THE SPONGE FAUNA OF THE ST. GEORGE'S SOUND, APALACHEE BAY, AND PANAMA CITY REGIONS OF THE FLORIDA GULF COAST[1]

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I. Introduction

The sponge populations of the Gulf of Mexico have been little investigated although the western coast of Florida harbors a commercial sponge fauna second only to that of the eastern Mediterranean (de Laubenfels, 1948). The commercial sponge fisheries of this country are centered in the Gulf.

Although sponges have been exploited for years, only two studies on the general sponge fauna of this area have been published. Carter (1884) listed tentative genera and a few species collected along the West Coast of Florida. These names were based on dry, fragmental specimens. De Laubenfels (1953a) reported on a collection of sponges made by the staff of the University of Miami Marine Laboratory in the eastern Gulf of Mexico in 1948. In his study, data from twenty-two stations were reported from the western coast of Florida in the area between the Dry Tortugas and Dog Island, to the west of Apalachee Bay. Three stations were occupied in the Apalachee Bay region and the results from these stations (de Laubenfels, 1953a) have been included in this paper.

The purpose of the present investigation was to survey the sponge fauna of the Apalachee Bay Region. This involved extensive collecting from stations in the area over a period of two years. In addition, specimens were obtained from Dr. John Morrill who made collections in the St. Mark's Light area in 1955.

The initiation of a detailed faunal investigation of the Panama City, Florida, area by the staff of the Oceanographic Institute, Florida State University, made possible the addition of several specimens from that vicinity for comparison. Some notes on the ecology of the sponge fauna are included.

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II. Collecting Stations

In Fig. 1 are located the collecting stations in the Apalachee Bay - St. George's Sound area including 14 occupied by the author and associates in 1956 and 1957 and three occupied by the University of Miami in 1948 (de Laubenfels, 1953a). Station depths are indicated in Fig. 1. Station 15, Panama City, was under investigation by Dr. Meredith Jones of the Oceanographic Institute, Florida State University, in 1959. A large part of his collections was obtained by dredging, the remainder by hand. Descriptions of the stations follow:

Station 1.—29°55′36″ N., 84°26′30″ W. Depth: 1.5-3.5 meters. Substrate: primarily outcrops of Tampa limestome; much open sandy bottom as well.

Station 2.—29°54′18″ N., 84°26′ W. Depth: 1 meter; intertidal in places. Substrate: chiefly sand; broken shells or other invertebrates serve as substrates for some species of sponges.

Station 3.—29°54′30″ N., 84°23′-84°24′ W. Depth: 1 meter; intertidal in places. Substrate: chiefly oyster bars in the area; some clear areas of sand and mud.

Station 4.—29°47′06″-29°48′ N., 84°19′ 30″ W. Depth: 10-14 meters. Substrate: rock and sand.

Station 5.—29°49′44″ N., 84°16′18″ W. Depth: 12 meters. Substrate: sand.

Station 6.—29°51′ N., 84°11′24″ W. Depth: 8 meters. Substrate: sand.

Station 7.—29°49′30″-29°49′48″ N., 84° 07′31″-84°08′ W. Depth: 9.5 meters. Substrate: rock and sand.

Station 8.—30°05′ N., 84°11′30″ W. Depth: intertidal on bar, 2-3 meters in channel south of bar. Substrate: oyster bar, mud and sand in channel south of bar.

Station 9.—30°04′30″ N., 84°11′ W. Depth: 1 meter. Substrate: sand and *Thalassia testudinum* Konig.

Station 10.—30°03′ N., 84°05′ W. Depth: 2.5-3.5 meters. Substrate: Tampa

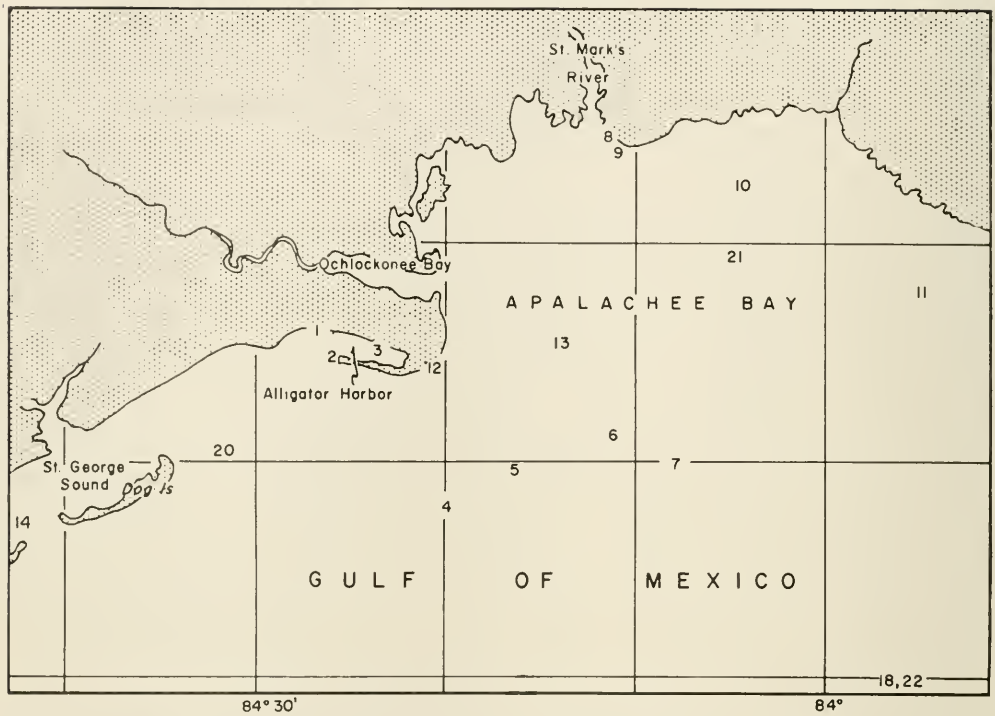


Figure 1. Map of the Apalachee Bay region, showing stations (drawn by Dr. Stuart Grossman, Institute of Marine Science, Port Aransas, Texas).

limestone outcrops in the sandy *Thalassia* grass flat.

Station 11.—29°57′30″-29°58′ N., 83° 55′-83°56′ W. Depth: 2.5 meters. Substrate: primarily sand and *Thalassia* grass flat. Some limestone outcrops occur.

Station 12.—29°53′56″ N., 84°20′-84°21′ W. Depth: 0 to 1 meter. Substrate: Beach. *Note:* Specimens from this station probably come from a sponge bed located approximately 29°56′ N., 84°15′ W., according to local residents.

Station 13.—29°55′18″ N., 84°14′12″ W. Depth: 5.5-6.5 meters. Substrate: predominantly muddy.

Station 14.—29°46′45″ N., 84°42′12″ W., Depth: 6 meters. Substrate: sand and/or mud.

Station 15.—This includes the entire Panama City area of the north Florida Gulf Coast, both offshore and estuarine areas.

University of Miami Stations.—October, 1948 (de Laubenfels, 1953a).

Station 20.—29°50′ N., 84°32′ W. Depth: 12.5 meters. Substrate: not indicated.

Station 21.—29°59′ N., 84°05′ W. Depth: 6.5 meters. Substrate: not indicated.

Stations 18, 22.—29°39′ N., 83°56′ W. Depth: 14-14.5 meters. Substrate: not indicated.

III. Methods

Wading, skin-diving with face-mask and swim-fins, dredging, and beachcombing were employed in the collection of specimens from the areas investigated.

Upon collection, fresh specimens were fixed immediately in ninety-five per cent isopropyl alcohol, since delay causes physiological and physical distortion, especially of the flagellate chambers (de Laubenfels, personal communication). The original alcohol was decanted and replaced with seventy per cent isopropyl alcohol after an hour.

Fixation and storage in formalin were avoided since these procedures eventually reduce the sponge to a gummy mass. Neutral formalin fixation (for histological purposes) may be used providing the specimen is soon placed in at least two changes of seventy per cent alcohol to remove any traces

of the formalin (de Laubenfels, personal communication).

Hand sections were cut and mounted after the method of de Laubenfels (1953b). Paraffin mounts and microtome sections were made on most specimens. After the paraffin was removed by xylene, the section on the slide was removed from the xylene, blotted, and treated in the same manner as hand-cut sections. Spicule mounts of specimens with siliceous spicules were prepared according to the method of de Laubenfels (1953b). Sponges with a cortex, a special dermal skeleton, or a dermal membrane required spicule mounts from both this outer area and the endosome. Differences in the spicule populations of ectosome and endosome often are significant taxonomic characters. Mounts of boring sponge spicules were made by the method of Old (1941). Spicule mounts of calcareous sponges were prepared in much the same manner as those of boring sponges, except that concentrated potassium hydroxide solution was substituted for the nitric acid. This more tedious method was used since the normal spicule mounting procedure of de Laubenfels (using KOH instead of HNO_3) always leaves a thick coating of white substance on the slide which renders observation difficult.

