as "a low perennial, woody at the base," but all the type collection in the Brandegee herbarium is entirely herbaceous, and the one plant that shows the root is unmistakably annual. Neither Brandegee's Comondú nor Purisima collections (cf. Proc. Calif. Acad. Sci. II, **2**:177. 1889, under *P. palmeri)* suggests the woody development and perennial habit characteristic of *P. palmeri. Perityle lobata* differs from its near relative, *palmeri,* in its herbaceous stems, green (not canescent) thinner and more deeply lobed leaves, and larger (3.5-5 instead of 3-3.5 mm. long) achenes whose sides are not glabrous but marked with conspicuous medial longitudinal lines of hairs.

441. **Perityle palmeri** Wats.

Perityle palmeri Wats., Proc. Am. Acad. **24**:57. 1889.—*Leptopharynx palmeri* Rydb., N. Am. Fl. **34**:23. 1914.—*Type locality:* Guaymas, Sonora.

Infrequent in shaded crevices on bare precipitous north-facing basalt cliffs at San Pedro Bay (4416) and on the ridge just east of Guaymas (3097). The plant has a thick woody root that grows tightly wedged in between the rocks.

442. **Perityle robusta** Rydb.

Perityle robusta Rydb., N. Am. Fl. **34**:16. 1914.—*Perityle incompta Brandg.,* Univ. Calif. Pub. Bot. **6**:503. 1919.—*Type locality:* Ceralbo Island.

Collected at San Nicolas Bay (3720), Loreto (3791), Monserrate Island (3865), Agua Verde Bay (3893, Espiritu Santo Island (4081), La Paz (3030, 3068), and Ceralbo Island (4046). The plant grows in sandy soil usually somewhat back from the ocean and is commonly branched from the base and 15-50 cm. high. The species seems to be a near relative of *P. emoryi,* replacing it in the southern part of the peninsula, and differing from it in larger heads, long (about 5 mm.) conspicuous rays, and more deeply dissected leaves. The only suggestion of intergradation between *P. robusta* and *P. emoryi,* is that found in the plants collected on the sands at Guadalupe Point (4150). These are suggestive of *P. emoryi,* especially in their short rays. Also referred to *P. robusta* are collections from San Francisco (3946) and Coronados (3756) islands. They grew on dunes and have coarse, indurated tap-roots, but can scarcely be perennial as they show no evidence of having flowered more than once. The leaves are thickish, more or less crisped, parted, glandular tomentose, and crowded near the base of the stem. This last form usually grew 25-50 cm. high, but on San Francisco Island some plants formed dense herbaceous masses 6-9 dm. high and 15 dm. broad.

443. **Perityle rotundifolia** (Benth.) Brandg.

Perityle rotundifolia Brandg., Zoe **4**:210. 1893.—*Amauria rotundifolia* Benth., Bot., Sulph. 31. 1844.—*Perityle fitchii* Torr., Pacif. R. R. Rep. **4**:100. 1857.—*Laphamia peninsularis* Greene, Bull. Calif. Acad. Sci. **1**:8. 1884.—*Type locality:* San Quintin, Lower California.

A single large plant, 35 cm. high, was found growing on the bank of an irrigation ditch at Mulegé (3676). The plant was rounded in outline with the lower branches decumbent and the herbage somewhat glutinous. The achenes are quadrangular, with the faces smooth and shiny but the angles hairy. *Perityle rotundifolia* is akin to *P. brandegeana* Rose (Bot. Gaz. **15**:114. 1890), but the latter apparently can be recognized through its slightly smaller heads and by the stout curved hairs covering the faces of the achenes.

444. **Trichoptilium incisum** Gray

Trichoptilium incisum Gray in Torr., Bot. Mex. Bound. 97. 1859.—*Psathyrotes incisa* Gray, Mem. Am. Acad. II, **5**:322. 1854.—*Type locality*: Colorado Desert near Colorado River, California.

A few plants were gathered in a sandy wash back of San Francisquito Bay (3581).

445. **Dyssodia speciosa** Gray

Dyssodia speciosa Gray, Proc. Am. Acad. **5**:163. 1861.—*Labetina speciosa* Nelson, Bot. Gaz. **47**:435. 1909.—*Clomenocoma speciosa* Rydb., N. Am. Fl. **34**:165. 1915.—*Type locality:* Cape San Lucas, Lower California.

Collected at La Paz (3058) where previously taken by Brandegee and Palmer, and at the Isthmus on Espiritu Santo Island (3966). It is a weak shrubby perennial that clambers up through larger shrubs and forms dense intricate masses 3-9 dm. broad. It is a very striking plant when in flower.

446. **Nicolletia trifida** Rydb.

Nicolletia trifida Rydb., N. Am. Fl. **34**:180. 1915.—*Type locality:* Los Angeles Bay, Lower California.

This is an interesting and conspicuous plant known only from the mid-section of the peninsula. It was collected at San Luis Gonzales Bay (3333), San Francisquito Bay (3562), and on Santa Inez Island where only a single plant was found. It affects sandy soil and spreads by deep rhizomes, so that when present it usually occurs in some abundance. The rays are white above, but outside they are marked by a broad medial longitudinal reddish-brown stripe. When bruised the plant exhales a strong Dyssodia-like odor that is entirely lost in drying.

447. **Porophyllum confertum** Greene

Porophyllum confertum Greene, Leaflets **2**:155. 1911.—*Porophyllum ochroleucum* Rydb., N. Am. Fl. **34**:189. 1916. —*Type locality:* Ceralbo Island.

Collected at the type locality which is situated just north of Gordas Point on the western shore of Ceralbo Island (4024). It was common there in gravelly washes, forming a slender shrub 15-25 dm. high. The plant has a rather strictly and little branched corymbose crown that is supported by a simple slender trunk-like stem. The corollas are a pale dilute yellow.

Also referred to *P. confertum* is the peninsular plant that has been frequently collected in the cape region, and of which Rydberg has segregated the broad leaved form as *P. ochroleucum.* The material from Ceralbo Island has an inflorescence slightly more crowded than that found in specimens from San

José del Cabo, but otherwise they seem quite similar. In its typical phases *P. confertum* may be recognized by its yellow corollas with lobes 1/3 - 1/4 as long as the tube, by its narrow heads with involucral bracts less than 1 cm. high, and by its tall (over 1 m.) erect bushy habit of growth. Its nearest relative is *P. gracile* which is a lower and more bushy plant with broader heads composed of longer (over 1 cm.) broader involucral bracts, and brownish-stained pallid flowers with lobes 1/6 - 1/10 as long as the tube. In *confertum* the main stem is long and simple, being terminated by a corymbosely branched crown, whereas in *gracile* the plant is bushy, the branching being from the base.

Porophyllum confertum as represented by extreme specimens, appears quite distinct from *P. gracile,* but its plea for specific distinctness is much clouded by several perplexing collections. In one made at Arroyo Salada *(Purpus 233)* the habit is correct, but the heads are a little large and, though the inner florets have lobes 1/4 - 1/5 the length of the tube, the outer florets have lobes a little less than 1/7 mm. as long as the tube. In a Brandegee collection from Sierra Laguna every thing is typical of *P. confertum* except that the flowers have lobes only 1/9 as long as the tube. To include the latter collection in *P. confertum* would be to destroy the diagnostic value of corolla-proportion, the only crucial character of quantitative nature. Further collecting will probably reveal *P. confertum* confluent with *P. gracile,* inasmuch as the latter occurs in the region immediately to the north of that occupied by the former. Brandegee (Zoe 1:313. 1890) says that the cape plant differs from *gracile* in the possession of a pleasing fragrance.

There are two leaf-forms in *P. confertum.* The Ceralbo Island plant has its leaves linear-filiform and about 2 mm. broad. The same leaf-shape occurs on the peninsula as does also a broader form 4 mm. wide. The broad-leaved form would best be called **Porophyllum confertum** var. **ochroleucum** (Rydb.), n. comb. *Porophyllum ochroleucum* was based on a collection made at Saucito by Brandegee. It has yellow corollas with lobes 1/6 - 1/7 as long as the tube. Though its heads appear to be a little large for good *confertum* the growth habit seems to be typical. It represents one of the intermediates between *P. confertum* and *P. gracile,* but for the present can be made to include broad-leaved forms of *confertum.*

448. **Porophyllum gracile** Benth.

Porophyllum gracile Benth., Bot. Sulph. 29. 1844.—*Type locality:* Magdalena Bay, Lower California.

Not uncommon in gravelly washes in the gulf area. Collections were made on Angel de la Guarda Island (3414, 4211), Las Animas Bay (3520), San Marcos Island (3615), San Nicolas Bay (3735), Kino Point (4415), Tiburon Island (4256), and Tepoca Bay (3300). It is occasionally tufted with 4-5 stems, but commonly it is a bush under 6 dm. high. Occasionally it becomes as much as 12 dm. high. The Tepoca Bay collection presents the only notable variation. It has very long (over 9 mm.) corollas that protrude far from the involucre and have lobes 1/4 - 1/5 as long as the tube. This variant is probably to be referred to one of Greene's many segregates.

449. **Porophyllum leptophyllum,** n. sp.

A compact bushy shrub 15-60 cm. high with a very twiggy cinerescent woody framework and very slender siccosanguine foliage-bearing peripheral branches; leaves sessile, coriaceous, green, linear, 5-12 mm. long, 1-1.5 mm. wide, gland-tipped, acuminate, not crowded; heads terminating short leafy branches, 7-8 mm. high, 5-6 mm. broad, 25-30-flowered; involucral bracts 5, usually colored, oblong or obovate, each with a single gland or rarely with several glands near the apex; corolla entirely yellowish or at times with purplish lobes, 4.5-5.5 mm. long, lobes ovate and less than 0.5 mm. long; pappus of 5 groups of slender unequal antrorsely barbed bristles that are a trifle shorter or longer than the corollas; achenes glabrous, 2.5 mm. long, about 0.5 mm. wide, 4-angled with faces 3-4 grooved.

Type: No. 1314, Herb. Calif. Acad. Sci., collected May 1, 1921, by I. M. Johnston (no. 3373) in the low hills back of Puerto Refugio, **Angel de la Guarda Island, Gulf of California.**

Collected on Angel de la Guarda (3373), San Esteban (3168), South San Lorenzo (3533), and Tiburon (4250) islands. Brandegee has collected it at Paso de las Dolores. The plant grows on dry rocky cliffs or on packed gravelly beaches near the sea. It forms compact globose masses 1-3 or 6 dm. high, composed of stiffish twiggy intricately branched stems. It is decidedly shrubby and very woody at the base, differing in these regards from its relative *P. crassifolium.* The twigs are the color of dried blood and give the plant a very dark tone when viewed from a distance. The plant has a strong and peculiar odor that is entirely lost in drying. The new species is most nearly related to *P. crassifolium.* It is readily recognized by its linear, nearly terete, coriaceous leaves, its stiffish twiggy blood-colored woody stems, and its fewer less crowded, somewhat smaller heads. The range of *leptophyllum* is to the north of that of *crassifolium.*

450. **Porophyllum tridentatum** var. **crassifolium** (Wats.), n. comb.

Porophyllum crassifolium Wats., Proc. Am. Acad. **24**:57. 1889.—*Type locality:* Mulegé, Lower California.

Growing in crevices on bluffs near the sea or on dry packed elevated beaches forming a very close globose mass 1.5-5 dm. high. The plant has very juicy herbage and is strongly aromatic with a characteristic Dyssodia-like odor. It was collected only on Carmen (3815) and Monserrate (3870) islands. The plant differs from *P. tridentata,* of the western shore of the peninsula, only in its leaves which are simply acute and not 3-toothed. The species are very closely related, both, for instance, having the peculiar glandular apiculation on the leaf-tips, both having a similar habit and habitats, and both having the same floral developments. The relations are so obvious that a mere unit leaf-difference does not seem sufficient reason for keeping them distinct.

451. **Peucephyllum schottii** var. **latisetum,** n. var.

Bristles of inner pappus series all broadly scarious-margined, margins 3 or more times as broad as the midrib.

Type: No. 1315, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3644) on talus footing gypsum cliffs on **San Marcos Island, Gulf of California.**

This variety is a geographical form, differing from the species in the possession of broadly margined inner pappus bristles. The plants of California have the bristles of inner pappus series inconspicuously winged, but the peninsular plants have the bristles so broadly margined that attention is at once directed to them. Plants intermediate in pappus development occur in the region along the International Boundary. The type of the species has very narrowly margined setæ. The variety ranges southward along the eastern peninsular coast to about lat. 27° N., it was collected on San Marcos Island (3349) and Palmer (cf. Contr. U. S. Nat. Herb. **1**:84. 1890) has material from Santa Rosalia. Brandegee and Goldman (Contr. U. S. Nat. Herb. **16**:369. 1916) have made collections at Calamujuet. Other collections were made at San Luis Gonzales Bay (3349), Angel de la Guarda Island (3375), and San Esteban Island (3170). On San Marcos Island the shrub was common and usually grew on talus footing gypsum cliffs, but at the other stations it occurred as isolated bushes or formed small colonies always on volcanic rock. It was not collected on South San Lorenzo Island, but it is one of the most common shrubs there, frequently forming dense colonies and making green large areas on the brown rocky slopes. The plant is a resinous shrub 1-2 m. high with an open crown formed of many strictly ascending branches. A native on San Marcos Island called it "romero", and was very positive regarding its value in the treatment of female ailments.

452. **Psathyrotes ramosissima** (Torr.) Gray

Psathyrotes ramosissima Gray, Proc. Am. Acad. **7**:363. 1868.—*Tetradymia ramosissima* Torr. in Emory, Notes Mil.

Recon. 145. 1848.—*Type locality:* Hills bordering the Gila River, Arizona.

Infrequent in a broad gravelly wash back of San Luis Gonzales Bay (3340). It has prostrate branches and forms mats 2-5 cm. high and 1-5 dm. broad. The herbage is glutinuous due to the heavy oily nature of the tomentum. The odor of the plant is very strong and disagreeable, being almost exactly that of *Trichostema lanceolata.* This sets the southern limit for the species, the most southern previous collection being Brandegee's from Agua Dulce.

453. **Gochnatia arborescens** Brandg.

Gochnatia arborescens Brandg., Zoe **5**:163. 1903.—*Type locality:* Cañon de Santa Maria, Lower California.

Near the south end of Ceralbo Island (4023) this species forms a close populous colony in a small draw near the head of a steep rocky cañon. The plants were arborescent with dark furrowed bark and an open crown. They were conspicuous when seen, due to the multitude of straw-colored glomerules which were borne on the leafless or nearly leafless branches. The leaves appear to drop soon after anthesis.

454. **Trixis californica** Kell.

Trixis californica Kell., Proc. Calif. Acad. Sci. **2**:182, f. 53. 1862.—*Trixis suffruticosa* Wats., Bot. Calif. **2**:459. 1880.—*Trixis angustifolia* var. *latiuscula* Gray, Syn. Fl. N. A. **1**:410. 1878.—*Type locality:* Cedros Island.

Collected at Los Angeles Bay (3443), and on San Pedro Nolasco (3149), Patos (3246), and Tiburon (3270) islands. It was observed on San Esteban, Angel de la Guarda, and Tortuga islands. The plant usually grows in rocky places, forming low open shrubs 5-9 dm. high. This western plant differs from *T. angustifolia* of central Mexico only in the lack of tomentum on the lower leaf faces. Some of the plants in the cape region show a tendency to become tomentose, and it may be better to apply Gray's varietal name to our plant.

455. **Malacothrix xanti** Gray

Malacothrix xanti Gray, Proc. Am. Acad. **9**:213. 1874.—*Type locality:* Cape San Lucas, Lower California.

A large colony was found growing on a hot dry shell beach at La Paz (3031), but only a few plants were found fit for collecting. The material is in good fruit, and instead of having the achenes castaneous as described by Gray, they are decided yellow. The species is apparently a very distinct one with *M. fendleri* as its nearest relative. It is readily distinguished from *fendleri* by its larger, thinner leaves, taller, naked stems, yellow achenes with 2-3 outer pappus-bristles, and pink or rose-colored ligules. The achenes of the two species are almost identical in form, size, and markings.

456. **Stephanomeria exigua** Nutt.

Stephanomeria exigua Nutt., Trans. Am. Philos. Soc. II, **7**:428. 1841.—*Ptiloria exigua* Greene, Pittonia **2**:132. 1890. —*Type locality:* "On the Rocky Mountain plains, toward the Colorado."

Scrambling up through bushes at Tepoca Bay (3295). The achenes have 4 ranks of smaller and more irregular tubercles than usually found on the faces of the fruit in this species, and the pappus-bristles are darker and longer-plumose than ordinary. The branches were numerous and very brittle.

APPENDIX

FUNGI AND LICHENS

Woody and leathery fungi were collected at every opportunity during the course of the Expedition. The few specimens collected were determined by Mr. C. G. Lloyd.

Lichens were taken at only a few localities, and then with no attempt at thorough collecting. The few conspicuous species collected have been authoritatively determined by Dr. E. A. Vainio.

Previous to the present list the only papers dealing with the peninsula fungus-flora were those by Patouillard & Hariot (Jour. de Bot. **10**: 250-252. 1896), and by Harkness (Proc. Calif. Acad. Sci. II, **2**:231-232. 1889).

The longest paper on the peninsular lichens is by Hue (Jour. de Bot. **9**: 108-113. 1895). Hasse (Contr. U. S. Nat. Herb., **17**:1-132. 1913) and Eckfeldt (Contr. U. S. Nat. Herb. **1**: 291-292. 1893), however, give scattering record concerning the peninsular lichen-flora.

FUNGI

1. **Tylostoma occidentale** Lloyd

Two plants were collected from a gravelly hillside at Ensenada Blanca on Monserrate Island (107).

2. **Schizostoma laceratum** Ehrenb.

A single specimen was collected on the dunes at San Nicolas Bay (117). Lloyd (Mycolog. Notes **7**: 1173. 1923) has given a long discussion of this species, and a photograph of the San Nicolas collection. The latter is said to be the first made outside of equatorial Africa.

3. **Gyrophragmium inquinans** Berk.

A colony of this plant was found in sandy soil under *Prosopis chilensis* at the south end of Tiburon Island (115).

4. **Podaxon farlowii** Masse

Collected at the north (110) and south (116) ends of Angel de la Guarda Island and on Sal si Puedes Island (111). The plant was rare, only a few plants being seen at each locality. It affected gravelly soil.

5. **Battarrea digueti** Pat. & Har.

Growing in populous colonies in sandy soil, in most instances under *Prosopis chilensis*. Seen only at Escondido Bay (109), San Josef Island (114), and Carmen Island (113). The type was collected by Diguet somewhere in Lower California. Lloyd (Mycol. Notes 7: 1174. 1923) has commented on the Academy collections of the species and has given photographs of them. A small form of the species, collected in sandy soil under Prosopis at the south end of Tiburon Island (112), has been described by Lloyd (loc. cit., 1175, fig. 2335) as forma *minor*.

6. **Calvatia occidentalis** Lloyd

A few plants of this species were found on a gravelly cañon floor in the hills back of Marquer Bay, Carmen Island (106).

7. **Fomes rimosa** Berk.

Infrequent on sickly trees of *Lysiloma candida* at Marquer Bay on Carmen Island (105), and at San Carlos Bay, Sonora (100).

8. **Fomes robustus** Karst.

Found growing on living *Lysiloma candida* at Puerto Ballandra on Carmen Island (108).

9. **Polyporus curtisii** Berk.

Collected from Bursera at Amortajada Bay on San Josef Island (103), and from Lysiloma at Puerto Ballandra on Carmen Island (104).

10. **Polyporus hispidus** Bagl.

Denuded specimens were collected from an old willow stump in the bottom-land at Mulegé (101).

11. **Polyporus,** sp.

A polypore, collected with the last species from a willow stump at Mulegé (102) has no spores or pores developed. Concerning the plant Mr. Lloyd remarks, "It is anomalous, but I judge from context appearance that it is *Polyporus patouillardi* Rich."

LICHENS

12. **Buellia subalbula** (Nyl.) Muell. Arg. f. **dissolens** Vain.
Tortuga Island on basalt.

13. **Omphalaria lecideoides** Vain.

Tortuga Island on basalt.

14. **Physcia integrata** (Nyl.) Vain.

Tortuga Island on basalt.

15. **Physcia integrata** (Nyl.) Vain. f. **pallescens** Vain.

Tortuga Island on basalt.

16. **Placodium murorum** (Hoffm.) DC.

Tortuga Island on basalt.

17. **Placodium murorum** (Hoffm.) DC. f. **lobulata** (Somerf.) Vain.

Tortuga Island on basalt.

18. **Placodium murorum** (Hoffm.) DC. f. **vitellina** Vain.

