

# SPONGES OF THE GULF OF CALIFORNIA

(PLATES 1-97)

MALCOLM GIBSON DICKINSON

## INTRODUCTION

The Gulf of California is a geographical unit. Its boundaries are definitely established by land on three sides. It is also, in a sense, a time unit, since its beginnings in the Eocene, extension in the Miocene, and continued existence to the present give it a definite age.

These durational boundaries make the region unique among the marine areas of a like size. Most coastal regions of the present oceans, such, for example, as the coast of California or even the Gulf of Mexico, have existed throughout known time, undergoing many changes of shape and shore but still continuing to exist.

These unusual features give the fauna of the Gulf of California a peculiar interest. It came into being in the Eocene and Miocene periods when, for at least part of the time, a water connection existed between the Atlantic and Pacific Oceans across Mexico. No known earlier fauna existed in the region, and it is there that a migratory fauna might be expected to establish itself. For this reason a study of the fauna of the Gulf region should logically be expected to furnish evidence on the ancestry and relationships of many of the Pacific coast forms.

With the exception of the work done on the cruise of the *Albatross* in 1891, the sponges of the Gulf of California have not been collected for a detailed scientific study. The records indicate that on the *Albatross* cruise three species of sponges were collected from the Gulf of California. All of these were deep-water forms, since the *Albatross* collecting was done largely at considerable depth. Such sponges are not of great significance as representative forms of a region, since the deep-water sponges are almost invariably cosmopolitan.

This lack of data on the sponge fauna to the south of California, including the Gulf region, has made it difficult to properly relate the sponges of California to those of other geographic areas. The California sponges have long been considered to be an isolated group, their origin a puzzle, and their relatives unknown.

With this background, the author began in 1935 his study of the sponges of the Allan Hancock Foundation collections. The results of



those years of study are presented herein in the form of a detailed taxonomic report on the sponges of the Gulf of California, together with the comparison of this fauna with that of the West Indies and of the coast of California.

#### ACKNOWLEDGMENTS

The writer wishes to express sincere thanks to Dr. M. W. de Laubenfels, whose advice at all stages has been invaluable and whose generosity with reprints, personal library, and other material has been most helpful.

#### MATERIALS AND TECHNIQUE

The sponges herein described were collected by members of the Allan Hancock Pacific Expeditions in 1933, 1934, 1935, 1936, 1937, 1939, and 1940. All collecting was done in December, January, February, March, and April. Over six hundred specimens were collected on the cruises of the *Velero III* from the Gulf region, which represent all 3 classes of sponges, 10 orders, 30 families, 56 genera, and 67 species. Twenty-six new species and one new genus were found.

The technique used in preparing the sponges is as follows: The animals, on collection, were placed directly into 95 per cent alcohol. Sufficient alcohol was added from time to time to keep the concentration above 80 per cent. For making slides, a thin slice of the sponge was taken perpendicularly and tangentially to the surface. This was done with a razor blade, as considerable depth was needed on the slide for proper identification. Sections up to .5 mm were used with good results. The bits of sponge were placed directly on the slide and flooded with 95 per cent alcohol, to which a small amount of basic fuchsin had been added. This solution was then blotted off. Absorbent paper toweling was found to be excellent for this purpose. Then the specimen was washed with absolute alcohol, blotted, and cleared with a saturated solution of carbol-xylene. The carbol-xylene was then removed with clear xylene and again blotted. Balsam was placed on the specimen and the cover slip pressed into place. A heavy balsam, warmed to the proper fluidity, was used without injury to the specimen. This was an advantage because the sections were rather thick and light balsam tended to run from under the cover slip.

The system of identification used throughout this paper follows the revision made by M. W. de Laubenfels (1936). The only other modern system is that of Hentschel (1923). His classification was very incomplete in the class Demospongia. He dealt with only 340 genera of the 602 definitely established in his time.



Since 1923 more than one hundred genera have been published. As this paper deals largely with the Demospongia, Hentschel's system is not practical. Earlier systems such as those of Minchin (1900) and Vosmaer (1885) are not useful in present-day work, both because they are necessarily incomplete and because they are not based on modern methods of identification.

## A TAXONOMIC ANALYSIS OF THE SPONGES OF THE GULF OF CALIFORNIA

The taxonomic analysis developed in the following pages presents first the order Keratosa, which is a complex and highly evolved group, and proceeds to the order Carnosa, which is primitive. Keratosa contains the type of the Phylum, as well as those sponges which are commercially valuable. For this reason the order is much studied. It is of historical interest because the keratose sponges are pictured on Grecian bas-reliefs, perhaps the oldest known recording of marine invertebrates. The Carnosa have evolved little beyond what is probably the most primitive Demospongia. The group of Carnosa is small; it contains no species of commercial value and is little studied. Because it is primitive, it is more closely related to the class Calcarea, which, since it is represented by few specimens in the Hancock collection, is discussed last.

Since many of the original descriptions of sponges need clarifying and interpreting in terms of modern, uniform taxonomical usage, all species studied, whether new or old, are described herein.

Order **KERATOSA** Bowerbank

Family **Spongiidae** Gray

Genus **HALME** Lendenfeld

**Halme hancocki**, new species

Plates 1, 2, Figs. 1-4

*Diagnosis.*—The specimen is a thin incrustation 8 by 5 by .5 cm and is apparently a fragment of a much larger mass. In alcohol the color is drab, both internally and externally. The color in life is not recorded. The consistency is distinctly fleshy and very firm to the touch. Conules are present on the surface, which is deeply pitted. Each depression is 2 to 3 mm in diameter and separated from the next only by a very thin wall. The whole appearance is that of an empty honeycomb. The entire specimen is exceptionally free of foreign material on the surface. The underside is quite smooth, except for occasional depressions probably due to irregularities in the surface of the coral on which the sponge grew.



Oscules, which vary in size from about 1,500 to 2,500  $\mu$  in diameter, are irregularly scattered over the surface. The pores are not visible to the naked eye.

Flagellate chambers are usually about 25 by 35  $\mu$ , but occasional smaller ones are observed. They are diploidal, as is characteristic of the family.

Ascending fibers average 150  $\mu$  in width, but vary between 120  $\mu$  and 165  $\mu$ . The tangential fibers vary between 70 and 125  $\mu$  with an average near 100.

*Holotype*.—AHF no. 1.

*Type locality*.—Isabel Island, Sinaloa, Mexico; porites coral; 4 m.

*Distribution*.—Gulf of California.

*Material examined*.—

Sta. 125-33 Isabel Island

3-19-33 4 m

*Remarks*.—The specimen differs from most of the genus in that it does not have sand particles at the nodes and also in that it has both relatively very large secondary fibers and very large amounts of detritus in the primary fibers.

It is most like the sponge first described as *Holopsamma laminae-favorsa*, Carter 1885, from Australia, but that sponge had a smooth ectosome, whereas the Hancock specimen possesses conspicuous cornules. Furthermore, *H. laminae-favorsa* had main fibers made up of sand grains with little spongin and tangential fibers only 16  $\mu$  wide. *H. hancocki* has a large amount of detritus irregularly placed in the primary fibers but no sand grains at the nodes, much spongin, and exceptionally wide tangential fibers (100  $\mu$  as compared to 16  $\mu$  average).

### Genus **HIRCINIA** Nardo

#### **Hircinia fusca** Carter

Plate 3, Fig. 5

*Hircinia fusca* Carter, 1880, p. 36.

*Diagnosis*.—This sponge has a ramose to digitate shape, is brown in life, and is rather firm in consistency.

The principal tracts have a diameter of 100 to 180  $\mu$  and have much detritus. The mesh of the fibers is about 1,000  $\mu$  in diameter. Filaments are abundant and average about 3  $\mu$  in thickness.

*Holotype*.—Liverpool Free Museum.

*Type locality*.—European waters.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 650-37 San Fransisco Island

3- 9-37 92 m



*Remarks.*—This sponge does not differ materially from published descriptions of the holotype.

Genus **VERONGIA** Bowerbank

**Verongia thiona** de Laubenfels

Plate 3, Fig. 6

*Verongia thiona* de Laubenfels, 1930, p. 28.

*Diagnosis.*—*Verongia* is an incrustation, spongy and yellow in life, turning blue or purple on drying. The fibers, which are laminate, are clear yellow. "Histological details: The flagellate chambers are spheroidal, 25  $\mu$  in diameter. Principal fibers 80 to 150  $\mu$  in diameter, cored by the usual pith as found in this genus. Pith of the fibers, 50  $\mu$  to 100  $\mu$  in diameter." (de Laubenfels 1932, p. 124.)

*Holotype.*—U.S.N.M.

*Type locality.*—Laguna Beach, California.

*Distribution.*—Southern California to the Gulf of California.

*Material examined.*—

Sta. 554-36	Angel de la Guardia Island	3- 8-36	20 m
Sta. 633-37	Espiritu Santo Island	3- 6-37	36 m
Sta. 1040-40	Guaymas Bay	1-23-40	Shore
Sta. 1073-40	Rocky Point, Sonora	2- 3-40	20 m

*Remarks.*—The specimens agree closely with the type specimen described from Laguna, although in the Gulf specimen the principal fibers are somewhat smaller (100  $\mu$  maximum, and the pith only 30 to 60  $\mu$ ).

Family **Dysideidae** Gray

Genus **DYSIDEA** Johnston

**Dysidea amblia** de Laubenfels

Plate 4, Figs. 7, 8

*Dysidea amblia* de Laubenfels, 1930, p. 28.

*Dysidea amblia* de Laubenfels, 1932, p. 123.

*Diagnosis.*—"Shape, digitate somewhat ramose. Size, up to 20 or 30 cm in height, about 1 cm in diameter. Consistency spongy. Color, in alcohol, drab. Oscules, inconspicuous, barely 100  $\mu$  in diameter. Pores, not evident. Surface, superficially conulose with conules usually less than 1mm high and less than 1 mm apart.

"Ectosomal specialization, a very thin dermis, not detachable. Endosomal structure, a fibrous reticulation with meshes about 250  $\mu$  in diameter. Principal or ascending fibers, 100  $\mu$  to 200  $\mu$  in diameter. Cored, sometimes superabundantly, by scattered sand grains often more than



100  $\mu$  in diameter. Accessory or transverse fibers 10  $\mu$  to 25  $\mu$  in diameter, often uncommon, usually free from inclusions. The flagellate chambers are conspicuous, crowded together, and about 45  $\mu$  to 55  $\mu$  in diameter." (de Laubenfels, 1932, p. 123.)

*Holotype*.—U.S.N.M.

*Type locality*.—"Long Wharf," Santa Monica, California.

*Distribution*.—Reported from Carmel, California, to the Gulf of California.

*Material examined*.—

Sta. 720-37 Rocky Point, Sonora, Mexico 3-24-37 12 m

*Remarks*.—The material examined agrees very closely with the southern California material, although the flagellate chambers are, on the average, somewhat larger and the mesh somewhat smaller in the Gulf specimens than is typical of specimens from southern California. In the latter respect the Gulf specimens are even closer to *Dysidea fragilis* of the West Indies than are the California specimens, indicating, perhaps, that the West Coast sponge may have evolved from the West Indies and that the differences became more marked as it spread north.

Order **HAPLOSCLERINA** Topsent  
Family **Halicionidae** de Laubenfels  
Genus **HALICLONA** Grant  
**Haliclona cinerea** (Grant)

Plate 5, Figs. 9, 10

*Spongia cinerea* Grant, 1827, p. 204.

*Halichondria cinerea* Fleming, 1828, p. 521.

*Isodictya cinerea* Bowerbank, 1866, p. 274.

*Reniera cinerea* Schmidt, 1870, p. 77.

*Haliclona cinerea* de Laubenfels, 1932, p. 120.

*Diagnosis*.—This is an encrusting form, drab in alcohol, and about 6 x 2 x 4 cm thick. Oscules are conspicuous over the surface and average 4 mm in diameter. The surface is very irregular with many porelike depressions. The endosome has vague tracts of spicules forming an irregular reticulation. The sole type of spicule is an oxea. Typical specimens from the Gulf of California show the following spicule measurements:

Specimen 1—5 x 115  $\mu$

Specimen 2—6 x 140  $\mu$

Specimen 3—4 x 190  $\mu$

*Holotype*.—Probably in the British Museum of Natural History.

*Type locality*.—Europe.



*Distribution*.—This species is cosmopolitan, having been reported from all parts of the world, notably from southern California.

*Material examined*.—

Sta. 515-36	San Francisco Island	2-24-36	Shore
Sta. 584-36	Concepción Bay	3-14-36	16 m

*Remarks*.—There is a considerable variation within the specimens examined, and it is possible to match the variations in spicule size with published variations in species. However, it appears preferable to identify all these specimens with the older cosmopolitan species, which should probably receive many of the *Haliclona* in synonymy.

### ***Haliclona palmata* (Ellis and Solander)**

Plate 6, Figs. 11, 12; Plate 7, Fig. 13

*Spongia palmata* Ellis and Solander, 1786, p. 189.

*Haliclona palmata* Burton, 1930, p. 511.

*Diagnosis*.—Specimens of this sponge are semiglobular, resilient, and drab in alcohol. Gemmules are present in some specimens. Their most characteristic size is 160 by 200  $\mu$ . The internal structure is typical Haliclonid architecture with the suggestion of reticulation and the lack of dermal specialization. The oxeas are 4 by 45  $\mu$  with very little variation and no differences in arrangement or size for the various sections of the sponge.

*Holotype*.—British Museum.

*Type locality*.—European waters.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 515-36	San Francisco Island	2-24-36	Shore
-------------	----------------------	---------	-------

*Remarks*.—The Hancock specimens of *Haliclona palmata* look, superficially, somewhat like *H. lunisimilis* de Laubenfels from Pacific Grove, California; but the oxeas are, as noted above, only 4 by 45  $\mu$  as compared with 8 to 10 by 110 to 125  $\mu$  in *H. lunisimilis*. It is possible that the specimens should be classified with those mentioned above as *H. cinerea* or with *H. lunisimilis*; but *H. palmata* is also well established and cosmopolitan, and the spiculation of our specimens is much closer to it than to that of either of the others.

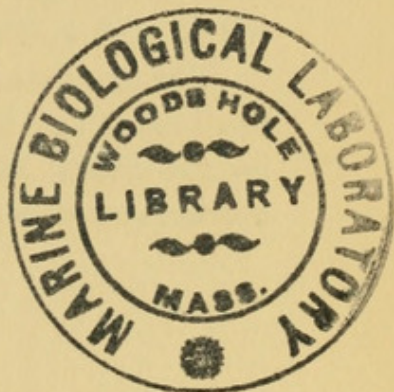
### ***Haliclona permolis* (Bowerbank)**

Plate 7, Fig. 14; Plate 8, Fig. 15

*Isodictya permolis* Bowerbank, 1866, p. 278.

*Isodictya ramuscula* Bowerbank, 1866, p. 314.

*Haliclona permolis* de Laubenfels, 1936, p. 38.





*Diagnosis.*—This is the cosmopolitan, lavender sponge, which is softly spongy and rather slimy to the touch. The Gulf specimens have oscular chimneys shaped like volcanic cones sometimes 1 cm high over the surface. Oscules are about 2 mm in diameter. Pores  $200\ \mu$  in diameter are abundant. There are no spicules in the dermis and no subdermal cavities. Specimens are 1 cm thick and cover an area averaging 25 cms square. The internal structure is an isodictyal reticulation of oxeas averaging 5 by  $130\ \mu$ .

*Holotype.*—British Museum.

*Type locality.*—British waters.

*Distribution.*—World wide.

*Material examined.*—

Sta. 515-36	San Francisco Island	2-24-36	Shore
Sta. 586-36	Concepción Bay	3-14-36	8 m

*Remarks.*—This specimen has been previously reported from Albemarle Island, Galapagos, by earlier Hancock Pacific Expeditions and again from Albemarle Island by members of the Presidential Cruise to those waters in 1938, as well as near Panama City by de Laubenfels in 1933. It has also been reported from nearly all oceans of the world. It is easily identifiable by its unvarying lavender color. This is one of the few instances where color seems important in sponge identification.