Measurements of mean size and range of spicules were based on not less than 10 (usually 20) spicules of each category. Some data are expressed in a formula: *i.e.* Lower limit-mean-upper limit (length) $\times$ lower limit-mean-upper limit (diameter).

IV. Systematics

Sixty-four species, in 48 genera, are included here. Of these, 56 species, in 41 genera, were found during the course of this investigation. The remainder were recorded only by de Laubenfels (1953a). None belong to the class Hexactinellida; but the Calcarea and Demospongiae are well represented.

The classification of de Laubenfels (1936a) is followed. All specimens have been assigned Oceanographic Institute, Florida State University, numbers designated by "OI". Duplicate specimens have been deposited with the United States National Museum and are referred to by USNM numbers.

CLASS DEMOSPONGIAE

Order Keratosa Bowerbank

Family Spongiidae Gray

Spongia barbara Duchassaing and Michelotti, 1864.—The commercial "yellow sponge" was taken at Station 21 in October, 1948 and reported as *S. zimmocca barbara* by de Laubenfels (1953a). It was later restored to specific rank in a paper published shortly after his death (de Laubenfels and Storr, 1958).

Spongia graminea Hyatt, 1877.—The well known species known as the "Key grass sponge" (de Laubenfels and Storr, 1958) was taken at Station 21 and reported by de Laubenfels (1953a).

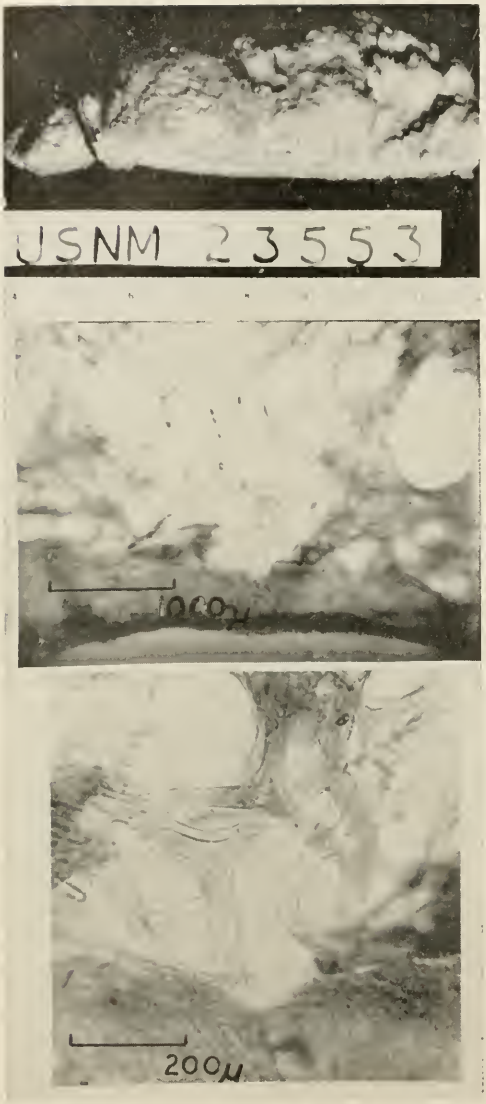
Spongia sp. (?).—OI 1052, USNM 23553, USNM 23558 (figs. 2-4). Specimens fitting closely the published description of the "Gulf grass sponge," *Spongia graminea tampa* de Laubenfels and Storr 1958 (page 110), were abundant at Stations 1 and 10. Depth was between 1.5 and 3.5 meters, and the sponges were found on a rock substrate.

These specimens also fit the written description of the "glove or finger sponge," *S. cheiris* reported by de Laubenfels and Storr 1958 (page 112), who found *S. cheiris* at Alligator Harbor, Florida. This report stems from specimens taken at Station 1 in the presence of de Laubenfels and later macerated, dried and sent to him by the author. Dr. de Laubenfels identified the sponge as the "glove sponge" in the field at the time of collection.

All this would lead to the conclusion that these specimens were indeed representative of *S. cheiris*. Unfortunately the specimens resemble the type specimens of *S. graminea tampa*, while the type specimen of *S. cheiris* seems close to, if not identical with, Hyatt's type specimen of *S. graminea*.

In addition there is the matter of color. *S. graminea tampa* is reported to be drab to pale taupe in color, whereas *S. cheiris* is black as is *S. graminea*. The author's specimens in life were white with faint lavender tints.

Dr. Willard Hartman of the Yale Peabody Museum feels that *S. cheiris* de Laubenfels and Storr is identical with *S. graminea* Hyatt and that *S. graminea tampa* de Laubenfels and Storr may indeed be a separate species (personal communication).



Figures 2-4. **2** (top). *Spongia* sp. (USNM 23553). **3** (middle). *Spongia* sp. section. **4** (bottom). *Spongia* sp. section.

Hippiospongia lachne de Laubenfels, 1936.—The "sheepswool sponge" of commerce was taken at Stations 18 and 22, and reported by de Laubenfels (1953a).

Hippiospongia gossypina (Duchassaing and Michelotti, 1864).—The "velvet sponge" is recorded only at Station 22 (de Laubenfels, 1953a).

Aulena columbia de Laubenfels, 1937.—The third report and the only record for the area is by de Laubenfels (1953a) from Station 20.

Ircinia fasciculata (Pallas, 1766).—OI 1000 and USNM 23556. The "stinker or garlic sponge" has the peculiar sulfurous odor characteristic of all species of *Ircinia.* The filaments, which are characteristic of the genus, had a mean diameter of 3.7 μ and ranged from 2 to 5.5 μ in diameter. The bulbs at the terminal ends of the filaments averaged 9.8 μ in diameter, with a range from 8.6 to 12.1 μ.

This sponge may be distinguished from all other members of the genus, except *I. ramosa,* by its brownish-white color. Also, its conules are much closer together than those of any other Floridian species in the genus except *I. ramosa.* The shape is variable, from massive to lobate and even occasionally ramose. In ramose specimens the branch ends tend to be pointed rather than bluntly rounded as in *I. ramosa* (de Laubenfels, 1950a).

The "garlic sponge" was extremely abundant throughout the year, usually on rock substrates at a depth of 2 to 15 meters. It was taken at Stations 1, 2, 10, 11, 12, 20, and 22. In addition it was found at Panama City, Florida, *i.e.* Station 15, on buoys.

Ircinia ramosa (Keller, 1889) de Laubenfels, 1948.—USNM 23689. One beachworn, macerated specimen was found at Station 12 on September 25, 1956, shortly after a heavy storm. It was preserved in dry condition.

The specimen was quite ramose, and had the characteristic bluntly rounded branch ends of the species, rather than pointed branch ends as in *I. fasciculata* (de Laubenfels, 1950a; Hartman, 1955). The branches were relatively broad, though flattened. At its widest point one branch measured 4.3 x 1.2 cm. Another branch was more rounded but still appeared slightly flattened; it measured 2 x 1.6 cm.

The surface was conulose with conules 1 to 2 mm high and averaging 2.2 mm apart, with a range of 1 to 4 mm. Oscules were scattered at random over the surface and were between 0.5 and 4 mm in diameter.

Filaments characteristic of the genus appeared abundantly. Although the mean sizes of the filaments and their tylote ends were not different from those of *I. fasciculata,* the size range in *I. ramosa* is distinctly smaller. Filaments of this specimen ranged from

2 to 4.4 μ in diameter, with a mean of 3.6 μ. The knobbed ends ranged from 4.4 to 9.9 μ, with a mean of 8.3 μ. The top figures of these ranges are distinctly smaller than those of the local specimens of *I. fasciculata* recorded here.

Ircinia campana (Lamarck, 1814) de Laubenfels, 1948.—OI 1006 and USNM 23579. This is the vase-shaped *Ircinia* with conules of medium size, 4 to 8 mm apart (de Laubenfels, 1936a, 1953a). It is reported to have a somewhat reddish color.

A specimen was taken at Station 20 and reported by de Laubenfels (1953a).

Specimens were taken at Stations 1, 4, 10, and 12 during the course of this investigation. Depth, in Apalachee Bay, ranged between 1.5 and 12.5 meters, and substrate was rock or sand. Specimens were basically white in color with overtones of pink, giving the flesh almost the color of Caucasian skin. The conules were about 1 mm high and only 2 to 4 mm apart. Flagellate chambers were hemispherical and small, with a mean diameter of 38 μ and a range from 27 to 46 μ.