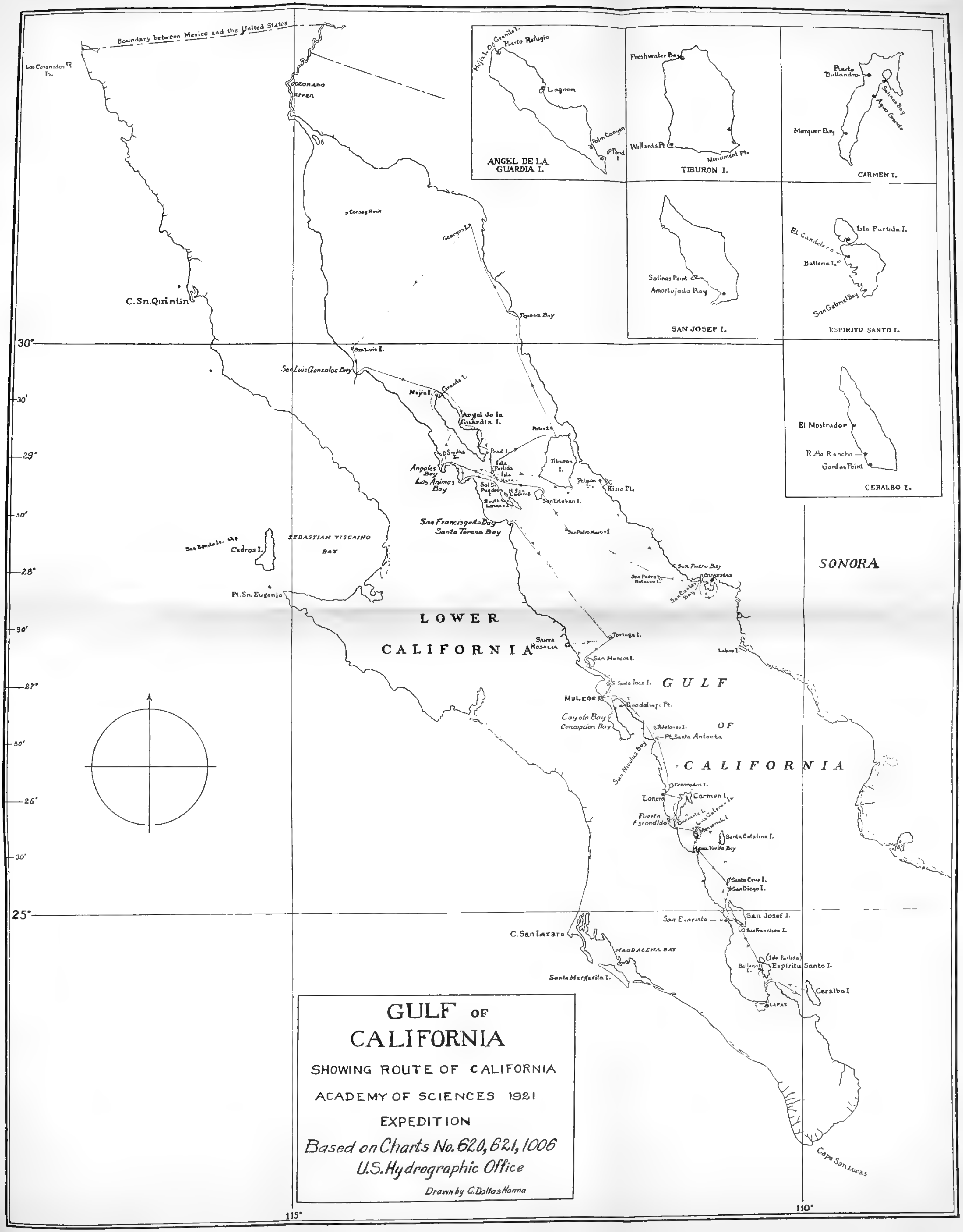
Forming very conspicuous reddish patches on the rocks of Patos Island.

19. **Ramalina complanata** (Sw.) Ach.

Sheltered rocky cliffs on San Pedro Nolasco Island.

20. **Roccella montagnei** Bél.

On rocks and on the bark of *Colubrina glabra* on San Pedro Nolasco Island.



GULF OF CALIFORNIA
SHOWING ROUTE OF CALIFORNIA ACADEMY OF SCIENCES 1921 EXPEDITION
Based on Charts No. 620, 621, 1006
U.S. Hydrographic Office
Drawn by C. Dallas Hanna
Boundary between Mexico and the United States
Los Coronados Is.
COLORADO RIVER
C. Sn. Quintin
Consag Rock
Georges I.
Tepoca Bay
San Luis I.
San Luis Gonzales Bay
Mejia I.
Granite I.
Angel de la Guardia I.
Patos I.
Pond I.
Smiths I.
Isla Partida
Angeles Bay
Los Animas Bay
Tiburon I.
Kino Pt.
San Esteban I.
San Francisquito Bay
Santa Teresa Bay
San Pedro Martir I.
Cedros I.
San Benito Is.
SEBASTIAN VISCAINO BAY
SONORA
San Pedro Bay
San Pedro Nolasco I.
GUAYMAS
Pt. Sn. Eugenio
LOWER CALIFORNIA
Tortuga I.
SANTA ROSALIA
Lobos I.
San Marcos I.
Santa Inez I.
GULF OF CALIFORNIA
MULEGE
Guadalupe Pt.
Coyote Bay
Concepcion Bay
Ildefonso I.
Pt. Santa Antonita
San Nicolas Bay
Coronados I.
LORETO
Carmen I.
Puerto Escondido
Danzante I.
Los Galeras Is.
Monserrat I.
Santa Catalina I.
Agua Verde Bay
Santa Cruz I.
San Diego I.
San Evaristo
San Josef I.
San Francisco I.
C. San Lazaro
MAGDALENA BAY
Santa Margarita I.
Isla Partida
Ballena I.
Espiritu Santo I.
Ceralbo I.
LA PAZ
Cape San Lucas
30°
30'
29°
28°
27°
26°
25°
115°
110°
ANGEL DE LA GUARDIA I.
Puerto Refugio
Lagoon
Palm Canyon
Pond I.
TIBURON I.
Freshwater Bay
Willards Pt.
Monument Pt.
CARMEN I.
Puerto Bullandro
Salinas Bay
Agua Grande
Marquer Bay
SAN JOSEF I.
Salinas Point
Amortajada Bay
ESPIRITU SANTO I.
Isla Partida I.
El Candelero
Ballena I.
San Gabriel Bay
CERALBO I.
El Mostrador
Ruffo Rancho
Gordus Point

PROCEEDINGS

OF THE

CALIFORNIA ACADEMY OF SCIENCES

FOURTH SERIES

VOL. XII, No. 31, pp. 1219–1222, text-figures 1–3 JULY 22, 1924

XXXI

EXPEDITION OF THE CALIFORNIA ACADEMY OF SCIENCES TO THE GULF OF CALIFORNIA IN 1921[1]

A NEW MOUSE (PEROMYSCUS SLEVINI) FROM THE GULF OF CALIFORNIA

BY

JOSEPH MAILLIARD

Curator, Department of Ornithology and Mammalogy

While there is in the United States National Museum at Washington, D. C., a large series of specimens of mice of the genus Peromyscus from the coastal regions and islands of the Gulf of California, that region had not been completely worked over when the California Academy of Sciences sent an expedition to the Gulf in 1921. It was planned that during this expedition, rodents were to be obtained, if possible, from every island of any size in the Gulf, but, unfortunately, on account of the indisposition of that member of the party who represented the Academy's Department of Mammalogy, little work of this sort was accomplished. Among the few specimens of rodents secured, however, was a mouse which appears to be of a new species, taken on Santa Catalina, a small island two or three miles wide and eight or nine miles long, 17 miles northeast of Cape San Marcial.

[1]A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 22, 1924

As the collections at hand do not contain sufficient material for proper comparison, this specimen was sent to Dr. E. W. Nelson, Chief of the United States Biological Survey, Washington, D. C., with a request for a diagnosis. Dr. Nelson at once became interested in the matter and turned over the specimen for critical examination to Major E. A. Goldman, who agreed that this mouse was specifically different from anything so far described. Dr. Nelson writes: "The specimen, an adult male, has been examined by Major E. A. Goldman, who reports that, as you had anticipated, it is undescribed. It belongs to the subgenus Haplomylomys and is most closely allied to *Peromyscus californicus,* but differs so decidedly that he regards it as specifically distinct. . . . While additional specimens are, of course, very desirable, the characters presented by the specimen you forwarded are so well marked that it may safely be assumed to represent a new species, . . ."

Major Goldman also wrote: ". . . it seems to me one of the most interesting finds that have been made on any of the islands, as the species appears to be related to *Peromyscus californicus,* which is not known to occur anywhere south of the San Pedro Martir Mountains in Lower California. Collections have been made on many of the islands and the races of Peromyscus found to occur were in all cases either *Peromyscus maniculatus* or *Peromyscus eremicus* groups."

The singular part of this is that the San Pedro Martir Mountains, the most southern habitat of *Peromyscus californicus,* as mentioned above, are nearly 250 miles north of Santa Catalina Island. No examples of the *californicus* group have ever been taken on the mainland of Mexico proper.

The description of this specimen, as given below, is largely compiled from Major Goldman's report, as sent to me by Dr. Nelson, and I take advantage of the opportunity to thank these two gentlemen for the assistance which they have so cordially given to me in this and other cases.

On account of the interest shown in matters pertaining to the Department of Mammalogy, and the frequent assistance in the matter of collecting specimens so willingly given by Mr. Joseph R. Slevin, Assistant Curator of the Department of Herpetology, it gives me pleasure to name this new species

Peromyscus slevini Mailliard, new species

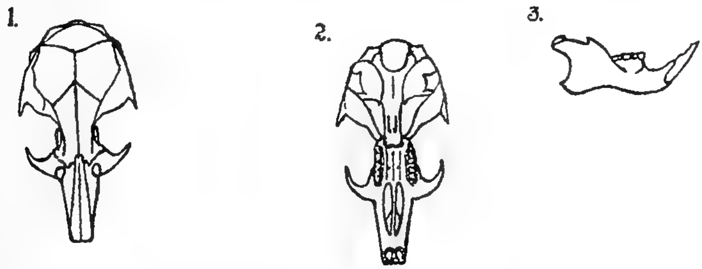
Subgenus Haplomylomys

(Text-figures 1-3)

Type: Adult male, skin and skull, No. 3935, Mus. Calif. Acad. Sci., prepared by Virgil W. Owen from an example brought aboard ship by a member of the party, June 12, 1921, from **Santa Catalina Island** (25° 43′ 50″ N. Lat.), **17 miles N.E. of Punta San Marcial, Lower California.**

General characters: Most nearly related to *Peromyscus californicus,* and of similar size, but external measurements exceeded by large examples of *californicus.*

Comparisons: Color of specimen (in worn pelage) decidedly paler than in average *californicus,* and largely pale



Skull of type of *Peromyscus slevini.* Fig. 1, dorsal aspect; fig. 2, ventral aspect; fig. 3, right mandible. All natural size.

cinnamon, darker dorsally through the admixture of fine, almost black hairs: below white, with less and much lighter touch of pale cinnamon in pectoral region; feet creamy white: fore legs very pale cinnamon; tail more sharply bicolor, with ventral side nearly white and dorsal side distinctly darker than any portion of dorsum; pelage shorter and ears smaller.

Skull similar in general to that of *californicus,* but narrower and differing in detail; interparietal much less extended laterally and its anterior margin forming an angle medianly somewhat greater than a right angle, giving to the anterior half of the interparietal a decidedly rhomboidal appearance, this margin in *californicus* being either straight across the skull about at right angles to the longitudinal axis or slightly curved; nasals reaching posteriorly well beyond posterior ends of premaxillæ, instead of the ascending branches of the premaxillæ reaching or passing beyond posterior ends of nasals; zygomata slightly heavier; dentition similar to that of *californicus,* but the maxillary and mandibular toothrows somewhat longer, and the cusplet in the posterior reentrant angle of the second upper molar larger than usually found in the occasional skulls of *californicus* exhibiting this feature; incisive foramina longer in proportion to size of skull; mandible much deeper and heavier than in *californicus* skulls of equal condylo-basilar length, and, in fact, heavier than in any of the large series of *californicus* in the collection of the California Academy of Sciences.

In comparison with *Peromyscus californicus insignis,* the race of southern California, *slevini* appearing to represent a larger form with a larger skull and relatively heavier rostrum, differing in other particulars as from *californicus.*

Measurements: Skin: total length, 225 mm.; tail vertebræ, 120; hind foot, 27; ear from crown, 15; ear from notch, dry, 16.5. Skull: greatest length, 31; basilar length, 23; zygomatic width, 15.6; interorbital constriction, 4.6; interparietal, 9.2x3.7; nasals, 11.5; shelf of bony palate, 4.8; palatine slits, 7; diastema, 8.2; post-palatal length, 10.2; maxillary toothrow, 4.9.

PROCEEDINGS

OF THE

CALIFORNIA ACADEMY OF SCIENCES

FOURTH SERIES

VOL. XII, Nos. 32 and 33, pp. 1223-1285, plates 89-92 OCTOBER 10, 1924

XXXII

Report of the President of the Academy for the Year 1923

BY

C. E. GRUNSKY

President of the Academy

XXXIII

Report of the Director of the Museum for the Year 1923

BY

BARTON WARREN EVERMANN

Director of the Museum

SAN FRANCISCO

PUBLISHED BY THE ACADEMY

1924

PROCEEDINGS

OF THE

CALIFORNIA ACADEMY OF SCIENCES

Fourth Series

Vol. XII, Nos. 32 and 33, pp. 1223-1285, plates 89-92 October 10, 1924

XXXII

REPORT OF THE PRESIDENT OF THE ACADEMY FOR THE YEAR 1923

By C. E. GRUNSKY

President of the Academy

Complying with the requirements of the constitution of the California Academy of Sciences, the following report on the activities of the Academy during the year 1923 is submitted by your President.

Our membership has been slightly increased during the year 1923.

On January First, 1923, we had:—		
Members		1030
New Members added during the year were		91
Total		1121
We lost:—		
By death	23	
By resignation	31	
And dropped for delinquency in the payment of dues	13	
Total		67
Membership on January First, 1924, was		1054

The membership is classified as follows:

Patrons	13
Honorary members	24
Life members	84
Fellows	23
Members	910
	1054

The Academy carries on its list of patrons the following names:

Living

George C. Beckley
William B. Bourn
William H. Crocker
Peter F. Dunne
Barton Warren Evermann
Herbert Fleishhacker
Joseph D. Grant
A. Kingsley Macomber
John W. Mailliard
Joseph Mailliard
M. Hall McAllister
Ogden Mills
William C. Van Antwerp

Deceased

William Alvord
Charles Crocker
John W. Hendrie
Mrs. Charlotte Hosmer
James Lick
Alexander F. Morrison
Amariah Pierce
Ignatz Steinhart

Those who were called by death during 1923 are as follows:

Boardman, Samuel H.	Member	July 14, 1923
Bothin, Henry E.	Member	October 14, 1923
Britton, John A.	Member	June 29, 1923
Carolan, Francis	Member	November 11, 1923
Drum, Frank G.	Member	August 28, 1923
Goodale, Prof. George L.	Honorary	April 11, 1923
Gregg, Wellington	Member	January 7, 1923
Halpin, George H.	Member	April 1, 1923
Hawxhurst, Robert	Life	January 9, 1923
Hirsch, Alphonse	Member	September 6, 1923
Hueter, E. L.	Member	November 10, 1923
Hughes, Hugh	Member	January 10, 1923
Jennings, Thomas	Member	March 30, 1923
Letts, Arthur	Member	May 18, 1923
Moore, George A.	Member	August 26, 1923
McCormick, E. O.	Member	November 1, 1923
Page, Arthur	Member	August 18, 1923
Perkins, George C.	Life	February 26, 1923
Rosenberg, Adolph	Member	March 26, 1923
Stoll, Dr. Otto	Honrary	
Thornton, A. W.	Member	March 16, 1923
Vogdes, General A. W.	Life	February 9, 1923
Wheeler, Charles Stetson	Member	April 27, 1923

The Academy has published during 1923 the following papers:

FOURTH SERIES OF THE PROCEEDINGS

Vol. XI, No. 22, pp. 655-662—REPORT OF THE PRESIDENT OF THE ACADEMY FOR THE YEAR 1922, by C. E. Grunsky.

Vol XI, No. 23, pp. 663-700—REPORT OF THE DIRECTOR OF THE MUSEUM FOR THE YEAR 1922, by Barton Warren Evermann.

Vol XII, No. 1, pp. 1-26—FIELD WORK AMONG THE BIRDS AND MAMMALS OF THE NORTHERN COAST OF CALIFORNIA IN 1921, by Joseph Mailliard.

Vol XII, No. 2, pp. 27-29—NEW SPECIES OF HYNOBIUS FROM JAPAN, by E. R. Dunn.

Expedition of the California Academy of Sciences to the Gulf of California in 1921:

Vol. XIII, No. 2, pp. 3-4—A New Subspecies of Watersnake (*Natrix vibakeri ruthveni*), from Eastern Asia, by John Van Denburgh.

Vol. XIII, No. 3, pp. 7-28—Further Notes on the Birds and Mammals of Siskiyou County, California, by Joseph Mailliard.

Vol. XIII, No. 4, pp. 29-41—Fall Field Work in Plumas and Yuba Counties, California in 1922, by Joseph Mailliard.

Vol. XIII, No. 5, pp. 43-109—Observations upon the Bird Life of Death Valley, by Joseph Grinnell.

Vol. XIII, No. 6, pp. 111-130—Notes on the Hepaticæ of California, by Alexander W. Evans.

During the year 1923 11 free lectures were delivered at the stated meetings of the Academy, as follows:

January 3. The Public Shooting Ground—Game Refuge Bill; and An International Treaty for the Conservation of the Fisheries of the Pacific; by Dr. Barton Warren Evermann, Director, California Academy of Sciences; Dr. Joseph Grinnell, Director Museum of Vertebrate Zoology; Mr M. Hall McAllister, Treasurer, California Academy of Sciences; Dr. H. C. Bryant, in charge, Education, Publicity, and Research, California Fish and Game Commission; Mr. C. B. Lastreto, San Francisco, California; Mr. Joseph Mailliard, Curator of the Department of Ornithology and Mammalogy, and others.

March 7. The Habits and Characteristics of the California Mountain Lion and Methods of Hunting It. Illustrated, by Mr. Jay C. Bruce, Official Mountain Lion Hunter, California Fish and Game Commission.

April 4. Life and Habits of the Golden Eagle in California, by Mr. W. P. Steinbeck, Stockton, California.

May 2. Hawaiian Trails and Mountains. Illustrated, by Dr. Vaughan MacCaughey, Superintendent of Public Instruction, Territory of Hawaii.

June 6. Hunting in Africa with Camera and Gun. Illustrated, by Mr. R. C. Baird, the Bank of California, San Francisco.

July 5. A Naturalist's Visit to San Francisco Mountain, Arizona, by Mr. Harry S. Swarth, Curator of Birds, Museum of Vertebrate Zoology, University of California.

August 1. The Procession of Flowers on Mount Tamalpais, by Miss Alice Eastwood, Curator, Department of Botany, California Academy of Sciences, San Francisco.

September 5. Guadalupe Island Elephant Seals. Illustrated, by Dr. G. Dallas Hanna, Curator, Department of Invertebrate Paleontology, California Academy of Sciences, San Francisco.

October 3. Trails and Camps in Lower California. Illustrated, by Dr. John Van Denburgh, San Francisco.

November 7. Geography and the Making of Species, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology, Berkeley, California.

December 5. The Shore Birds of the San Francisco Bay Region. Illustrated, by Mrs. G. Earle Kelly, Alameda, California.

The Sunday afternoon lectures delivered in the Museum building during 1923 included the following:

JANUARY 7. How Animals Eat; A Chalk Talk for the Children. Illustrated, by Dr. J. S. Kingsley, Berkeley, California.

JANUARY 14. China Old and New. Illustrated with stereopticon slides and moving pictures, by Dr. C. K. Edmunds, President, Canton Christian College, Canton, China.

JANUARY 21. Palestine: Its Geology and Geography. Illustrated, by Prof. Earle G. Linsley, Professor of Geography and Geology, Mills College.

JANUARY 28. Changing Changeless Palestine:—Economic and Political Conditions. Illustrated, by Prof. Earle G. Linsley, Professor of Geography and Geology, Mills College.

FEBRUARY 4. A Naturalist's Rambles in Sothwestern Deserts. Illustrated, by Dr. F. B. Sumner, Associate Professor of Biology, Scripps Institution for Biological Research, La Jolla, California.