### Family **Callyspongiidae** de Laubenfels

Genus **CALLYSPONGIA** Duchassaing and Michelotti

**Callyspongia californica**, new species

Plate 8, Fig. 16; Plate 9, Figs. 17, 18

*Diagnosis.*—The specimen of this sponge is a fragment 5 cm long, 4 cm wide, and slightly more than 1 cm high. The general form tends to be somewhat ramose. The consistency is from mediocre to fragile, and the entire specimen is translucent but brownish in color, both internally and externally.

The surface is superficially smooth. There appears to be a surface membrane about  $100\ \mu$  thick, which is very tightly held. Uniformly scattered over the specimen are openings  $200\ \mu$  in diameter. There are in addition larger openings 2 mm in diameter. These tend to occur at the end of the branches, but this is not always the case.

The spiculation, as is typical in *Callyspongia*, consists exclusively of small oxeas and is tangential. The oxeas are rather larger than is usual for this genus. Many were found which measured 5 by  $150\ \mu$ , but the average size is more nearly 3 by  $80\ \mu$ . The ascending fibers are  $25\ \mu$  wide



and contain about 20 rows of spicules. The fibers are largely spongin, containing but very little detritus. The primary dermal mesh measures 130 by 220  $\mu$  as an average. The second mesh is about 100  $\mu$  square.

*Holotype*.—AHF no. 2.

*Type locality*.—Tangola Tangola Bay, Mexico; Lat. 15° 45' 37" N, Long. 96° 05' 24" W, Tangola Tangola Island.

*Distribution*.—Same.

*Material examined*.—

Sta. 261-34 Tangola Tangola

3- 1-34 Shore

*Remarks*.—This specimen differs from *Callyspongia vaginalis* Lamarck in the size of the oxeas, which frequently measure 5 by 150  $\mu$  with an average of 3 by 80  $\mu$  as compared with an average of 3 by 50  $\mu$  for *C. vaginalis*, which has an upper limit of 4 by 70  $\mu$ . *C. ridley* Burton is the only species that has such large spicules. This specimen, which was collected in Australia, has oxeas that measure 8 by 200  $\mu$ .

The coarser dermal fibers of *C. vaginalis* vary from 30 to 70  $\mu$  and form a mesh 130 to 400  $\mu$  in diameter. The specimen under discussion shows main fibers which vary little from 25  $\mu$  and a primary mesh which rarely exceeds 220  $\mu$ . The finer dermal strands of the Hancock specimen measure 8  $\mu$  wide as compared with an average of 15  $\mu$  for *C. vaginalis* and form a mesh about 100  $\mu$  square as against 80  $\mu$ .

This specimen is also very much smaller with tubes much shorter than *C. vaginalis*, which has a typical tube length of 20 cm as compared with 1 cm. The texture is more delicate and does not exhibit the characteristic conules.

In reviewing the species of *Callyspongia* for purposes of comparison, it was noted that the species described by Lendenfeld, 1912, p. 2, as *Spinosella infundibulum* should not be left in *Callyspongia*. In general, of course, *Spinosella* falls in synonymy to *Callyspongia*, but on the basis of Lendenfeld's description his *infundibulum* belongs in the Haliclونidae, the genus *Cribrochalina*.

Although this specimen is not properly from the Gulf of California region, it seems expedient to include it in the present paper, since its location to the south places it directly in the path which was probably followed by the present sponge fauna of the Gulf of California as it migrated from the West Indies. A water passage across Mexico connecting the Atlantic and the Pacific existed in the late Miocene period.



Order **POECILOSCLERINA** TopsentFamily **Adociidae** de LaubenfelsGenus **ADOCIA** Gray**Adocia gellindra** de Laubenfels

Plate 10, Figs. 19, 20

*Halichoclona gellindra* de Laubenfels, 1932, p. 114.*Adocia gellindra* de Laubenfels, 1936, p. 71.

*Diagnosis*.—"Shape encrusting, size 2 to 4 mm thick, somewhat more than 4 square cm in area. Consistency, fragile. Color in life, pale lavender. Oscules, few and irregular in shape, about 1 mm in diameter, often with raised collars nearly 1 mm high. Pores, abundant, 30  $\mu$  to 50  $\mu$  in diameter. Surface, superficially smooth.

"Ectosomal specialization, a crust of tangentially placed oxeas, its thickness only about 20  $\mu$ . Endosomal structure, oxeas in very regular isodictyal reticulation, united at their apices only.

"Principal spicules, oxeas size 3  $\mu$  by 110  $\mu$  to 4  $\mu$  by 120  $\mu$ . The specimen from Laguna Beach, California, had spicules 8  $\mu$  by 150  $\mu$  to 10  $\mu$  by 170  $\mu$ ." (de Laubenfels, 1932, p. 114.)

*Holotype*.—U.S.N.M.

*Type locality*.—Carmel, California.

*Distribution*.—Reported from Carmel, California, to the Gulf of California.

*Material examined*.—

Sta. 728-37 San Esteban Island

3-27-37 Shore

*Remarks*.—The oxea size (5 by 145  $\mu$  to 8 by 180  $\mu$ ) of the Gulf specimens is rather larger than the typical size found in the holotype but corresponds very closely with the sizes reported from the specimens found at Laguna Beach, California.

**Adocia ambrosia**, new species

Plate 11, Figs. 21, 22; Plate 12, Figs. 23, 24

*Diagnosis*.—The specimen of this sponge is 14 cm long, 4 cm wide, and 3 cm thick. It is rather ramose in general form. In texture it is woody, and in color a light drab when preserved. The surface is superficially smooth, and there is a definite tangential dermal skeleton, nondetachable, averaging 600  $\mu$  in thickness. The specimen appears to be a fragment of a larger mass.

Pores are abundantly scattered all over the surface, although they are too small to be seen with the naked eye. The average diameter of these openings is 30  $\mu$ .



Oscules are also found. They vary in size up to 4,000  $\mu$  with an average of 3,500  $\mu$ . The spiculation is, in general, tangent and reticulate. The principal megascleres are exclusively diacts with an average size of 14 by 240  $\mu$ , and there is little variation from the average. A second category of oxeas, averaging 3 by 130  $\mu$ , with very little size variation is also present.

*Holotype*.—AHF no. 3.

*Type locality*.—East of San Marcos Island, Mexico; 12 fms; sand bottom.

*Distribution*.—Same.

*Material examined*.—

Sta. 581-36 San Marcos Island 3-14-36 24 m

*Remarks*.—This *Adocia* differs from *A. gellindra*, also found in the Gulf, chiefly in the size of the principal oxeas, which are almost twice as large, and in the possession of a second class of megascleres. In the latter respect it is like *A. neens*, a West Indian sponge, but *A. neens* has much smaller spicules and has a protoplasmic mesh at the surface resembling that found in *Callyspongia*. It might be added that the ramose shape and drab color of the new species contrast with the lavender color and encrusting form of *A. gellindra*.

Genus **PELLINA** Schmidt  
**Pellina semitubulose** (Lieberkühn)

Plate 13, Figs. 25, 26

*Halichondria semitubulose* Lieberkühn, 1859, p. 363.

*Diagnosis*.—The specimen is a paper-thin tube 3 or 4 mm in diameter and 25 mm long. It is broken at one end.

The ectosome is raised and easily detachable, since it covers subdermal spaces. It contains tangentially placed spicules. The endosome has a well-defined isodictyal reticulation.

The sole kind of spicule is the smooth oxea. These are most frequently 5 by 130  $\mu$ , but there is considerable range from 10 by 125  $\mu$  to 2 by 50  $\mu$ .

*Holotype*.—Unknown.

*Type locality*.—Mediterranean.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 640-37 San Lorenzo Channel 3- 7-37 60 m

*Remarks*.—The tube described above is beyond doubt an oscular chimney broken from the basal mass, of which only fragments are left along with the tube.



Genus **SIGMADOCIA** de Laubenfels**Sigmatocia edaphus** de Laubenfels

Plate 14, Figs. 27, 28; Plate 15, Fig. 29

*Gellius edaphus* de Laubenfels, 1930, p. 28.*Sigmatocia edaphus* de Laubenfels, 1936, p. 69.

*Diagnosis.*—This is a rather massive sponge, almost stony hard, and, when preserved, white in color. Oscules 1 to 2 mm in diameter are often present. The surface appears to be smooth. There is a well-developed dermal layer, although it is only 10 to 20  $\mu$  thick and not easily detachable. Tangentially placed spicules are present in this special layer.

The spiculation is typical of the family and genus, consisting of oxeas as large as 18 by 400  $\mu$  with considerable variation down to 10 by 225  $\mu$ . The microscleres are sigmas only and these average 40  $\mu$  in length.

*Holotype.*—U.S.N.M.

*Type locality.*—Pescadero Point, California.

*Distribution.*—Pescadero Point south to the Gulf of California.

*Material examined.*—

Sta. 667-37 Carmen Island

3-12-37 120 m

*Remarks.*—The oxeas in these specimens average somewhat larger than the specimens from central and southern California (15 by 270  $\mu$  as against 18 by 400  $\mu$ ); but there is considerable variation within all specimens, so that overlapping occurs at least to some extent. The microscleres are of about the same length in specimens from all locations.

Family **Coelosphaeridae** HentschelGenus **RHIZOCHALINA** Schmidt**Rhizochalina pacifica**, new species

Plate 15, Fig. 30; Plate 16, Figs. 31, 32

*Diagnosis.*—The Hancock specimens of this sponge appear to be oscular chimneys or lipostomous fistules torn from a basal plate or mass, only fragments of which are present.

The specimens are white, averaging about 3 cm long and from .5 cm to 1 cm in diameter. The surface, which is tough and leathery, is white in alcohol and pierced by abundant pores about .5 mm in diameter. There are oscules at the ends of most of the chimneys. These are 2 or 3 mm in diameter. The surface is slightly hispid.

The endosome is not dense and is held together between the tough ectosome and the fleshy cloacal dermis.

The only spicules are oxeas, which are about 30  $\mu$  by 1,300  $\mu$ . There is little size variation, although rare thinner and longer oxeas are found.



The principal fibers are  $50\ \mu$  in diameter and contain 4 spicule rows. The secondary fibers are difficult to make out and contain only occasional spicules. Spicules are also scattered in confusion outside the fibers.

*Holotype*.—AHF no. 4.

*Type locality*.—San Jaime Banks, off Cape San Lucas, Mexico; Lat.  $22^{\circ} 50' 30''$  N, Long.  $110^{\circ} 15'$  W; old coralline algae, granite rocks.

*Distribution*.—Gulf of California.

*Material examined*.—

Sta. 618-37 San Jaime Bank 3- 3-37 150 m

*Remarks*.—The San Jaime Banks are not in the Gulf of California; but their location near the mouth, plus the fact that the sponge fauna from there is, in most cases, also found in the Gulf proper, makes the location an integral part of the region as far as this study is concerned.

There is no other *Rhizochalina* reported from the west coast of the Americas. In fact, none has been reported from the American zone of the Pacific Basin. The nearest relative appears to be *R. sessilis* Kirkpatrick, 1900, from the East Indies. This had a pyramid to fingerlike shape, but its oxeas are only 14 by  $372\ \mu$ . This is a large difference. The principal tracts are much larger and contain 10 rows of spicules, while the secondary tracts are about the size of the principal tract in the Gulf species and contain 3 rows of spicules. *R. oleracea* Schmidt, 1870, which is the genotype, is somewhat similar, but has even smaller spicules than *R. sessilis*. It is West Indian.

Family **Plocamiidae** Topsent

Genus **PLOCAMIA** Schmidt

**Plocamia karyoka**, new species

Plate 17, Figs. 33, 34; Plate 18, Fig. 35

*Diagnosis*.—This is an encrusting sponge, rather firm in consistency, with branching protrusions often several mm in diameter, making up the bulk of the specimen. The preserved material from the Gulf is, of course, drab.

The endodermal structure is interesting in that its ascending columns with connecting spicules give it a ladderlike appearance under the low power of a microscope.

The principal spicules are subtylostyles with microspined heads; size  $18\ \mu$  by  $340\ \mu$ . Secondary spicules, strongyles with microspined heads; size  $16\ \mu$  by  $200\ \mu$  to  $22\ \mu$  by  $175\ \mu$ . Interstitial spicules, tylostyles; size  $12\ \mu$  by  $200\ \mu$  to  $3\ \mu$  by  $160\ \mu$ . First microscelere, palmate isochelas of a peculiar twisted form; length  $10\ \mu$  to  $17\ \mu$ . Second microscelere, toxas; length  $18\ \mu$  to  $80\ \mu$ .



*Holotype*.—AHF no. 5.

*Type locality*.—Isabel Island, Mexico; 40 m; dead shells and sand.

*Distribution*.—Same.

*Material examined*.—

Sta. 974-39 Isabel Island

5- 9-39 Shore

*Remarks*.—This sponge is close to *Plocamia karykina* of California, but the tylostyles are much longer ( $18\ \mu$  by  $340\ \mu$ ) and there are strongyles instead of tylotes. The most interesting feature of this specimen is the peculiar contortion of the palmate isochelas. One palm on nearly all of them is turned at right angles to the other, making them difficult to identify as to type. This type of contortion is common with sigmas but relatively rare with chelas. Such contortion never occurs in *P. karykina* from California.

Genus **PLOCAMIONIDA** Topsent

**Plocamionida** igzo de Laubenfels

Plate 18, Fig. 36

*Plocamia igzo* de Laubenfels, 1932, p. 102.

*Plocamionida igzo* de Laubenfels, 1936, p. 78.

*Diagnosis*.—This is an encrusting sponge, stiff to woody in consistency, and drab in alcohol. California specimens are red in life. Oscules are rarely present, and the surface specialization is not evident to the naked eye.

The endosome is of the plumose type of architecture but not closely organized.

The spiculation is rather typical of the genus with smooth to microspined tylostyles  $11\ \mu$  by  $190\ \mu$  to  $35\ \mu$  by  $340\ \mu$  as dermal spicules, spined tylotes  $13\ \mu$  by  $130\ \mu$  as principal spicules, and arcuate chelas  $14\ \mu$  long.

*Holotype*.—U.S.N.M.

*Type locality*.—Point Piños, California.

*Distribution*.—Central California to the Gulf of California.

*Material examined*.—

Sta. 277-34 Isabel Island

3- 5-34 30 m

*Remarks*.—Perhaps it is worthy of note that both *Plocamionida* and *Plocamia* are found at Isabel Island and are common in the same locality in central California. In view of this fact we might well be justified in considering them as variations of the same genus. However, the chelas are very different, and this has been frequently used as a basis for separation. The peculiar contorted chelas of the Isabel Island *Plocamia* make them resemble, if somewhat superficially, the more primitive types. Dropping the two into synonymy will, probably, be justified but at present awaits further material for study.



Family **Cyamonidae** de LaubenfelsGenus **CYAMON** Gray**Cyamon argon**, new species

Plate 19, Figs. 37, 38

*Diagnosis.*—This sponge is bushlike in appearance. It covers an area of 4 by 2 by 3 cm. The preserved specimen is dark brown in color. The consistency is firm and corklike, and the surface is extremely uneven and covered with branchlike projections 1 cm long by 1 mm in diameter. The entire surface is hispid to 500  $\mu$ . Neither pores nor oscules can be found.

The main mass of this sponge consists of closely packed triacts covered with low, blunt spines especially at the ends, which are rounded. Two of the rays of the triacts are much longer than the third, being on the average 25  $\mu$  by 125  $\mu$ , while the third ray is only 25  $\mu$  long although almost as thick as the longer rays at its base. Occasional triacts are found which lack the blunt spines. Very long interstitial smooth styles are also present. These are 27  $\mu$  by 400  $\mu$  minimum and probably much longer, as most of them are broken. Another type of spicule occasionally found is long, smooth, and wavy. This type is so regularly broken that its exact nature is difficult to determine, but it is at least 42  $\mu$  by 325  $\mu$  and appears to be stylote.

*Holotype.*—AHF no. 6.

*Type locality.*—South Bay, Cerros Island; Lat. 28° 05' 20" N, Long. 115° 18' 40" S; 24 m; rock close to kelp beds.

*Distribution.*—Same.

*Material examined.*—

Sta. 287-34 Cerros Island

3-10-34 25 m

*Remarks.*—This new species is very distinctive, being completely unlike the genotype, which has mostly tetractine spicules (instead of triactine spicules) with all rays of equal length. It is perhaps most like *Cyamon neon* of southern California, but that sponge had only the short ray of the triacts spined, and both triacts and tetracts which are often oxecote. *C. neon* is also a massive sponge without the peculiar surface specialization found on the new species. There are also numerous differences in spicule size.