The filaments of this species have been reported as 3 to 4 μ in diameter (de Laubenfels, 1936a) or 10 to 14 μ in diameter (Lendenfeld, 1888). The Apalachee Bay area specimens fall close to de Laubenfels' measurements. Filaments proper averaged 4 μ in diameter, range 2.2 to 4.8 μ, while the bulbous endings averaged 9.7 μ in diameter with a range from 8.6 to 11.4 μ. The filaments became distinctly narrower close to the bulbous ending. These narrower areas averaged 2.6 μ and ranged from 1.8 to 4 μ in diameter.

Ircinia strobilina (Lamarck, 1816) de Laubenfels, 1948.—OI 1040, USNM 23573. This is a cake-shaped *Ircinia.* Its coloration is reported to vary from dark grey to black and its conules are 6 to 12 mm apart (de Laubenfels 1936a, 1948). It was taken from a sunken ship off Panama City, Florida, depth 12.5 meters, substrate iron. The specimen is a flat cake 9 cm in diameter and 2 cm high.

Verongia longissima (Carter, 1882) de Laubenfels, 1936.—This is a long thin, ramose *Verongia.* Its color in life is reported to be gray, drab, or dull yellow (Carter 1882; de Laubenfels, 1936a, 1948), slowly turning carmine or grey upon death (de Laubenfels, 1936a, 1948).

The species was not found during the course of the present investigation and was reported from Station 20 only in the area by de Laubenfels (1953a, page 515).

Verongia sp.—OI 998, USNM 23552. This is also a long thin, ramose *Verongia,* which is persistently light brown on the upper surface and dull yellow on the lower one. On dying in air, or in alcohol, it quickly turns to dark purple and in alcohol remains thus indefinitely. It was found common at Stations 7, 10, and 11 and beachworn, macerated specimens were seen at Station 12.

Depth ranged from 2 to about 13 meters. Of significance, on every occasion when the author viewed this species underwater it was not attached, but merely lying on the bottom, generally on the sandy substrate of a grass flat or other somewhat protected area. The abundance of beachworn, macerated specimens seems to support the hypothesis of unattached habit.

Diameter of the individual branches of the sponge was about 1 cm while the length of some observed specimens exceeded 30 cm, the branches often intertwining to some extent.

Consistency in life is softly spongy.

The surface was minutely conulose, the conules being 0.5 to 1.5 mm high and 1 to 2.2 mm apart. The oscules were 3 to 6 mm in diameter and 0.9 to 2.8 cm apart; they were scattered over the surface of the sponge in an irregular fashion though a majority were located on the upper surface. A dermis about 15 μ thick covers the sponge.

The skeleton consisted of an irregular meshwork of spongin fibers averaging in size about 560 x 670 μ (range: 400 to 1050 μ). The concentrically laminated spongin fibers averaged 105 μ (range: 48 to 230 μ) in diameter, each with a central pith zone constituting 30 to 60 percent of its overall diameter.

The small ovate flagellate chambers averaged 20.2 μ in diameter (range: 14 to 33 μ).

A comparison of the data from these specimens with those from *V. fistularis, aurea, longissima,* and *fulva* (=*aurea* per de Laubenfels 1948) yields the impression that this sponge may indeed fall within the scope of *V. aurea* as recognized by de Laubenfels (1948: 85, 87), especially in view of the rapid color change noted above, but its living coloration, conule arrangement and spacing, dermal thickness, flagellate chamber

size, and oscular location resemble more closely those of *V. longissima* and therefore its final allocation is deferred to some future date.

Family DYSIDEIDAE Gray

Dysidea etheria de Laubenfels, 1936.—OI 1019, USNM 23557. This lamellate sponge is characterized by beautiful sky blue coloration, primary and secondary fibers that are both heavily cored with coarse debris, and a conulated surface. The bright blue color distinguishes it in the field.

Specimens were found at Station 8, November 17, 1956, and station 10 in the summer of 1957. The species appears to be fairly common, at least seasonally.

Dysidea crawshayi de Laubenfels, 1936.—OI 1047, USNM 23586. This is the third record of this sponge. It was redescribed briefly by de Laubenfels (1948: 145), and later redescribed by him in detail (1950a: 26-28).

One specimen was taken from the grass flat at Station 11, at 2.5 meters, by J. Branham, R. Hathaway and R. Bhatnagar on October 31, 1957. This specimen tended to be amorphous but had some low, broad lobes. Its color was not quite characteristic of the species but was a pinkish red, instead of the orange color previously recorded. Primary fibers were heavily cored with detritus and secondary fibers less so, which corresponds well with the original description.

Size was 6 cm in diameter and 3 cm in height. The mean sample size of the eurypyllous flagellate chambers was 69 μ (range: 53 to 84 μ).

Euryspongia rosea de Laubenfels, 1936.—OI 1044, USNM 23574. One specimen was taken on the grass flat at Station 11 on October 31, 1957, by J. Branham, R. Hathaway and R. Bhatnagar.

Shape was lobate to ramose, total height 18 cm, total diameter 9 cm. The diameter of each branch was about 2 cm. Color was light to medium brown. This differs from the recorded rosy red color and possibly may be accounted for by the several hours the specimens spent in air before reaching the laboratory.

Flagellate chambers ranged between 50 x 30 μ, and 80 x 50 μ.

Ianthella ardis de Laubenfels, 1950.—OI 1045, USNM 23576. This amorphous sponge was primarily a dark plum color externally and pink internally during life. It was taken at Station 7 on rock and sand, November 3, 1957. Upon its surface there appeared to be a yellow slime or sheen similar to that on *Iotrochota birotulata* (Higgin). Apparently it is not uncommon since it was found in two of the dredge hauls made in the area.

The consistency of my specimens was that of soft cork. The surface was covered with conules about 1 mm high and 2 to 5 mm apart and there was a definite, dense, dermis 30 to 45 μ thick covering the sponge. The endosome, in sections, appeared quite fleshy containing ovate, sacklike flagellate chambers in profusion. These were 22-31.9-49 μ in diameter. The laminated spongin fibers were 96-210.8-345 μ in diameter and appeared dendritic in arrangement, that is, they branched but seldom, if ever, anastomosed. This is attributed to the fact that the fibers were generally 1 to 2 mm apart in the sections and that their anastomoses were not seen because of the thinness of the sections. The fibers contained a large central pith area constituting about one-third of the diameter in smaller fibers to two-thirds of the diameter in larger ones. The small cells within the fibers, which set this genus apart (de Laubenfels 1948: 157), were also noted.

These specimens most closely match those that de Laubenfels (1936a: 31-32) originally reported as *I. basta* and which he later considered conspecific with *ardis* (1950a: 33). The morphology of my specimens and of de Laubenfels' *basta* specimen resembles closely that of the type specimen of *I. ardis* with the exception of color, flagellate chamber size, and dermal thickness.

Color in both my specimens and de Laubenfels' *basta* may be said to be purple while that in the *ardis* type specimen is reported yellow to emerald green (de Laubenfels 1950a: 31). Flagellate chamber size in de Laubenfels' *basta* specimen is 25 to 45 μ which matches the data from my specimens well, while the size in the *ardis* type specimen is about 30 to 60 μ. Dermal thickness in both my and the *basta* specimens is generally between 30 and 45 μ while in the *ardis* type specimen it is reported to be 15 μ (de Laubenfels 1950a: 32).

In spite of the differences noted above, I am reluctant to designate this as a new species at present because of the overall morphological similarity exhibited among

the specimens. Further specimens are needed to give an estimate of the range of variation in each population.

I am indebted to Drs. Willard D. Hartman and Patricia R. Bergquist for indicating the proper generic assignment of these specimens.

Family APLYSILLIDAE Vosmaer

Darwinella joyeuxi Topsent, 1889.—OI 1007, USNM 23550. The genus is peculiar for having triaxon horny spicules and is set apart for that reason.

During the course of the present investigation specimens of this species were taken at Stations 4, 8, and 13 between 2.5 and 14 meters on rock and sand bottoms. Shape was massive to amorphous. De Laubenfels (1953a: 517-518) previously reported a specimen from Station 20 as *D. mulleri.* As discussed below, this specimen is considered identical with those taken during this investigation.

This dull red, softly spongy, conulose sponge reached a maximum height of 10 cm and diameter of 15 cm. Its principal laminated spongin fibers averaged 50 μ (range 32 to 61 μ) in diameter and rarely were cored with siliceous spicular detritus and other material. The secondary, or connecting, fibers which had a mean diameter of 19.7μ (range 10 to 30 μ) were not so cored. The arrangement of these fibers appeared to be quite ordinary for the genus, as was the general architecture.