FEBRUARY 11. Giant Forest and the High Sierras. Illustrated, by Mr. Guy Hopping, Chief Ranger, Sequoia and General Grant National Parks.

FEBRUARY 18. Some Facts about the Mountain Lion and the Coyote. Illustrated, by Mr. Joseph Dixon, Economic Mammalogist, Museum of Vertebrate Zoology, Berkeley.

FEBRUARY 25. San Francisco, a World City. Illustrated with motion pictures, by Mr. Robert Newton Lynch, Vice-President and General Manager, San Francisco Chamber of Commerce.

MARCH 4. The Monroe Doctrine: What it is not, and What it is, by Mr. Edward Berwick, Publicist, Pacific Grove, California.

MARCH 11. America as seen by the first Japanese Embassy, by Mr. T. Komatsu, Manager, Toyo Kisen Kaisha for America.

MARCH 18. History and Political Life of Chile. Illustrated, by Hon. Marcos G. Huidobro, Consul for Chile.

MARCH 25. Art, Literature, and Intellectual Development in Chile. Illustrated, by Hon. Marcos G. Huidobro, Consul for Chile.

APRIL 1. Weather Forecasting for the Pacific States. Illustrated, by Mr. E. A. Beals, Meteorologist, United States Weather Bureau, San Francisco.

APRIL 8. Our Solar System and What we Know of Its Origin. Illustrated, by Dr. Robert G. Aitken, Astronomer, Lick Observatory.

APRIL 15. California's Mountain Play Grounds. Illustrated, by Mr. Paul G. Redington, District Forester, United States Forest Service, San Francisco.

APRIL 22. Experiments with Species Hybrids and Their Bearing on Evolution. Illustrated, by Prof. E. B. Babcock, Professor of Genetics, University of California.

APRIL 29. California's Wild Life in Motion Pictures. Illustrated, by Dr. H. C. Bryant, in charge, Education, Publicity and Research, California Fish and Game Commission.

MAY 6. Algeria. Illustrated, by Mr. I. H. Morse, San Francisco.

MAY 13. Hay Fever and Asthma in Relation to Plant Pollen. Illustrated, by Dr. Harvey M. Hall, Carnegie Institution of Washington.

MAY 20. Malaria and the Mosquito. Illustrated with moving pictures, by Prof. W. B. Herms, Professor of Parasitology, University of California.

MAY 27. Monkeys and Men. Illustrated, by Dr. James G. Needham, Professor of Entomology and Limnology, Cornell University.

NOVEMBER 4. The Manchurian Plague Epidemic of 1921. Illustrated, by Dr. Ivan C. Hall, Associate Professor of Bacteriology, University of California.

NOVEMBER 11. The Introduction of Foreign Birds and Mammals into the United States, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology.

NOVEMBER 18. The Bacillus of Long Life, a Discussion of the Sour Milk Therapy. Illustrated, by Dr. Ivan C. Hall, Associate Professor of Bacteriology, University of California.

NOVEMBER 25. Bird-life as a Community Asset, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology.

DECEMBER 2. Missionary Work in New Guinea. Illustrated, by Rev. Charles W. Abel, Director of the New Guinea Evangelization Society.

DECEMBER 9. Saving the Redwoods,—a Priceless Heritage. Illustrated, by Hon. Joseph D. Grant, Vice-President, Save the Redwoods League.

DECEMBER 16. The Shore Birds of the San Francisco Bay Region. Illustrated, by Mrs. G. Earle Kelly, Alameda, California.

DECEMBER 23. The Trees and Shrubs of Marin County, by Miss Alice Eastwood, Curator of Botany, California Academy of Sciences, San Francisco.

An analysis of the Treasurer's records will show that, apart from the operation of the Aquarium, the Academy has expended during the year on the operation and maintenance of its museum and the activities of its curators and their assistants the sum of $53,882.67. The mortgage debt of the Academy has been reduced during the year by another $10,000. It is now $260,000. Interest on this mortgage was paid to the amount of $15,730.52.

The John W. Hendrie Endowment of $10,000 invested in 60 shares of the Mercantile Trust Company has yielded an income of $900 during the calendar year 1923. This will be expended as hitherto in the publication of scientific papers.

The operation and maintenance of the aquarium was estimated to require $40,260 for the fiscal year 1923-24. The expenditures to February first of this year, since July first, indicate that this estimate was substantially correct.

A detailed statement of the Ignatz Steinhart Trust to December 31, 1923, accompanies the Treasurer's Report.

It is notable that the bequest of $250,000 from the Ignatz Steinhart Trust was increased by interest on temporary investments nearly 20 per cent, providing a total of $304,757.46 for the erection and equipment of the Steinhart Aquarium. Of this amount $22,332.26 remains unexpended, and will be utilized as exigencies demand in perfecting the equipment.

On July 1, 1923, building operations on the Steinhart Aquarium were practically completed and operation by the Academy with funds provided by the City and County of San Francisco commenced at that time. On September 29, 1923, the Aquarium was formally dedicated and opened to the public with appropriate ceremonies. From the date of the opening to the end of the year 548,137 people have visited the Aquarium, a record probably not exceeded, if equalled, by any similar institution in the world.

A wonderful display of aquatic life is here presented which wins enthusiastic appreciation from all visitors. It will prove of incalculable benefit to the City of San Francisco and stands as a monument to the public spirit of Ignatz Steinhart.

Taylor Collection of Reptiles and Amphibians

The acquisition of this valuable collection of reptiles and amphibians from the Philippine Islands was completed during the past year. It was made possible by the following donations:

William H. Crocker	$4,500.00
Herbert Fleishhacker	500.00

The problem of supplying glass containers for this collection was generously met by donations from the following members of the Academy:

William F. Herrin	$100.00
C. O. G. Miller	100.00
Selah Chamberlain	100.00
Louis F. Monteagle	50.00
George Uhl	20.00
	$370.00

Cross Sections of Sequoias

Through the generosity of Trustee Joseph D. Grant, who defrayed the entire cost of transportation and installation, one cross section each of the *Sequoia gigantea* and *Sequoia sempervirens* were presented to the Museum. These are appropriately installed in a manner to display the annual ring-growth with chronological data exhibiting contemporary events during the life of the trees. The age of one is 1710 years.

A Natural History of the Ducks

The Academy now possesses a copy of the valuable monograph on the "Natural History of the Ducks of the World," by Dr. John C. Phillips, thanks to the generosity of Dr. Emmet Rixford, Dr. Arthur H. Taylor, Mr. H. B. Blatchley, Mr. José Costa, Mr. Thomas Palache, and Mr. J. B. McCauley, who contributed $200 for its purchase. This work is in four volumes, two of which have been received. A limited edition, profusely illustrated, is being issued to subscribers only.

Mary E. Hart Bequest

On February 2, 1923, a bequest of $100 was received from the Mary E. Hart Estate in lieu of certain collections of Indian baskets mentioned in her will but which could not be located.

The Academy is sincerely appreciative of such donations and contributions which make possible the extension of its activities. In this connection it should be noted that the Academy is assisting in the matter of the preservation of wild life. It is acting as the agent for the disbursement of certain funds entrusted to it for this purpose.

Details of the work done during the year will appear from the reports of the Director of the Museum and the curators of the Academy's various departments. The work in all of these has been advanced with commendable energy.

That the Academy's work is appreciated and recognized in wide circles will appear from the following comment by

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution. He says under date of December 22, 1923, with special reference to the expedition which the Academy sent to the Gulf of California in 1921, "I wish to congratulate...... all concerned on the fine research work that the Academy is doing, and upon the manner in which the results of the various scientific activities are being published. I also wish to congratulate you on the progress of the Aquarium, and the public spirit shown by the people of California in sustaining the work of the Academy."

XXXIII

REPORT OF THE DIRECTOR OF THE MUSEUM FOR THE YEAR 1923

By BARTON WARREN EVERMANN
Director of the Museum

The annual report of the Director for the year 1922 was presented to the Academy at the annual meeting, February 21, 1923. During the past year the activities of the Museum have continued in a satisfactory way and very considerable additions and improvements have been made; these will be fully presented in their respective appropriate places.

Personnel

The personnel of the Museum has undergone only slight change in the year, the employes of the Academy at this date being as follows: Dr. Barton Warren Evermann, Director and Executive Curator of the Museum, Editor of the Academy publications, and Director of the Steinhart Aquarium; W. W. Sargeant, Secretary to the Board of Trustees; Miss Susie M. Peers, Secretary to the Director; Joseph W. Hobson, Recording Secretary; Miss Alice Eastwood, Curator, and Mrs. Kate E. Phelps, assistant, Department of Botany; Edward P. Van Duzee, Curator, Dr. F. R. Cole, Curator in Dipterology, and J. O. Martin, assistant, Department of Entomology; Dr. John Van Denburgh, Curator, and Joseph R. Slevin, assistant curator, Department of Herpetology; Dr. G. Dallas Hanna, Curator, Dr. Roy E. Dickerson and F. M. Anderson, honorary curators, Merle Israelsky, assistant curator, and William Barbat, temporary assistant, Department of Invertebrate Paleontology; Joseph Mailliard, Curator, and Miss Mary E. McLellan, assistant curator, Department of Ornithology and Mammalogy; Dr. Walter K. Fisher, Curator, Department of Invertebrate Zoology; Frank Tose, Chief taxidermist, Chandler Smith, Russell Hendricks, Douglas Kelly and Cecil Tose, student assistants, Department of Taxidermy; Edward P. Van Duzee, assistant librarian, Mrs. Helen Van Duzee, library assistant, and Dean Burk, temporary library assistant; Wm. C.

Lewis, janitor; George W. Edwards, assistant janitor; Frank W. Yale, assistant janitor; Raymond L. Smith, doorkeeper and general assistant; J. H. Kavanaugh, day watch; Archie McCarte, night watch; Mrs. Johanna E. Wilkens, janitress.

Accessions to the Museum and Library

As in the past, the accessions to the museum and the library have been many and valuable. A few of the more notable are mentioned in the President's report and a detailed list will be found in the appendix to this report (pp. 1269-1278).

Co-operation with Public and Private Schools

Co-operation with the schools in their educational work has been more close and effective than in any previous year. Appreciation of the educational value of visits to the Museum for the purpose of studying the habitat groups and other collections seems to be growing among the teachers and school officials and schools are visiting the Museum in increasing numbers. Within the year our taxidermists have completed eleven portable habitat groups designed as loan exhibits for use in the public schools. The groups are as follows: Western Meadow Lark, Western Robin, California Woodpecker, San Francisco Towhee, Barn Owl, Least Sandpiper, Killdeer, Western Savannah Sparrow, California Ground Squirrel, Redwood Weasel, Sierra Chickaree, Sierra Golden-mantled Ground Squirrel and Spiny Pocket Mouse. These are now being circulated in the Berkeley and San Francisco public schools, under the immediate supervision of Mrs. Anna V. Dorris, Director of Visual Instruction in the Berkeley Public Schools.

Other exhibits of this character will be prepared as time and materials permit. It is to be regretted that we have not two or three expert preparators who can devote all their time to the preparation of exhibits suitable for loan to the schools.

The Director and various members of the staff have been called upon to lecture before various schools, clubs and elsewhere in the interest of public education. The requests that come to the Director for lectures have been more numerous than he could accept.

The number of teachers and students who come to the Museum to examine and study specimens in our research collections is increasing and the number of pupils that come *as schools with their teachers* to study the habitat groups and other exhibits is also increasing, the numbers for the year 1923 being as follows:

Schools of San Francisco:	
Number of classes	185
Number of teachers	167
Number of pupils	5225
Schools Outside of San Francisco:	
Number of classes	52
Number of teachers	51
Number of pupils	1095
Grand Totals:	
Total number of classes	237
Total number of teachers	218
Total number of pupils	6320

Visitors to the Museum

The Museum has been open to the public every day in the year. The popularity of the Museum seems unabated. The recognition of the educational value of the exhibits seems more pronounced than ever before. The total number of visitors during the past year was 498,775. The number by months and years since the opening, September 22, 1916, is shown in the following table:

Month—	1916	1917	1918	1919	1920	1921	1922	1923
January		23170	25260	17241	27013	25755	19038	15270
February		22058	23698	17586	23450	25679	18534	20529
March		31606	26810	27397	25419	28279	27922	26341
April		32175	23274	25994	32208	24939	36057	21911
May		26154	26391	28369	37107	25517	27237	37597
June		32123	29843	32248	36207	29406	27131	39511
July		37193	31420	48028	52492	43186	36263	64530
August		24619	31137	43730	53470	39422	34787	50849
September	16448	27866	29847	34007	42013	31458	28408	69870
October	36933	20629	14743	30463	33500	24861	19459	66894
November	27718	21810	8531	25246	19347	18593	19080	48766
December	15002	21693	19588	21188	21340	15062	13339	36707
Total	96101	321096	290542	351497	403566	332157	307255	498775

Department Activities

The same spirit of enthusiasm, industry, loyalty, and hearty cooperation which has always characterized the members of the staff continues undiminished. It is this splendid characteristic that has enabled the Museum to accomplish so much with its limited resources, and I wish to take this opportunity to express my appreciation.

The activities of the various departments will be set forth fully in the reports of the respective curators; only brief mention of some of them need be made here.

Miss Eastwood, curator of botany, spent a few days in early September in northern Lower California, where she obtained a considerable collection of herbarium specimens. Brief trips made by the curator to various California localities resulted in small but valuable collections.

Mr. Van Duzee, curator of entomology, made short collecting trips to the Potholes and Yuma, to the San Bernardino Mountains, to San Diego County and the northern portion of Lower California, and the vicinity of Mt. Diablo and Pittsburg.

Dr. Van Denburgh and Mr. Slevin of the department of herpetology, as guests of the Mexican Government, made an extended collecting trip into the San Pedro Martir Mountains, in northern Lower California, where they obtained many valuable specimens. They also spent some time collecting in San Diego, Imperial, Orange, Riverside and Los Angeles counties, in southern California, and on Todos Santos Islands, Lower California.

The growth of the Library has been slower than it should have been. Larger appropriations are required for the purchase of books that are seriously needed in the work of the various departments and for binding books and pamphlets that should be bound in order to prevent injury.

Mr. Mailliard of the departments of mammalogy and ornithology, assisted by Mr. Frank Tose, chief taxidermist, spent one week in April at the Potholes, where good collections of birds and the smaller mammals, including material for several habitat groups, were obtained. In April to June field work was carried on by Mr. Mailliard in Shasta, Lassen, and Modoc counties, followed by work in Butte and Lassen counties and in Marin County.

Dr. Hanna, curator of invertebrate paleontology, made several short trips to various parts of the State which resulted in the addition of valuable collections to that department.

Meeting of the Pacific Division of the American Association for the Advancement of Science and its Affiliated Societies

The 1923 meeting was held at Los Angeles September 17-20, in the buildings of the University of Southern California, in conjunction with the Summer Session of the American Association for the Advancement of Science. The meeting proved to be one of the most successful and interesting the Division has ever had. The meetings of the various affiliated societies were of unusual interest, particularly those of the Astronomical Society of the Pacific, due in large part to the large number of astronomers who had come to southern California on account of the eclipse of September 10.

The Academy was well represented in the attendance and on the various programs. Professor E. P. Lewis delivered the Presidential address on the evening of September 17, his subject being "The Contributions of Astronomy to Civilization." Vice-President C. E. Grunsky presided at most of the general sessions. Among the members of the Academy who were in attendance and many of whom were on the program were the following: Clinton G. Abbott, Le Roy Abrams, Robert G. Aitken, W. E. Allen, F. M. Anderson, Alfred W. Anthony, Ralph Arnold, Edward A. Beals, A. J. Basinger, S. Stillman Berry, Charles Lewis Camp, Douglas H. Campbell, Bruce L. Clark, F. C. Clark, John N. Cobb, Frank R. Cole, Alfred Cookman, John Adams Comstock, Donald R. Dickey, E. T. Dumble, W. F. Durand, Alice Eastwood, E. O. Essig, Barton Warren Evermann, Joseph Grinnell, C. E. Grunsky, G. Dallas Hanna, W. B. Herms, A. Brasier Howell, Merle C. Israelsky, Edmund C. Jaeger, David Starr Jordan, J. S. Kingsley, C. B. Lastreto, Eugene Law, A. O. Leuschner, E. P. Lewis, Chas. B. Lipman, D. T. MacDougal, E. G. Martin, Isabel McCracken, George F. McEwen, John C. Merriam, Elmer G. Osterhoudt, G. P. Rixford, Mrs. Dorothea K. Roberts, W. W. Sargeant, N. B. Scofield, Alvin Seale, Chester Stock, C. S. Stoltenberg, James Rollin Slonaker, F. B. Sumner, Walter Penn Taylor, Will F. Thompson, Sidney Dean Townley, Edward P. Van Duzee, A. G. Vestal, Alfred O. Woodford, and W. S. Wright.

Use of the Academy's Library and Collections by Investigators and Students

During the year the number of investigators, students and teachers who have made use of the library, study collections and laboratories was larger than ever before.

From time to time young men interested in natural history have expressed the wish that the Academy might offer instruction in methods of collecting and in taxidermy. In order to meet this demand our chief taxidermist arranged to receive as student assistants members of the Academy or members of their families who desire instruction along those lines. Among those who have availed themselves of this opportunity to learn the principles and methods of natural history collecting and taxidermy are the following: C. P. Russell, Chandler Smith, Russell Hendricks, Douglas Kelly, and Cecil Tose.

The Boy Scouts, under Scout Master Harold E. Hansen, continue to hold their regular weekly meetings in the Academy's Auditorium.

Publications by the Museum Staff

The curators and others connected with the Museum staff have been active in contributing to the literature of their respective subjects. The list of their contributions for 1923 is as follows:

Evermann, Barton Warren

1. Conservation of the Marine Life of the Pacific. <Mid-Pacific Magazine, Vol. XXV, No. 4, pp. 303-328, April, 1923.
2. The Steinhart Aquarium. <The Oakland Tribune, April, 1923.
3. Red Snappers and That Sort of Thing. <Outdoor Life, Vol. LI, No. 5, pp. 333-336, May, 1923.
4. The Pelicans of Pyramid Lake. <Overland Monthly, Vol. LXXXI, No. 1, pp. 16-18 and 45, May, 1923.
5. The Conservation of the Marine Life of the Pacific. <Scientific Monthly, Vol. XVI, No. 5, pp. 521-538, May, 1923.
6. The Fishery Resources of the Pacific. <The Catalina Islander, Vol. X, No. 16, pp. 1-2, May 2, 1923; continued in Vol. X, No. 17, May 9, pp. 1-2 and 10; No. 18, May 16, pp. 1-2; No. 19, May 23, pp. 2, 4, 5, 8.
7. The Marine Life of the Pacific. <Trans. Commonwealth Club of California, Vol. XVIII, No. 3, pp. 105-119, May, 1923.
8. Notes on Fishes from Apia, Samoa. <Copeia, No. 119, pp. 70-71, June 16, 1923 (with Alvin Seale).

9. Notes on Fishes from Guadalcanar, Solomon Islands. <Copeia, No. 120, pp. 77-78, July 20, 1923 (with Alvin Seale).
10. The Seals and Otters of the Pacific. <Fur Trade Review, August, 1923, pp. 94-100.
11. Report of the Director of the Museum for the year 1922. <Proc. Calif. Acad. of Sci., 4th Ser., Vol. XI, No. 23, pp. 663-700, August 22, 1923.
12. The Steinhart Aquarium and its Hawaiian Fishes. <Aloha, Vol. 4, No. 7, pp. 3-5, September, 1923.
13. The Pacific Fisheries as Contributors to the Wealth of the Nation. <San Francisco Business, Vol. 7, No. 11, pp. 8-9, September 14, 1923.
14. Dr. Richard Gause Boone. <The Sierra Educational News, Vol. XIX, No. 8, pp. 469-470, October, 1923.
15. The Steinhart Aquarium. <California Fish and Game, Vol. 9, No. 3, pp. 106-108, July, 1923.
16. The Steinhart Aquarium opened at San Francisco. <California Fish and Game, Vol. X, No. 44, pp. 1-2, November 14, 1923.

Slevin, Joseph R.

1. Expedition of the California Academy of Sciences to the Gulf of California in 1921. General Account. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 6, pp. 55-72, map, June 2, 1923.

Van Denburgh, John

1. A New Subspecies of Watersnake (*Natrix vibakari ruthveni*) from Eastern Asia. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 2, pp. 3-4, July 26, 1923.

Van Denburgh, John, and Slevin, Joseph R.

1. Preliminary Diagnoses of four New Snakes from Lower California, Mexico. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 1, pp. 1-2, July 25, 1923.