Genus **TRIKENTRION** Ehlers**Trikentrion helium**, new species

Plate 20, Figs. 39, 40

*Diagnosis.*—This sponge is 7 by 5 by 5 cm. It is made up of undulating or corrugated sheets, which are rather thin and attached at one edge. The texture is woody and somewhat brittle. The color in alcohol is drab throughout. A thick spicule brush covers the surface to a depth of 3 mm in many places.



There is a distinct surface layer 500  $\mu$  thick, but this is nondetachable, indicating a lack of extensive subdermal cavities. Occasional openings are found which average about 1 mm in diameter. These are probably oscules. The endosomal structure is decidedly firm and fleshy, and the gross cavities cannot be seen with the naked eye.

The chief spiculation consists of a mass of triacts, which have large spines on the short ray only. The triact is about 250  $\mu$  long and 25  $\mu$  thick. The spined third ray averages 24  $\mu$  in length. The only other spicule type is a very long, thin oxea. These are 4  $\mu$  thick and reach a length of several mm.

*Holotype*.—AHF no. 7.

*Type locality*.—Cerro Island; Lat. 28° 05' 20" N, Long. 115° 18' 40" S; dredged from 20 fms in the bay.

*Distribution*.—Same.

*Material examined*.—

Sta. 287-34 Cerro Island

3-10-34 Shore

*Remarks*.—It is interesting to note that *Cyamon* and *Triaktrion* were found near each other in the Gulf of California. *Cyamon* is found in the West Indies but not *Triaktrion*; both *Triaktrion* and *Cyamon* are found in the East Indies. The California species of *Cyamon*, *C. neon*, is similar to *Triaktrion helium* but has only very small spines on the triacts, while this sponge has very large ones; and, most important, the California sponge has styles, while the Gulf specimen does not. *Triaktrion flabelliformis* has the large spines but also some monacts. It is probably the closest relative of the new species.

### Family Myxillidae Hentschel

#### Genus IOPHON (Gray) de Laubenfels

##### *Iophon indentatus* Wilson

Plate 21, Figs. 41, 42; Plate 22, Fig. 43

*Iophon lamella* Wilson, 1904, p. 146.

*Iophon indentatus* Wilson, 1904, p. 151.

*Diagnosis*.—Specimens of this sponge are massive, brown in alcohol, and mediocre in consistency. Oscules about 1 mm in diameter are scattered over the surface of some specimens. No pores are evident to the naked eye. The endosomal structure is "breadly."

The principal spicules are acanthostyles 13  $\mu$  to 17  $\mu$  by 300  $\mu$  to 333  $\mu$ . The ectosomal spicules are smooth tylotes with heads microspined; size 5  $\mu$  by 200  $\mu$  to 266  $\mu$ . Palmate anicochelas of the usual contort type about 13  $\mu$  long, and bipocillates 15  $\mu$  long are common in one of the specimens



which was collected in deep water. The other specimen has few microscleres. Occasional sigmas were found in one specimen, but these may not be proper.

*Holotype*.—U.S.N.M.

*Type locality*.—Gulf of California and west coast of Central America.

*Material examined*.—

Sta. 559-36	Isla Partida	3- 9-36	90 m
Sta. 560-36	Isla Partida	3- 9-36	140 m

*Remarks*.—Wilson, 1904, described two sponges from the west coast of Central America as *Iophon indentatus* and *Iophon lamella*. They were collected by the *Albatross* in 1891. As there is little to distinguish between the two and as both are from the same locality, *I. lamella* should be placed in synonymy with *I. indentatus*.

Other *Iophon* sponges reported are *I. chelifera* Lambe, 1893, which was reported from the west coast of Canada and again from southern California by de Laubenfels (variety California) and a variety of *I. chelifera* (ostiamagna) reported by Wilson, 1904, from the eastern tropical Pacific. All of these, together with *I. indentatus*, are very close together and are probably a single species.

### Genus MYXICHELA de Laubenfels

#### *Myxichela microtoxa* de Laubenfels

Plate 22, Fig. 44; Plate 23, Figs. 45, 46

*Diagnosis*.—This sponge is a massive form of Myxilliidae. The surface is broken into a closely packed mass of protuberances, between which openings about 800  $\mu$  in diameter are occasionally to be seen. A surface membrane, if present, is not clearly defined. The color of the preserved specimen is drab throughout, and the consistency rather corklike. The surface is occasionally hispid to 100  $\mu$ .

The chief megascleres are acanthostyles which are exceptionally rough. They are 20  $\mu$  by 333  $\mu$  in average size. Dermal spicules are tylotes with heads microspined. The size of these spicules is most frequently 4  $\mu$  by 190  $\mu$ . There are no smooth styles. The microscleres are palmate chelas, which are rather consistently 15  $\mu$  long, and toxas, which have an average length of 135  $\mu$ .

*Holotype*.—AHF no. 8.

*Type locality*.—Between Angel de la Guardia Island and Isla Partida; 40 m; nullipores.

*Distribution*.—Same.



*Material examined.*—

Sta. 555-36 Angel de la Guardia Island 3- 8-36 40 m

*Remarks.*—This sponge is not close to any other member of the genus. The genotype *Myxichela tawiensis* is perhaps the nearest relative, but it has bipocilli and the toxas are more than twice as large. *Lepthoclathria hoplotoxa* is similar in the size of the microscleres and the same type of megascleres, although they are much smaller, but it is a thin encrusting sponge instead of massive.

## Genus MYXILLA Schmidt

*Myxilla mexicensis*, new species

Plate 24, Figs. 47, 48; Plate 25, Figs. 49, 50

*Diagnosis.*—This sponge is massive, 10 cm by 7 cm by 6 cm, and amorphous. The color in alcohol is pinkish drab, the consistency mediocre. A distinct dermal membrane about 100  $\mu$  thick covers rather extensive subdermal cavities and is easily detachable. The surface of the sponge is superficially smooth. Occasional openings 3 mm in diameter and irregularly placed are found. The endosome is very coarse in microscopic structure.

Coring spicules are very small anchorate chelas, which are usually 12  $\mu$  but sometimes only 10  $\mu$  long. Sigmas are also present, as a rule about 14  $\mu$  in length. An occasional sigma 32  $\mu$  was found in one specimen, but these do not appear to be proper.

*Holotype.*—AHF no. 9.

*Type locality.*—Off San Francisco Island; 60 m; corallines.

*Distribution.*—Gulf of California.

*Material examined.*—

Sta. 513-36	San Francisco Island	2-24-36	60 m
Sta. 520-36	Agua Verde Bay	2-27-36	15 m
Sta. 607-36	San Lorenzo Channel	3-21-36	48 m
Sta. 642-37	Espiritu Santo Island	3- 8-37	55 m

*Remarks.*—All the sponges of the Myxillidae, which are massive, have megascleres that are very close to one another in type. They are distinguished as to genus by the combination of microscleres present (or absent) and as species largely by the size range of the spicules. It is on this basis that the above species is established. The microscleres are exceedingly small for their type for the *Myxilla*. In fact, they represent an extreme for the genus. *M. agennes* de Laubenfels, 1930, apparently the nearest relation, differs in having sigmas about 33  $\mu$  and chelas about 27  $\mu$ . This sponge is from California. *M. rosacea* Lieberkühn, 1859, has sigmas 49  $\mu$  and chelas 30  $\mu$ . In addition, the styles are spiny throughout their length instead of only on the head.



Family **Tedaniidae** Ridley and DendyGenus **TEDANIA** Gray**Tedania nigrescens** (Schmidt)

Plate 26, Figs. 51, 52

*Reniera nigrescens* Schmidt, 1862, p. 64.*Tedania nigrescens* Gray, 1867, p. 495.

**Diagnosis.**—Specimens of this sponge vary from massive to encrusting. In alcohol the color varies from almost black to drab. Oscules up to 5 mm in diameter are frequently present, although not always so. There is a dermal layer about 50  $\mu$  thick and nondetachable, although some specimens seem to lack the layer perhaps because of rough handling. As a rule, the surface is smooth, though in some specimens it is broken by protuberances especially around the oscules.

Principal spicules in specimens from the Gulf are styles averaging about 8  $\mu$  by 150  $\mu$ . Special dermal spicules are tylotes 4  $\mu$  by 200  $\mu$ . The microscleres are the characteristic roughened raphids (onychaetes) 1  $\mu$  to 2  $\mu$  by 140  $\mu$ .

**Holotype.**—British Museum.

**Type locality.**—Mediterranean.

**Distribution.**—World wide.

**Materials examined.**—

Sta. 598-36	Puerto Escondido	3-17-36	Shore
Sta. 631-37	La Paz Bay	3- 6-37	10 m
Sta. 639-37	Espiritu Santo Island	3- 7-37	10 m
Sta. 650-37	San Francisco Island	3- 9-37	90 m

**Remarks.**—*Tedania nigrescens* has been reported from James Island, Galapagos, and Magdalena Bay, Mexico, collected on the Presidential Cruise to these waters in 1938, and by the Hancock Pacific Expeditions from Albemarle Island in the Galapagos; also from Mexico and Central America.

Genus **ACARNUS** Gray**Acarus erithacus** de Laubenfels

Plate 27, Figs. 53, 54; Plate 28, Fig. 55

*Acarus erithacus* de Laubenfels, 1927, p. 258.

**Diagnosis.**—This is a massive sponge, brilliant red in life and drab when preserved. Its spiculation is described as follows: "Ectosomal spicules, tylotes with heads microspined; size 3  $\mu$  by 185  $\mu$  to 4  $\mu$  by 175  $\mu$ . Interratital spicules, cladotylotes, size 11  $\mu$  by 230  $\mu$ . Chords 35  $\mu$ . Coring spicules styles; size, 18  $\mu$  by 345  $\mu$  to 17  $\mu$  by 425  $\mu$ ; these are the



most conspicuous elements. Echinating spicules acanthocladotylotes, size  $3\ \mu$  by  $80\ \mu$ , chords  $11\ \mu$  and larger. First microscleres, palmate isochelas; length,  $14\ \mu$  to  $16\ \mu$ ; second microscleres, toxas; length,  $40\ \mu$  to  $340\ \mu$ ." (de Laubenfels, 1932, p. 104.)

*Holotype*.—U.S.N.M.

*Type locality*.—Pacific Grove, California.

*Distribution*.—Central and southern California, coast of Baja, California, and the Gulf of California.

*Material examined*.—

Sta. 1085-40 San Pedro Nolasco Island 2- 6-40 55 m

*Remarks*.—The Gulf specimen has a rather greater range in spicule length than the California specimens, the styles sometimes attaining a length of  $800\ \mu$ , while the toxas show an even more amazing variation than those of the California specimens, reaching a maximum of  $440\ \mu$ . There are many, however, which are in the size range of the holotype.

### Genus **LISSODENDORYX** Topsent

#### **Lissodendoryx isodictyalis** Topsent

Plate 28, Fig. 56; Plate 29, Figs. 57, 58; Plate 30, Figs. 59, 60

*Halichondria isodictyalis* Carter, 1882, p. 285.

*Tedania leptoderma* Topsent, 1889, p. 49.

*Lissodendoryx isodictyalis* Topsent, 1894, p. 9.

*Diagnosis*.—This is a massive sponge, drab in alcohol, and soft in consistency. The surface is superficially smooth and oscules are prominent. A dermis is present about  $10\ \mu$  thick. It overlies extensive subdermal cavities and contains special dermal spicules, which are tylotes averaging  $4\ \mu$  by  $175\ \mu$ . The interior mesh is made up of smooth styles  $5\ \mu$  by  $145\ \mu$  on the average. Arcuate isochelas  $21\ \mu$  long and sigmas  $18\ \mu$  long are the microscleres.

*Holotype*.—British Museum.

*Type locality*.—West Indies.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 500-36 Espiritu Santo Island 2-20-36 Shore

Sta. 1041-40 Guaymas Bay 1-23-40 Shore

*Remarks*.—This sponge has been reported from the West Indies, the Mediterranean, and the East Indies, as well as from the Gulf of California. The characteristics of specimens found in the Gulf follow very closely previously published descriptions.



Family **Raspailiidae** HentschelGenus **HEMECTYON** Topsent**Hemectyon hyle** de Laubenfels

Plate 31, Figs. 61, 62; Plate 32, Figs. 63, 64

*Hymectyon hyle* de Laubenfels, 1930, p. 28.

*Diagnosis.*—This species has the characteristic ramose shape of the family. The echinating spicules are unusual-looking acanthostyles  $12\ \mu$  by  $180\ \mu$  and larger with only the sharp ends spined; coring spicules, styles averaging  $18\ \mu$  by  $480\ \mu$ , also some strongyles somewhat shorter, and raphids about  $2\ \mu$  by  $250\ \mu$ . There are some very long, thin spicules present which are so broken that their length cannot be determined.

*Holotype.*—U.S.N.M.*Type locality.*—Point Fermin, California.*Material examined.*—

Sta. 559-36	Isla Partida	3- 9-36	90 m
Sta. 618-37	San Jaime Bank	3- 3-37	150 m
Sta. 751-37	Los Frailes Bay	4- 4-37	30 m

*Remarks.*—The Gulf specimens of the species show considerable variation of spicule size, tending on the whole to have larger spicules than the specimens reported from southern California.

**Hemectyon hymani**, new species

Plate 33, Figs. 65, 66

*Diagnosis.*—This is a very beautiful, fan-shaped species. It is lacelike in appearance, and characteristic specimens are about 45 cm square and not over 3 or 4 mm thick at any point. It is rather stiff and woody in texture, and the surface is slightly hispid to the touch. The color in alcohol is light drab, almost white. Pores and oscules are not visible.

The spicules on the periphery of the sponge are erect and consist of acanthotylostyles averaging  $6\ \mu$  by  $130\ \mu$ . The echinating spicules are acanthostyles and acanthotylostyles  $30\ \mu$  by  $300\ \mu$ , the former being noteworthy because of a frequent right angle bend toward the head end. Coring spicules are smooth styles  $36\ \mu$  thick and very long, but so broken that an actual length cannot be assigned. Microscleres are raphids size  $2\ \mu$  by  $150\ \mu$ .

*Holotype.*—AHF no. 10.

*Type locality.*—San Jaime Banks off Cape San Lucas, Mexico; Lat.  $22^{\circ} 50' 30''$  N, Long.  $110^{\circ} 15'$  W; 150 m; old coralline algae.

*Distribution.*—Same.*Material examined.*—

Sta. 618-37	San Jaime Bank	3- 3-37	150 m
-------------	----------------	---------	-------



*Remarks.*—This sponge is closely related to *Hemectyon hyle* de Laubenfels, which is found in the same region. It differs, however, by its distinctive form, which is very unlike the vase-like form of *H. hyle*, found in the same region. The spiculation is consistently about half as large, although we are undoubtedly dealing with a fully mature specimen. Should intermediate types, in form and spiculation, be discovered, it is possible that this species would fall in synonymy; but at present it seems more convenient to erect a new species for this distinctive group of specimens. Another possibility is that we are dealing with a series of stages in a complex life history or that this sponge has distinct male and female forms and that we have here one of the sexes of which *H. hyle* is the other.

Family **Microcionidae** Hentschel

Genus **HETERECTYA** Hallmann

**Heterectya cerebella**, new species

Plate 34, Figs. 67, 68

*Diagnosis.*—The preserved specimen of this sponge is drab in color. It is 3 cm by 2 cm by 2 cm and is made up of coalesced twisted columns 2 or 3 mm in diameter, which give it the appearance of brain coral. The specimen is a fragment of a larger mass. The surface is finely grained, but ectosomal specialization is very vague. Two openings are visible on the specimen each about 4 mm in diameter. They are probably oscules.

The megasclere spiculation is typical of the genus with smooth styles 35  $\mu$  by 600  $\mu$ , which do not differ in the surface layer. The echinating spicules are peculiarly bent styles. The bending is sharp and occurs about one-fifth of the length from the head. The lower third of the spicule is heavily spined. The average size is 30  $\mu$  by 400  $\mu$ . No microscleres are present.

*Holotype.*—AHF no. 11.

*Type locality.*—Off Isla Partida to the south; 90 m; sand bottom.