The horny, almost equi-rayed, triaxon spicules had rays averaging 10.4 x 559 μ (range 7 x 437 to 16 x 650 μ).

The ovate flagellate chambers had mean dimensions of 26.2 x 58.7 μ (range 14 x 39 to 39 x 61 μ).

Were it not for the slight amount of detrital coring of the principal fibers, these specimens would fall to *D. australiensis* Carter as recognized by Topsent (1905: CLXXVI, CLXXXIII) and Levi (1952: 38-39), or to *D. mulleri* Schultze if de Laubenfels' (1948: 168-170) broad concept of that species is considered valid.

Checking of de Laubenfels' (1953a) specimen slide from Station 20 failed to yield any evidence of detrital coring which, however, was rare even in my specimens. In all other respects, however, his specimen compared favorably to mine. De Laubenfels' statement (1948: 171) that some of the horny spicules in *D. joyeuxi* anastomose to form a reticulation independent of the principal keratose fibers was not verified by reference to the original description or to Topsent's later reference to this species (1905: CLXXXIV,CLXXXVII-CLXXXIX) and therefore is to be disregarded.

Probably the specimens of *Darwinella* heretofore reported by de Laubenfels (1950a: 38-39; 1953a: 517-518) are all *D. joyeuxi,* in view of the overall agreement between them and the specimens reported here and the relative rarity of coring material in these specimens. On the other hand, it may also be true that de Laubenfels' view is the correct one and that they represent *D. mulleri.* If this is true then *D. joyeuxi* also falls to *mulleri* on the basis of the evidence presented above. At this time I prefer to maintain the distinction between the two, at least until new specimens and data are forthcoming which may clarify the issue.

Family HALISARCIDAE Vosmaer

HALISARCA **PURPURA,** sp. nov.—(figs. 5-9). OI 1038, USNM 23589.

USNM 23589 is designated as the holotype; April 14, 1957 by Mr. J. Branham.

Locality and abundance.—This species was reported abundant and encrusting on the turtle-grass, *Thalassia testudinum* Konig, at Station 9 on the date of collection. Subsequent visits by the author failed to yield any new specimens. Depth was less than 1 meter.

Shape and size.—Basically encrusting, but the surface was somewhat lobate and therefore appeared almost wrinkled. The largest specimen was 6 cm long and 1-1.8 cm in diameter. A smaller specimen was 3.8 x 0.4 x 0.8 cm.

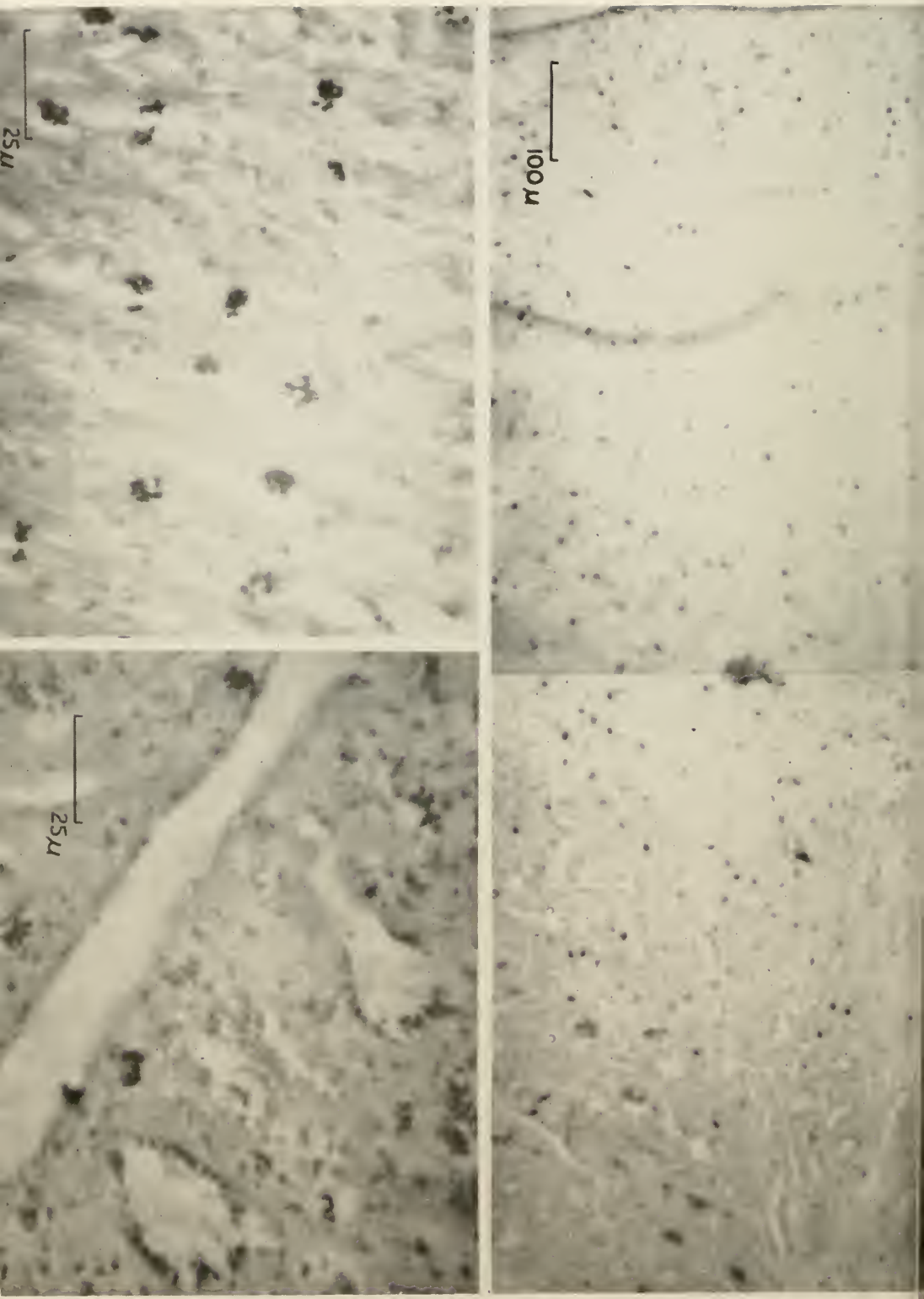
Color.—Color in life was a striking purplish-red, brighter than maroon. This color was found throughout the fresh organism by Mr. Branham but the color in alcohol was drab grey throughout.

Consistency.—Soft, almost colloidal.

Surface.—Smooth.

Oscules.—Not observed; they are presumed to be very small.

Ectosomal anatomy.—There was a protoplasmic dermis, over a 600 to 700 μ thick alveolar zone of small subdermal cavities which ranged in size from 2 x 2 μ to 20 x



Figures 5-7. Read with page turned sideways. **5** (top). *Halisarca purpura,* sp. nov., section. **6** (lower left). *Halisarca purpura,* sp. nov., section of outer alveolar zone. **7** (lower right). *Halisarca purpura,* sp. nov., section of choanosome.

37 μ. This alveolar zone contained many 8 to 32 cell developmental stages.

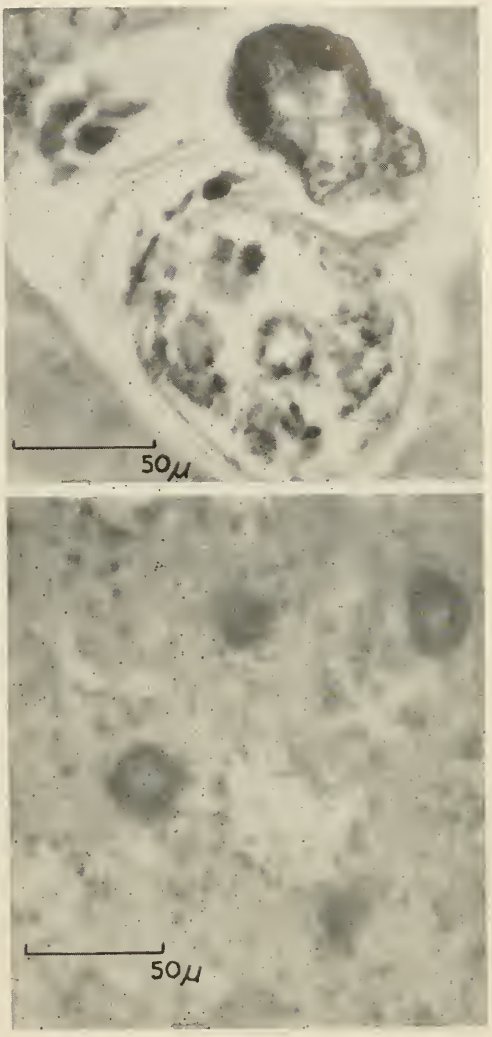
Endosomal anatomy.—This consisted of flagellate chambers, canals, and hyaline jelly between them. The flagellate chambers had a mean size of 21 x 38 μ (range in length: 18 to 80 μ; diameter 12 to 30 μ). They were long and sack-like and sometimes branched. There were a great many developing spermatocytes and oocytes in the endosome, indicating sexual maturity at the time of collection.