Mailliard, Joseph

1. Field Work Among the Birds and Mammals of the Northwest Coast of California in 1921. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 1, pp. 1-26, January 2, 1923.
2. The Tree Swallow Added to the Pribilof List. <Condor, Vol. XXV, No. 1, p. 31, January 17, 1923.
3. Census of Birds' Nests in the Music Concourse, Golden Gate Park, San Francisco, Calif. <Gull, Vol. 5, No. 3, pp. 2-3, March, 1923.
4. An Explanation of a Seeming Discrepancy. <Condor, Vol. XXV, No. 3, p. 108, May 19, 1923.
5. How is This for Conservation of Wild Life? <Condor, Vol. XXV, No. 4, pp. 125-126, July 28, 1923.
6. Early Nesting of Nuttall Sparrow in Golden Gate Park. <Condor, Vol. XXV, No. 4, p. 133, July 28, 1923.
7. Expedition of the California Academy of Sciences to the Gulf of California in 1921. The Birds. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 24, pp. 443-456, August 21, 1923.

8. Report of the Department of Exhibits, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, Nos. 22-23, pp. 678-679, August 22, 1923 (in Report of Director for 1922).
9. Report of the Department of Mammalogy, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, No. 23, pp. 682-683, August 22, 1923 (in Report of Director for 1922).
10. Report of the Department of Ornithology, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, No. 23, pp. 683-684, August 22, 1923 (in Report of Director for 1922).
11. Further Notes on the Birds and Mammals of Siskiyou County, California. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 3, pp. 7-28, September 13, 1923.
12. Fall Field Work in Plumas and Yuba Counties, California, in 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 4, pp. 29-41, October 15, 1923.

Van Duzee, Edward P.

1. An Entomological Antique. <Science, New Series, Vol. LVII, p. 269, March 2, 1923.
2. Expedition of the California Academy of Sciences to the Gulf of California in 1921. The Hemiptera. <Proc. Calif. Acad. Sci., 4th Series, Vol. XII, No. 11, pp. 123-200, June 7, 1923.
3. Hemiptera or Sucking Insects of Connecticut. Family Fulgoridæ. <Conn. State Geol. and Nat. Hist. Surv., Bul. No. 34, pp. 24-55, July, 1923.
4. Notes on *Lygæus kalmii* Stål and Allies (Hemiptera). <Canadian Entomologist, Vol. LV, p. 214, September, 1923.
5. A New Subspecies of *Euryophthalmus cinctus* (Hemiptera). <Canadian Entomologist, Vol. LV, p. 270, November, 1923.
6. A Rearrangement of our North American Thyreocorinæ (Hemiptera). <Entomological News, Vol. XXXIV, pp. 302-305, December, 1923.

Hanna, G. Dallas

1. Notes on Some Land Snails of the Sierra Nevada Mountains with Description of a New Species. <By G. Dallas Hanna and Emmet Rixford. Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 4, pp. 43-50, pl. 4, Jan. 2, 1923.
2. Upper Miocene Lacustrine Mollusks from Sonoma County, California. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 3, pp. 31-41, pls. 1-3, Jan. 2, 1923.
3. A New Species of Carychium from Vancouver Island, British Columbia. <Proc. Calif. Acad. Sci., Vol. 12, No. 5, pp. 51-53, text fig. 1., Jan. 2, 1923.
4. What is the Future of the Fur Seal? <Fur Trade Review, January, 1923, pp. 357-358, 359. (Three photographs accompanying article were printed in same number but inadvertently placed under article by W. J. Brett.)
5. Random Notes on Alaska Snow Buntings. <Condor, Vol. 25, No. 2, pp. 60-65, 2 photographs, March-April, 1923.

6. (Review of Fauna from the Eocene of Washington, by Charles E. Weaver and Katherine Van Winkle Palmer. <Univ. Wash. Publ. Geol., Vol. 1, No. 3, June, 1922). >The Nautilus, Vol. 36, April, 1923, pp. 141, 142.
7. (Review of the Same Paper). <Journal of Geology, Vol. 31, No. 3, pp. 261-263, April-May, 1923.
8. (A Biological Survey of the Pribilof Islands, Alaska, by Edward A. Preble, W. L. McAtee and others. <North American Fauna No. 46, U. S. Dept. Agriculture, June 20, 1923, pp. 1-257, pls. 1-15). The publication is based largely on collections made by G. Dallas Hanna and contains seven of his photographs as well as large numbers of his field notes.
9. Annual Report of the Department of Invertebrate Paleontology for 1922. <Proc. Calif. Acad. Sci., Vol. 11, 4th Ser., pp. 680-683, August 22, 1923. Bibliography of G. D. H. on pp. 670-672.
10. (Map of the Gulf of California, Showing Route of California Academy of Sciences 1921 Expedition. Based upon Charts Nos. 620, 621, 1006, U. S. Hydrographic Office). <In Expedition of the California Academy of Sciences to the Gulf of California in 1921, General Account by Joseph R. Slevin. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 6, opp. p. 72, June 2, 1923.
11. Results of Preliminary Examination of seven samples of Sediments from near Lomitas (Los Angeles, County, California.) <Bull. Southern Calif. Acad. Sci., Vol. 22, pt. 2, p. 64, July, 1923.
12. A Cruise Among Desert Islands (with A. W. Anthony.) <National Geographic Magazine, Vol. 44, No. 1, pp. 71-99, 33 photographs, July, 1923. Syndicated article "Survival of the Unfit," by Henry Smith Williams, San Francisco Examiner, Oct. 22, 1923, etc., based on this. Also an article and photographs in The Illustrated London News, September 27, 1923, was based on this account. Another Article entitled "A Brother of the Strange Beasts before Adam," based on this appeared in the Literary Digest, Vol. 79, No. 8, November 24, 1923, pp. 50-52, 3 photographs.
13. Note on *Lymnæa hemphilliana* (Baker). <Nautilus, Vol. 37, No. 1, p. 23, July, 1923.
14. Pleistocene Freshwater Mollusks from North Central Texas. <Nautilus, Vol. 37, No. 1, p. 25, July, 1923.
15. Some Eocene Foraminifera near Vacaville, California. <Univ. Calif. Publ. Geol., Vol. 14, No. 9, pp. 319-328, pls. 58-59, Oct. 31, 1923.
16. Rare Mammals of the Pribilof Islands, Alaska. <Journal of Mammalogy, Vol. 4, No. 4, pp. 209-215, pl. 23, Nov. 1923.
17. Results of California Academy of Sciences Expedition to the Gulf of California in 1921. Land and Freshwater Mollusca. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 26, pp. 483-527, pls. 7-11, Dec. 31, 1923.

Eastwood, Alice

1. The Winter Flowers on Mt. Tamalpais. <Out of Doors, January, 1923.

2. The Origin of Some Locality and Trail Names on Mt. Tamalpais. <Out of Doors, April, 1923.
3. The Fall Flora of Mt. Tamalpais. <Out of Doors, September, 1923.
4. Trees of Mt. Tamalpais. <Trails (the yearly bulletin of the California Alpine Club).
5. The Botany of that part of Menzies' Journal relating to California. <Calif. Historical Society, January, 1924.

Needs of the Museum

The increase in the activities of the Academy and the growth in the work of the various departments in the past year have increased the needs of the Academy until they are now more numerous and greater than ever before. Every department is growing in its collections and material equipment. The floor space, never entirely adequate, in each department, is now more than exhausted. Many collections and specimens valuable for exhibition purposes and others that should always be readily accessible for research have to be stored and are difficult of access. In the department of botany it has been found necessary to place some 20 herbarium cases in the hall. The department of ornithology and mammalogy has found it necessary to store many valuable specimens in a number of places difficult to reach.

We have no space available for exhibits in the departments of entomology, herpetology, paleontology, invertebrate zoology, or botany.

It has long been the desire of Mr. Van Duzee to put on exhibition properly prepared specimens of many of the economically important insects such as the Anopheles and Stegomyia mosquitoes and other carriers of disease, the insects injurious to agricultural and horticultural crops, and those injurious to domestic animals. Such exhibits as he has in mind would be intensely interesting and of great educational value.

The department of paleontology is in a position to provide a number of exhibits that would prove very instructive particularly in economic geology, and the department of herpetology could readily provide a number of exhibits that would rival in scientific and popular interest any of the habitat groups we now have. The same may be said of the other departments, particularly that of botany. It would be a comparatively easy matter to provide many botanical exhibits that would prove of unusual interest and value. The department of ornithology and mammalogy has no suitable place for displaying any of the species of birds or mammals of intermediate size, such as the larger hawks and owls, ravens, crows, waders, foxes, wolverine, marten, mink, and similar species. It has been the desire of the Director to have installed a comprehensive exhibit of the fur-bearing animals of California. This exhibit would include one or more mounted animals and at least two dressed skins (one prime and one unprime) of each species; also descriptive matter regarding the abundance, distribution, habits and commercial value of each species, and the laws for their protection or capture. If we had suitable space for the display of such animals there is little doubt but that the furriers of San Francisco and others would be glad to assist in making such an exhibit possible.

Another exhibit which the curator of ornithology and the Director have long had in mind is one showing by seasons the birds of Golden Gate Park. This would consist of five cases of mounted specimens, the first containing a pair, male and female, of each species of bird known to occur in the Park in the winter, the second case to show the spring migrants, the third the species known to breed in the Park, the fourth the fall migrants, and the fifth case would contain specimens of all the species known to be in the Park *today*. This last would, of course, be a constantly changing assemblage. When a species that was known to be in the Park migrated or disappeared, the specimens of that species would be taken out of the case; when a new arrival in the Park was noted by the observers specimens would be placed in the case. A teacher bringing her class to the Museum could say to them: "The Museum says all the kinds of birds in this case are in the Park today; let us go out and see how many of them we can find".

We have already made a beginning on this exhibit, but collecting the specimens and mounting them requires time and expense. With only one taxidermist progress is very slow. It is hoped that some public-spirited man or woman interested in children may be found who will give the financial assistance needed for the completion of this exhibit which will undoubtedly prove not only of great interest and educational value to the children of the public and private schools but to adults as well. A sum of money that would enable us to employ two expert collectors and taxidermists for two or three years would be sufficient.

Dedication and Formal Opening of the Steinhart Aquarium

At the time of the last Annual Report, the Steinhart Aquarium was under construction. Building operations progressed with reasonable speed and were practically completed by the first of July. The stocking of the tanks and pools with fishes and other aquatic life was begun at once, and the dedication and formal opening of the Aquarium occurred on Saturday afternoon, September 29. At 2 o'clock a private view of the Aquarium was given the Trustees, Council and Members of the Academy and the dedication ceremonies were held at 3 o'clock in the court in front of the Aquarium, more than five thousand people being present. The following program was presented:

PROGRAM

MUSIC - - - - - - - PARK BAND

ADDRESSES:

1. Hon. C. E. Grunsky, *President of the Academy.*
2. Hon. Wm. H. Crocker, *President Board of Trustees.*
3. Mr. Jesse W. Lilienthal, *Executor Estate Ignatz Steinhart.*

MUSIC - - - - - - - PARK BAND

4. Hon. William Sproule, *Park Commissioner.*
5. Hon. James Rolph, *Mayor, San Francisco.*
6. Dr. David Starr Jordan, *Chancellor Emeritus Stanford University.*
7. Dr. Barton Warren Evermann, *Director of the Aquarium.*

MUSIC - ANTHEM, STAR SPANGLED BANNER

Address by William H. Crocker

No ambition is more laudable than the desire to perpetuate one's name. When this is coupled with the broader plan of benefiting the community in which we live, true philanthropy is achieved.

The fulfillment of this ambition has shown itself in many forms and divers foundations in our country. What could be more beautiful, more instructive and beneficial to the public at large than the establishment of the Steinhart Aquarium which we are dedicating here today.

It is a moving picture of the wonders of the Deep. From the remote places of the Pacific and Atlantic oceans, their inhabitants, in all their beauty of color and grace of movement, live before us. Think what it means to us, our children and our children's children.

Ignatz Steinhart spent his active life here in San Francisco. He was one of our successful citizens in business. He was inspired by a sense of duty to accomplish something good, elevating and instructive for the present generation with which he lived, and for future generations to come. His name will remain in perpetuity among us; but even better still, Mr. Steinhart will be classed among the benefactors of mankind who have utilized their resources for educational purposes and the betterment of civilization.

Address by C. E. Grunsky

The Steinhart Aquarium which is today being opened to the public has been made possible by the Ignatz Steinhart bequest of $250,000 to the California Academy of Sciences. The need of an aquarium here has long been felt. How except through the agency of an aquarium shall the general public be made familiar with the life in our streams, lakes, and in the ocean? An aquarium then is educational; but it is more than that. It makes a special appeal because it displays in a convenient way and in attractive environment such a variety of living things. Where else can the movements of fishes and all varieties of aquatic life be so well observed as in the aquarium? Here there is color and form and movement and variety, almost beyond belief; and how easy to learn while being fascinated with the beauty of the scene in the simulated stream or ocean bed?

Some there are at this dedication who will recall the few tanks so long maintained at Woodward's Gardens, on 14th Street near Market many years ago. There was a descent into a cave-like chamber in the walls of which the tanks were placed. Six or eight or more there may have been, I do not remember, but I do recall the great impression which they made upon me when as a boy, before I knew anything about aquariums, I descended the steps and found myself gazing from the dim light of the cave into a brilliantly lighted tank of sea life.

It hardly seems possible that San Francisco should for such a long time after the passing of Woodward's Gardens have been without an aquarium. The more is this to be wondered at when it is recalled how popular an attraction the aquariums at the Panama Pacific Exposition had proved to be. Crowds were attracted by the exhibit in one of the main buildings and crowds, too, by the marvelous colorful display in the Hawaiian building. Many were the regrets later expressed, that no means were at hand to make such collections of aquatic life permanent.

By reason of geographic position on the shore of the Pacific Ocean, with water upon three sides, and with access by water to California's two great rivers, and as the center of a great metropolitan area, San Francisco is the ideal location for an aquarium of the first rank and is now placed in a position to make a satisfactory display of the life in the ocean as well as in the streams which flow to the ocean. The desirability of an aquarium here was fully realized by Mr. Ignatz Steinhart; as it had been, too, by his brother, Mr. Sigmund Steinhart. The latter, the first to pass away, had left in the hands of his surviving brother a comparatively small fund which was to be used for aquarium purposes if opportunity offered. The former some years before his death began to study aquariums and to weigh the possibility of erecting an aquarium in San Francisco. His interest in this matter led to conferences with Dr. Evermann, the Director of the Museum of the California Academy of Sciences, and with others. The outcome of these conferences crystallized in a desire to have San Francisco give assurance that if some one should erect and equip a building for aquarium purposes, the City would provide operating funds to assure its maintenance and operation. This desire found expression in a charter amendment, adopted by the electors of San Francisco in 1916, to the effect that the City pledged itself to accept an aquarium when constructed and to provide funds for the operation thereof.

After the adoption of this Charter Amendment it was confidently expected that Mr. Ignatz Steinhart would at an early date enter upon the construction of an aquarium. But he was called by death before any definite steps had been taken. In his will, however, he made the provision for the project which we see fully realized today. He bequeathed to the California Academy of Sciences $250,000 as already stated, to be used in the construction and equipment of an aquarium in Golden Gate Park. The trust thus imposed was, of course, accepted by the Academy. This acceptance was conditioned upon favorable action by the City in the matter of allowing the aquarium to be erected in Golden Gate Park adjacent to the Academy buildings as stipulated by Mr. Steinhart, and the making of provision by the City for the operating expenses of the aquarium. In 1918 the electors passed the necessary charter amendment authorizing the erection and equipment of the aquarium subject to the provisions and conditions named in the Steinhart bequest. Studies were, thereupon, commenced in order that advantage might be taken of experiences elsewhere. Dr. Evermann accompanied by Engineer T. Ronneberg visited the aquariums of the East and brought back much valuable information. The plans for the building were entrusted to Architect Lewis P. Hobart. The result speaks for itself.

On behalf of the Academy, I desire to express at this time the appreciation, by its officers and members, of the cordial cooperation accorded to the Academy and its representatives by the Park Commission of San Francisco, in connection with the construction work and the parking about the building. We have also to thank the California State Fish and Game Commission and Mr. F. A. Potter, Superintendent of the Aquarium at Honolulu for valuable aid in securing fish and other material, and the Southern Pacific Company, the Los Angeles Steamship Company, the Matson Navigation Company, and many other corporations and individuals for courtesies extended and assistance rendered in making collections and in transporting the collected specimens.

I shall not enter upon a description of the aquarium itself which falls properly to its Director, Dr. Barton W. Evermann, from whom you are to hear presently. It is fitting, however, that we recall the words of the donor whose name the Aquarium bears. I quote from his bequest, as incorporated into the San Francisco Charter amendment which empowered the Board of Supervisors to carry into effect the terms, provisions and conditions of this bequest:

"It being my earnest desire to provide the citizens of San Francisco with an aquarium to be erected in Golden Gate Park of said City, and to be called the 'Steinhart Aquarium'; and provided such an aquarium has not heretofore been constructed or placed in operation by me or any other party or parties; I hereby give, devise and bequeath to the California Academy of Sciences of San Francisco, the sum of ($250,000) two hundred and fifty thousand dollars, for the erection and completion of an aquarium to be located in the Golden Gate Park of said City of San Francisco, and adjacent or adjoining to the new buildings and museum of said Academy of Sciences in said Park." . . . .

"The management, superintendence and operation of said aquarium to be in charge and under the direction of said Academy of Sciences; and I expect that the necessary funds for the maintenance and operation of said aquarium will be furnished by the City of San Francisco for the benefit of the inhabitants thereof or others, who may enjoy said aquarium or derive knowledge and information therefrom."

The Academy, Mr. Mayor, under the terms of this bequest has accepted the trust as set forth, not alone to construct the Aquarium and equip it, but also to operate it for the benefit and enjoyment of all who care to visit it. The Academy desires through you, Mr. Mayor, to advise all who are concerned that the first part of this trust has now been fulfilled. The construction is completed, operation has commenced, and the aquarium, complete and fully equipped, is now ready to be formally opened to the public.

Address by David Starr Jordan

After complimentary remarks concerning the people, the weather and the Aquarium, Dr. Jordan said, in part:

I feel as though I were in a sense a grandfather to the Steinhart Aquarium. Some twenty years ago, Mr. Ignatz

Steinhart came to me to talk over the possibilities of such an enterprise, its cost, its management and the place to put it. All his plans have been faithfully carried out, and in the best possible way. I feel like a grandfather again, because the director of the Aquarium and its superintendent were both students of mine. I taught them to know fish.

It is forty-five years now since Barton Warren Evermann first joined my little student tramping party from Somerset, Kentucky, by way of Cumberland Falls, to the French Broad River, the Great Smoky Mountains, and by way of Tallulah into the heart of Georgia. All along the way we interviewed the flowers, the ferns and the fishes, and the impression has never faded away. We have been working together on fishes ever since those days.

Alvin Seale came to us at Stanford at the end of the last century, when fishing the world over was good. He has been my partner in various investigations and has made many of his own. One notable act was his transfer from Galveston to Hawaii of the mosquito-devouring top-minnow, *Gambusia,* now successfully introduced also in Formosa and the Philippines.

One feature of the Steinhart Aquarium we must not overlook, its value to scientific research. The people of this city, the children especially, will look with wonder and profit on the hundreds of varied forms of fishes; the men of science will make use of them for extending our knowledge of marine life.

The most famous aquarium in the world is the one at Naples. Not for its variety of fishes, for in this regard the Mediterranean cannot compare with Hawaii and the South Seas. It is, however, the center to which hundreds of naturalists all over the world have been drawn for most important studies. This has been because the Aquarium made provision for such study. The upper floor was turned over to Dr. Anton Dohrn, and the great universities of the world were glad and proud to rent "tables" for students, with the equipment of books and instruments of precision which go with each table.

In the Steinhart Aquarium the same provision is made except that the research rooms are in the basement. But they are equally well provided and the day will come when students of sea-life will cross oceans and continents to work in these hospitable halls.

Address by Barton Warren Evermann

On a sweet day in June, 45 years ago, a young college professor of zoology and a young student of his sat together on the bank of the Cumberland River just below the beautiful Cumberland Falls. The sun shone on the spray, and a rainbow arched the chasm which the river had cut. Beautiful climbing ferns, sensitive briars, orchids and magnolias covered the almost vertical walls that hemmed the river in.