*Distribution.*—Same.

*Material examined.*—

Sta. 559-36 Isla Partida

3- 9-36 90 m

*Remarks.*—This is the only member of the genus so far reported from the Pacific coast. Its nearest relative appears to be *Raspailia inaequalis* Dendy, but this sponge has oxaeas as well as styles for dermal spicules. It should be transferred to *Echinaxia*. It is interesting to note that the specimen of *Heterectya* was full of worms of various kinds.



Genus **ISOCIONA** Hallmann  
**Isociona lithophenix** de Laubenfels  
Plate 35, Figs. 69, 70; Plate 36, Figs. 71, 72

*Plocamia lithophenix* de Laubenfels, 1927, p. 263.

*Isociona lithophenix* de Laubenfels, 1932, p. 99.

*Diagnosis.*—This sponge has a vague sort of ectosomal specialization. The endosome is an isodictyal reticulation. The principal spicules are acanthostyles to acanthostrongyles  $14\ \mu$  by  $140\ \mu$ . The dermal spicules are smooth tylostyles  $5\ \mu$  by  $200\ \mu$ . A few smooth styles  $10\ \mu$  by  $210\ \mu$  and some acanthostyles  $15\ \mu$  by  $150\ \mu$  are also found. The palmate isochelas are typically  $17\ \mu$  to  $21\ \mu$ . The toxas in the Gulf specimens sometimes reach the length of  $260\ \mu$  but average around  $180\ \mu$ .

*Holotype.*—U.S.N.M.

*Type locality.*—Pacific Grove, California.

*Distribution.*—Central and southern California and the Gulf of California.

*Material examined.*—

Sta. 542-36	Puerto Refugio	3- 4-36	50 m
Sta. 559-36	Isla Partida	3- 9-36	90 m
Sta. 562-36	San Esteban Island	3-10-36	90 m

*Remarks.*—The toxas found in specimens from the Gulf are somewhat larger than those found in specimens from southern and central California, but this is not an especially significant difference. This *Isociona* is the only member of the genus other than the genotype.

Family **Ophlitospongiidae** de Laubenfels  
Genus **MYCALE** Gray  
**Mycale angulosa** (Duchassaing and Michelotti)  
Plate 37, Figs. 73, 74; Plate 38, Figs. 75, 76

*Pandaros angulosa* Duchassaing and Michelotti, 1864, p. 89.

*Hircinia purpurea* Whitfield, 1901, p. 49.

*Mycale angulosa* de Laubenfels, 1936, p. 116.

*Diagnosis.*—This is a massive sponge with large cavities and a generally coarse gross architecture. It has a densely packed fiber mass ascending to a fan-shaped surface structure. The spicules are tylostyles sometimes only sub; size  $2\ \mu$  by  $200\ \mu$ . The palmate anisochelas are  $14\ \mu$  to  $20\ \mu$  and the sigmas  $42\ \mu$  to  $45\ \mu$ .

*Holotype.*—Museum of the University of Turin.

*Type locality.*—West Indies.



*Distribution.*—This sponge has been described from the West Indies and from the Gulf of California as just noted. It has also been described from Australia, but the Australian specimen is certainly not conspecific.

*Material examined.*—

Sta. 1039-40 Guaymas Bay

1-23-40 10 m

*Remarks.*—The specimen mentioned above is remarkably close to previously published descriptions. The California member of this genus, *M. bellabellensis* Lambe, has much larger chelas than *M. angulosa*. It has, moreover, very few, if any, sigmas. It is probable that several *Mycale* should be synonymized where the differences are in the size ranges of the chelas alone.

### Genus CARMIA Gray

#### *Carmia contax*, new species

Plate 39, Figs. 77, 78; Plate 40, Figs. 79, 80; Plate 41, Fig. 81

*Diagnosis.*—This sponge is about 2 square cm by .5 cm thick. The surface is irregular, the consistency is softly spongy, pores and oscules are not evident.

A special dermal membrane, very thin and detachable, is found in places. This is filled with spicules in confusion. The general endosomal structure is bready with occasional fibers.

The principal spicules are styles to subtylostyles; size  $7\ \mu$  by  $300\ \mu$ . Dermal and interstitial spicules tylostyles; size  $3\ \mu$  by  $240\ \mu$ . There are three size categories of palmate anisochelas: first,  $6\ \mu$  to  $7\ \mu$ ; second,  $14\ \mu$  to  $16\ \mu$ ; third,  $21\ \mu$  to  $23\ \mu$ . This triple range of anisochelas is rather typical of *Mycale* and *Carmia*. Other microscleres are sigmas  $75\ \mu$  and  $18\ \mu$  long, toxas averaging  $55\ \mu$ , and some raphids  $2\ \mu$  by  $150\ \mu$ .

*Holotype.*—AHF no. 12.

*Type locality.*—Los Frailes, Lower California; 20 m; sand and algae bottom.

*Distribution.*—Same.

*Material examined.*—

Sta. 751-37 Los Frailes

4-4-37 20 m

*Remarks.*—This species differs from its nearest relative, *C. contarenii* Martens, 1824, chiefly in the very small size of the sigmas and in the peculiarly shaped heads on the tylostyles of *C. contarenii*, which, while definitely tyloles, may be smaller than the thickest part of the shaft, and show a trilobate structure. *C. contarenii* also has trichodragmas and no toxas. It should be transferred to *Mycale* for this reason. It is found off England and in Mediterranean waters.



***Carmia fascifibula* (Topsent)**

Plate 41, Fig. 82; Plate 42, Figs. 83, 84

*Esperella fascifibula* Topsent, 1904, p. 210.*Mycale fascifibula* de Laubenfels, 1932, p. 70.*Carmia fascifibula* de Laubenfels, 1936, p. 118.

**Diagnosis.**—The specimen of this sponge from the Gulf of California is greenish white in alcohol and cartilaginous in consistency. There is a distinct ectosome 100  $\mu$  thick, which is detachable and covers subdermal cavities. Openings about 65  $\mu$  in diameter can be made out. These are probably pores. No oscules were found on this specimen.

The dermal spicules are tylostyles 10  $\mu$  by 450  $\mu$  to 500  $\mu$ . The principal spicules are styles of the same size. It is difficult to distinguish the two categories, as they are the same size and the tylote modification has every intermediate grade.

The microscleres are two ranges of palmate anischelas 50  $\mu$  and 20  $\mu$  to 22  $\mu$ , sigmas about 250  $\mu$  long and 50  $\mu$  to 60  $\mu$  wide, as well as trichodragmas and toxas.

**Holotype.**—Paris.

**Type locality.**—Azores.

**Distribution.**—Cosmopolitan.

**Material examined.**—

Sta. 557-36 Isla Partida

3- 8-36 90 m

**Remarks.**—The double-headed tylostyles mentioned in the original description do not seem to be present in this specimen; otherwise, it agrees precisely.

**Genus *MICROTYLOSTYLIFER* Dendy*****Microtylostylifer partida*, new species**

Plate 43, Figs. 85, 86; Plate 44, Fig. 87

**Diagnosis.**—The consistency of this sponge is corklike, the color drab throughout. It is very heavily hispidated. The average length of the protruding spicules is more than 3 mm. Protuberances about 3 mm high by 2 mm at the base are visible through the spicule plush. There are twenty of them on the specimen.

A distinct cortical layer, about 600  $\mu$  thick, is present. It is very closely held. Pores and oscules, if present, are not visible because of the very heavy spicule brush. A cross section of the specimen shows it to be fleshy with gross cavities averaging 300  $\mu$ .

Three types of megascleres are present. The dermal spicules are peculiar tylostyles, which have a much thickened shaft. The central



portion of the shaft is thicker than the noblike ends. The same is true to a lesser extent with the styles, which are coring. These spicules are rather thick toward the center but taper to the rounded end. The third megasclere is a thin, exceedingly long spicule, probably an oxea. These are  $30\ \mu$  thick. Just how long they are is not possible to say, as they are much broken; but they extend at least 4 or 5 mm.

The trichodragma modification is present in the microscleres. Tylostyles  $100\ \mu$  to  $150\ \mu$  long and  $1\ \mu$  to  $2\ \mu$  thick are the microscleres.

*Holotype*.—AHF no. 13.

*Type locality*.—West of Isla Partida, Lower California, Mexico; 140 m; rock bottom.

*Distribution*.—Same.

*Material examined*.—

Sta. 560-36 Isla Partida 3- 9-36 140 m

*Remarks*.—No other member of this genus appears to have been reported from the Pacific coast. The type of the genus is Australian. It appears to be the nearest relative, but the spicule sizes do not at all correspond.

Family **Amphilectidae** de Laubenfels

Genus **BIEMNA** Gray

**Biemna rhadia** de Laubenfels

Plate 44, Fig. 88; Plate 45, Fig. 89

*Biemna rhadia* de Laubenfels, 1930, p. 26.

*Diagnosis*.—The specimen of this sponge is 6 cm by 4 cm by 2 cm, color in life drab, consistency mediocre. Occasional oscules 2 mm in diameter are present. The endosomal structure is mostly confused but shows occasional tracts.

The principal spicules are styles  $25\ \mu$  by  $500\ \mu$  to  $28\ \mu$  by  $1500\ \mu$ . The most usual size is  $28\ \mu$  by  $750\ \mu$ . There is a tremendous range of sigmas,  $20\ \mu$  to  $400\ \mu$  in length. Rhaphids  $1\ \mu$  by  $150\ \mu$  are also present.

*Holotype*.—U.S.N.M.

*Type locality*.—Monterey Bay, California.

*Distribution*.—Central California to the Gulf of California.

*Material examined*.—

Sta. 557-36 Isla Partida 3- 8-36 90 m

*Remarks*.—The California specimens of this sponge do not differ materially, but they do not show quite the size range of spicules that is found in the Gulf specimens.



Order **HALICHONDRIINA** Vosmaer  
 Family **AXINELLIDAE** Ridley and Dendy  
 Genus **AXINELLA** Schmidt  
**Axinella mexicana** de Laubenfels  
 Plate 45, Fig. 90; Plate 46, Figs. 91, 92

*Axinella mexicana* de Laubenfels, 1935, p. 6.

**Diagnosis.**—The Hancock specimen of this sponge is 4 cm by 3 cm by 3 cm, very hispid, and woody in consistency. Pores  $800\ \mu$  and oscules 5 mm in diameter are abundant. In alcohol the color is light, almost white. Great plumose tracts are evident in the endosome even to the naked eye.

The principal spicules are oxeas  $20\ \mu$  by  $300\ \mu$  to  $28\ \mu$  by  $500\ \mu$ , averaging  $25\ \mu$  by  $465\ \mu$ . Styles  $25\ \mu$  by  $400\ \mu$  and less are also found. Both types are almost always sharply bent. There are no microscleres.

**Holotype.**—American Museum of Natural History.

**Type locality.**—Lower California.

**Distribution.**—Lower California and Gulf of California.

**Material examined.**—

Sta. 560-36	Isla Partida	3- 9-36	140 m
-------------	--------------	---------	-------

**Remarks.**—The fact that the oxeas exceed the styles in average length is rather unusual.

The Gulf specimens of this sponge do not differ in any particular from specimens originally described.

Genus **DRAGMACIDON** Hallmann  
**Dragmacidon opisclera** de Laubenfels  
 Plate 47, Fig. 93, 94; Plate 48, Fig. 95

*Dragmacidon opisclera* de Laubenfels, 1935, p. 7.

**Diagnosis.**—Specimens of this sponge are drab in alcohol, cartilaginous in consistency, and only slightly hispid. The chief spicules are styles  $22\ \mu$  by  $400\ \mu$  to  $35\ \mu$  by  $700\ \mu$  or larger. The oxeas have about the same range but average shorter. Very thin, sinuous spicules are also present,  $\frac{1}{2}\ \mu$  to  $2\ \mu$  thick and sometimes as long as  $500\ \mu$ . The trichodragma modification is found in some specimens. All spicules are bent.

**Holotype.**—American Museum of Natural History.

**Type locality.**—Lower California.

**Distribution.**—Lower California and the Gulf of California.

**Material examined.**—

Sta. 542-36	Puerto Refugio	3- 4-36	50 m
Sta. 556-36	Isla Partida	3- 8-36	60 m
Sta. 557-36	Isla Partida	3- 8-36	90 m
Sta. 750-37	Outer Gorda Bank	4- 4-37	10 m
Sta. 1081-40	Isla Partida	2- 5-40	75 fms



*Remarks.*—There seems to be more overlapping in the size ranges of the styles and oxeas in the Gulf specimens than in the specimens from the Pacific side.

Genus **THIELEIA** Burton  
**Thieleia rubiginosa** (Thiele)  
Plate 48, Fig. 96; Plate 49, Fig. 97

*Hymeniacidon rubiginosa* Thiele, 1905, p. 421.

*Thieleia rubiginosa* Burton, 1932, p. 329.

*Diagnosis.*—Gulf specimens of this sponge are drab and cartilaginous. The surface is conulose with oscules up to 2 mm in diameter often located on the cones. The endosome is drab and "bready." There is some evidence of vertical structure, and the oscules open into cavities which often go completely through the sponge.

The only spicules are styles most typically  $9\ \mu$  by  $300\ \mu$  but with variations plus and minus.

*Holotype.*—British Museum.

*Type locality.*—West coast of South America.

*Distribution.*—West coast of South America to the Gulf of California.

*Material examined.*—

Sta. 552-36	Angel de la Guardia Island	3- 6-36	Shore
Sta. 553-36	Pond Island	3- 8-36	Shore

*Remarks.*—The cloacal-like cavities running through these specimens, while not unique for the family, are unusual for the genus.

Genus **HIGGINSIA** Higgin  
**Higginsia higginsissima**, new species

Plate 49, Fig. 98; Plate 50, Figs. 99, 100; Plate 51, Fig. 101

*Diagnosis.*—This sponge is coral pink in alcohol. It is composed of stocklike growths fused together into a mass. Its consistency is cartilaginous. There is much infiltrated sand in the specimen, and the surface is so caked and imbedded that the pores and oscules cannot be located properly. The size is 7 cm by 5 cm by 4 cm.

The principal megascleres are oxeas which average in size about  $12\ \mu$  by  $600\ \mu$ . There is considerable variation, however, and occasionally oxeas up to  $20\ \mu$  by  $1,800\ \mu$  are found. The second megascleres are smooth styles. These are rather rare. They have the same general measurements as the oxeas, although they do not attain quite the extremes in size.

The first microscleres are spined strongyles which are often sharply bent at the center. The typical size is  $3\ \mu$  by  $90\ \mu$ . The second microscleres



are spined centrotylotes, bent at the central knob. The third microsclere is a smooth, straight centrotylote about  $2\ \mu$  by  $21\ \mu$ . The spiny centrotylotes are intermediate in size between the first and third type.

*Holotype*.—AHF no. 14.

*Type locality*.—San Lorenzo Channel, Espiritu Santo Island; 48 m; bottom of coralline.

*Distribution*.—Same.

*Material examined*.—

Sta. 607-36 Espiritu Santo Island 3-21-36 48 m

*Remarks*.—*H. papillosa* Thiele, 1905, is a close relative of this sponge. It was reported on the Presidential Cruise of 1939 by de Laubenfels, 1939, from Albemarle Island, Galapagos, and it was originally described from Chile. It, however, does not have the centrotylotes either smooth or spiny and has instead sharply bent spiny tornotes.

Family **Halichondriidae** Gray  
Genus **HALICHONDRIA** Fleming

**Halichondria panicea** (Pallas)

Plate 51, Fig. 102; Plate 52, Fig. 103

*Spongia panicea* Pallas 1766, p. 388.

*Halichondria panicea* Johnston, 1842, p. 114.

*Diagnosis*.—This is an encrusting sponge, white in alcohol, orange in life, with a smooth surface. The ectosomal specialization is strongly marked. There is a dermal layer  $150\ \mu$  to  $200\ \mu$  thick containing tangentially placed spicules. The endosome has the same spicules in confusion. These spicules are oxeas  $12\ \mu$  by  $245\ \mu$  to  $15\ \mu$  by  $250\ \mu$ .

*Holotype*.—Unknown.

*Type locality*.—Europe.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 519-36 San Francisco Island 2-26-36 Shore

Sta. 549-36 Angel de la Guardia Island 3- 6-36 80 m

*Remarks*.—This sponge is common in European waters and is found along the California coast as well as in the Galapagos Islands.