Skeleton.—None; only the colloidal ground substance was present.

Discussion: De Laubenfels (1948: 175) stated that the flagellate chambers of *Halisarca dujardini* Johnston are "commonly 25 microns in diameter by 60 microns to 150 microns long." The color is a dull yellowish brown. The diameter of the flagellate chambers of *H. magellanica* Topsent (1901b: 44) are reported to range between 70 and 100 μ. *H. magellanica* is purple in color.

Specimens taken at Station 9 by Mr. Branham have flagellate chambers which are in the range of *dujardini*, while their color resembles that of *magellanica*. Since there are few anatomical characters to go by in this genus, we might have an intermediate between the two species. Indeed, some authorities regard other members of the genus as conspecific with *dujardini*, but considering the wide range of the genus and the isolated occurrence of the forms reported, as well as the few distinct morphological characters, at the present I regard them as separate species as does de Laubenfels (1932, 1948).

A detailed study of the embryology in the manner of Levi (1956a) may further clarify the situation.



Figures 8-9. **8** (top). *Halisarca purpura*, sp. nov., section of spermatocysts. **9** (bottom). *Halisarca purpura*, sp. nov., section of oocytes.

Order Haplosclerina Topsent

Family Haliclonidae de Laubenfels, 1932

Haliclona rubens (Pallas, 1766) de Laubenfels, 1932.—OI 1037, USNM 23554. This dull red, ramose sponge was plentiful throughout the year along the beach at Station 12. Most specimens, however, were badly beachworn and macerated.

The oxeas which make up the skeleton in this species averaged 136 x 4.1 μ in size (range in length: 115 to 157 μ; width 1.8 to 7.3 μ). This agrees well with the range of Hartman's 1955 data from the Gulf of Campeche, and does not vary greatly from the de Laubenfels (1936a, 1949a) values from Florida and the Bahamas, though Carter (1882) and Wilson (1902) report larger spicules. Carter found 230 μ oxeas while Wilson's are reported to be 3 μ longer than the largest spicules in my specimens, or 160 x 4 μ. Hartman (1955) tabulated all of these data.

Haliclona rubens was reported in an annotated checklist for the study area (Menzel, 1956).

Haliclona viridis (Duchassaing and Michelotti, 1864) de Laubenfels, 1936.—OI 1014, USNM 23587. The coloration of this

sponge varied from light green to grey-brown. Its skeleton consisted entirely of oxeas, plus a few stylote and strongylote spicules that were clearly derived from the oxeas.

De Laubenfels (1953a) reported the species from Station 21 (USNM 23396). Measurements made on a slide of this specimen indicate that the oxeas had an average size of 165.9 x 5.7 μ (range in length: 144 to 201 μ; width: 2 to 10 μ).

Specimens on rock at Stations 4, 7, and 13, between 6.5 and 14 meters, were taken during the course of the present investigation. Spicule size was much nearer the "3 by 120 microns" size given by de Laubenfels (1950a) for Bermuda. The mean size found was 120.2 x 3.3 μ (length range: 96 to 153 μ; width range: 1 to 7 μ).

Haliclona permollis (Bowerbank, 1866) de Laubenfels, 1936.—OI 1036, USNM 23585. This is a brownish-grey or lavender *Haliclona*. Its shape varies from thickly encrusting to massive and amorphous. Its skeleton is reported to be comprised of an isodictyal reticulation of oxeas. Sometimes a few of the oxeas are modified to styles, but this is not uncommon in the genus.

This species is cosmopolitan and variable. De Laubenfels found spicule ranges of 3 x 90 to 5 x 100 μ from Plymouth (Note in de Laubenfels' Card Index of Porifera), 6 to 8 x 150 μ from California (1932: 121), 4 x 105 to 5 x 110 μ from Bermuda (1950a: 47). The skeleton of the present specimen, taken from Panama City, had oxeas averaging 5 x 150 μ (range: 1 x 109 μ to 7 x 178 μ).

Because of the pronounced isodictyal reticulation of the skeleton, and the lack of any dermal or cortical specialization, this specimen is placed here. However, the length of the spicules may indicate that it is a separate species.

Haliclona sp. (?).—USNM 23686, 23687 (figs. 10, 12). On both November 4 and November 16, 1956, specimens were taken at Station 9 by Mr. R. Hathaway and the author.

One specimen consisted of a number of ramose arms, 0.5 to 1 cm in diameter, extending from a base of 1 x 2 cm. The maximum overall length was about 6 cm. Another specimen appeared to be one of the ramose arms plus a few pieces of such an arm. The piece was 0.5 to 1 x 6.5 cm. One specimen in alcohol was light greenish tan and the other was white. Consistency was softly compressible and both specimens were easily torn.

The surface of both specimens was typically haliclonid and the endosome of both was isodictyally recticulate in places. There were also vague tracts containing 3 to 6 spicule rows. The principal spicule was a sharp-pointed oxea 96-124-139 x 1.8-6.1-10.6 μ in the tan specimen and 103-131-167 x 2-6.7-11 μ in the white one. There seems to be a tendency for the larger spicules to become strongylote or stylote; for example, in the tan specimen the strongylote type was 77-104.2-123 x 7-8.8-13 μ and the stylotes were 105-118.6-125 x 7-8.6-11 μ. Only the thicker spicules were so modified; there seemed to be no juvenile forms of these types. In addition the overall length seemed to diminish as this rounding-up occurred, as indicated by the fact that the mature oxeas seemed to be longer than the styles of comparable width, and the styles in turn were longer than the strongyles. There was no localization of these types within the specimen. This, with the reticulate nature of the sponge and the ramose branches from the main body, seem to indicate the genus *Pellina* Schmidt but the lack of any dermal specialization indicates *Haliclona*.

Haliclona erina de Laubenfels (1936b: 457) seems extremely close to the present specimens, and it may be that they are conspecific with it. De Laubenfels listed the oxeas as being 3 x 120 to 10 x 200 μ but made no mention of a pronounced strongylote and stylote modification. Indeed, his slide shows relatively few such forms. For this reason, I feel that the present conservative course is wisest.

Family Desmacidonidae Gray

Xytopsene sigmatum de Laubenfels, 1949. —OI 1017, USNM 23548. This bright orange, amorphous sponge with conical elevations was found at Station 1, on Tampa limestone between 1 and 3 meters deep, throughout the year. It reached a height of 6 cm and a base diameter of up to 10 cm.

The spiculation is distinctive, containing tylotes, two sizes of sigmas, and also two sizes of isochelas that are primarily arcuate

Figures 10-11. **10** (top). *Haliclona* sp. (USNM 23686, 23687). **11** (bottom). *Callyspongia repens*, sp. nov. (USNM 23551).

but verge towards palmate. In his original description de Laubenfels listed only one type of isochela, but Dr. Willard Hartman found two in slides of specimens from Station 1. De Laubenfels' slide also shows two sizes of isochelas.

The sizes of the various spicule types are as follows: in the ectosome, tylotes 262-280.3-314 x 3.0-4.36-5.5 μ, chelas 33-39.8-44 and 11-14.5-15 μ in chord length, sigmas 40-45.2-51 and 11-13.6-15 μ in chord length, in the endosome, tylotes 249-270.5-301 x 2.9-4.24-5.7 μ, chelas 22-38.9-44 and 13-15.2-18 μ, and sigmas 40-43.9-53 and 11-14.3-15 μ.

This is the second record of the sponge. This specimen was identified by the late Dr. de Laubenfels, who originally described the species from the Western Bahamas.

Family CALLYSPONGIIDAE de Laubenfels

Callyspongia vaginalis (Lamarck, 1814) de Laubenfels, 1936.—OI 996, USNM 23565. This, the common tube sponge, was found previously in the area at Station 20.

Living specimens of the sponge were taken at Station 4, depth 11 meters, from a rock substrate. Beachworn specimens were found throughout the year at Station 12.

The color in life was buff brown. Hollow cylindrical tubes 3 cm in diameter and 20 cm in height were found. Spiculation was entirely of oxeas, and the structure was typically callyspongiid, *i.e.*, the dermal specialization consisted of a secondary reticulation of small fibers with the coarser primary meshwork, thereby giving an overall appearance of distinctly smaller mesh size at the surface.