The professor and his pupil saw all these, but they, for the moment, were chiefly interested in a small fish which the student had caught. The professor was giving his student his first lesson in systematic ichthyology. By means of a "Manual of Vertebrates," which the professor had recently written, and which contained descriptions of all the mammals, birds, reptiles and fishes then known from the eastern United States, the little fish was soon identified as the common stone-roller or dough-belly, whose scientific name is *Campostoma anomalum;* "anomalum," because its very long intestine is wound around its air-bladder, like the wire or string around a leaky garden hose to keep it from bursting—a structure quite "anomalous" among fishes.

In the weeks that followed, while tramping southward through Kentucky, Tennessee, North Carolina and Georgia, across the Cumberland Mountains and the Great Smokies, the professor and his student had frequent opportunity to take a look at the fishes in the streams they crossed. They sat on the banks of many of them—as the French Broad, the Swannanoa, the Tallulah and the Tugaloo, and studied and identified such fishes as they had caught. And thus the student's interest in fishes grew day by day.

Since those glorious days, the professor and his student have fished together in many waters, both fresh and salt, and in many lands. They have caught fish, usually while fishing together, in every state and territory in the Union, and in some foreign countries. They, sometimes alone, sometimes with others helping them, have waded a hundred miles or more, in rivers, lakes and along ocean shores, through which they dragged nets with which to catch the fish.

Sometimes the "water was fine" and felt very pleasant; sometimes it was very cold and felt very different; but it was always *wet!* One occasion is recalled when they fished in a certain icy-cold river in Colorado whose name is Rio de las Animas Perdidas, or the River of the Lost Souls.

After a hasty inspection the professor decided that the best place to draw the seine was on a gently sloping gravel bar on the opposite side of the river, and said, "We will wade across and try it over there." There was a bridge only a few yards above us, and the three other members of the party said, "Why not cross on the bridge?" But, despite their protest, the professor gathered up one end of the seine, Davis the center, Fesler the other end, the other the collecting bucket, and we all started across, stepping from stone to stone where the water was deep. Soon the professor slipped and went in over his head! Scrambling back to shore as best he could, he remarked, between shivers, "I always thought that the place where lost souls went was a good deal hotter than this place is." We all then went up and crossed on the bridge.

On another occasion we went from Salt Lake City down into the Land of Juab where we fished the Sevier River. The professor had inadvertently left his seining clothes at the hotel, so he said, "You boys can do the seining today; I'll stay on the bank and boss the job and examine the catch as you bring it ashore." Fishes of several very interesting kinds proved abundant, and the professor became greatly excited. He disappeared for a moment in the bushes, but soon reappeared garbed only in a hat and a long linen duster, with the remark, "This is great! I want to share the fun with you boys."

We got many kinds of fishes in that interesting stream, and, as we drove back to Juab in the cool of the evening, we commemorated the event by fabricating and singing a "round" (a parody on "The Animal Fair"), which ran something like this:

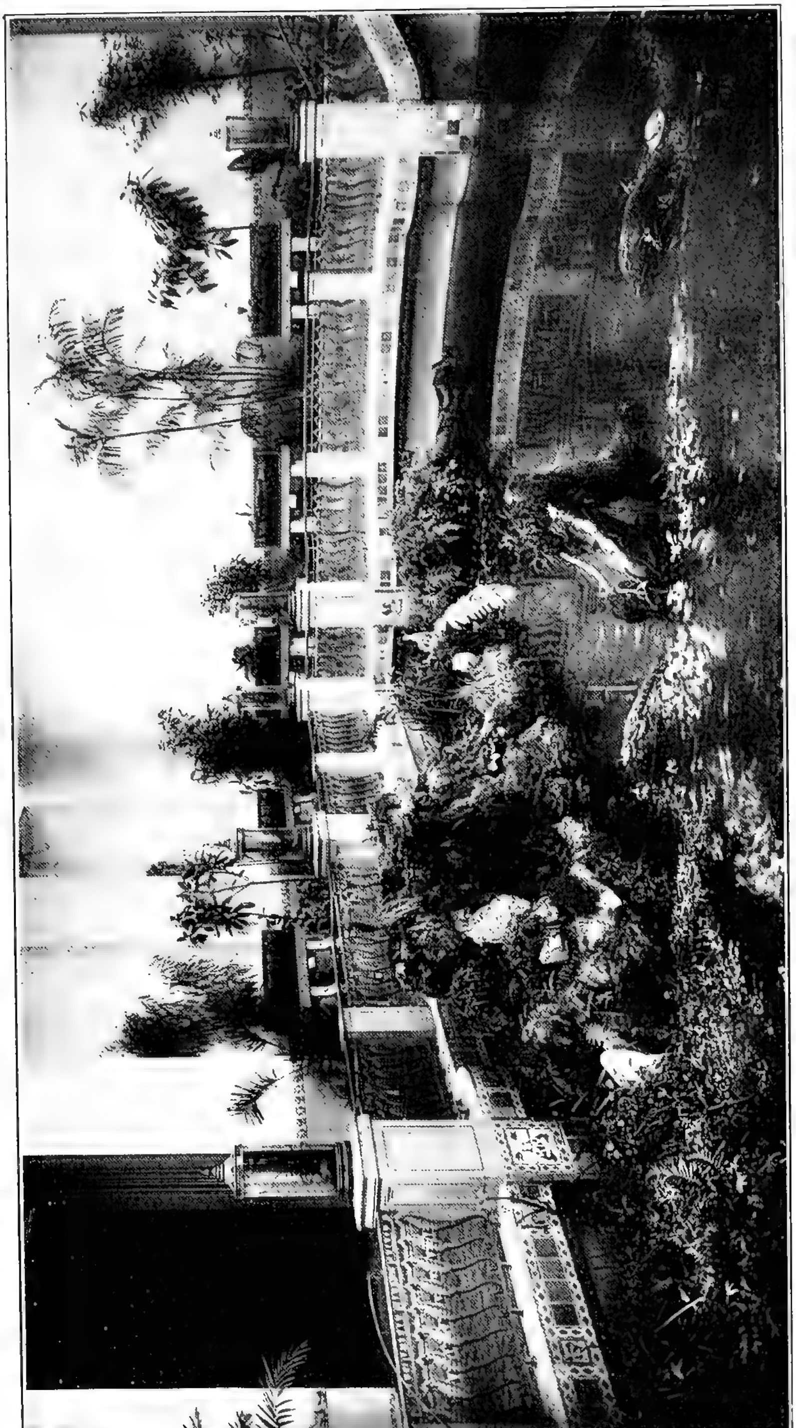
> We went to the fisheries fair,
> The suckers and chubs were there;
> And old Cottus blob with a red corn cob
> Was combing the bullfrog's hair.
> Pantosteus he got drunk
> And fell on Agosia's trunk,
> Rhinichthys sneezed
> And fell on his knees,
> And that was the end
> Of the Blob,
> blob,
> blob.

With these many years of intimate association with Dr. David Starr Jordan in the study of fishes, it was quite natural that I, his student, should develop an interest in live fishes as well as fishes preserved in alcohol. So, in 1916, when some one told me that Mr. Ignatz Steinhart, a public-spirited citizen of San Francisco, was also interested in fishes and aquariums, I determined to meet him.

Through a mutual friend, the late Rudolph J. Taussig, I first met Mr. Steinhart on March 8, 1916. Mr. Steinhart spoke freely of his long interest in public aquariums and the interest of his brother Sigmund Steinhart; how he had dreamed for years of establishing a public aquarium in San Francisco; how he had visited all the aquariums in America and Europe; how he had employed experts to study aquarium problems and assemble data for him; how he had made propositions to various individuals and organizations to join him in the undertaking; how he had met with one difficulty and rebuff after another, until finally he had become so discouraged that he abandoned the idea entirely and decided to devote his money to an entirely different purpose. His decision seemed to be final; and I left Mr. Steinhart that evening with the feeling that there was no hope that he would ever put any money into an aquarium.

Two days later Mr. Steinhart phoned me to come and take luncheon with him at the California Market. I did so and he at once said that he had been thinking about the aquarium

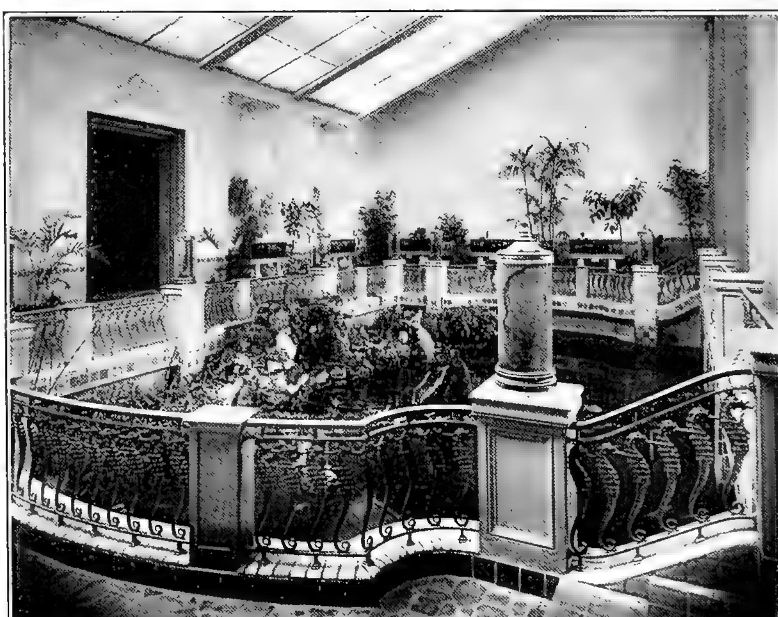
IGNATZ STEINHART (1840-1917)
FOUNDER OF THE STEINHART AQUARIUM
OF THE
CALIFORNIA ACADEMY OF SCIENCES



THE SWAMP ROOM OF THE STEINHART AQUARIUM

It is approximately 58 feet by 60 feet. In the center of the room is a swamp 24 by 40 feet, in which are shown many species of aquatic animals, including alligators, frogs, turtles, salamanders and water snakes; also aquatic plants. Around the swamp are two series of balanced aquariums which are very attractive and interest the public greatly.

A Portion of the Swamp Room in the Steinhart Aquarium



Another View of the Swamp in the Steinhart Aquarium
Note the artistic railing around the swamp

his sudden death May 15, 1917, and the announcement that he had left in his will $250,000 to the California Academy of Sciences for an aquarium building and its equipment.

The executors paid the $250,000 to the Academy December 17, 1919. Immediately thereafter the architect's engineer, Mr. Trygve Ronneberg, and I went east and visited all the aquariums in America, and in the summer following I visited that at Honolulu. The knowledge gained from a study of these aquariums was of great value in our planning of the Steinhart Aquarium. When the $250,000 was paid to the Academy (December 17, 1919) building conditions were not good, so the trustees loaned the money at a good rate of interest payable monthly. Whenever a monthly interest payment was received government certificates were bought with it. As a result something near $55,000 in interest has now been received, and we have put $305,000 instead of $250,000 into the building and its equipment. Building operations began April 1, 1922, and you now see the building practically completed.

In certain features the Steinhart Aquarium is the most complete and satisfactory of any in this country.

We have four kinds of water—fresh water of the local temperature for local freshwater fishes and similar species; fresh water cooled to meet the needs of trout, salmon and other cold water species; salt water of the local temperature for local and other salt-water species suited to that temperature; and salt water warmed to meet the needs of fishes from the Hawaiian Islands and elsewhere in the tropics.

There will be upwards of 110 tanks, large and small, and large outdoor pools. One unique feature is a large indoor tropical swamp stocked with various species of turtles, frogs, water snakes, salamanders, alligators and aquatic plants. Around the tropical swamp are two series of balanced aquariums which are very beautiful and interesting.

Another unique feature is a fish-hatching equipment where an expert detailed by the State Fish and Game Commission will demonstrate the methods of fish culture. Still another unique feature is a well-equipped biological laboratory in which college professors, high school teachers, students and others can carry on investigations of any problems of aquatic life that can be studied from aquarium material. It is expected that this laboratory will prove of real value to the public schools.

The aquarium employs what is known as the closed circulation system: the water being stored in large reservoirs from which it is kept circulating through the aquariums, the same water being used over and over again for years.

The object has been to carry out the wishes of Mr. Steinhart by providing an aquarium that will be of the broadest general interest and that will be of the highest educational value to the city and the state. To what extent this aim has been realized you can judge when you enter the aquarium.

The staff has now been selected and the aquarium is in operation. We are fortunate in having secured as superintendent in immediate charge of the aquarium Mr. Alvin Seale, who built the Manila Aquarium, which he operated for several years. As principal expert assistants to Superintendent Seale we have secured Mr. H. Walton Clark, for many years connected with the United States Bureau of Fisheries, and Mr. Wallace Adams, as assistant superintendent.

That this occasion is a very happy one for me may well be believed. It marks the realization of an ambition that has possessed my soul for many years. And I can repeat what I have often heard Dr. Jordan repeat from good old Izaak Walton: "It is good luck to any man to be on the good side of the man who knows fish." And I may add, it is good fortune for any man to have "walked with Jordan," and doubly blest is he who has *fished* with Jordan.

And as we are assembled here today, my thoughts go back to that delicious day at Cumberland Falls 45 years ago. The wax was soft then and the impress grew indelible. I see again the whole scene—the great silvery waterfall, the broad sheets of white and green water pouring over the precipice to lose themselves in the swish and swirl of the great cauldron at the base; the spray filling the gorge, the spray-washed and diamond-studded ferns and moss and shrubs on the walls, the gorgeous masses of flowers, the mist rising above the gorge and gleaming in the sunlight, and the rainbow arching all.

The professor and his pupil sit together here again today. In imagination they have reached the rainbow's end, and they have found, not the mythical pot of gold, but something of vastly greater interest and value to you and me and all the people of California—this beautiful aquarium, this splendid enduring memorial to Ignatz Steinhart, erected, in the felicitous words of the donor, "for the benefit of the inhabitants of San Francisco and others who may enjoy said aquarium and derive knowledge and information therefrom."

Would that Mr. Steinhart could be with us here today and enjoy with you and me and all of us, and that all of us might enjoy with him, the fruition of his dream.

Numerous letters and telegrams that had been received from institutions and individuals in various parts of the United States and elsewhere conveying felicitations and congratulations were read, a few of which may be mentioned:

Luther Burbank; Riverside Public Library; Duncan Burnet, librarian, University of Ga.; Jarl Lindfari, vice-consul of the Republic of Finland; Iowa Geological Survey; U. S. Naval Observatory; William McInnes, Director Victoria Memorial Museum; American Philosophical Society; Professor Henry Fairfield Osborn, President, Am. Mus. Nat. Hist.; President, Univ. of Mich.; Dr. J. N. Rose, U. S. N. M.; Dr. Charles D. Walcott, Secty. Smith. Inst.; Dr. E. J. Allen, Director Marine Biological Assn. of the United Kingdom, Plymouth, England; President of the Tokyo Imperial University; C. Anderson, Director, Australian Museum, Sydney; Académie des Sciences de Russie; Botanischer Verein de Provinz Brandenburg; Dr. Charles H. Townsend, Director, New York Aquarium.

AQUARIUM PERSONNEL

The personnel of the Aquarium is as follows:

Dr. Barton Warren Evermann, Director, part time; W. W. Sargeant, Secretary, part time; Susie M. Peers, Secretary to the Director, part time; Mrs. Constance W. Campbell, stenographer and typewriter, part time; Alvin Seale, Superintendent; Wallace Adams, Assistant Superintendent; H. Walton Clark, Aquarist and Chief Collector; William J. Martin, Assistant Collector; Clynt S. Martin, Chief Engineer; Frank Terlin, Assistant Engineer; John R. Moorefield, Assistant Engineer; H. F. Stevens, Relief Engineer; Charles Brandt, Chief Attendant; W. S. Walker, Assistant Attendant; Clyde E. Guidry, Assistant Attendant; Peter J. Burke, Janitor; Patrick O'Neill, Assistant Janitor; S. J. Shenefield, Carpenter; and Lucie Hicks, Door Attendant.

Committee on Conservation of Wild Life

This is one of the Academy's most active committees. Its membership consists of M. Hall McAllister, chairman; Barton Warren Evermann, W. B. Lewis, John R. White, and S. Leonard Abbott.

Among the most important achievements of the committee may be mentioned the following: The Academy's Conservation Committee was appointed to act as the California or Pacific Coast representative of the Permanent Wild Life Protection Fund of New York, Dr. W. T. Hornaday, Trustee. Through the Academy's Special Observers, the Committee has distributed considerable conservation literature and given much publicity to conservation matters.

The Committee also makes and publishes an Annual Census of certain large mammals in California.

The census for 1923 was as follows: Valley Elk, 468 animals; Mountain Sheep, 212 animals; Antelope, 1007 animals.

Valley Elk—An occasional visit is made to the herd in Kern County, where the animals live an undisturbed life among the willows and tule lands bordering Buena Vista Lake. The Academy caught up and distributed in 1914 and 1915 about 166 Valley Elk from this herd. The herds giving most promise are those in the paddock in the Yosemite Valley, which now number eleven head, and, that on the Monterey peninsula, which number about thirty.

The animals were placed in the following reservations or parks: Balboa Park, San Diego; J. M. Danziger property, Santa Monica Mountains, Los Angeles County; E. L. Doheny property, Santa Monica Mountains, Los Angeles County; City Park, Riverside; Modesto City Park, Modesto; California Redwood Park Association, Big Basin; Seventeen-mile Drive, Monterey; Santa Cruz City Park; Alum Rock Park, San Jose; Mooney Park, Visalia; Fresno City Park; A. V. Lisenby Park, Friant; P. H. Loinaz Park, Fresno; John Zapp Park, Fresno; Vancouver Pinnacles; J. F. Dunne Park, San Felipe; Del Paso Park, Sacramento; City Park, Petaluma; Eden Valley, Mendocino County; and the Yosemite Valley.

Mountain Sheep—These animals live in the inaccessible desert mountains of southern California. The Committee has had posted a number of metal signs of WARNING and REWARD on or near their habitat.

One law-breaker was arrested and fined $100 for killing two sheep in the Southern Sierra and our first $50-reward was paid to the informer.

Antelope—The Mount Dome Herd in Siskiyou County, northern California, which numbers over 100 animals, has been our special care. They are now ranging in their usual habitat in the Modoc Lava Beds. The Committee has also posted all the Antelope country with metal warning signs and endeavors by reasonable publicity to give these animals all protection possible. It might be noted that the U. S. Biological Survey joined with a private subscription of $1000—(made by a member of the Academy) and a fund was raised which was used to capture in northwestern Nevada some 40 antelope fawns. This herd is now being held in Reno, Nevada, and will shortly be transferred to their permanent home on the Tonto Plateau in the Grand Cañon of the Colorado in Arizona.

Subscriptions—The following amounts have been received during the year for use of the Conservation Committee:

Permanent Wild Life Protection Fund	$300
American Bison Society	100

Special Wild Life Observers

California Academy of Sciences, San Francisco

1. Albright, Horace M.......Superintendent, Yellowstone National Park, Wyoming.
2. Anthony, Alfred W.......237 Spruce Street, San Diego, California.
3. Courtright, George W.....Malin, Klamath County, Oregon.
4. Cuthbert, Edmund R.....David, Chiriqui, Panama.
5. Durbin, William G.......Susanville, Lassen County, California.
6. Eakin, J. Ross...........Superintendent, Grand Canyon National Park, Grand Canyon, Arizona.
7. Hedderly, Edwin A.......Pacific Finance Building, Los Angeles, California.
8. Hutchings, H. W.........Acting Superintendent, Glacier National Park, Belton, Montana.
9. Jaeger, Edmund C........Director, Riverside Junior College, Riverside, California.
10. Karstens, Henry P........Superintendent, Mount McKinley National Park, McKinley Park, Alaska.

11. Lee, William J. . . . . Susanville, Lassen County, California.
12. Lewis, Washington B. . . . . . Superintendent, Yosemite National Park, Yosemite, California.
13. Miller, John O. . . . . Tennant, Siskiyou County, California.
14. Ober, Edwin H. . . . . Big Pine, Inyo County, California.
15. Russell, Carl P. . . . . Park Naturalist, Yosemite, California.
16. Sanson, N. B. . . . . Banff Museum, Banff, Alberta, Canada.
17. Shay, Arthur T. . . . . Upland, San Bernardino County, California.
18. Thomson, Charles Goff. . . . Superintendent, Crater Lake National Park, Medford, Oregon.
19. Tomlinson, Owen A. . . . . . . Superintendent, Rainier National Park, Ashford, Washington
20. White, John R. . . . . Superintendent, Sequoia National Park, Sequoia, Tulare County, California.

Department Reports

Department of Botany

Following is a statement of the approximate number of species and specimens in cases in the Herbarium at this date.