Family **Semisuberitidae** de Laubenfels

Genus **RHAPHOXYA** Hallmann

**Rhaphoxya laubenfelsi**, new species

Plate 52, Fig. 104

*Diagnosis*.—The color of this sponge in alcohol is light green throughout. The general shape is ramose, much like tree coral, with an over-all







abundant and average  $150\ \mu$  in diameter. There is a very tough membrane present over cavities. This membrane contains no spicules.

The specimen, as is typical of *Adreissa*, has only styles. These are  $40\ \mu$  by  $2,000\ \mu$  in the flesh, with smaller ones organized in the tract.

*Holotype*.—AHF no. 16.

*Type locality*.—San Jaime Banks, off Cape San Lucas; Lat.  $22^{\circ} 50' 30''$  N, Long.  $115^{\circ} 15'$  W; 240 m; granite rocks on the bottom.

*Distribution*.—Same.

*Material examined*.—

Sta. 619-37 San Jaime Bank

3- 3-37 240 m

*Remarks*.—No other member of this genus has such enormous styles; and, while the extreme simplicity and consequent similarity of species here placed make many species seem unnecessary, still this represents an extreme without intermediates and therefore justifies the erection of a new species.

Genus **HYMENIACIDON** Bowerbank  
**Hymeniacidon adreissiformis**, new species

Plate 55, Figs. 109, 110; Plate 56, Fig. 111

*Diagnosis*.—This specimen is tan in color when preserved in alcohol. It is cartilaginous in consistency and appears to be a fragment of a larger encrusting mass.

There is a distinct cortical layer which averages  $100\ \mu$  in thickness. This is semidetachable, and there are subdermal cavities. The specimen is not hispid. The surface has many craterlike structures irregularly placed, some of which contain oscules. There are about 35 oscules on the fragment, which range in size from 1 mm to 4 mm. Many ascending canals are present, which give the cross section of this sponge the appearance of vertical structure.

The only spicule type is a smooth style, which is abundant and strewn in considerable confusion throughout the flesh. The styles are peculiar in their very abrupt, rounded ends, which give the appearance in some instances of being cleanly cut away. Indeed, that was the first impression recorded when the specimen was examined, but closer study revealed that all the spicules were of the same length, whether rounded or sharply truncated. The pointed end of these styles approaches the tornote modification.

*Holotype*.—AHF no. 17.

*Type locality*.—Middle San Benito, Lower California, Mexico; from the shore.



*Distribution*.—The same.

*Material examined*.—

Sta. 609-36 San Benito

3-24-36 Shore

*Remarks*.—The canals found in this sponge give it the superficial appearance of being organized into tracts. If this were true, it might be placed in the genus *Adreissa*.

The peculiar modification of the styles is unique for the genus.

### **Hymeniacidon sinapium** de Laubenfels

Plate 56, Fig. 112

*Hymeniacidon sinapium* de Laubenfels, 1930, p. 26.

*Diagnosis*.—This sponge is typical of the family and genus, having a thin fleshy dermis and an endosomal structure in which the spicules are mostly in confusion, although occasional vague tracts, made up of styles points upward, are found.

The sole type of spicule is a style size  $9\ \mu$  by  $350\ \mu$ .

*Holotype*.—U.S.N.M.

*Type locality*.—Newport Bay, California.

*Distribution*.—Southern California to the Gulf of California.

*Material examined*.—

Sta. 1041-40 Guaymas Bay

1-23-40 Shore

*Remarks*.—In the California specimens the styles are about a third larger on the average than in the Gulf specimens.

### Genus **OXEOSTILON** Ferrer-Hernandez

#### **Oxeostilon oxeon**, new species

Plate 57, Figs. 113, 114; Plate 58, Figs. 115, 116

*Diagnosis*.—This sponge is 3 cm by 2 cm by 1 cm, drab when preserved, and corklike in consistency. The surface is covered with peculiar hornlike protuberances. These are 2 mm high and about 1 mm at the base. A distinct surface membrane is present, although it is less than  $100\ \mu$  thick. It is easily detachable and there are extensive subdermal cavities. On areas which retain the surface membrane no pores or oscules are visible, but when the membrane has been lost, openings 1 mm in diameter, which form grooves on the exposed surface appear. Often the openings merge into one another.

The megascleres show great variety in size and are frequently bent or curved. Both oxeas and styles are present. Representative measurements are  $30\ \mu$  by  $600\ \mu$ ,  $40\ \mu$  by  $800\ \mu$ , and  $40\ \mu$  by  $900\ \mu$ . The styles and oxeas are, in general, about the same size but occasionally oxeas were



found  $35\ \mu$  by  $1,000\ \mu$  and  $50\ \mu$  by  $1,150\ \mu$  or more. Microscleres are lacking, but peculiar lenslike silicon masses were found in one specimen. These were  $20\ \mu$  on the long axis.

*Holotype*.—AHF no. 18.

*Type locality*.—West of Isla Partida; 140 m; rock bottom.

*Distribution*.—Gulf of California.

*Material examined*.—

Sta. 560-36 Isla Partida 3- 9-36 140 m

Sta. 562-36 San Esteban Island 3-10-36 100 m

*Remarks*.—*O. annandalei* Ferrer-Hernandez, 1923, the genotype, was found in Spanish waters. This, however, had forklike endings on some spicules, while others were faintly polytylote. A typical spicule size is  $12\ \mu$  by  $400\ \mu$ .

A specimen of the new species was also found at James Island, Galapagos.

### ***Oxeostilon burtoni* de Laubenfels**

Plate 59, Fig. 117

*Oxeostilon burtoni* de Laubenfels, 1934, p. 15.

*Diagnosis*.—This is a massive sponge. The Gulf specimens are about 7.5 cm by 5 cm by 5 cm and still retain a coral pink color in alcohol at least on part of the surface. There is a thin surface membrane over large cavities and pore areas. The pores are very irregular in size, averaging perhaps 1 mm in diameter. There is a very slight hispidation in places.

The spicules are variable in size, but common measurements are  $280\ \mu$  by  $18\ \mu$  for styles and  $320\ \mu$  by  $10\ \mu$  for oxeas.

*Holotype*.—U.S.N.M.

*Type locality*.—West Indies.

*Distribution*.—West Indies and Gulf of California.

*Material examined*.—

Sta. 1097-40 Puerto Escondido 2-11-40 18 m

*Remarks*.—The spicules found in the Gulf specimens of this sponge are somewhat smaller than those reported for the holotype.

### **Order HADROMERINA Topsent** **Family Choanitidae de Laubenfels** **Genus CHOANITES Mantell** ***Choanites mineri* de Laubenfels**

Plate 59, Fig. 118; Plate 60, Figs. 119, 120; Plate 61, Fig. 121

*Choanites mineri* de Laubenfels, 1935, p. 10.

*Diagnosis*.—This sponge is fairly typical of the genus. "The megascleres are of one sort only—tylostyles—approximately  $10\ \mu$  by  $345\ \mu$ , the



erect dermal ones being the same size as those of the endosome. Among them is an abundance of microscleres, which abundance is very uncommon in the order Hadromerina. These are quite typical of the genus *Choanites*, being centrotylote microstrongyles. The typical size is  $2\ \mu$  by  $30\ \mu$ ; some are as small as  $1\ \mu$  by  $18\ \mu$  and a few as large as  $3\ \mu$  by  $36\ \mu$ ." (de Laubenfels 1935, p. 10.)

*Holotype*.—American Museum of Natural History.

*Type locality*.—Lower California.

*Distribution*.—Lower California and Gulf of California.

*Material examined*.—

Sta. 579-36	San Marcos Island	3-14-36	20 m
Sta. 1048-40	Puerto Refugio	1-26-40	Shore

*Remarks*.—This sponge was originally collected from the Pacific side of Lower California.

The specimens from the Gulf follow the description of the holotype very closely, although the spicules of both classes tend to range rather smaller than the spicules of the specimen from the west coast.

### DELAUBENFELSIA, new genus

*Diagnosis*.—This genus is established for a sponge which corresponds closely in general architecture with the type of the family, but which possesses the unique microscleres described below.

*Type species*.—*Delaubenfelsia raromicrosclera*.

*Remarks*.—This genus is named in honor of the foremost living authority on the Porifera, M. W. de Laubenfels.

#### *Delaubenfelsia raromicrosclera*, new species

Plate 61, Fig. 122; Plate 62, Figs. 123, 124; Plate 63, Figs. 125, 126

*Diagnosis*.—Specimens of this sponge are dull drab in alcohol, stiffly spongy in consistency, and superficially smooth.

Six specimens were collected, all of which may have been torn from the same mass. The specimen from which the slides were made is 6 cm by 6 cm by 4 cm. There is a tough cortex about 1 mm thick, which is detachable only with difficulty. The pores are not visible to the naked eye but oscules 2 mm or 3 mm in diameter are occasionally found. The general form appears to be cakelike and probably developed from a spherical or subspherical form much as does *Geodia mesotriaena* on the California coast.

The gross endosome is quite solid with only very fine cavities. There is evidence of radial structure.



The microscopic structure shows a plumose development with tracts of tylostyles pointing upward. Deep in the sponge the tracts are as much as  $160\ \mu$  in diameter, perhaps larger. Near the surface these break up into smaller tufts about  $30\ \mu$  in diameter and protrude slightly from the surface.

The megascleres are tylostyles with well-developed heads at least twice the diameter of the shaft. Occasionally they show the double tylote modification. The average size is  $10\ \mu$  to  $12\ \mu$  by  $380\ \mu$ . One was found that was  $12\ \mu$  by  $810\ \mu$ , while a few juveniles only  $5\ \mu$  by  $210\ \mu$  are to be found. The great majority, however, are very near the average.

The microscleres are unique. They are long and sinuous. They might be termed spirasters with a strongylote modification on the spines if we enlarged the term spirasters to include curvature only in one plane or nearly in one plane such as occurs in toxas. They might be termed spiny toxas except that there are always two distinct curvatures, sometimes three or four, instead of one. Furthermore, the spines are very large; indeed, they are often fully the size of the main shaft and not tapering. Another peculiarity is the branching, which is common near one or both ends, usually at the apex of a curve. These branches commonly have an enlarged end. Perhaps the best term to apply would be strongylote toxasters, although one should keep in mind that the curvature is not confined to the simple one of a toxa but is often multiple. The microscleres are located throughout the sponge and vary from  $18$  to  $40\ \mu$  in length.

*Holotype*.—AHF no. 19.

*Type locality*.—Outside Concepcion Bay, Lower California, Mexico; 24 m; corallines.

*Distribution*.—Same.

*Material examined*.—

Sta. 683-37 Concepción Bay

3-15-37 24 m

*Remarks*.—This genus resembles *Sphaciospongia* in the tendency to grow into a cakelike mass. There is some evidence of relationship also, to *Alcyospongia india* de Laubenfels from the West Indies. This genus, however, has a distinct stalk, is spherical, and has oxeas instead of tylostyles. The microscleres are spiny rhabds, which are not curved.

*Choanites mineri* is somewhat similar, having the tylostyles of approximately the same size and the same general architecture. The microscleres, however, are centrotylote microstrongyles, usually microspined. They look nothing like the microscleres of this new species. Numerous other genera of this family have peculiar microscleres but none which approach those of this species.



Genus **SPIRASTRELLA** Schmidt**Spirastrella coccinea** (Duchassaing and Michelotti)

Plate 64, Figs. 127, 128; Plate 65, Figs. 129, 130

*Thalysias coccinea* Duchassaing and Michelotti, 1864, p. 84.*Spirastrella coccinea* de Laubenfels, 1936, p. 143.

*Diagnosis.*—This specimen is very heavily loaded with minute lumps of what appear to be coral fragments. These are incorporated into the body of the sponge. The color in life is not recorded, but in alcohol it is almost white. The surface is very irregular. There is a cortex which is not easily detached. It is about 100  $\mu$  thick.

The megascleres are tylostyles 340  $\mu$  by 10  $\mu$ . They are frequently in bundles or in tracts that cross and recross, giving, under favorable conditions, a netlike appearance to the endosome. Microscleres are typical spirasters 20  $\mu$  to 25  $\mu$  long.

*Holotype.*—Museum of the University of Turin.

*Type locality.*—West Indies.

*Distribution.*—West Indies and the Gulf of California.

*Material examined.*—

Sta. 1040-40 Guaymas Bay

1-23-40 Shore

*Remarks.*—This species is fairly common in the West Indies and has been reported from the Mediterranean, although the Mediterranean form is probably not conspecific, unless all members of this genus, which is widely distributed, are considered so closely related as to be synonymous.

Family **Suberitidae** SchmidtGenus **ATERGIA** Stephens**Atergia corona**, new species

Plate 66, Figs. 131, 132; Plate 67, Fig. 133

*Diagnosis.*—The specimens of this sponge collected range in size from 2 cm to 5 cm in diameter and are frequently roughly globular. They are decidedly hispid up to 5 mm. Pores and oscules are not usually visible through the spicule plush, but occasionally a conule surmounted by an oscule occurs. The consistency is rather brittle.

There is a distinct brittle surface layer over extensive cavities, while the body of the sponge is coarse and "bready" to fibrous. The megascleres consist of two size ranges of tylostyles. The dermal spicules are erect tylostyles about 5  $\mu$  by 160  $\mu$ . There are also interstitial tylostyles of the same size range in radiating groups. The coring spicules are much larger tylostyles 20  $\mu$  by 1,500  $\mu$  to 2,000  $\mu$ , in which the tylote modification is not at the end of the spicule. Some small oxeas, which may be regarded either as microscleres or as small megascleres, are also present. These are 2  $\mu$  by 60  $\mu$ . They are frequently in fan-shaped masses or rafts.



*Holotype*.—AHF no. 20.

*Type locality*.—San Jaime Bank off Cape San Lucas; Lat. 22° 50' 30" N, Long. 110° 15' W; 150 m; old coralline algae, granite rock.

*Distribution*.—Same.

*Material examined*.—

Sta. 618-37 San Jaime Bank 3- 3-37 150 m

*Remarks*.—This is a new genus to the Pacific Coast. The new species is typical of the genus, but no other species approaches it in spicule size.

Genus **LAXOSUBERITES** Topsent

**Laxosuberites rugosus** (Schmidt)

Plate 67, Fig. 134; Plate 68, Figs. 135, 136

*Suberites rugosus* Schmidt, 1868.

*Laxosuberites rugosus* Topsent, 1896.

*Diagnosis*.—The Gulf of California specimen of this sponge is an incrustation 1 cm thick and about 6 cm square. It is white in alcohol, fairly smooth on the surface, and has numerous cones about 5 mm high by 1 cm at the base irregularly placed. Each cone is surmounted by a closed oscule. When the surface is cut away, very regular passages 1 mm in diameter and perhaps 2 mm apart are found leading vertically. When the sponge is cut, this gives the edge an appearance of very regular vertical structure.

The spicules are styles to tylostyles, which at the surface are arranged in tufts, point upward. Typical measurements for our specimen are 120  $\mu$  by 6  $\mu$  and 260  $\mu$  by 8  $\mu$ . Those of the holotype are described as 175  $\mu$  to 375  $\mu$  and about the same thickness as ours.

*Holotype*.—Paris.

*Type locality*.—Mediterranean.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 552-36 Angel de la Guardia Island 3- 6-36 Shore

*Remarks*.—The sponge, which is provisionally identified as *Laxosuberites rugosus*, has a genotype originally from the Mediterranean. There is little difference between members of this genus, and *L. rugosus* may easily embrace all of the species.

**Laxosuberites zeteki** de Laubenfels

Plate 69, Figs. 137, 138; Plate 70, Fig. 139

*Laxosuberites zeteki* de Laubenfels, 1936, p. 450.

*Diagnosis*.—The Gulf specimen of this sponge is massive and resembles in gross structure a mass of giant fingers fused. The ends of the "fingers" protrude and give the surface a lumpy appearance. The color is bright



yellow. A typical specimen is 20 cm thick and at least 10 cm square, and is apparently a part of a larger mass. At the surface it is colored a dull green by foreign material. Oscules and pores are not evident. The endosome contains numerous canals 2 mm or 3 mm in diameter which tend to run vertically. The sole spicule type is a tylostyle which varies from  $2\ \mu$  by  $540\ \mu$  to at least  $20\ \mu$  by  $840\ \mu$ . The spicules are in confusion except for bunches placed points upward at the surface.