The spicules of area individuals averaged 92 x 3 μ (range: 84 x 2 to 101 x 4 μ), which is fully 20 μ longer than the largest thus far recorded for the species. In view of the overall agreement with the published description (de Laubenfels, 1936a: 56) I do not feel that this difference constitutes sufficient evidence for designation as a new species, and therefore it is placed here.

The surface of many of the tubes was covered with small bright sky-blue spots 1 to 2 mm in diameter and 3 to 4 mm apart. These apparently represent a species of *Parazoanthus,* presumably *P. parasiticus* (Duchassaing and Michelotti) Verrill as described by Duerden (1903: 495). My specimens however were blue whereas Duerden's were brown, *i.e.*, clear with pale brown tentacles. Thus possibly these represent a new species. Evidently these organisms are common on *Callyspongia* for most specimens observed were seen to have them, either actually present or represented by pits in beachworn macerated specimens.

CALLYSPONGIA **REPENS**, sp. nov.—OI 1008, USNM 23551 (figs. 11, 13).

The holotype is designated as USNM 23551.

Locality and abundance.—One specimen was taken during September, 1955, by Dr. John Morrill in the vicinity of Station 10. It was also taken in abundance on September 26, 1956, as beachworn specimens, at Station 12 shortly after a storm. The substrate was rock.

Shape.—Repent ramose; it has branches 1 to 2 cm in diameter which intermingle and coalesce as they cross each other making the sponge seem almost flabellate. It may be hollow but is not the conspicuous tube that *C. vaginalis* is; rather its branches may or may not be hollow depending upon circumstances and thickness, the thicker branches more commonly being hollow.

Size.—The largest specimens reached a total length of 18 cm and a diameter of 9 cm.

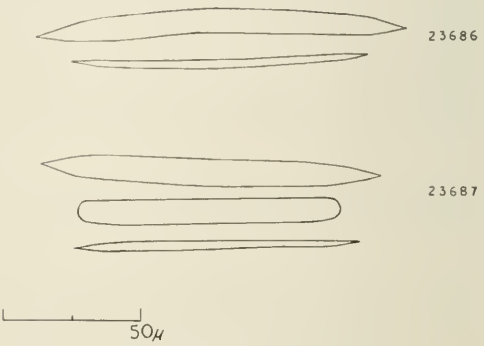


Figure 12. Spicules of *Haliclona* sp.

Color—Yellow-green to cream-colored in life, pale yellowish tan.

Oscules.—Widely scattered, generally terminal or on the upper side; diameter about 6 mm.

Consistency.—Somewhat spongy and elastic but fragile.

Ectosomal anatomy—Typically callyspongiid; there is a primary meshwork of fibers averaging about 390 x 520 μ (range: 250 to 775 μ), which encloses a finer secondary meshwork of smaller fibers about 94 x 135 μ (range: 57 to 210 μ). Both sets of fibers generally are heavily cored with spicules; the primary fibers contain 1 to 11 spicule rows and range in diameter from 19 to 58 μ, while the secondaries contain only 1 to 4 spicule rows and are between 10 and 29 μ across.

Endosomal anatomy.—Fibro-reticulate, the endosomal portions of the primary surface fibers form a meshwork averaging about 280 x 400 μ and range in diameter from 110 to 640 μ. Very little sponge tissue was seen, for the most part it seems confined to the areas adjacent to the fibers.

Skeleton.—The spiculation resembles that of *C. procumbens* (Carter) as described by de Laubenfels (1936a: 57) under the name *Patuloscula plicifera* (Lamarck) and later corrected by him (1950a: 61; 1953a: 523). There are oxeas, some verging to strongyles, 75-100.3-107 x 1-3.9-7 μ, as well as mi-

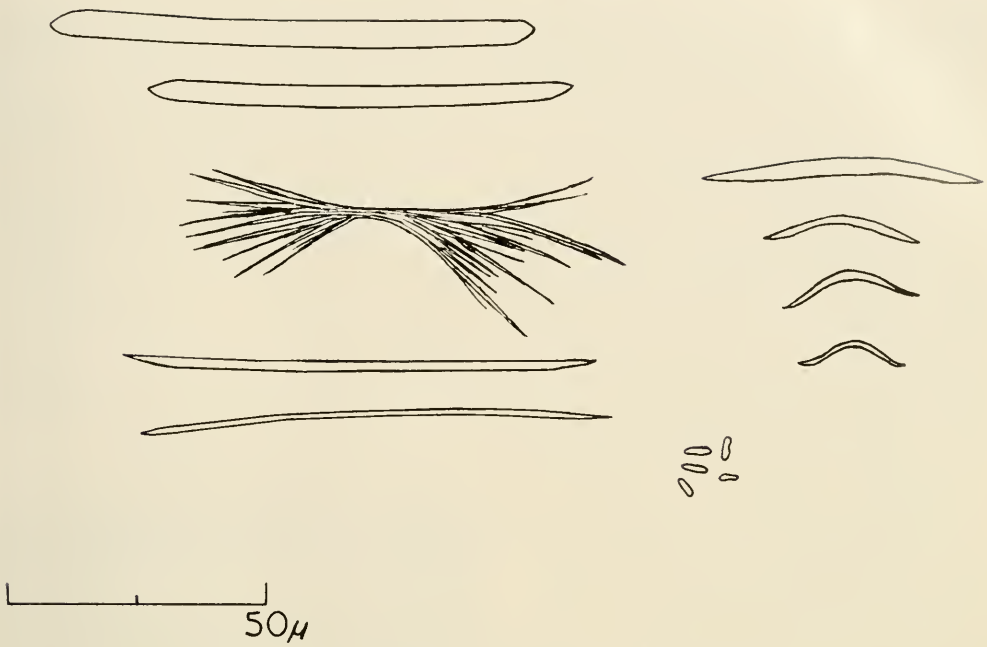


Figure 13. Spicules of *Callyspongia repens*, sp. nov.

croxeas of which many are bent to resemble toxas so closely as to be mistaken for them. Three classes of microxea were found. There were raphides, 18-33.8-55 μ, and two sizes of bent microxeas many of which went so far as to become pseudo-toxas. The larger ones were 23-25.1-32 x 1.8-2.2-2.7 μ while the smaller were 7-14.4-20 μ long. There were also small siliceous objects 3-4.1-6 x 0.8-1.2-1.6 μ which looked like little bright kidney beans in the field.

Discussion.—This species most resembles *C. procumbens* (Carter 1882: 365) from which it differs chiefly in color, somewhat smaller mesh size than that reported by de Laubenfels (1936a: 57-8), and in the densely packed fibers as opposed to the sparsely cored fibers of *procumbens* originally reported and verified in de Laubenfels' preparations. Indeed, de Laubenfels' material matches the literature data (Carter 1882: 365; Dendy 1890: 355-56) with the one exception that de Laubenfels' slides contain thinner spicules than the material reported on by previous workers. Burton's (1934: 539) report of toxas in the type specimen of *procumbens* is also matched by de Laubenfels' data.

Though the spicule size of this species better approximates the data presented by Carter and Dendy than does that of de Laubenfels, the other morphological differences cited above preclude the designation of my specimens as *procumbens* both on a quantitative basis and on the purely qualitative impression resulting from the comparative material examined.

Order Poecilosclerina Topsent
Family ADOCIIDAE de Laubenfels

Adocia neens (Topsent, 1918) de Laubenfels, 1936.—OI 1031, USNM 23601. This species was found as an encrustation 3 to 4 mm thick and 3 to 4 cm in diameter on *Geodia gibberosa* Lamarck at Station 11, depth 2.5 meters, on October 31, 1957. Color was white in life and is the same in alcohol.

The presence of a neatly reticulate skeleton of oxeas verging toward strongyles, and a detachable reticulate dermal skeleton, place the specimens in this species. There seem to be two sizes of spicules. One averaged 126 x 6 μ (range: 110 to 134 μ), the other averaged 110 x 3 μ (range: 98 to 116 μ). The small ones are undoubtedly immature. De Laubenfels (1936a: 58) indicated that the spicules of his specimen were 118 x 5 μ in general and some were

as small as 105 x 1 μ. Thus the Apalachee Bay specimen has slightly longer spicules, a difference which I feel not marked enough to justify designation of a new species.

Family COELOSPHAERIDAE Hentschel

COELOSPHAERA **FISTULA**, sp. nov. —OI 1049, USNM 23583 (figs. 14, 16). The holotype is designated as USNM 23583.