	Species	Specimens
General collection in 68 cases	42,288	122,852
Mosses	1,511	3,826
Hepatics	180	562
Lichens	849	1,541
Algæ (Prager Herbarium)	614	614
Fungi " "	3,656	3,656
Ferns " "	985	985
Cereals " " (Hohenacker collection)		172
	50,083	134,208

The number of specimens in the Prager Herbarium is still unknown as the catalog which came with the herbarium, lists species only and many species are represented by specimens from different regions. The algæ, ferns and fungi are in the original packages and only the catalog has been used in numbering species and specimens. When we are able to stamp and number every specimen sheet in the herbarium an exact report can be obtained; probably the number of specimens is at least 150,000. The boxes of microscope slides are also unlisted. These specimens consist of diatoms, mosses and fungi beautifully mounted.

The most important accessions during the year have been as follows: 407 specimens of flowering plants donated by Ellsworth Bethel of the Colorado State Museum, collected chiefly in Shasta County, California, while engaged in the Blister Rust Investigation; 1178 specimens from southern China and Siam collected under the auspices of the Canton Christian College and obtained from Walter T. Swingle in exchange; 418 specimens, chiefly exotics, donated by Eric Walther and collected by him in gardens and parks in the San Francisco Bay Region, Santa Barbara and Monterey; 850 specimens from the National Herbarium in continuation of exchange; 229 specimens from southern California, sent by Philip A. Munz, from the Baker Herbarium, Pomona College, Claremont, California, in exchange; 351 specimens of trees and shrubs from the Arnold Arboretum in continuation of exchange; 189 specimens donated by Mrs. Charles W. McKelwey collected in Glacier National Park and the Atlantic States.

More than 50 individuals have contributed specimens chiefly for identification. Their names will appear on the list of donors. The Curator collected as follows, not including mosses which are listed separately: Angels Camp, Calaveras Co., 106; Shasta Springs, Siskiyou Co., 121; Mt. St. Helena, 45; Mt. Hamilton and Mt. Diablo, 24; Yosemite Valley, 53; Del Norte Co., 400; Humboldt Co., 41; Point Reyes, 56; Lower California, 96; Los Angeles, 14; Santa Barbara (exotics), 44; a total of approximately 894 specimens not including many duplicates.

The collection of mosses has been increased by almost 500 specimens. Miss Anna Head collected in the Feather River Region, Mrs. Enid Michaels in the Yosemite Region, Mrs. E. C. Sutliffe and Mrs. Marian L. Campbell in Marin Co., Mrs. S. E. Hirstel in Yosemite Valley, and Miss Stella Handelin at Eureka, Humboldt Co. Mr. R. E. Bradshaw of Palo Alto has donated 18 fine specimens named by authorities. The Curator has collected about 400 specimens of mosses wherever collections of other plants have been made and especially in Marin Co. on Mt. Tamalpais and in Mill Valley. These collections are mostly undetermined. Some are now in the hands of specialists; others will be sent later and none is as yet incorporated in the general collection.

Besides collecting mosses, Mrs. E. C. Sutliffe has taken charge of our collection of Hepatics, sending the fresh collections to Professor Alexander W. Evans at Yale University for determination. There have been added two genera and three species to the known flora of California. She has donated 30 specimens received in exchange from Miss C. C. Haynes, Highlands, New York.

The collection made by Ivan M. Johnston in Lower California on the expedition of the California Academy of Sciences in 1921 has been mounted and incorporated into the herbarium. There are 1418 specimens of flowering plants and ferns including 46 types of new species and subspecies. The collection of Algæ is a notable one, containing 122 specimens and including 55 types. This collection will form the basis of a paper on the Algæ of Lower California by Dr. W. A. Setchell and Dr. N. L. Gardner, now in press. [1] They have added to the collection two types collected by Walter E. Bryant on an Academy Expedition many years ago and 5 types collected by T. S. Brandegee. There are also 12 cotypes from the collection of Mrs. Marchant.

The duplicates of the flowering plants and ferns of the Johnston collection have been labelled and arranged in six or seven sets, each set having also been listed. These sets will be sent to the most important herbariums for exchange when Johnston's paper has been published and distributed. There are 3472 duplicates.

The herbarium donated by Professor George R. Kleeberger has also been incorporated into the herbarium. Besides the valuable collection of mosses and hepatics there are 3293 mounted and 2256 unmounted specimens. It includes a valuable numbered set of plants collected by Kellogg and Harford

[1] This report has been published as Proc. Calif. Acad. Sci., Vol. XII, No. 29, pp. 695-949, pls. 12-88, map.

in 1868-69, containing duplicates of types and part of the collections on which the Botany of the California Geological Survey was founded; also a collection from the herbarium of D. C. Eaton, specimens collected in Utah on the Clarence King Exploration of the 40th Parallel. The donor's own collections in Connecticut, Wisconsin and California add to the great value of this herbarium.

The exhibition of flowers, both native and exotic, which is maintained in the vestibule of the Museum is one of the most popular features of the Museum and has great educational value. Each specimen is labelled with the scientific and common name and, in the case of the native flowers, the locality, while the native country is given with the exotics. More than a thousand species are on exhibition during the year, as there is continual change. Some good friends of the Academy have been of great assistance in sending or bringing specimens. Mr. W. P. Steinbeck of Stockton has sent beautiful flowers from the Sierra Nevada almost every week during the flowering season, Mrs. E. C. Sutliffe and Mrs. S. E. Hirstel have brought in lovely specimens from Marin Co.; while Eric Walther has contributed almost all the exotics, a most important part of the exhibition. Mrs. Johanna Wilkens has been as usual most efficient in keeping the exhibition clean and in good order.

My assistant, Mrs. George H. Phelps, has done excellent work in mounting the numerous accessions and distributing them into the herbarium. The evening class of the gardeners and the Botanical Club have had regular meetings and excursions. Popular talks on botanical subjects and conservation have been given to various clubs and the influence of the Academy thereby extended. The list of trees, shrubs, and hardy perennials in Golden Gate Park has been completed and will soon be published in the Report of the Park Commissioners. This list has been prepared by Eric Walther under the supervision of John McLaren, Superintendent of the Park. The determinations have been made by the Curator. There are 125 families, 569 genera, 1679 species and 788 varieties, making a total of 2167 labelled specimens. This work has taken a great deal of time and its success is due to the untiring efforts of Eric Walther.

A catalog of the exotics cultivated out-of-doors in California would be a most useful and illuminating publication and could be made from the fine collection now in our herbarium.

My greatest need is more help as my time is taken up altogether with curatorial work that cannot be done except by a botanist.

ALICE EASTWOOD, *Curator.*

DEPARTMENT OF ENTOMOLOGY

Work in the Department of Entomology in 1923 was characterized more by the development of the material on hand than by extensive additions. Circumstances made it inadvisable for the curator to do the usual amount of field work but more was accomplished in the mounting of accumulated material and the determination and arrangement of the unworked species. Dr. F. E. Blaisdell continued his work on the Academy collection of Coleoptera, and a number of difficult and interesting families of beetles have been gotten into shape and await the purchase of the necessary cases for their arrangement. Dr. F. R. Cole completed a second installment of his report on the Diptera of the Gulf Expedition, covering most of the families except the Bombyllidæ reported on in 1922, and in October, at considerable personal sacrifice he spent three weeks at the Academy working over the dipterous insects accumulated during the past two years, thus making possible the rearrangement of our entire collection of the two-winged flies. During the early part of the year Prof. T. D. A. Cockerell completed work on four families of the bees of the Gulf Expedition, and after his return from Siberia, he completed six more families. These studies on the bees show a large percentage of new forms among the Mexican material (64 out of 106 being new) and greatly enhance the value of this portion of the Academy collection of insects. Mr. C. D. Duncan completed the study of the Academy material in the Vespidæ, including the hornets and yellow-jackets, and Mr. C. L. Fox studied the digger wasps of the Family Bembecidæ. Mr. Morgan Hebard finished his work on the orthoptera of the Gulf Expedition. Mr. Ralph Chamberlin that on the spiders and millepeds, and Mr. Joseph Chamberlin that on the pseudoscorpions. Finally, the curator was able to devote some time to systematic work on the North American Hemiptera, completing work on the Chermidæ and nearly completing that on the Cicadellidæ. Dr. E. C. Van Dyke, who each year adds largely to the collections of the Academy, spent the whole year in China where he again made extensive collections of insects for the Academy of Sciences. This material did not reach us until too late for inclusion in this report but will be fully covered in the report for next year.

Accessions to the Department of Entomology in 1923 number 13,045 specimens slightly fewer than in the preceding year.

Field work by the curator included a week spent at Potholes, California, and Yuma, Arizona, in April, a week in Mill Creek Cañon, San Bernardino Mountains, in September, as the guest of Dr. F. R. Cole and his parents, and about four days' work at Ensenada, Lower California, and Alpine in San Diego County, in September, one day at Mt. Diablo in May and one day at Pittsburg, California in November, as the guest of Mr. and Mrs. J. O. Martin. The total number of insects added by this field work is 4630. Other important accessions are: From F. F. Crevecoeur, 1541 beetles from Kansas, in part purchased; Mr. J. A. Kusche, 1322 specimens, mostly exotics, purchased; Mr. Clifford Dodds, 1241 insects from Mexico, in addition to those recorded last year; Mr. J. O. Martin, 719 specimens, including many rare forms and the types of seven species of beetles described by him; Mr. C. L. Fox, 619 insects, largely from the Sequoia National Forest; Mr. Louis Slevin, 509 specimens from Monterey Co., California; Dr. F. E. Blaisdell, 362 insects, including types and a valuable series of western cicadas; Mr. Herman Peters, 360 specimens from Queensland, recorded but not enumerated in our report for 1916; Mr. E. R. Leach, 197 insects; Mrs. H. E. Ricksecker, 183 insects from California; Miss Louise Knobel, 182 insects from Arkansas, purchased; Mr. B. C. Marshall, 148 beetles from Arkansas; Mr. J. R. Slevin, 136 insects taken in field work in Lower California; Mr. A. Christoffersen, 125 insects from the Pribilof Islands; Mr. F. R. Jones, 44 insects; Mrs. S. A. Anderson, 21 insects from Columbia, some of them large and interesting forms; Dr. C. H. Kennedy, 228 dragon-flies, mostly from California, and all correctly determined. Other smaller donations were received from various friends of the Academy and from Mr. George P. McNear, a complete set of the 10 volumes of L'Echange, a rare entomological journal published in Paris.

During a part of the year the curator was fortunate in having the help of Mr. J. O. Martin. This made possible the mounting and labelling of all material secured during the year and of much that had accumulated during previous years.

One gratifying feature of the Academy activities directly related to the Department of Entomology was the publication of 17 papers on the entomological results of the 1921 Expedition to the Gulf of California. These papers already fill 388 pages of the Academy Proceedings and enumerate 710 species and subspecies, of which 284 are new to science. Two other completed papers now await publication and there are several groups of insects still to be studied including the balance of the Coleoptera, Hymenoptera and Lepidoptera, the Neuropteroid insects and a few Diptera.

Another interesting feature of the work of this department is the growth of the collection of type specimens of insects. These now number 1383 holotypes and allotypes and include the holotypes of probably 800 or more species of insects. Unfortunately the types of most of our western insects have been taken by commercial collectors and sold to eastern museums where they are quite inaccessible to western students. This condition is quite paralleled by that formerly existing in the east where so large a proportion of the species were sent to Eruope in earlier years and now the student of eastern insects must cross the Atlantic to examine the types of many of his species, an undertaking comparable to the trip to the east required of our western students. In both cases it is a serious handicap to entomological work. The feeling formerly existing that most serious entomological work is done in the east and therefore the types should be preserved there, no longer holds good. The California Academy of Sciences is doing its part in supplying storage facilities, as safe as they can be made, and in encouraging the placing of the types of western insects in western museums where they will be of most service to science. It is to be hoped that in time a broader view of the field on American entomology will induce eastern workers to place the types of western species that may come into their hands in western museums where they will be accessible to workers in that fauna.

Edward P. Van Duzee, *Curator*

Department of Exhibits

As all of the space for large habitat groups is occupied, the work in the exhibition halls is necessarily confined to the installation, in the panels between the large ones, of more of the smaller groups. Four of the latter have been installed during the year by the chief taxidermist, Mr. Frank Tose, as follows: Ring-tailed Cat (*Bassariscus astutus raptor*); Allied Kangaroo Rat (*Dipodomys merriami simiolus*), Burrowing Owl (*Speotyto cunicularia hypogæa*), and Sierra Golden-mantled Ground Squirrel (*Callospermophilus chrysodeirus chrysodeirus*). Two panels were arranged to display seal skins in successive stages of preparation.

In addition to this work three additional portable groups for school use have been arranged, and construction begun upon others. There is constant demand for these groups, and more will be constructed as opportunity presents.

Mr. Tose has also done some exchange work with other departments, such as: the installation of the group of Northern Elephant Seal (*Macrorhinus angustirostris*) in the Steinhart Aquarium, the making of casts of a huge turtle for the Department of Herpetology, and the tanning of a number of large mammal skins, many of which really belonged in the Department of Mammalogy.

Material for this department has been received as follows: *By exploration*, 41 specimens. *By gift:* John McLaren, 1; W. M. Phillips, 2; J. S. Scupham, 2. *By purchase:* 3 specimens.

Joseph Mailliard, *Curator.*

Department of Herpetology

At the beginning of the year 1923 the Academy's collection of reptiles and amphibians numbered 51,006 specimens. There have been added during the year 2132 specimens, so that the collection has grown to 53,138 specimens.

The number of specimens added during each of the past six years has been about as follows: In 1918, 1724 specimens; in 1919, 2666; in 1920, 1466; in 1921, 5002; in 1922, 4934; and in 1923, 2132 specimens.

Gifts of specimens during the year have been received as follows: From Frank Arundell, 4 specimens; H. L. Mason, 1; Prof. H. M. Hall, 14; Steinhart Aquarium, 44; J. L. Hitchcock, 1; L. M. Klauber, 213; S. F. International Fish Co., 1; H. P. Losing, 1; Mrs. E. C. Sutliffe, 1; Don P. Johnston, 1; Frank Stevens, 3; Dr. L. A. Draper, 1; and Dr. E. C. Van Dyke, 32.

Specimens have been secured from 12 counties of California, as follows: Imperial, 24 specimens; Lake, 1; Los Angeles, 4; Marin, 1; Orange, 29; Riverside, 86; San Diego, 448; San Luis Obispo, 11; Santa Barbara, 12; Sonoma, 1; Tuolumne, 15; and Ventura, 38.

Specimens from other localities are: Alabama, 1 specimen; Arizona, 21; Florida, 5; Indiana, 4; Iowa, 1; Michigan, 1; New York, 23; North Carolina, 6; Texas, 4; Utah, 1; Washington, 207; Africa, 2; Asiatic Russia, 2; Australia, 101; Bonaire Island, 3; Brazil, 2; China, 45; India, 1; Japan, 4; Mexico, 856; Pacific Ocean, coast of Calif., 1; Philippine Islands, 170; South America, 1; West Indies, 3.

Descriptions of five new species and subspecies of snakes from Mexico and Asia were published in the year.

Through the courtesy of Professors Alfonso L. Herrera and José Maria Gallegos, the Curator and Assistant Curator, in the early summer were the guests of the Mexican Government on an expedition to the San Pedro Martir Mountains in northern Lower California. During the period of preparation for this expedition to the mountains collections were made in San Diego, Imperial, Orange, Riverside, and Los Angeles counties, California, and on the Todos Santos Islands in Lower California. This field work resulted in 1327 specimens of reptiles and amphibians, of which four snakes were new to science.

John Van Denburgh, *Curator.*

Department of Invertebrate Paleontology

At the close of 1922, Mr. Frank M. Anderson and the curator were busily engaged in the task of preparing a report on the Eocene invertebrates found at the type locality of the Tejon Group in Kern County, California. The work was finished early in the year and the paper awaits an opportunity for publication. It is one of the most comprehensive papers thus far prepared in the department.

The completion of this task cleared the way for Mr. Anderson to proceed with his studies of the paleontology of Colombia, South America, and reports on the large collections which were donated to the Academy were in course of preparation at the end of the year.

When the work on the Tejon Eocene was finished the curator began to devote such time as he was free from routine duties to the study of the fossil micro-organisms of the western sediments. In May an arrangement was made with the Pacific Oil Company and its associates whereby half-time was devoted to the microscopical study of sediments from its oil wells and the application of the information thus obtained to economic problems. The remainder of his time was devoted to purely Academy duty or research. The arrangement proved very satisfactory to all concerned. A full time assistant was provided by the company. Mr. Roy T. Hazard filled the position until he returned to the University of California in August. He was followed by Mr. H. L. Driver who continued to the end of the year. All work was done in the laboratories of the Academy. In a few months it resulted in the accumulation of a very large collection of microscopical material. New equipment was installed and methods of study devised which greatly facilitated the work. The department became an exceedingly busy place and is now the headquarters for such work in the west. Students and professors of both neighboring Universities sought and were given assistance on a great many occasions.

The reduction of Academy time and expense of the curator through the above mentioned arrangement permitted the employment of a full time assistant in the Academy work and the return to the general fund of a considerable part of the original expense appropriation allotted to the department. Mr. Merle C. Israelsky filled the position of assistant very creditably and much valuable work was accomplished during the remainder of the year.

From time to time Mr. William Barbat was temporarily employed in the department and he completed most satisfactorily the arrangement of the vast collection of Gulf of California marine shells. This collection is now stored in such a way that it is readily accessible in any part. Dr. Fred Baker of Point Loma, California, continued his studies of the collection but the final report may not be expected before the close of 1924, owing to the huge task which confronts him.

The field work which was carried on was largely in connection with microscopical studies but considerable collections of higher organisms were obtained at various places in California. The Academy was put to practically no expense in this connection.

Two accessions during the year deserve special mention. Three hundred species of named fossils from Europe were obtained in exchange for minerals from Mr. R. W. Wilke of Palo Alto, California. A very large and accurately labelled collection of California fossils consisting of many thousand specimens was donated by the Southern Pacific Company.

Outstanding loans of material for scientific study from the department at the close of the year were as follows:

Professor Bruce L. Clark, University of California, Berkeley, Fossil mollusks from the Tertiary; Dr. Mary J. Rathbun, U. S. National Museum, Washington, D. C., Fossil crustaceans from Western Teritiary; Dr. Paul Bartsch, U. S. National Museum, Washington, D. C., Marine shells from the Galapagos Islands; and Mr. Donald Hughes, Stanford University, Pleistocene Foraminifera from Lomitas, California.

G. DALLAS HANNA, *Curator.*

LIBRARY

Work in the library of the Academy during the year 1923 was largely of a routine nature. All books received were accessioned, cataloged and properly shelved, and periodicals and exchanges were collated and arranged on the shelves with the series to which they belong. The task of collating and arranging the accumulated material pertaining to Education, Engineering, Astronomy Meteorology, Physics and a few related subjects, was completed, thus placing the collection of material in the lower library room in shape for convenient use.

During the summer a considerable number of duplicate volumes in the library storeroom was transferred to the library of the Steinhart Aquarium as a loan, where it will be of service in strengthening the library facilities of that department of the Academy's activities.

The total number of volumes added during the year was 357, of which 44 were secured by purchase, 251 by exchange for the publications of the Academy, 39 were added through subscription to scientific serials and 23 were received by gift. This enumeration does not include pamphlets and excerpts of which many were received, mostly as gifts. It is gratifying to note that the Academy is now receiving regularly its exchanges from nearly all countries in the war zone, including Russia, these receipts embracing most or all the back numbers issued since their interruption in 1914.

Use of the library by the Academy staff has increased during the past year as has that by the general membership. More use has also been made of the privilege of inter-library loans which has materially supplemented the resources of the Academy library.

As during the preceding year the work in the library has been done by Mrs. Helen Van Duzee with some assistance during the later weeks of the year from Mr. Dean Burk, both of whom have rendered efficient service.

EDWARD P. VAN DUZEE, *Assistant Librarian.*

DEPARTMENT OF MAMMALOGY

Work in this department is carried on in conjunction with that of the Department of Ornithology and by the curator of the latter, so that the field work covers the same territory in both cases.

When the present curator took charge, there was a large accumulation of unprepared osteological specimens, for which there had been no means or time to put in proper condition for preservation. Steam-heated apparatus has been installed upon the roof of the Museum building, and the assistant curator, Miss McLellan, has been devoting her energies during the last part of the year to the preparation of these specimens and with most satisfactory results.

There has been also on hand a number of unprepared hides of large mammals. These have been carefully tanned by Frank Tose, of the Department of Exhibits, and are now stored in their proper place.

The present curator and assistant curator have had their time so occupied as to be unable to finish the identifying and proper labelling of all the specimens in the mammalogical collection, but this work is carried on as time permits and is well under way.