*Holotype*.—U.S.N.M.

*Type locality*.—Balboa, Canal Zone.

*Distribution*.—Both ends of Panama Canal and the Gulf of California.

*Material examined*.—

Sta. 1041-40 Guaymas Bay

1-23-40 Shore

*Remarks*.—This sponge agrees exactly with the published description of specimens from Panama even to the greenish algae deposits on the surface.

### Genus **PSEUDOSUBERITES** Topsent

#### **Pseudosuberites pseudos**, new species

Plate 70, Fig. 140; Plate 71, Figs. 141, 142; Plate 72, Fig. 143

*Diagnosis*.—The specimens of this sponge are chocolate brown in color. There is a distinct cortex, semidetachable and about  $400\ \mu$  thick. Pits or cones about 3 mm in diameter and about the same distance apart are found in a regular pattern on the surface. These may be closed oscules. No openings are visible. There is no hispidation.

Gross internal structure is very coarse and, like the surface, cartilaginous in consistency. Smooth tylostyles are the only spicules. Those of the endosome are a confused mass with typical measurements  $10\ \mu$  by  $330\ \mu$ ,  $8\ \mu$  by  $270\ \mu$ , and  $10\ \mu$  by  $300\ \mu$ . In the special dermal layer, the spicules, while very like those of the endosome, are arranged in a tangential layer. They also tend to be somewhat thinner. A typical size is  $6\ \mu$  by  $330\ \mu$ .

*Holotype*.—AHF no. 21.

*Type locality*.—Pond Island, Lower California, Mexico; from the shore of the lagoon.

*Distribution*.—Same.

*Material examined*.—

Sta. 547-36 Angel de la Guardia Island

3- 5-36 2 m

Sta. 553-36 Pond Island

3- 8-36 Shore

Sta. 1076-40 Tepoca Bay

2- 3-40 11 m

Sta. 1088-40 Ensenada de San Francisco

2- 7-40 2 m

*Remarks*.—*P. melanos* de Laubenfels, 1934, from the West Indies has spicules  $10\ \mu$  by  $200\ \mu$ , but this sponge is black and rather digitate.



**Pseudosuberites hyalina** (Ridley and Dendy)

Plate 72, Fig. 144; Plate 73, Fig. 145

*Hymeniacidon hyalina* Ridley and Dendy, 1887, p. 168.*Pseudosuberites hyalina* Topsent, 1896, p. 127.

*Diagnosis.*—Since this sponge is the type of the genus, its description is covered by the genus diagnosis. Its spicules are up to  $26\ \mu$  by  $1,200\ \mu$  and perhaps larger.

*Holotype.*—British Museum.*Type locality.*—West coast of Chile.*Distribution.*—Cosmopolitan.*Material examined.*—

Sta. 650-37 San Francisco Island 3- 9-37 94 m

*Remarks.*—This sponge is common in the Mediterranean.Order **EPIPOLASIDA** SollasFamily **Sollasellidae** LendenfeldGenus **EPIPOLASIS** de Laubenfels**Epipolasis oxyspicula**, new species

Plate 73, Fig. 146; Plate 74, Figs. 147, 148

*Diagnosis.*—In alcohol this sponge is an intense black on the surface and a dark gray color within. The specimen is 11 cm by 9 cm by 3 cm. The shape is massive. The consistency is about that of hard rubber. The surface is hispid in patches about  $500\ \mu$ . The larger areas are superficially smooth, but the spiculation may have been rubbed off. The ectosomal specialization probably consists only in a concentration of pigment cells at the surface. This black surface shades gradually into the gray of the endoderm so that a definite thickness cannot be assigned.

No openings are found in the undamaged areas of the sponge surface.

The spicules are arranged so that a definite radial structure is noticeable, although nothing of the nature of tracts can be established.

The spicules are oxeas and show great variability in size, but there are two definite size ranges. The first of these is most characteristically  $40\ \mu$  by  $2,000\ \mu$ . The second type tends to be dermal and erect. These are on the average  $4\ \mu$  by  $100\ \mu$ .

*Holotype.*—AHF no. 22.*Type locality.*—Port Escondido, Mexico; from a shore of rock shingle.*Distribution.*—Same.*Material examined.*—

Sta. 591-36 Port Escondido

3-16-36 Shore



*Remarks.*—The nearest relative of this sponge appears to be *E. angulospiculata* from the Gulf of Mexico, which, however, has a bright yellow endosome. The larger spicules are strongyloxeote at one end or at both ends. The smaller spicules are also much larger than the corresponding category in the new species, while the larger range is considerably shorter.

Family **Tethyidae** Gray  
Genus **TETHYA** Lamarck  
**Tethya aurantia** (Pallas)

Plate 75, Figs. 149, 150

*Alcyonium aurantium* Pallas, 1766, p. 210.

*Tethya aurantia* Topsent, 1900, p. 294.

*Diagnosis.*—Most specimens of this sponge found in the Gulf were pinkish in alcohol, although they are usually reported as drab.

The shape of the sponge is more or less hemispherical and warty. It has a cortex 1 mm thick and a radial structure.

The spicules found in this Gulf specimen were: strongyles 10  $\mu$  by 650  $\mu$  to 38  $\mu$  by 2,500  $\mu$ ; tylostrongyes 35  $\mu$  by 1,500  $\mu$ ; spherasters diameter up to 100  $\mu$ ; tylasters diameter up to 25  $\mu$ ; microasters up to 10  $\mu$ .

*Holotype.*—Unknown.

*Type locality.*—European.

*Distribution.*—World wide.

*Material examined.*—

Sta. 537-36	Angeles Bay	3- 2-36	Shore
Sta. 540-36	Puerto Refugio	3- 3-36	Shore
Sta. 720-37	Rocky Point	3-24-37	Shore
Sta. 1049-40	Puerto Refugio	1-27-40	Shore

*Remarks.*—This sponge has been recorded from Baja California and from Upper California.

Order **CHORISTIDA** Sollas  
Family **Ancorinidae** Gray  
Genus **PENARES** Gray

**Penares cortius** de Laubenfels

Plate 76, Figs. 151, 152; Plate 77, Fig. 153

*Penares cortius* de Laubenfels, 1930, p. 26.

*Diagnosis.*—The architecture of this sponge is typical of the family and genus. "Principal spicules, oxeas; size, ranging up to 22  $\mu$  by 950  $\mu$ . Ectosomal spicules, dichotriaenes; size of rhabds, about 50  $\mu$  by 400  $\mu$ ; size of clads, including the deuteroclads, up to 50  $\mu$  by 310  $\mu$ . First micros-



cleres, bicurvate microstrongyles; size  $3\ \mu$  by  $50\ \mu$  to  $8\ \mu$  by  $160\ \mu$ ; a very few of the smallest ones are faintly centrotylote. Second microscleres; oxyspherasters, total diameter  $19\ \mu$  to  $25\ \mu$ , the smallest ones having the most numerous rays." (de Laubenfels 1932, p. 37.)

*Holotype*.—U.S.N.M.

*Type locality*.—Pescadero Point, California.

*Distribution*.—Central California to the Gulf of California.

*Material examined*.—

Sta. 496-36 Fraile Bay

2-18-36 160 m

*Remarks*.—The bicurvates found in this sponge are relatively rare. *P. tyloaster* Dendy has bicurvates, but they are oxeas instead of strongyles.

### Genus **STELLETTA** O. Schmidt

#### **Stelletta estrella** de Laubenfels

Plate 77, Fig. 154; Plate 78, Figs. 155, 156

*Stelletta estrella* de Laubenfels, 1930, p. 25.

*Diagnosis*.—The sponge is typical of the family and subfamily. It is massive, subspherical, cartilaginous, radial in plan, and has a tough cortex.

Spicules are: oxeas,  $50\ \mu$  by  $2,500\ \mu$  and larger; diaenes and triaenes, up to at least  $75\ \mu$  by  $4,000\ \mu$ ; oxyspherasters,  $8\ \mu$  to  $10\ \mu$  in diameter average; tylospherasters,  $10\ \mu$  in diameter.

*Holotype*.—U.S.N.M.

*Type locality*.—Southern California.

*Distribution*.—Southern California to the Gulf of California.

*Material examined*.—

Sta. 707-37 Angel de la Guardia Island

3-20-37 Shore

*Remarks*.—There is no significant difference between the specimens of this sponge from the Gulf and those from the coast of southern California. A closely related species, *S. clarella* de Laubenfels, is found in central California.

### Family **Geodiidae** Gray

#### Genus **ERYLUS** Gray

#### **Erylus discastera**, new species

Plate 79, Figs. 157, 158; Plate 80, Fig. 159

*Diagnosis*.—The size of this sponge is 4 cm by 4 cm by 7 cm, the consistency cartilaginous, the color drab throughout.

The surface is superficially smooth and has no special oxeas. No pores or oscules are visible.

There is a distinct surface layer  $900\ \mu$  thick or less. This is semi-detachable and apparently not over subdermal cavities. The endosome is



very fine grained and does not present any well-defined structure. The gross cavities are rare and too small to be easily seen with the naked eye.

The first megascleres are plagiotriaenes or diaenes about  $40\ \mu$  by  $2,000\ \mu$ . Occasional triaenes, which are almost calthrops, are also found as are small oxeas about  $20\ \mu$  by  $600\ \mu$ . These latter are usually dermal.

The principal microscleres are sterrasters, which are modified into the disc shape that differentiates this genus so markedly from *Geodia*. These spicules are large, averaging  $240\ \mu$  in diameter. Second microscle is a very abundant sterraster only  $9\ \mu$  in diameter. A third type is a spheraster which is typically  $15\ \mu$  in diameter. There are also present microstrongyles  $3\ \mu$  by  $60\ \mu$ .

*Holotype*.—AHF no. 23.

*Type locality*.—West of Isla Partida; 140 m; rock bottom.

*Distribution*.—Same.

*Material examined*.—

Sta. 560-36 Isla Partida

3- 9-36 140 m

*Remarks*.—This species is unique chiefly because of the enormous size of the sterrasters. No other species has sterrasters which compare with them.

The species *E. alleni* de Laubenfels is similar but has much smaller sterrasters and lacks the long plagiotriaenes. It is West Indian. *E. proximus* Dendy from the Indian Ocean is similar but has strongyles in addition to oxeas and it also lacks the large sterrasters.

### Genus GEODIA Lamarck

#### *Geodia mesotriaena* Lendenfeld

Plate 80, Fig. 160; Plate 81, Figs. 161, 162; Plate 82, Figs. 163, 164

*Cydonium mulleri* Lambe, 1892, p. 72.

*Geodia mesotriaena* Lendenfeld, 1910, p. 96.

*Diagnosis*.—Sponges in this species have the characteristic armor of the family. When young the sponge is subspherical, but as it grows it spreads laterally into a massive cake. There is always a spicule plush present, sometimes two or more cm long, although this is frequently rubbed off or damaged. Where the plush is not too dense, special pore areas are found. The general endosomal structure tends to the radiate.

The following analysis gives the types of spicules found in *G. mesotriaena* and an indication of sizes to be expected:

Diacts (usually oxeas), often several mm long; plagiotriaenes and diaenes, often several mm long; ana- and protriaenes, several mm long (known as long as about 22 mm); dermal oxeas or styles, about  $200\ \mu$ ; sterrasters,  $50\ \mu$  to  $100\ \mu$  plus.



A variety of small asters is also found, which have well-developed spines that may be either sharp or rounded on the points. The centrum of these asters varies from conspicuous to absent. The size range is from about  $2\ \mu$  to  $40\ \mu$ .

*Holotype*.—U.S.N.M.

*Type locality*.—Off southern California.

*Distribution*.—Southern Alaska to the Gulf of California.

*Material examined*.—

Sta. 500-36	Espiritu Santo Island	2-20-36	Shore
Sta. 510-36	Ballenas Bay	2-22-36	Shore
Sta. 518-36	San Francisco Island	2-25-36	Shore
Sta. 614-37	Agua Verde Bay	3- 1-37	100 m
Sta. 618-37	San Jaime Bank	3- 3-37	150 m
Sta. 627-37	Ensenada de los Muertos	3- 5-37	Shore
Sta. 634-37	Espiritu Santo Island	3- 6-37	Shore
Sta. 670-37	Escondido Bay	3-12-37	70 m
Sta. 749-37	Isabel Island	4- 3-37	Shore
Sta. 1051-40	Angel de la Guardia Island	1-27-40	Shore

*Remarks*.—The spicules of *Geodia mesotriaena* are very large, and, therefore, differences which would go unnoticed in smaller spicules are magnified and seem more important than they are. It seems axiomatic that distinctions made on the basis of spiculation should involve gross differences only in species with such large spicules. This rule has not always been followed.

### *Geodia japonica* (Sollas)

Plate 83, Figs. 165, 166; Plate 84, Figs. 167, 168

*Cydonium japonica* Sollas, 1888, p. 333.

*Geodia japonica* Lendenfeld, 1903, p. 52.

*Diagnosis*.—This sponge is massive and knobby. The surface is hispid and has special pore areas with pores about .5 mm in diameter. The entire specimen is 8 cm by 6 cm by 5 cm.

The ectosome is vary hard and about 1 mm thick. The endosome is "bready." In addition to the usual oxeas, ana- and protriaenes, there are sterrasters up to  $130\ \mu$  in diameter, euasters  $22\ \mu$  to  $30\ \mu$ , and small siliceous masses  $5\ \mu$  in diameter which may be spherasters with almost no spines.

*Holotype*.—U.S.N.M.

*Type locality*.—Japan.

*Distribution*.—Pacific Basin.

*Material examined*.—

Sta. 562-36	San Esteban Island	3-10-36	90 m
-------------	--------------------	---------	------



*Remarks.*—This sponge is not very different from *G. mesotriaena*, described above; and, although it answers the description of *G. japonica* much more closely, it may be only an atypical specimen of *G. mesotriaena*.

Genus **GEODINELLA** (Gray)

**Geodinella isabella**, new species

Plate 85, Fig. 169

*Diagnosis.*—This sponge is encrusting and massive. Its size is 3 cm by 6 cm by 6 cm. The consistency is leathery, and the color of the preserved specimen in dark drab. The surface is definitely hispid, although microscopically so. There is a distinct cortex 1 mm thick, which is not detachable.

The cortex is largely a sterraster armor. The sterrasters are 30  $\mu$  in diameter. Two sizes of oxeas are present. The first of these is most often about 15  $\mu$  by 550  $\mu$ . The second has an average size of 3  $\mu$  by 100  $\mu$ . These two types do not represent the ends of a continuous series, as spicules of intermediate size are not present. The tylostyles typical of the genus are the same size as the smaller oxeas. Oxyspherasters are abundant subdermally. These are 30  $\mu$  in diameter. There are also very abundantly what appear to be oxyspherasters only 5  $\mu$  in diameter.

*Holotype.*—AHF no. 24.

*Type locality.*—Isabel Island, Sinaloa, Mexico; porites coral; 4 m.

*Distribution.*—Same.

*Material examined.*—

Sta. 125-33 Isabel Island

3-19-33 4 m

*Remarks.*—*Geodinella robusta* Lendenfeld, reported from various *Albatross* stations of California to southern Alaska, may be a near relative of this sponge. It does not have the two size ranges of oxeas, however, and the asters are much larger.

Family **Craniellidae** de Laubenfels

Genus **CRANIELLA** Schmidt

**Craniella arb** (de Laubenfels)

Plate 85, Fig. 170; Plate 86, Figs. 171, 172; Plate 87, Fig. 173

*Tetilla arb* de Laubenfels, 1930, p. 26.

*Craniella arb* de Laubenfels, 1935, p. 12.

*Diagnosis.*—This is a spherical to subspherical sponge with a pronounced radiate structure, pronouncedly hispid, with a dense cortical area about 1 mm thick. Occasional oscules are found.



It has oxeas and ana- and protriaenes several mm long. One protriaene was found which measured 32.4 mm long. The most characteristic spicule is the spiny sigmalike microscelere, which has well-rounded, almost tylote ends. They are thicker in proportion to their length than true sigmas and are about 10  $\mu$  long.

*Holotype*.—U.S.N.M.