The specimens were taken from the Station 4 area April 29, 1957, by J. Branham and R. Hathaway.

Locality and abundance.—This species was relatively common in the vicinity of Station 4 throughout the year. It was growing on tests of dead sand dollars, *Mellita quinquiesperforata* (Leske), at a depth of 12 to 14 meters.

Shape.—Fistulate, like a small bent finger standing erect upon the surface of the sand dollar test. No basal mass was observed.

Size.—Up to 1 cm in height and between 5 and 7 mm in diameter. This represents the largest found though many were considerably smaller.

Color.—White, both in life and in alcohol.

Oscules.—No obvious vents were found, as is often the case in the Coelosphaeridae.

Ectosomal anatomy.—This consisted of a dermal region, 75 to 100 μ thick, densely packed with spicules in confusion; their interstices were also packed with organic material, flesh, and perhaps spongin.

Endosomal anatomy.—The endosome was wanting and was replaced by a hollow fluid-filled area. Presumably the fluid was sea water but no investigations were made concerning it.

Skeleton.—The spicules were packed in the ectosome in confusion and did not invade the hollow central cavity. The megascleres were tylotes 107-211-240 x 4-4-5 μ. The mean size of the heads at each end was 5.7 μ (range: 5 to 7 μ). The microscleres were unguiferate isochelas 9-10.5-12 μ, and sigmas 25-40.8-53 μ. The chelas generally bore four teeth at each end. A few were seen that seemed to have three teeth but observation was difficult due to their position on the slide. Under lower magnifications these may appear to be arcuate isochelas.

Discussion.—The sponge is placed in this genus due to its structure and spiculation. The size and range of its spicules effectively exclude it from any of the existing described species. In *C. actinioides* (Hallmann, 1914) from Australia, the microscleres are closest in size to those of the Station 4 specimens, but the chelas are arcuate and the megascleres are over 100 μ longer. *C. tunicata* (Schmidt, 1870), the only West Indian member of the genus to date, does have broad spatulate three-toothed isochelas. However, they are too large, averaging about 31 μ (Topsent, 1920: 17) and do not resemble closely those of the present specimens.

Rhizochalina oleracea Schmidt, 1870.—USNM 23688 (figs. 15, 17). Specimens were found growing on *Geodia gibberosa* at Station 11, October 31, 1957. It was de-

Figures 14-15. **14** (top) *Coelosphaera fistula*, sp. nov. (USNM 23583) on *Mellita* test. **15** (bottom) *Rhizochalina oleracea* Schmidt (USNM 23688).

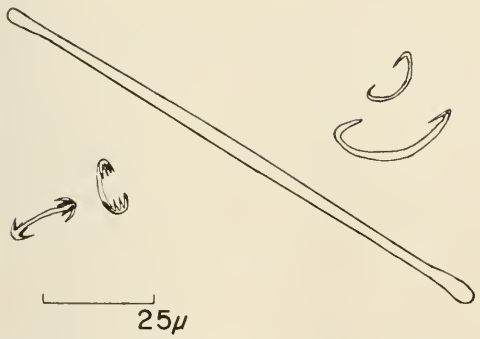


Figure 16. Spicules of *Coelosphaera fistula*, sp. nov.

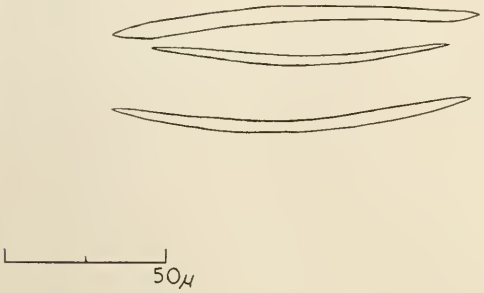


Figure 17. Spicules of *Rhizochalina oleracea* Schmidt.

scribed as *Phloeodictyon nodosum* by George and Wilson (1919: 152-53) from Beaufort, N. C. This was corrected by de Laubenfels (1947: 35) on the basis of his study of "many West Indian specimens of *oleracea*," though the results of these studies were never published. A search of de Laubenfels' slide collection yielded five specimen slide sets from the West Indian region definitely identified as *oleracea* by him. The spicular and gross morphological data from these is compared to both the literature data and my own in Table 1. Wells, *et al.* (1960: 212) also confirm de Laubenfels' opinion after examining George and Wilson's type specimen.

My specimen consisted of fingerlike cylindrical fistulae arising from an encrusting basal portion 2 to 5 mm thick. The fistulae were 2 to 4 mm in diameter and 2 to 4 cm long. They were hollow and the ends of each were closed and were not oscular sites. Color was white.

The surface of the fistular wall was smooth, being a tangentially arranged, unispicular, triangular reticulation supported by a more or less perpendicular unispicular reticulation above vague tracts or confusedly arranged spicules lying parallel to the surface. The perpendicular reticulation is somewhat vague in itself and holds the surface layer one spicule length above the interior layer. The endosome is wanting in the fistulae, being replaced by the large central cavity.

The ectosome of the basal portion is similar to that of the fistulae except that the tangential dermal reticulation appears more polygonal due to a somewhat more dense arrangement of the spicules which comprise it. Also, here we find that the tracts just below the perpendicular reticulation are more definite. They are more closely packed with spicules and range from 60 to 135 μ in diameter. These, in turn, are supported above extensive subectosomal cavities 90 to 380 μ in diameter by perpendicular extensions of some of the endosomal tracts.

Below the subectosomal cavities lies a loose mass of vague and distinct tracts of spicules 45 to 125 μ in diameter forming a vague reticulation. There are also many spicules loosely scattered in vague bundles or in confusion throughout the flesh.

The general morphology of this sponge is in close agreement with that of George and Wilson's, Topsent's (1920: 2), and de Laubenfels' specimens (Table 1). The size range of the oxeas which comprise the skeleton matches well the data of Wilson (1902: 395), George and Wilson, Topsent, and de Laubenfels' smaller spiculed specimens though his larger spiculed specimens, *i.e.* USNM 22390, 22388, and BNMH TW 17 VIII, may require reallocation on further study (see Table 1). The color difference from brown (Topsent) to brownish white (George and Wilson) is considered insignificant, especially since de Laubenfels' specimens are recorded as ranging between yellowish drab and pale grey in life.

That this sponge has not been found here before is probably due to its small size and inconspicuous habitus. Probably it is far more common than this one collection indicates.

Family Plocamiidae Topsent

HOLOPLOCAMIA **DELAUBENFELSI**, sp. nov.—OI 1039, USNM 23596 (fig. 18).

The holotype is designated as USNM 23596.

TABLE 1.
Comparative Data on Rhizochalina oleracea

Collection	Museum Number	Identified by	Basic Shape (+ fistulae)	Original Data μ	Supplementary Data μ
Apalachee Bay	USNM 23688	Little	Encrusting	Base, Ecto. 93-104.6-110 x 3-4.2-4.3 Base, Endo. 81- 98.2-109 x 1-3.8-6 Fistula 93-110.9-132 x 1-3.9-6	
				By de Laubenfels	By Little
Johnson Coll. Puerto Rico	USNM 22271	de Laubenfels	Semispherical (fistulae branch)		105-118.8-134 x 2-3.4-5
Puerto Rico	USNM 22389	de Laubenfels	Semispherical (+ "Roots")		105-122.5-157 x 3-3.9-5
Puerto Rico	USNM 22390	de Laubenfels	Spherical (+ "Roots")	160 x 4, 200 x 7, 210 x 10	211-236.1-259 x 7-7.6-10
Puerto Rico	USNM 22388	de Laubenfels	Spherical (+ "Roots")	160 x 9	195-205.6-211 x 6-8.4-10
Brit. Mus. Nat. Hist. (West Ind.)	BMNH TW 17 VIII	de Laubenfels	Hollow Mass	250 x 10	211-253.5-278 x 4-7.8-10
				By George & Wilson	By Wells *et al.*
Beaufort, N. C. (George & Wilson)	USNM 23611	de Laubenfels, Wells *et al.*	Encrusting	100 x 4-5	94-120 x 3-6
				By Wilson	
?	?	Wilson	Subspherical	140 x 5	
				By Topsent	
Strasbourg	?	Schmidt	One piece + fistula	85-143 x 2-3	