Accessions to the collection have been as follows: *By exploration*, 171 specimens. *By gift:* John Cebrian, 1; H. Walton Clark and William J. Martin, 28; California State Department of Agriculture, 1; Mrs. Kleupfer, 1; Miss Sarah Lindsay, 1; Dr. Homer Righetti, 1; Francis A. Smith, 11; W. M. Phillips, 3; Steinhart Aquarium, 2; U. S. Bureau of Fisheries, 3. *By purchase*, 48 specimens. Specimens in the collection now number 4426.

JOSEPH MAILLIARD, *Curator.*

DEPARTMENT OF ORNITHOLOGY

Excellent progress can be reported from this department for the year 1923. All of the cataloging and card-indexing has been brought up-to-date by the assistant curator, Miss M. E. McLellan, who has also completed the mounting and arranging of the egg collection.

Field work has received as much attention as the funds allotted to the department would allow, and included a week's trip in early April to Potholes, Imperial County, California, by the curator, accompanied by Mr. Frank Tose as assistant and Dr. Barton Warren Evermann and Mr. E. P. Van Duzee; continuous field work from April 26 to June 25, with R. J. Woods as a student assistant, and with car and camp equipment, in Shasta, Lassen, and Modoc counties; work conducted at points in Butte and Lassen counties, from August 27 to September 30; and a few days at the end of the year at Inverness, Marin County, California, as the guest of Mr. and Mrs. Hugh B. Logan. Observations were carried on and specimens were secured at all the places visited.

The collections of the department have been made use of by students of ornithology, and school teachers take advantage of the loan collection of birds for use in their classes.

Accessions to the collections have been as follows: Bird skins:—*By exploration*, 464 specimens. *By gift:* Wallace Adams, 111; California Fish and Game Commission, 1; John Cebrian, 1; I. B. Connett, 1; E. C. Counter, Jr., 1; Dr. E. Goodman, 1; Joseph Mailliard, 3; Ignatius McGuire, 1; John McLaren, 2; W. M. Phillips, 3; E. G. Schmiedell, 1; M. J. Smith, 1; Earl B. Snyder, 1; C. A. Westenberg, 1. The total number of specimens on hand at the end of the year 1923 is 39,931, an increase of 593 over last year's total.

Nests and birds' eggs have been received, as follows: *By exploration*, 7 specimens. *By gift:* A. P. Christoffersen, 36; H. J. Grauerhalz, 1; Mrs. Lucy M. Zoberbier, 1.

JOSEPH MAILLIARD, *Curator.*

Steinhart Aquarium

The Steinhart Aquarium opened its doors to the public September 29, 1923. The 85 exhibition tanks have all been stocked, maintained, and kept reasonably clean. The several thousands of animals have been regularly fed and cared for, and the building has been kept open to the public every day,—including Sundays and all holidays, from 10 a. m. until 5 p. m.

On January 1, 1924, there were on exhibition a total of 8,046 animals representing 177 species. These are divided among the animal kingdom as follows: 7891 fishes, 75 turtles, 35 snakes, 4 alligators, 12 frogs, 5 fur seals, 2 Steller sea lions, 2 California sea lions, 1 leopard seal, 1 canvas-back duck. Not included in the above total are a number of invertebrates, among them being 200 crabs, starfish, sea urchins, hermit crabs, etc. The mortality list numbers 334 fishes, which is not excessive. Most of these dead specimens have been preserved and form the nucleus of a study collection.

The 16 tanks of tropical fishes from the Hawaiian Islands constitute one of the most popular exhibits in the Aquarium. There are now 226 of these fishes representing 51 species. This number will soon be increased. One of the most satisfactory exhibits is the five tanks of Golden Trout from the Kern River region. All of the known species of Golden Trout are shown, also the Kern River trout, *Salmo gilberti*. Of the 141 golden trout placed in the exhibition tanks July 31, only three small ones have died.

In the normal salt-water tanks the brilliantly-colored Garibaldis (*Hypsypops rubicundus*) form a very attractive exhibit. They share the popular attention, however, with the large California pipefish, leopard sharks, emybro skates and electric rays. There are 407 specimens of fish in the 16 tanks of normal salt-water, representing 45 different species.

The exhibits have been acquired in three different ways:—(1) collected by members of the Aquarium staff; (2) purchased outright; (3) received as gifts. The greater number have been acquired in the first manner. The Steller Sea Lions, California Sea Lions, Leopard Seals, and a few turtles, snakes and frogs have been purchased. The fur seals were obtained through the courtesy of the United States Bureau of Fisheries. Gifts are numerous. Among those who have donated specimens of special value may be mentioned the following:

California Fish and Game Commission through Mr. W. H. Shebley, a large number of trout and other fishes; the Nevada State Fish and Game Commission, 110 albino eastern brook trout; and the New York Aquarium, nine horseshoe crabs. There were many other donations.

The number of invertebrates in the tanks is still comparatively small, consisting of about 220 crabs of several species, a few chitons, sea urchins and starfish, and at present, one octopus. It is hoped to increase the number and add more delicate forms as the tanks become thoroughly leached out and ripened. The invertebrates are apparently more susceptible to lime and mineral salts from the cement and pipes than vertebrates are and it will be some months before these delicate forms can be kept in the tanks without considerable loss.

In addition to the large indoor exhibition tanks there are 20 balanced aquariums, and provision has been made to increase this number to 40. The 10 large balanced aquariums around the planted area were all arranged planted, and their contents donated to the Steinhart Aquarium, by the amateur aquarists of San Francisco, a prize having been offered for the most attractive aquarium and a second prize for the best assemblage of fishes in a single tank.

The central feature in the building is the swamp. This has proved to be an object of unusual interest to visitors. At the present time, in addition to a considerable number of plants and vines, it contains 35 snakes, 4 alligators, 75 turtles, frogs and toads, and 300 fishes of which about 150 are the mosquito fish (*Gambusia affinis*).

Through the courtesy of the California State Fish and Game Commission we have been enabled to keep a supply of young fish in the hatchery. On January 8 a number of dog salmon eggs were placed in the hatchery and were objects of great interest to the visitors. Owing, however, to the eggs being immature when taken, they did not hatch. It is intended soon to add some jars to the equipment and to hatch out not only salmon and trout but shad and other anadromous fishes.

On October 9, through the courtesy of the U. S. Bureau of Fisheries, four two-year old male fur seals were received at the Aquarium from the Pribilof Islands. They were at once placed in the big central pool and some live carp were given to them. The seals immediately captured the carp and began to feed. Since that time we have had very little difficulty in the matter of feeding. On November 29 four two-year-old female fur seals were received from the same source. One refused to eat and died within a few days. Two of the first lot also sickened and died. A careful autopsy showed that death was due to perforation of the alimentary canal caused by a small round worm. The remaining five were treated with a vermifuge with apparently good success, as they are now in good condition, feed freely, and show no evidence of internal parasites. It is interesting to note that they consistently refuse fresh salmon for food. They prefer herring, anchovies or sardines to any other kinds of fish, and will usually refuse a fish if it has been beheaded or sliced. They take octopus and squid freely.

In the east one of the out-door pools we have had since the opening of the Aquarium a fine yearling Leopard or Harbor Seal, captured in San Francisco Bay by some fishermen. For some months it was kept at the Paladini Wholesale Fish Market on Clay Street. The doors of this market were wide open and there was nothing to prevent the seal from returning to the bay, but it made no effort to escape, evidently preferring the atmosphere of the fish market.

On September 12, 1923, two fine California Sea Lions, one of each sex, were purchased from Mr. Will Winston, of Pacific Grove. They are believed to be about one year or eighteen months old, were secured at Santa Barbara, California, and arrived in good condition. They keep in excellent health, and form a lively and interesting addition to the exhibits.

On December 13, 1923, two fine yearling male and female Steller Sea Lions were purchased from Mr. G. M. McGuire of Santa Barbara. They arrived in good condition and were at once placed in the pool with the California Sea Lions. They are of much heavier build and much less active than the California Sea Lions. They feed freely on all kinds of fish and have remained in good condition.

The Library at present contains 610 bound books and perhaps a thousand pamphlets, almost all being a loan from the Academy library. Practically all of these publications relate to Marine Biology.

The Laboratory, although not yet equipped, is being utilized to some extent and forms the meeting place of the thriving San Francisco Aquarium Society of 75 members which meets regularly on the first Thursday evening of each month.

As at present constituted, the personnel of the Aquarium, exclusive of the four members of Academy staff on part time, numbers fifteen people, viz.:—one superintendent; one assistant superintendent; one aquarist; one collector; one carpenter; three feeders and attendants; three engineers; two janitors; one door attendant; and one relief man. This seems a large number, but it is as few as the institution can be operated with efficiently. The machinery and pumps at the Aquarium have to run all the time, night and day, making it necessary to have three shifts of engineers. In order that each one may have one day off in seven a relief man is necessary. It is a pleasure to commend the work of the Aquarium employees and to note the cheerfulness and efficiency with which their work has been performed.

Alvin Seale, *Superintendent.*

Accessions to Museum and Library

Adams, Wallace, Steinhart Aquarium: Assortment of artificial eyes and 7 lbs. arsenical soap and 1 lb. arsenic; The Osprey, Vol. 5, No. 3, January and February, 1901; 111 bird skins from Mexico; 5 separates from the United States Geological Survey Professional Papers. Gift.

American Museum of Natural History, New York City: Three lizards from West Indies. Exchange.

Anderson, Mrs. Eric, Shasta Springs: Two California plants. Gift.

Anderson, Frank, Berkeley: California State Mining Bureau, Bulletin No. 10, first edition. Large collection of Tertiary and Cretaceous fossils from Colombia, South America; collection of living shells from Panama Bay; four specimens of foraminiferal shale from Southern California. Gift.

Anderson, Mrs. S. A., 2604 Etna Street, Berkeley, California: 21 insects from Colombia. Gift.

Arboretum, Arnold, Jamaica Plain, Mass.: Three hundred and ten specimens of North American plants; Zabel collection, 41 specimens, European and exotic. Exchange.

Arundell, Frank, Fillmore, Calif.: Two lizards, *Phrynosoma hernandesi*, female, and *Phrynosoma platyrhinos*, from Arizona. Gift.

Australian Museum, Sydney, N. S. W.: One hundred and one specimens of reptiles and amphibians from Australia. Exchange.

Baker, Dr. Fred, Point Loma: Four species of marine mollusks from Hawaii; 20 land and freshwater shells from Java, China, and Costa Rica. Gift. Three specimens, *Succinea lauta* Gld., from Japan. Exchange.

Barbour, Dr. Thomas, Cambridge, Mass.: Three lizards from China. Exchange.

Bassett, F. W., Jonesville: Twenty-four California plants. Gift.

Behrens, Miss Bertha T., 958 Haight Street, San Francisco: One California plant. Gift.

Berry, Dr. S. S., Redlands: Sixty-six land and freshwater shells from western North America (10 species, including paratypes of three species). Gift.

Bethel, Ellsworth, State Building, Denver, Colorado: 283 California plants, 70 specimens mounted; 33 specimens unmounted. Gift.
Thirty-seven California plants. Exchange.

Billings, F. H., Redlands, California: 26 specimens of California plants. Gift.

Blair, Duke, Skagg: Seven specimens of Realgar. Gift.

Blaisdell, Dr. Frank E., 1520 Lake Street, San Francisco: 362 insects, mostly from Mt. Hermon, California; U. S. D. A. Farmer's Bulletins Nos. 1286 and 1249; U. S. D. A. Year Book 1922; 120 pamphlets. Gift.

Blazic, Antone, 630 Parkman Avenue, Los Angeles: One plant from Massachusetts; 93 specimens southern California exotics. Gift.

Bliss, Mrs., Tahoe City: Three California plants. Gift.

Bowman, C. W., San Francisco: One Alaska parka. Gift.

Boyd, Miss Louise, San Rafael: One botanical specimen from King's Mountain. Gift.

British Museum, London, England: Two frogs from Philippine Islands. Exchange.

Bush, R. E., Georgetown: One California plant. Gift.

Calif. Academy of Sciences Expedition to Galapagos Islands (1905-1906): Two hundred and forty-five land shells (sixty-three lots) including types of fourteen described species and five undescribed subspecies. Exploration.

Gulf of California Expedition, 1921: Collection of marine mollusks numbering approximately 100,000 specimens. Collection of fossil shells numbering about 1,000 specimens. Exploration.

California Department of Agriculture, San Francisco: One *Paradoxurus* sp. in flesh, from Cebu, Philippine Islands. Gift.

California Fish and Game Commission, San Francisco, California: One *Fulica americana* (albino), in flesh, from Santa Cruz County, California. Gift.

Cebrian, John C., 1801 Octavia Street, San Francisco: One *Scapanus* sp. (no data); one fan of Egret feathers; one Gorgonian Coral. Gift.

Christoffersen, A., San Francisco: 36 bird eggs from Sea Lion Rock, Pribilof Islands; 24 botanical specimens and photographs from St. Paul Island, Alaska; 125 insects from St. Paul Island, Alaska. Gift.

Clark, H. Walton, California Academy of Sciences: Four freshwater Pelecypoda; one Microtus in flesh; 27 skulls from San Mateo County. Gift.

Comstock, Dr. John A., Southwest Museum, Los Angeles, California: One rare moth (*Hemileuca brusi*) from California. Gift.

Cornett, I. B., Los Baños: One mounted specimen of *Philacte canagica*, from Los Baños. Gift.

Cornwall, Ira. E., Quarantine Station, Williams Head, Victoria, B. C.: Seven Barnacles from British Columbia; one Barnacle from Humpback Whale. Gift.

Cramsie, Mrs. J. E., Smartsville, California: 12 California plants. Gift.

Daring, W. L., U. S. Forest Service: One California plant. Gift.

De Graw, Mrs., Auberry: One plant from Fresno County. Gift.

d'Eilbert, W. D., Willows: One plant from Butte County. Gift.

Dodds, Clifford, Ventura, California: 1241 insects from Los Mochas, Mexico. Gift.

Dodds, C. T., University of California, Berkeley: One thousand insects from Sinaloa, Mexico. Exchange.

Dolter, Carl, Monterey, California: One specimen *Haliotis kamtschatkana*, Monterey, California. Gift.

Donahoe, Mrs. Joseph, Menlo Park: Two botanical specimens from Menlo Park. Gift.

Eastwood, Miss Alice, California Academy of Sciences, San Francisco: U. S. Department of Agriculture Year-book, 1913 to 1918 (six books); three land snails from northern California; 12 California plants. Gift.
100 Ostracods from Yosemite; 400 specimens of plants from Del Norte County; 121 specimens of plants from Siskiyou and Shasta Counties; 41 specimens of plants from Humboldt County; 45 specimens of plants from Mt. St. Helena; 53 specimens of plants from Yosemite; 96 specimens of plants from Ensenada, Mexico; 44 specimens exotics from Santa Barbara; 56 specimens from Pt. Reyes; 14 specimens from Los Angeles; 24 specimens from Mt. Hamilton and Mt. Diablo; 36 specimens from Shasta Springs; 16 specimens from Yreka and vicinity. Exploration.

Erwin, Richard P., Boise, Idaho: Three small rattlesnakes from X-ray Gulch, five miles east of Boise, Idaho; one large rattlesnake from Indian Creek, about 20 miles south of Boise, Idaho; one gopher-snake taken at Kuna Cave, five miles south of Kuna, Idaho; five rattlesnakes from Snake River at Swan Falls, Ada Co., Idaho. Gift.

Evermann, Dr. Barton Warren, California Academy of Sciences: Six books; one botanical specimen from Amaknak Island, Alaska. Gift.
Three sets (6 eggs) *Auriparus flaviceps flaviceps*, from Imperial County. Exploration.

Fenn, Mrs. R. W. Lindsay: One botanical specimen from Lindsay, Tulare County. Gift.

Fields, W. S., Ferry Building, San Francisco: One botanical specimen from Japan. Gift.

Fleming, George, San Diego: Six native plants from San Diego. Gift.

Fouke Fur Co., St. Louis, Mo.: Three fur-seal skins, one of them showing natural condition of skin before removal of hair, after dressing, and after dyeing. Gift.

Fox, C. L., San Francisco: Two land snails from Sequoia National Forest. Gift.

Fox, C. L., 1621 Vallejo Street, San Francisco: 619 insects, mostly from California. Gift.

Gaylord, E. G., Hanna, Dr. G. D. Menke, J. G., Pacific Oil Company, San Francisco: Lot of Maricopa shale. Gift.

Goodman, Dr. E., San Francisco: One *Phalaropus fulicarius*, in flesh, from San Mateo County, California. Gift.

Goodrich, Calvin, Toledo, Ohio: Forty-one specimens, representing six species of freshwater Gastropoda. Exchange.

Goudkoff, Paul P., Bakersfield: Two specimens *Cardium meekianum*. Gift.

Grant, Miss Adele L., Cornell University, Ithaca, New York: 14 California plants. Gift.

Grauerholz, H. J. San Francisco: Nest of *Cinclus mexicanus unicolor*, from Humboldt County. Gift.

Grevecoeur, Onaga, Kansas: 1541 beetles from Kansas, 900 purchased, 641 presented. Gift and Purchase.

Griffin, Miss Alice, Glen Ellen: One botanical specimen from Sonoma County. Gift.

Haley, Mr. and Mrs. George, San Francisco: One botanical specimen from St. Paul Island. Gift.

Hall, Prof. H. M., Berkeley: Fourteen frogs from California. Gift.

Hallawell, Harry E., Market Street, San Francisco: One cultivated plant, for determination. Gift.

Hanna, Dr. G. Dallas, California Academy of Sciences, San Francisco: United States National Museum, Bulletin 62; University of Michigan, University Bulletin, New Series, Volume 15, No. 15; University of Michigan, Occasional papers of the Museum of Zoology, No. 137; 18 pamphlets. Gift.

Hanna, Marcus A., Department of Geology, University of Washington, Seattle, Washington: A large collection of mollusks from Pyramid Lake, Nevada, consisting of several thousand specimens of two species which are apparently confined to that body of water; fifteen freshwater snails from six miles east of Ensenada, Lower California. Gift.

Hanscome, Russel, 848 Clayton Street, San Francisco: One plant from Marin County. Gift.

Hart, Cecil, Los Angeles: Thirteen weeds from Los Angeles and 40 other plants from southern California. Gift.

Hazard, William, Hallawell Seed Company, San Francisco: One cultivated plant. Gift.

Hercules Powder Co., San Francisco: One tooth of fossil mammoth found in San Diego County, California. Gift.

Hitchcock, J. L., San Francisco: One rattlesnake from Lake County. Gift.

Holladay, Edmund Burke, Pasadena: Four volumes, including old numbers of the Academy's publications, and two photographs. Gift.

Hunt, Miss Clara A., St. Helena: Seven plants from St. Helena. Gift.

Jackson, Miss Belle R., San Rafael: Four California plants. Gift.

Jeffers, Le Roy, New York: Four books. Gift.

Jones, Mr. Frank P., Wilmington, Delaware: 44 insects, mostly from Texas and Arizona. Gift.

Jones, Miss Katherine D., Berkeley: One botanical specimen, exotic, cultivated in California. Gift.

Johnston, Don P., Okeechobee, Florida: One rattlesnake from Florida. Gift.

Johnston, E. C., Lawrence, Kansas: Fourteen botanical specimens from Akutan, Alaska. Gift.

Jordan, Dr. David Starr, Stanford University: One slab fossil fish, and one sample diatomaceous earth from Lompoc. Gift.

Kelley, Mrs. G. Earle, Alameda: One botanical specimen from Porterville and 14 other California plants. Gift.

Kennedy, C. H., Ohio State University: 228 dragon-flies, mostly from California. Gift.

Keys, Miss Jennie G., Sacramento: One California plant. Gift.

King, Miss M. Alice, Placerville: Fifty California plants. Gift.

Kingsley, E. S., San Francisco: One Indian mortar and two pestles. Gift.

Kinsey, Dr. A. C., University of Indiana, Bloomington, Indiana: 114 gall-flies and their galls. Gift.

Klauber, L. M., San Diego: 23 salamanders from New York State, and 108 salamanders from San Diego County. Gift.

Klein, Miss Marie G., San Francisco: One California plant. Gift.

Kleupfer, Mrs., San Francisco: One *Callithrix leucopus*, in flesh, from Panama. Gift.

Kneiss, Karl E., San Francisco: Five echinoid tests, and 156 molluscan shells. Gift.

Knobel, Miss Louise, Hope, Arkansas: 182 insects, from Arkansas. Purchase.

Kusche, J. A. Montebello: 1322 insects from Solomon Islands. Purchase.

Leach, E. R., Piedmont: 149 insects from California. Gift.