*Type locality*.—Pescadero Point, California.

*Distribution*.—Central California to the Gulf of California.

*Material examined*.—

Sta. 538-36	Angeles Bay	3- 3-36	50 m
Sta. 541-36	Puerto Refugio	3- 4-36	120 m
Sta. 542-36	Puerto Refugio	3- 4-36	30 m
Sta. 544-36	Puerto Refugio	3- 4-36	130 m
Sta. 618-37	San Jaime Bank	3- 3-37	150 m
Sta. 632-37	San Gabriel Bay	3- 6-37	48 m
Sta. 669-37	Danzante	3-12-37	110 m
Sta. 675-37	Pulpito Point	3-15-37	110 m
Sta. 701-37	Angeles Bay	3-20-37	40 m
Sta. 712-37	Puerto Refugio	3-21-37	30 m
Sta. 716-37	Willard Point	3-23-37	12 m
Sta. 1048-40	Puerto Refugio	1-26-40	11 m
Sta. 1057-40	Puerto Refugio	1-29-40	50 m

*Remarks*.—This is the most common sponge in the Hancock collection from the Gulf of California.

Order **CARNOSA** Carter

Family **Halinidae** de Laubenfels

Genus **PACHASTRELLA** Schmidt

**Pachastrella dilifera** de Laubenfels

Plate 87, Fig. 174; Plate 88, Fig. 175

*Pachastrella dilifera* de Laubenfels, 1934, p. 1.

*Diagnosis*.—This species has no clearly defined cortex, is pale drab in alcohol, and has oscules about 1 mm in diameter. The surface is relatively smooth.

In the specimen in this collection the spicules are: calthrops, each ray 70  $\mu$  by 500  $\mu$ ; oxeas, 50  $\mu$  by 2,000  $\mu$  plus; spirasters, 15  $\mu$  long; metasters, 40  $\mu$ ; microrhabds, 3  $\mu$  by 200  $\mu$ .

*Holotype*.—U.S.N.M.

*Type locality*.—West Indies.

*Distribution*.—West Indies and Gulf of California.



*Material examined.*—

Sta. 534-36 San Francisquito Bay 3- 2-36 250 m

*Remarks.*—As compared to the West Indian holotype, the spicules of these specimens tend to be slightly smaller.

The nearest relative of this sponge, *P. monilifera*, is cosmopolitan, and further collecting may prove that this specimen is widespread.

***Pachastrella multipora*, new species**

Plate 88, Fig. 176; Plate 89, Figs. 177, 178; Plate 90, Figs. 179, 180; Plate 91, Fig. 181

*Diagnosis.*—This specimen is 7 cm by 4 cm by 1½ cm. Both ectosomal and endosomal portions are drab in alcohol. The consistency is woody, and there is a distinct hispidation. A detachable surface membrane 200  $\mu$  thick is found. Pores are very abundant and range from 30  $\mu$  to 90  $\mu$  in diameter. No oscules are evident.

The endosome is "bready" with some suggestion of vertical to radial structure. Gross endosomal cavities are larger just beneath the ectosomal membrane. Flagellate chambers 25  $\mu$  in diameter are occasionally seen.

The principal megascleres are calthrops with rays 45  $\mu$  by 390  $\mu$  and oxeas 32  $\mu$  by 800  $\mu$ . The microscleres are metasters 12  $\mu$  long, peculiar spirasters, with short, blunt rays, also 12  $\mu$  long.

*Holotype.*—AHF no. 25.

*Type locality.*—Off White Rock, Isla Partida; 60 m; bottom of sand and gravel.

*Distribution.*—Gulf of California.

*Material examined.*—

Sta. 556-36 Isla Partida 3- 8-36 60 m

Sta. 559-36 Isla Partida 3- 9-36 90 m

*Remarks.*—This sponge, also found in the Gulf of California, differs from *Pachastrella dilifera* in the much smaller size of the microscleres, the presence of a definite detachable ectosomal membrane, the absence of the large metasters, and the difference in structure of the spirasters. *P. monilifera* Schmidt has centrotylote microrhabds 10  $\mu$  to 20  $\mu$  long instead of the long raphids. *P. cribium* Lebewohl from Japan has the large metasters and very thick microrhabds.

**Genus SPHINCTERELLA (Schmidt)*****Sphincterella osculanigera*, new species**

Plate 91, Fig. 182; Plate 92, Figs. 183, 184; Plate 93, Fig. 185

*Diagnosis.*—The specimen of this sponge is 3 cm by 2 cm by 2 cm and is cartilaginous in consistency. In alcohol the sponge has an olive-green



ectosome and a drab endosome. The surface is superficially smooth. There are oscules  $2,500\ \mu$  in diameter. These are coronal and covered by a black sieve net with openings  $100\ \mu$  in diameter.

There is a well-marked ectosome 1 mm thick, which may be detached with difficulty.

The gross endosomal structure is "bready" and confused.

The principal spicules are oxeas  $75\ \mu$  by  $2,100\ \mu$  and calthrops  $95\ \mu$  by  $410\ \mu$ . A few of the latter are only triradiates. Two smaller types of oxeas are present. The first,  $2\ \mu$  by  $800\ \mu$ , is smooth. The second,  $10\ \mu$  by  $375\ \mu$ , is lumpy and gives the impression of having a series of small rings around it throughout its length. There are also characteristic asters, which average about  $15\ \mu$  in length.

*Holotype*.—AHF no. 26.

*Type locality*.—Tepoca Bay, Mexico; from the shore of a rocky reef.

*Distribution*.—Same.

*Material examined*.—

Sta. 1077-40 Tepoca Bay

2- 4-40 13 m

*Remarks*.—*Sphincterella tricornis* Wilson, 1904, from Panama seems to be the nearest relative of this sponge. It, however, has very much larger oxeas,  $135\ \mu$  by  $5,000\ \mu$ , only the smaller size of triradiates, and lacks the black net arrangement which is so striking a feature of the Hancock sponge.

### Family Plakinastrellidae de Laubenfels

#### Genus POECILLASTRA Sollas

#### *Poecillastra tenuilaminaris* Sollas

Plate 93, Fig. 186; Plate 94, Fig. 187

*Normia tenuilaminaris* Sollas, 1880, p. 186.

*Poecillastra tenuilaminaris* Sollas, 1888, p. 85.

*Diagnosis*.—This is a thin sponge, stiff, drab in alcohol, and smooth. Typical spicule measurements are as follows:

Calthrops (size of rays),  $50\ \mu$  by  $450\ \mu$ ; oxeas,  $3,870\ \mu$  by  $60\ \mu$ ; plesiasters (greater length),  $30\ \mu$ ; metasters (greater length),  $15\ \mu$ ; microxeas,  $3\ \mu$  by  $145\ \mu$ .

*Holotype*.—British Museum.

*Type locality*.—Japan.

*Distribution*.—This sponge has been found in southern California near Santa Catalina Island as well as in Japan and the Gulf of California.

*Material examined*.—This sponge was found in the Gulf of California. Exact location is unknown.

*Remarks*.—Spicules in this specimen are somewhat larger than is typical.



Order **ASCONOSA** de Laubenfels  
 Family **Leucettidae** de Laubenfels  
 Genus **LEUCETTA** Haeckel  
**Leucetta losangelensis** de Laubenfels

Plate 94, Fig. 188; Plate 95, Figs. 189, 190; Plate 96, Fig. 191

*Leuconia losangelensis* de Laubenfels, 1930, p. 25.

*Leucetta losangelensis* de Laubenfels, 1932, p. 13.

*Diagnosis.*—The majority of the specimens of this sponge are amorphous, approaching closely, as in the holotype, the form of the Demospongia.

The principal spiculation is a confused mass of triaxons, both regular and sagittal, with rays varying from 10  $\mu$  to 45  $\mu$  to 40  $\mu$  by 450  $\mu$ . Oxeas are occasionally present but are almost certainly not proper. Quadriradiates almost never occur.

*Holotype.*—U.S.N.M.

*Type locality.*—Laguna Beach, California.

*Distribution.*—Southern California to the Gulf of California.

*Material examined.*—

Sta. 497-36	Fraile Bay	2-18-36	15 m
Sta. 515-36	San Francisco Island	2-24-36	Shore
Sta. 518-36	San Francisco Island	2-25-36	Shore
Sta. 652-37	San Francisco Island	3- 9-37	Shore
Sta. 659-37	Agua Verde Bay	3-10-37	Shore
Sta. 713-37	Puerto Refugio	3-21-37	50 m
Sta. 1045-40	Tiburon Island	1-25-40	Shore
Sta. 1077-40	Tepoca Bay	2- 4-40	13 m
Sta. 1084-40	San Pedro Nolasco	2- 6-40	111 m

*Remarks.*—This is the most common calcareous sponge of the Gulf. Calcareous sponges do not appear as abundantly in the Hancock collection as one would expect.

The specimens of this species in this collection do not differ materially from those off southern California, although a few Gulf specimens show a tendency toward a tubelike form.

Family **Leucosoleniidae** Minchin  
 Genus **LEUCOSOLENIA** Bowerbank  
**Leucosolenia irregularis** Jenkin

Plate 96, Fig. 192; Plate 97, Fig. 193

*Leucosolenia irregularis* Jenkin, 1908, p. 44.

*Diagnosis.*—As is typical of members of this genus, this is a small white sponge rather brittle to fragile in consistency. The spicules are triacts in which one of the rays is much larger than the others, 40  $\mu$  by



600  $\mu$  in the largest spicules. The smaller rays are 12  $\mu$  by 200  $\mu$ . Oxeas are also present. A typical size is 27  $\mu$  by 700  $\mu$ . This specimen shows the typical ascon development of the genus.

*Holotype*.—British Museum.

*Type locality*.—East Africa.

*Distribution*.—Cosmopolitan.

*Material examined*.—

Sta. 584-36 Concepción Bay

3-14-36 8 m

*Remarks*.—The shape of this sponge is not very symmetrical; in fact, it tends to be leafy. It is quite probable that this specimen may not be conspecific with Jenkin's sponge, as the spicule sizes are even larger than he reported, but there are such an enormous number of species *Leucosolenia* that it seemed better to identify this specimen with Jenkin's species rather than erect a new species where the differences are not clear cut.

## SUMMARY

1. A detailed, systematic study of the sponges of the Gulf of California is recorded here. The only sponge collecting in the region for scientific purposes, previous to the Allan Hancock Pacific Expeditions, was done on the *Albatross* Expedition in 1891. Three specimens so far as known were reported from the Gulf on that cruise, all from relatively deep water.

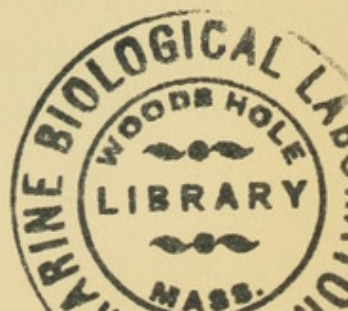
2. Three classes, 10 orders, 30 families, 56 genera, and 67 species of sponges are represented in the Allan Hancock Foundation collection of sponges from the Gulf of California.

3. Twenty-six species and one genus of sponges, new to science, are described in this paper.

4. The Demospongia are the dominant type found in the Gulf of California. Less than 4 per cent of the sponges collected from the region are Calcarea, as against a normal expectancy of 10 to 15 per cent for shallow water forms. This is probably due to the fresh water poured into the confined area of the Gulf of California from the Colorado River.

5. There is evidence that the Gulf of California presents near optimum conditions for sponges because species density is very great, while population density per species is low.

6. The waters of tropical and subtropical America in both the Atlantic and Pacific Oceans should be considered as a single faunal unit in spite of present-day isolation because of the number of "geminate" and "identical" species in the two areas.





7. The sponge "geminates" occurring on the two sides of tropical and subtropical America have not arisen by convergent evolution under the influence of similar conditions, because the conditions in areas where "geminates" occur are widely different.

8. The sponge fauna of the Gulf of California and the West Indies are closely related. Fifty-eight per cent of the sponges in the Allan Hancock Foundation from the Gulf are either identical with, or "geminates" of, West Indian forms.

9. The major portion of the sponge fauna of the Gulf of California arose as an "off branching" from the West Indian stock probably in the late Miocene period when the portal of Tehuantepec across Mexico was open.

10. A large portion of the present sponge fauna of the coast of California proper probably arose as an extension of the fauna of the Gulf of California. Forty-eight per cent of the sponge genera from the Gulf in the Allan Hancock collection are identical with, or "geminates" of, forms from the coast of California proper.

11. There is some evidence that the coast of California may represent, for sponges, a transition zone between the tropical, or subtropical, and temperate regions.

12. The sponge fauna of the Gulf of California is intermediate between that of the West Indies and that of the coast of California proper. "Geminate species" occurring in the latter region arise either because California forms are identical with Gulf forms, which in turn are "geminates" of sponges from the West Indies or because the Gulf sponges, which are "geminates" of California forms, are identical.



## LITERATURE CITED

## ARNDT, W.

1913. Zoologische Ergebnisse der ersten Lehr-Expedition der Dr. P. Schottländerschen Jubiläums-Stiftung. Jahresber. Schles. Ges. vaterl. Cultur, 1912, pp. 110-136.

## BOWERBANK, J. S.

1845. Observations on the Spongiadae, with descriptions of some new genera. Ann. Mag. Nat. Hist., ser. 1, vol. XVI, pp. 400-410.
1858. On the anatomy and physiology of the Spongiadae. Part I: On the spicula. Phil. Trans. Roy. Soc. London, vol. CXLVIII, pp. 279-332, pls. XXIII-XXVI.
1862. On the anatomy and physiology of the Spongiadae. Part III: On the generic characters, the specific characters and the method of examination. Phil. Trans. Roy. Soc. London, vol. CLII, pp. 1087-1135, pls. LXXII-LXXIV.
1864. A monograph of the British Spongiadae. Vol. I. Ray Soc., London, xx 290 pp., 37 pls.
1866. A monograph of the British Spongiadae. Vol. II. Ray Soc., London, pp. 1-388.

## BRADLEY, J. H.

1928. The Earth and Its History—A Textbook of Geology, Boston, New York. Ginn and Co., pp. 1-404.

## BRONSTED, H. V.

1924. Sponges from the Auckland and Campbell Islands. Papers from Dr. Th. Mortensen's Pacific Expedition 1914-1916. Vidensk. Medd. Kjobenhavn, vol. 75, pp. 117-167.

## BURTON, M.

1930. Norwegian sponges from the Norman Collection. Proc. Zool. Soc. London, part 2, pp. 487-546, pls. I-II.
1932. Report on a collection of sponges made in South Saghalin by Mr. Tomoe Urita. Sci. Rep. of Tohoku Imp. Univ., Fourth series, vol. VII, no. 2, pp. 195-206, pls. VII-VIII.
1932. Sponges. Discovery Reports, University Press, Cambridge, vol. VI, pp. 237-392, pls. XLVIII-LVII.
1934. Sponges. (Great Barrier Reef Expedition 1928-29 Scientific Reports). Brit. Mus. Nat. Hist., vol. 14, pp. 513-614, pls. I-II.

## CARTER, H. J.

1871. On two undescribed sponges (*Ectyon*, *Acarnus*) and two Esperidae from the West Indies; also on the nomenclature of the Calisponge *Clathrina* Gray. Ann. Mag. Nat. Hist., ser. 4, vol. VII, pp. 268-283, pl. XVII.
1873. On the Hexactinellidae and Lithistidae generally, and particularly on the Aphrocallistidae, Aulodictyon, and Farreae, together with facts elicited from their deciduous structures, and descriptions respectively of three new species. Ann. Mag. Nat. Hist., ser. 4, vol. XII, pp. 349-373, 437-472, pls. XIII-XVII.
1880. Descriptions of three new sponges from the Barents Sea. Ann. Mag. Nat. Hist., ser. 5, vol. VI, pp. 256-257.
1880. Report on specimens dredged up from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren. Ann. Mag. Nat. Hist., ser. 5, vol. VI, pp. 35-61, 129-156, or pp. 457-510, pls. IV-VIII.
1882. Some sponges from the West Indies and Acapulco in the Liverpool Free Museum described, with general and classificatory remarks. Ann. Mag. Nat. Hist., ser. 5, vol. IX, pp. 266-301, 346-368, pls. XI-XII.
1885. Description of sponges from the neighborhood of Port Phillip Heads, South Australia. Ann. Mag. Nat. Hist., ser. 5, vol. XV, pp. 107-117, 196-222, 301-321, pl. IV, and ser. 5, vol. XVI, pp. 277-294, 347-368.