Lindsay, Miss Sarah, 159 Ninth Avenue, San Francisco: One *Callithrix leucopus* in flesh. Gift.

Little, Luther, South Pasadena: Five land shells from Riverside County. Gift.

Losing, H. P., Mobile, Alabama. One snake from Alabama. Gift.

Mailliard, Joseph, California Academy of Sciences, San Francisco: A large and valuable collection of freshwater shells from Eagle Lake, 150 specimens of land and freshwater shells from northern California, and one song sparrow from Marin County. Gift.

Accessory materials for Oregon Ground Squirrel and Lewis Woodpecker groups; one red-breasted sapsucker nest from Modoc County; 152 bird skins from Butte, Lassen, Modoc, and Tehama counties; 200 freshwater mollusks from Lassen County; 68 mammal skins and skulls from Butte, Lassen, and Modoc counties; one *Thryomanes bewicki spilurus*, in flesh, from San Francisco; 75 bird skins and 32 mammal skins from Imperial County; 176 bird skins and 36 mammal skins, and 28 mammal skins and skulls from Modoc County; three sets of eggs and two nests from Modoc

County; one nest of White-headed Woodpecker from Lassen County; 47 bird skins from Modoc and Lassen counties; two nests of Marsh Wren from Lassen County; 16 mammal skins from Modoc and Lassen counties; one set eggs from Modoc County. Exploration.

Marshall, Byron C., Imboden, Arkansas: 148 beetles, from Arkansas. Gift.

Martin, Bruce: 93 insects from Colombia, South America. Gift.

Martin, J. O., California Academy of Sciences, San Francisco: 719 insects, mostly from California, including types of seven of his new species of beetles; 14 freshwater shells from Mt. Diablo. Gift.

Martin, Wm. J., Steinhart Aquarium, San Francisco: Six specimens of fossil shells from 12 miles west of Petaluma. Gift.

Mason, H. L., Stanford University: One toad from California. Gift.

McGuire, Ignatius, San Francisco: One *Thryomanes bewicki spilurus*, in flesh, from San Francisco. Gift.

McKelwey, Mrs. Charles W., Arnold Arboretum, Jamaica Plain, Mass.: 189 botanical specimens from Rocky Mountains and New England. Gift.

McKenzie, Mrs. E. R., San Luis Obispo: Four California plants. Gift.

McLaren, John, Golden Gate Park, San Francisco: One specimen of *Buteo borealis calurus* in flesh; one *Macropus rufus* in flesh, from Golden Gate Park; specimens of three Australian plants; one specimen of *Mustela zanthogenys munda* in flesh, from Golden Gate Park; one skunk in flesh, from Golden Gate Park; one *Ardea herodias hyperonca*, in flesh, from Golden Gate Park; one specimen of *Odocoileus virginianus macrourus* fawn, from Golden Gate Park; and one *Chenopsis atrata* in flesh, from San Francisco. Gift.

McLellan, Miss Mary E., San Francisco: Fourteen specimens Fluminicola from Jonesville, Butte County. Exploration.

Meiere, Mrs. Ernest, Los Altos, California: One plant for determination. Gift.

Menzies, Robert, San Rafael: Four cultivated plants from Marin County. Gift.

Merriam, Dr. C. Hart, Lagunitas, California: Four specimens of California plants. Gift.

Michael, Mrs. Enid, Yosemite, California: 13 botanical specimens from Yosemite. Gift.

Miller, Robert C., Department of Zoology, University of California: One vial alcoholic specimens of *Teredo nivalis*. Gift.

Mitchell, Mrs. H. M., San Francisco: Twenty California plants. Gift.

Munz, Philip A., Pomona College, Claremont: 14 specimens of California wild flowers. Exchange.

Museum of Natural History, Leiden, Holland: Four salamanders from Japan. Exchange.

Nijgh & Van Ditmar, Rotterdam, Holland: One book, Modern Holland. Gift.

Norton, A., Pacific Grove: One botanical specimen from Monterey. Gift.

Ogle, Alva E., Ornbaun: One *Bassariscus astutus raptor*, female, in flesh. Purchase.

Orpet, E. O., Park Superintendent, Santa Barbara: Two California plants. Gift.

Pack, Herbert J., Logan, Utah: One toad from Utah. Exchange.

Peters, Herman, San Rafael: 360 insects from Australia. Gift.

Peers, Miss Susie M., San Francisco: Current issues of Science. Gift.

Peterson, A., San Francisco: Indian pestle from near Austin Creek, Duncan Mills, Sonoma County. Gift.

Phillips, Warren, Golden Gate Park Warden: One *Accipiter cooperi* and one *Accipiter velox*, in flesh. Gift.

Ping, Professor, C., Nanking, China: 11 snakes from China. Exchange.

Pomona College, Pomona: 122 botanical specimens from Nicaragua, collected by C. F. Baker, and 106 from southern California, collected by P. A. Munz and Ivan Johnston. Exchange.

Pope, Dr. Saxton, San Francisco: One book, "Hunting with the Bow and Arrow," by Saxton Pope. Gift.

Purdy, Carl, Ukiah: Two California plants. Gift.

Putnam, P. G., Pullman, Washington: 34 salamanders, 41 frogs, 3 lizards, 1 snake, 42 toads, and 3 turtles. Purchase.

Raphael, Miss T. V., Worth Hotel, San Francisco: Five California plants. Gift.

Raven, Miss Gertrude, Tomales: Three California plants. Gift.

Reagan, Albert B., Cornfields, Arizona: One land shell from Cornfields, Arizona, and nine land shells from the Mogollon Mountains, Arizona. Gift.

Redfern, C. M., 52 Shoreview Avenue, San Francisco: Two exotic plants for identification. Gift.

Reed, C. A., Santa Cruz: One California plant. Gift.

Renner, Otto, Paso Robles: Six California plants. Gift.

Rhodes, Captain H. W., Berkeley: Nine books. Gift.

Richards, Mrs. J. E., San Jose: botanical specimen. Gift.

Ricksecker, Mrs. H. E., 1683 Eighth Avenue, San Francisco: 183 insects from Oakland and Cisco. Gift.

Righetti, Dr. Homer, 818 Shreve Building, 210 Post Street, San Francisco: One *Ursus* sp., skull, from Alaska. Gift.

Rixford, Dr. Emmet, 1795 California Street, San Francisco: Two specimens of California plants and three fossil shells from Wildhorse Cañon, Monterey County, collected by Jack Copley for Mrs. Edward Dowd of Monterey. Gift.

Rixford, G. P., San Francisco: Five specimens of exotic plants cultivated in California. Gift.

Robertson, G. D., Los Angeles: One specimen *Turritella uvasana* from San Clemente Cañon, San Diego County. Gift.

Rodda, Mrs. A. F., San Francisco: Forty-one plants from Utah. Gift.

Rose, Alexander, Rose's Nursery, San Francisco: One exotic plant. Gift.

Ruddock, George T., Berkeley: One botanical specimen from Montana. Gift.

Ryan, C. A., Monterey: Six specimens *Ostrea lurida*, from Quaternary deposits, two miles east from Castorville. Gift.

San Francisco International Fish Co., San Francisco: One leather-back turtle (*Dermochelys schlegelii*), caught off Santa Cruz. Gift.

Sessons, Miss Kate O., San Diego: One California plant and specimens of a rare acacia from San Diego. Gift.

Schmiedell, E. G., 203 California Street, San Francisco: One *Circus hudsonicus*, in flesh, from Solano County. Gift.

Scupham, J. R., Oakland: One adult and one young *Didelphis virginiana*, in flesh, from Alameda County. Gift.

Shell Company of California, San Francisco: 125 fossils from Peru. Gift.

Skinner, Kenneth, Brooklands Estate Office, Weybridge, England: 13 sets of bird eggs. Exchange.

Slevin, J. R., California Academy of Sciences: One botanical specimen from Montana and one California plant. Gift. 40 land shells from Todos Santos Island, Lower California, and 136 insects from Lower California, mostly from San Pedro Martir Mountains. Exploration.

Slevin, Louis, Carmel: 509 insects from California, mostly from Monterey County. Gift.

Snyder, Earl B., Ornbaun: One Pygmy Owl, in flesh, from Ornbaun. Gift.

Smith, C. Piper, San Jose: Duplicate of type specimen of a *Lupinus*. Gift.

Smith, Miss Emily S., San Jose: Three California plants. Gift.

Smith, Francis A. (through Dr. David Starr Jordan), Kin Jo Ri, Koksan, Korea: Six skins and five skulls of wild boar from Korea. Gift.

Smith, Mrs. M. J., 501 Irving Street, San Francisco: One mounted specimen of *Eulabes religiosa*, from India. Gift.

Southern Pacific Company, Geological Department, San Francisco: Twelve boxes of fossils and 11 boxes of rock. Gift.

Stacey, J. W., Golden West Hotel, San Francisco: 11 botanical specimens from California localities. Gift.

Steinbeck, W. P., Stockton: 38 California plants. Gift.

Steinhart Aquarium, Golden Gate Park, San Francisco: One *Phoca richardi geronimensis*, juvenile, in flesh: 38 salamanders and one toad from Washington; one skull of *Callorhinus alascanus*, from the Pribilof Islands, from the male that died in the Aquarium Dec. 14, 1923. Gift.

Stephens, Frank, San Diego: Three snakes from San Diego County. Gift. Two boxes pine bark, material for California Woodpecker Group; three immature desert wood rats, and accessory materials for woodrat group; four Dipodomys from San Diego County, in flesh; 34 mammal skins from San Diego County; three skins of Fox Sparrow; two specimens of *Taxidea taxus neglecta*, with skulls, from San Diego County; seven mammal skins and skulls from Riverside and San Bernardino counties. Purchase.

Stephens, Mrs. Kate, San Diego: Eleven species of fossils from Claiborne Eocene. Gift.

Stow, Mrs. Vanderlyn, San Francisco: Nest of *Vespa fernalki*. Gift.

Strecker, John K., Waco, Texas: 548 reptiles and amphibians from southeastern United States and Australia. Exchange.

Sutliffe, Mrs. E. C., San Francisco: Nine California plants; one lizard from Marin County, one snake skin from Alameda Creek, and one rattlesnake skin. Gift.

Swingle, Dr. Walter T., Indio: One botanical specimen from Indio. Gift.
1178 Chinese plants. Exchange.

Thew, Miss Susan P., Exeter: One California plant. Gift.

Tieje, Dr. Arthur S., Los Angeles: Five specimens of diatomaceous earth from Sierra Vista, Los Angeles County. Gift.

Tose, Frank, California Academy of Sciences, San Francisco: Seven birds from San Mateo County; five specimens of *Speotyto cunicularia hypogæa*, from Berkeley, two specimens of *Citellus beecheyi beecheyi*, from Berkeley, three birds from Berkeley, one *Microtus* from San Francisco, one *Sciurus niger rufiventer*, in flesh, from San Francisco, and one example of *Citellus beecheyi beecheyi*, in flesh, from Alameda County. Exploration.

U. S. Bureau of Fisheries, Washington, D. C.: Two skeletons and one skull of *Callorhinus alascanus* from Pribilof Islands. Gift.

U. S. National Museum, Washington, D. C.: 850 botanical specimens. Exchange.

Van Denburgh, Dr. John, California Academy of Sciences, San Francisco: 75 freshwater Gastropods and 50 freshwater Pelecypods from Los Gatos. Gift.
85 nests of common birds, without accompanying sets of eggs and 18 bird skins, common species. Exchange.

Van Duzee, E. P., California Academy of Sciences, San Francisco: Eight specimens of plants from southern California. Gift.
4630 insects, as follows: 1516 from Yuma, Arizona and Potholes, California; 150 from Mt. Diablo; 41 from Mill Valley; 2467 from Ensenada, Lower California; San Diego County, and Mill Creek Cañon; 135 from Huntington Lake; 321 from Pittsburg, and 200 land shells from Utah, collected in the summer of 1922. Exploration.

Van Duzee, Mrs. Helen, San Francisco: One book. Gift.

Walter, Frank, San Diego: One exotic botanical specimen from San Diego. Gift.

Walther, Eric, Golden Gate Park, San Francisco: 46 insects from the Golden Gate Park; 113 exotic plants from Santa Barbara; 20 exotic plants from Monterey; 320 botanical specimens, exotics, cultivated in California; and 120 cultivated plants from Golden Gate Park. Gift.

Westenberg, C. A., 1128 Benvenue Avenue, Berkeley (through H. V. Redmond, 3030 Benvenue Avenue, Berkeley): One *Ara macao*, in flesh, from Mexico. Gift.

Wicks, Miss Ethel, San Francisco: One California plant. Gift.

Wilke, R. M. Palo Alto: Collection of 300 named species of European fossils. Exchange.

Woodrum, J. H., 2038 Ellis Street, San Francisco: Image found in a bag of coffee sent from Brazil to Hills Brothers, San Francisco, in 1923. Gum from New Zealand. Jade (New Zealand Store) from New Zealand, used by Aborigines in making war implements. Gift.

Wright, Mrs. Elizabeth, Calistoga: One California plant. Gift.

Wright, Miss Elizabeth C., Mono Lake, Calistoga, California: Eight specimens. Gift.

Wynd, F. Lyle, Eugene, Oregon: Three Oregon plants. Gift.

Zoberbier, Mrs. Lucy M., San Francisco: One Rhea egg from Argentine Republic. Gift.

FINANCIAL STATEMENTS

REPORT OF THE TREASURER

for the fiscal year ending March 31, 1924

April 1, 1923, Balance due Crocker National Bank		$ 2,249.90

Receipts

Dues	$ 3,862.25	
Charles Crocker Scientific Fund Endowment Income	1,335.13	
James Lick Endowment Income	53,732.24	
General Income	17,602.20	
John W. Hendrie Endowment Income	900.00	
U. S. Treasury Certificates	2,997.50	
Interest	563.91	
Bills Receivable, Ignatz Steinhart Trust	119,000.00	
Ignatz Steinhart Trust Interest	2,826.24	
Ducks of the World Donation	160.00	
J. D. Grant Donation	279.85	
Alaska Fur Seal Motion Pictures (Fouke Fur Company)	290.00	
Wild Life Protection Fund	350.00	
W. G. Wright Fund	43.00	
Publications	404.84	
Sundry Refunds	268.68	
Museum	353.78	
Sundry Accounts	89.33	
Post Card Sales	1,192.41	
		$206,251.36
		$204,001.46

REPORT OF THE TREASURER—Continued

Expenditures

Expense	$ 2,668.04	
Salary Expense (general)	18,022.82	
Bills Payable	10,000.00	
Insurance	2,023.75	
Interest	15,255.53	
Museum Department Appropriations	8,481.35	
Museum Department Salaries	13,995.00	
Library	1,307.12	
Dues Refunded	20.00	
Publication	2,699.35	
Office Furniture	50.00	
Steinhart Aquarium Construction	99,890.49	
Steinhart Aquarium Equipment	17,773.77	
Steinhart Aquarium Revolving Fund	5,000.00	
Antelope Fund	8.76	
Alaska Fur Seal Motion Pictures	290.00	
Wild Life Protection Fund	208.20	
Tools and Equipment	294.02	
Loan to Sperry Flour Company	5,000.00	
Sundry Accounts	502.41	
Sundry Creditors	3,838.34	
Contingent Fund	570.48	
		$207,899.43

March 31, 1924, Balance due the Crocker National Bank.......$ 3,897.97

M. Hall McAllister, *Treasurer.*

Examined and found correct,
McLaren, Goode & Co., *Certified Public Accountants.*
San Francisco, Calif., April 26, 1924.

INCOME AND OPERATING EXPENSES

For the Fiscal Year, April 1, 1923 to March 31, 1924

Income:		
Charles Crocker Scientific Fund Endowment Income		$ 1,335.13
James Lick Endowment Income		53,732.24
General Income		17,602.20
Dues		3,862.25
Interest from Temporary Investments		561.41
Profit on Post Card Sales		424.49
Total Income		$ 77,517.72
Expenditures:		
General Expense	$ 1,821.63	
Salaries	32,444.18	
Interest on Mortgage	15,255.53	
Insurance	2,023.75	
Total Expenditures		$ 51,545.09
Net Income Transferred to Surplus Account		$ 25,972.63

SUMMARY OF SURPLUS ACCOUNT

March 31, 1924

Balance, March 31, 1923		$371,683.00
Additions:		
Net Income for Fiscal Year	$ 25,972.63	
Donations:		
Ducks of the World	200.00	
Accounts Transferred to Surplus by Resolution of Board of Trustees, dated January 28, 1924:		
W. B. Bourne	2,659.31	
Wm. H. Crocker	8,342.26	
Herbert Fleishhacker	4,000.00	
J. D. Grant	2,990.27	
A. K. Macomber	3,500.00	
John W. Mailliard	1,250.00	
Ogden Mills	5,000.00	
Wm. C. Van Antwerp	5,120.00	
Total Additions to Surplus		$ 59,034.47
		$430,717.47
Deductions:		
Depreciation:		
Office Furniture	$ 271.22	
Commercial Building	10,336.37	
Museum Building	3,840.51	
Storage Cases	229.70	
Tools and Equipment	391.04	
		$ 15,068.84
Surplus, March 31, 1924		$415,648.63

IGNATZ STEINHART TRUST

March 31, 1924

Amount of Fund:		
Bequest from the Ignatz Steinhart Estate...		$250,000.00
Interest on Temporary Investments........		54,975.65
		$304,975.65
Disposition of Fund:		
Steinhart Aquarium Construction..........	$263,315.69	
Steinhart Aquarium Equipment............	22,092.45	
Temporary Investments:		
Bills Receivable......................	16,000.00	
Revolving Fund......................	5,000.00	
		$306,408.14
Due Calif. Acad. Sciences, Funds Temporarily Advanced to Steinhart Trust Fund..........................	$ 1,432.49	
		$304,975.65

BALANCE SHEET

March 31, 1924

Assets

Property:		
Real Estate, 831-833 Market Street	$600,000.00	
Real Estate, Jessie Street	8,083.65	
Commercial Building, 831-833 Market St.	516,818.66	
		$1,124,902.31
Museum, Golden Gate Park:		
Construction	$192,025.92	
General Collections	137,912.17	
Library and Equipment	74,412.38	
Tools and Equipment	28,556.73	
Office Furniture	3,874.64	
		$ 436,790.84
Investment Securities		20,600.00
Ignatz Steinhart Trust:		
Bills Receivable	$ 16,000.00	
Aquarium Construction	263,315.69	
Aquarium Equipment	22,092.45	
Aquarium Revolving Fund	5,000.00	
Total Trust Investment and Cash		$ 306,408.14
Current Assets:		
Office Cash Fund	$ 186.20	
Notes Receivable, Sperry Flour Co.	5,000.00	
Accounts Receivable:		
Ignatz Steinhart Trust Fund	1,432.49	
Sundry Accounts	168.25	
Post Cards in Stock (for sale)	1,731.83	
Foreign Exchange	36.84	
		$ 8,555.61
		$1,897,256.90

BALANCE SHEET—Continued

Liabilities

Endowments:		
James Lick Endowment	$804,902.31	
Charles Crocker Endowment	20,000.00	
John W. Hendrie Endowment	13,600.00	
		$ 838,502.31
Ignatz Steinhart Trust	$250,000.00	
Ignatz Steinhart Trust Interest	54,975.65	
Due California Academy of Sciences, Funds Temporarily used in Construction	1,432.49	
		$ 306,408.14
Alvord Bequest, Botanical		5,000.00
John W. Hendrie Endowment Income		2,700.00
W. G. Wright Fund		113.20
Wild Life Protection Fund		141.80
Ducks of the World Fund		100.00
Bills Payable		260,000.00
Reserve for Depreciation		59,837.34
Sundry Creditors		4,907.51
Crocker National Bank (overdraft)		3,897.97
Surplus		415,648.63
Total		$1,897,256.90

W. W. Sargeant,
Secretary, Board of Trustees.

We have examined the foregoing Balance Sheet, together with the books and accounts of the California Academy of Sciences, and, in our opinion, it is properly drawn up so as to exhibit a true and correct view of the Academy's affairs, as shown by the books.

McLaren, Goode & Co.,
Certified Public Accountants.

San Francisco, Calif.,
April 26, 1924.

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PROCEEDINGS
Fourth Series

VOLUME XI—*Continued*

OCCASIONAL PAPERS

VOLUME XII

VOLUME XII—*Continued*

VOLUME XIII

The Academy cannot supply any of its publications issued before the year 1907, its entire reserve stock having been destroyed in the conflagration of April, 1906. Any of the papers of the Fourth Series, including those in Vols. I to XIII, and Occasional Paper No. 10, can be supplied.

SUNSET PRESS, SAN FRANCISCO