## DENDY, A.

1891. A Monograph of the Victorian sponges. Part I: The organization and classification of the Calcarea Homocoela, with descriptions of the Victorian species. Trans. Roy. Soc. Victoria, vol. 3, pp. 1-81, pls. I-II.



1897. Catalogue of Non-Calcareous Sponges collected by J. Bracebridge Wilson, Esq., M. A., in the neighborhood of Port Phillip Heads. Part III. Proc. Roy. Soc. Victoria, ser. 2, vol. IX, pp. 230-259.
1921. Report on the Sigmatotetraxonida collected by H. M. S. *Sealark* in the Indian Ocean. Trans. Linn. Soc. London, vol. XVIII, pt. 1, pp. 1-164, pls. 1-18.
1924. Porifera. Part I: Non-Antarctic sponges. British-Antarctic (*Terra Nova*) Expedition, 1910. Brit. Mus. Nat. Hist., Zool., vol. VI, no. 3, pp. 269-392, pls. I-XV.
- DENDY, A. AND R. W. H. ROW  
1913. The classification and phylogeny of the calcareous sponges; with a reference list of all the described species, systematically arranged. Proc. Zool. Soc. London, pp. 704-813.
- DUCHASSAING DE FONBRESSIN, P., AND G. MICHELOTTI  
1864. Spongiaires de la Mer caraibe. Memoire publié par la Société hollandaise des sciences à Harlem. Natuurk. Verh. Mij. Haarlem, vol. XXI, pp. 1-124, pls. I-XXV.
- EHLERS, E.  
1870. Die Esper'schen Spongien in der zoologischen Sammlung der K. Universität Erlangen. Erlangen, E. Th. Jacob, pp. 1-36.
- EKMANN, SVEN  
1935. Tiergeographie des Meeres, xii+542 pp., 24 figs., 8 vols. (Akad. Verlagsgesellschaft, Leipzig.)
- ELLIS, J. AND DANIEL SOLANDER  
1786. The natural history of many curious and uncommon zoophytes, collected from various parts of the globe. Systematically arranged and described by the late Daniel Solander. London, 206 pp., pls. 1-63.
- ESPER, E. J. C.  
1794. Die Pflanzenthier in Abbildungen nach der Natur mit Farben erleuchtet nebst Beschreibungen. Zweyter Theil, Nürnberg, 303 pp. This second part appeared 1791-1794 and contains Lief. 7-12. About Sponges, pp. 102, 165-282, 289-294.
- FLEMING, J.  
1828. A history of the British animals, exhibiting the descriptive characters and systematical arrangement of the genera and species of quadrupeds, birds, reptiles, fishes, mollusca and radiata of the United Kingdom. Edinburgh-London.
- GRANT, R. E.  
1827. Notice of two new species of British sponges. Edinburgh, New Philos. Journ., vol. 2, (1826?), pp. 203-204.  
1841. Outlines of Comparative Anatomy. Porifera. London, pp. 5-9, 310-313, figs. 2-4.
- GRAY, J. E.  
1867a. Notes on the arrangement of sponges with the description of some new genera. Proc. Zool. Soc. London, pp. 492-558, pls. XXVII-XXVIII.  
1867b. On *Placospongia*, a new generic form of Spongiadae in the British Museum. Proc. Zool. Soc., pp. 127-129.
- GÜNTHER, A.  
1868. An account of the fishes of the states of Central America, based on collections made by Capt. J. M. Dow, F. Godman, Esq., and O. Salvin, Esq. Trans. Zool. Soc. 1868, vi+pp. 377-494, with plates 63 to 87, and woodcuts.
- HAECKEL, E.  
1872. Die Kalkschwämme: eine Monographie. Vol. 2. System der Kalkschwämme. Berlin.
- HALLMANN, E. F.  
1917. A revision of the genera with microscleres included or provisionally included, in the family Axinellidae; with descriptions of some Australian species: Part III. Proc. Linn. Soc. New South Wales, pp. 634-675, pls. XL-XLIV.  
1920. New genera of monaxonid sponges related to the genus *Clathria*. Proc. Linn. Soc. New South Wales, vol. XLIV, pp. 767-792, pls. XXXVI-XL.



## HENTSCHEL, E.

1911. Tetraxonida. 2 Teil: Fauna Südwest-Australiens (Michaelson und Hartmeyer). Vol. III, pp. 279-393.  
1923. Porifera. Handbuch der Zoologie von Kükenthal. Berlin and Leipzig, vol. 1, pp. 307-418.

## HERNANDEZ, F. FERRER

1921. Esponjas recogidas en la campana preliminar del "Girlanda." Bol. de Pesca Madrid, vol. 6, pp. 161-177.  
1923. Mas datos para el conocimiento de las esponjas de las costas españolas. Bol. de Pesca Madrid, vol. 7, pp. 247-272.

## HIGGIN, T.

1875. On a new sponge of the genus *Luffaria*, from Yucatan, in the Liverpool Free Museum. With remarks by H. J. Carter. Ann. Mag. Nat. Hist., ser. 4, vol. XVI, pp. 223-227, pl. VI.

## IJIMA, I.

1927. The Hexactinellida of the Siboga Expedition. Siboga Exped. Rep. Leiden. vol. CVI, pp. 1-383.

## JENKIN, C. F.

1908. National Antarctic Expedition (Nat. Hist.) 4: Calcareia. London, vol. IV, pp. 1-49, pl. 1-12.

## JOHNSTON, G.

1842. History of the British sponges and lithophytes. Edinburgh, London, Dublin, xii+264 pp., 25 pls.

## JORDON, D. S., AND MARY CYNTHIA DICKERSON

1908. Notes on a collection of fishes from the Gulf of Mexico at Vera Cruz and Tampico, Washington, D.C., Smithsonian Inst. Proc. U. S. Nat. Mus., vol. XXXIV, pp. 11-22.

## KIRKPATRICK, R.

1900. Description of sponges from Funafuti. Ann. Mag. Nat. Hist., ser. 7, vol. VI, pp. 345-362, pls. XIII-XV.

## LAMARCK, J. B. P. A. DE MONET

1814. Sur les Polypiers empâtés. (dont l'exposition commence au 20<sup>e</sup> vol des Annales, p. 294). Mém. du Muséum., vol. I, pp. 69-80.  
1815. Suite des Polypiers empâtés (dont l'exposition commence au 20<sup>e</sup> vol. des Annales, p. 294). Mém. du Muséum., vol. I, pp. 162-168, 331-340.

## LAMBE, L. M.

1892. On some sponges from the Pacific Coast of Canada and Behring Sea. Proc. and Trans. Roy. Soc. Canada, vol. X, sec. IV, pp. 67-78, pls. III-VI.  
1893. Sponges from the Pacific Coast of Canada. Proc. and Trans. Roy. Soc. Canada, vol. XI, sec. IV, pp. 25-43, pls. II-IV.

## LAUBENFELS, M. W. DE

1926. New sponges from California. Ann. Mag. Nat. Hist., ser. 9, vol. XVII, pp. 567-573.  
1927. The red sponges of Monterey Peninsula, California. Ann. Mag. Nat. Hist., ser. 9, vol. XIX, pp. 258-266.  
1930. The sponges of California. Stanford Univ. Bull., ser. 5, vol. V, no. 98, pp. 24-29.  
1932. Physiology and morphology of Porifera exemplified by *Iotrochota birotulata* Higgin. Papers from Tortugas Laboratory, Carnegie Inst. Wash. Pub. no. 435, vol. XXVIII, II, pp. 37-66.  
1932. The Marine and fresh-water sponges of California. Proc. U. S. Nat. Mus., no. 2927, vol. LXXX, Art. 4, pp. 1-140.  
1934. New sponges from the Puerto Rican Deep. Smithsonian Miscellaneous Collection Vol. XCI, no. 17, pp. 1-28.  
1935. Some sponges of Lower California (Mexico). American Museum Novitates no. 779, pp. 1-14. Issued February 11, 1935.  
1936. A comparison of the shallow-water sponges near the Pacific end of the Panama Canal with those at the Caribbean end. Proc. U. S. Nat. Mus., no. 2993, vol. LXXXIII, pp. 441-464.



1936. A Discussion of the Sponge Fauna of the Dry Tortugas in Particular and the West Indies in General with Material for a Revision of the Families and Orders of the Porifera. Papers from the Tortugas Laboratory, Carnegie Inst. Wash., Pub. no. 467, vol. XXX, pp. 1-225, 22 pls.
- LENDENFELD, R. VON  
 1885. A monograph of the Australian sponges. Part. III. Proc. Linn. Soc. New South Wales, vol. IX, pp. 1083-1150.  
 1903. Tetraxonia. Das Tierreich, vol. XIX, pp. 1-168.  
 1910. Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding, and of other expeditions of the "Albatross," 1888-1904. The Sponges. I, The Geodidae. Mem. Mus. Comp. Zool., vol. XLI, no. 1, 259 pp., 48 pls.
- LIEBERKÜHN, N.  
 1859. Neue Beiträge zur Anatomie der Spongien. Arch. Anat. und. Phys., pp. 353-382, 515-529, pls. IX-XI.
- LINNAEUS, C. VON  
 1759. Systema naturae, ed. 10, vol. II, Vegetabilia.
- MANTELL, G. A.  
 1822. The fossils of the South Downs, or illustrations of the geology of Sussex. London, pls. I-XLII.
- MARTENS, G. M. VON  
 1824. Reise nach Venedig. Zweiter Theil: Venedig, Euganeen, Alpen von Bellano, Tirol, Baiern. Naturgeschichtlicher Anhang. Ulm. Mit zwei Kupfern und sieben lithôgraphirten Abbildungen., vi+664 pp.
- MINCHEN, E. A.  
 1900. Porifera. In E. Ray Lankester, A Treatise on Zoology. Part II: The Porifera and Coelentera. London, Adam and Charles Black, pp. 1-178.
- MONTAGU, G.  
 1818. An essay on sponges, with descriptions of all the species that have been discovered on the coast of Great Britain. Mem. Werner Soc., vol. II, pp. 67-122, pls. III-XVI.
- NARDO, G. D.  
 1833. Auszug aus einem neuen System der Spongiarien, wornach bereits die Aufstellung in der Universitäts-Sammlung zu Padua gemacht ist. Isis, Coll. pp. 519-523.
- PALLAS, P. S.  
 1766. Elenchus Zoophytorum. Hagae-comitum apud Petrum van Cleef.
- RIDLEY, S. O.  
 1881. On the genus Plocamia Schmidt, and on some other sponges of the order *Echinonemata*. With descriptions of two additional new species of *Dirrhopalum* by Prof. P. Martin Duncan. Journ. Linn. Soc. London, vol. XV, pp. 476-497, pls. XXVIII-XXIX.  
 1884. *Spongiida*. Report on Zoological Collections made in Indopacific Ocean during the voyage of H. M. S. "Alert" 1881-82. London, pp. 366-482, 582-630, pls. XXXIX-XLIII, LIII-LIV.  
 1887. Report on the Monaxonida collected by H. M. S. "Challenger" during the years 1873-1876. Rep. Sci. Res. Challenger, Zoology, vol. XX, part LIX, LXVII+275 pp., pls. I-LI.
- SCHMIDT, O.  
 1862. Die Spongien des adriatischen Meeres. Leipzig, vii+88 pp., 7 pls.  
 1864. Supplement der Spongien des adriatischen Meeres. Leipzig.  
 1868. Die Spongien der Küste von Algier. Mit Nachträgen zu den Spongien des adriatischen Meeres. (Drittes Supplement.) Leipzig, Engelmann, iv+44 pp., 5 pls.  
 1870. Grundzüge einer Spongien-Fauna des atlantischen Gebietes. Leipzig, iv+88 pp., 6 pls.
- SCHULZE, F. E.  
 1886. Ueber den Bau und das System der Hexactinelliden. Abh. Akad. Berlin, pp. 1-97.



## SOLLAS, W. J.

1886. Preliminary account of the tetractinellid sponges dredged by H. M. S. "Challenger," 1872-1876. Part I: The Choristida, Sci. Proc. Roy. Dublin Soc., vol. V, pp. 177-199.
1888. Report on the Tetractinellida collected by H. M. S. "Challenger," during the years 1873-1876. Rep. Sci. Res. Challenger, Zool., vol. XXV, pp. i-clxvi+1-458, pls. I-XLIV.

## STEPHENS, JANE

1915. Atlantic sponges collected by the Scottish National Antarctic Expedition. Trans. Roy. Soc. Edinburgh, vol. L, pp. 423-467.

## THIELE, J.

1898. Studien über pazifische Spongien: I. Zoologica, Heft 24, pp. 1-72, pls. I-VIII.
1899. Studien über pazifische Spongien: II. Zoologica, Heft 24, pp. 1-33, pls. I-V.
1905. Die Kiesel- und Hornschwämme der Sammlung Plate. Zool. Jahrb. Suppl. 6, pp. 407-496, pls. XXVII-XXXIII.

## TOPSENT, E.

1889. Quelques Spongiaires du Banc de Campêche et de la Pointe-à-Pître. Mém. Soc. Zool. France, vol. II, pp. 30-52.
1894. Une Réforme dans la Classification des Halichondrina. Mém. Soc. Zool. France, vol. VII, pp. 5-26.
1896. Matériaux pour servir à l'étude de la Faune des Spongiaires de France. Mém. Soc. Zool. France, vol. IX, pp. 113-133.
1900. Étude monographique des Spongiaires de France. III: Monaxonida (Hadromerina). Arch. Zool. Expér., vol. VIII, pp. 1-133.
1904. Spongiaires des Açores. Résult. Camp. Sc. Alb. Monaco, fasc. 25, pp. 1-280, pls. I-XVIII.
1920. Caractères et affinités des *Thoosa* Hanc. et des *Alectona* Cart. Considérations sur Leurs germes à armure. Bull. Soc. Zool. France, Paris, vol. XLIV, pp. 88-97.
1920. Spongiaires du Musée Zoologique de Strasbourg. Monaxonides. Bull. Inst. Océan. Monaco, no. 381, pp. 1-36.
1927. Diagnoses d'éponges nouvelles recueillies par le Prince Albert I<sup>er</sup> de Monaco. Bull. Inst. Océan. Monaco, no. 502, pp. 1-19.
1928. Spongiaires de l'Atlantique et de la Méditerranée, provenant des croisières du Prince Albert I<sup>er</sup> de Monaco. Résultats des Camp. Sc. Albert I<sup>er</sup> de Monaco, vol. LXXIV, pp. 1-376, pls. I-XI.
1932. Eponges de Lamarck conservées au Muséum de Paris. Second Part. Archives du Muséum, Paris, ser. 6, vol. VIII, pp. 61-124, pls. I-VI.

## VOSMAER, G. C. J.

1885. The sponges of the "Willem Barents" Expedition, 1880 and 1881. Bijdr. Dierk., vol. XII, pp. 1-47, pls. I-V.

## WHITFIELD, R. P.

1901. Notice of a new sponge from Bermuda and of some other forms from the Bahamas. Bull. Amer. Mus. Nat. Hist., vol. XIV, pp. 47-50, pls. I-V.

## WILSON, H. V.

1904. The Sponges. No. XXX of Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U. S. Fish. Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. Mem. Mus. Comp. Zool. Harvard Coll., vol. XXX, no. 1, pp. 1-164, 26 pls.
1925. Siliceous and horny sponges collected by the U. S. Fisheries Steamer "Albatross" during the Philippine Expedition, 1907-10. Bull. 100, U. S. Nat. Mus., Washington, vol. II, part 4, pp. 273-506, pls. 37-52.





Dickinson, M G. 1945. "Sponges of the Gulf of California." *Allan Hancock Pacific expeditions. [Reports]* 11, 1–55.

**View This Item Online:** <https://www.biodiversitylibrary.org/item/27570>

**Permalink:** <https://www.biodiversitylibrary.org/partpdf/39399>

**Holding Institution**

MBLWHOI Library

**Sponsored by**

MBLWHOI Library

**Copyright & Reuse**

Copyright Status: No known copyright restrictions as determined by scanning institution

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.