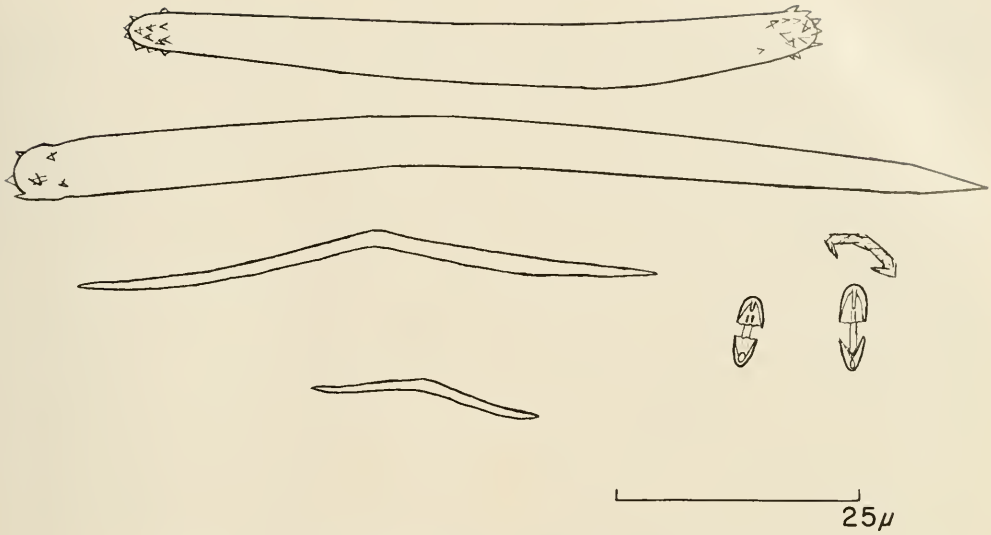


Figure 18. Spicules of *Holoplocamia delaubenfelsi*, sp. nov.

Locality and abundance.—One specimen was found growing on an oyster shell attached to a specimen of *Verongia* sp. at Station 10, August 13, 1957 by Dr. John Morrill and the author. Depth was 2.5 meters.

Shape.—Encrusting; the specimen was encrusted completely around the oyster shell making the sponge appear superficially massive and amorphous.

Size.—Diameter of the encrusted shell was about 3 cm and it was completely covered. Height of the sponge was approximately 1 to 3 mm.

Color.—Bright orange-red in life, and dark drab in alcohol.

Oscules.—No definite vents were seen.

Consistency—Firm, yet slightly elastic.

Ectosomal anatomy.—No definite dermis was observed. The surface was somewhat hispid since the tufts of plumose columns of spicules project through the surface.

Endosomal anatomy.—The endosome was made up of two regions, a confused mass of spicules which formed a base, and plumose columns of spicules which extended to the surface. These principal tracts contained 3 or 4 spicule rows and were 20 to 30 μ in diameter. They seemed almost axinellid in that they were so plumose. These were joined by secondary tracts 1 or 2 spicules wide, 8 to 10 μ in diameter, and one spicule long, thus appearing like rungs of a ladder between two upright plumose columns. The resulting mesh varied in size up to 150 x 190 μ, which seemed to be the modal size. Also observed were a few pieces of concentrically laminated spongin fiber 85 to 170 μ in diameter, containing pith. These appear to be dendritic because some branching was observed but no recrossing. These fibers were 290 to 960 μ apart in the sections.

Skeleton.—The megascleres consisted of strongyles and styles, both of which may be slightly acanthose at or near their rounded ends. The strongyles, mean size 138 x 9 μ (range: 112 to 153 μ), made up the bulk of the basal mass while the styles, mean size 265 x 15 μ (range: 199 to 306 μ), made up the bulk of the plumose columns, though both were found throughout the sponge. The strongyles characteristically had unequal ends, the smaller end corresponding to the pointed end in styles. They appeared like styles that had rounded up short of their goal. The microscleres included toxas, mean size 79 μ (range: 48 to 103 μ), and predominantly palmate isochelas, mean chord length 14 μ (range: 11 to 16 μ). The shovels on the isochelas averaged about 4 μ across. A few arcuate chelas within this size range were also found.

Discussion.—Lévi (1952: 54) advocated dropping *Holoplocamia* in synonymy to *Plocamilla* Topsent (1928: 63), but Topsent stressed that *Plocamilla* was set up for

sponges in which there was no differentiation of primary from secondary tracts such as are cited by him (1928: 63) for *Plocamia* and therefore also for *Holoplocamia* since this is separated from *Plocamia* only by the presence of spiny rather than smooth principal (diactinal) spicules (de Laubenfels 1936a: 75; plus personal communication). Therefore, I feel that the genus should be retained distinct from *Plocamilla.*

All other species within this genus have diacts entirely spined except the one described by Sollas (1879: 44) as *Plocamia plena* from West Africa. Its diacts are described as only slightly spined at the ends like those of the present specimen. The present specimen differs from *H. penneyi* de Laubenfels (1936a: 76), a Tortugas sponge, in size and relative thickness of spicules, in color, which in *H. penneyi* is brownish orange, and in the fact that the chelas of *H. penneyi* have rotated shafts so that one shovel is at right angles to the one at the other end.

The species is named in honor of the late world sponge authority, Dr. M. W. de Laubenfels, whose interest and confidence in me have been major factors in sustaining my work.

Family Cyamonidae de Laubenfels

Cyamon vickersi (Bowerbank, 1863) Gray, 1867.—OI 1046, USNM 23563. One specimen was taken at Station 4, November 3, 1957. Depth was 11 meters. The specimen was an encrustation less than 1 mm thick on a piece of limestone. The color was orange.

The species may be common; its hard texture and thinly encrusting habitus led to overlooking many such pieces of orange-encrusted limestone in the course of dredging. This specimen was brought back to the laboratory only as a check.

The principal spicules were tetraxons, and a few pentactines (which are aberrant tetraxons) with the rays approximately equal, rounded and acanthose near the end of each ray. The rays in this specimen averaged about 41 μ (range: 20 to 55 μ). There were also a few subtylostyles about 877 x 13 μ, as well as very long, thin styles which echinated the surface, being perpendicular to it with their points out. They were 2 to 6 μ wide and up to 2 mm long, but most were broken. No acanthostyles, which supposedly give rise to the tetraxons (Dendy 1921: 117), were found. A few tetraxons had one acanthotylote-tipped arm very long in relation to the other arms, which seemed to be stubby in these cases. Thus, the part corresponding to the point in Dendy's developing tetraxons is acanthotylote, possibly indicating an intermediate stage in development.

The species was redescribed in detail by de Laubenfels (1936a, 1950a).

Family Myxillidae Hentschel

Merriamium tortugasensis de Laubenfels, 1936.—OI 1009, USNM 23561 (figs. 19, 21). Several specimens of this sponge were taken at Station 7, depth 10 meters, November 3, 1957. One other small specimen was taken at Station 4, depth 12.5 meters, the same day, thus indicating that the sponge is common, at least seasonally, within the area. The substrate was rock.

Color, alive, was fire red. Shape was massive. The largest specimen measured 5 x 3 cm wide and 6 cm high.

The spiculation of tornotes, acanthostyles, and arcuate isochelas is distinctive.

Family Tedaniidae Ridley and Dendy

Tedania ignis (Duchassaing and Michelotti, 1864) de Laubenfels, 1936.—OI 1061, USNM 23560. Several specimens of this sponge were taken at Station 10, August 13, 1957, and also at Station 11, October 31, 1957. Depth in both cases was about 2.5 meters; substrate in the first case was *Sargassum* and in the second was *Geodia gibberosa.* Habitus was encrusting to massive. This sponge is thought to be extremely abundant, at least seasonally.

The orange to pinkish-red coloration plus the spiculation of tylotes, styles (rarely subtylostylote), and roughened raphides are distinctive. A further distinctive feature of the species is that the heads of the tylotes are faintly microspined near the apex. It was redescribed in detail by de Laubenfels (1936a, 1950a, 1950b).

Lissodendoryx isodictyalis (Carter, 1882) Topsent, 1889.—OI 1011, USNM 23584. One specimen of this species was found at Station 10, August 13, 1957 permeating between the trellis of ascon tubes of *Leucosolenia canariensis* (Miklucho-Maclay); depth 2.5 meters. It was subsequently found in the Panama City area encrusting on steel buoys at a depth of less than 1 meter.

The lavender to brownish-green color of the exterior and the yellow interior are distinctive, as is the spiculation which consists of tylotes, slightly bent styles, sigmas, and arcuate isochelas. Hartman (1958: 41) discussed in detail whether we should separate the *carolinensis* type (Wilson, 1911) and the *isodictyalis* type (Carter, 1882). They were placed together by de Laubenfels (1947: 35). There are distinct differences in the microsclere populations of the two groups. The *carolinensis* type has large sigmas and small chelas while the *isodictyalis* type has small sigmas and large chelas. Hartman concluded that since both of these variations occur side by side in the Mediterranean they should not be separated at present.

The specimens collected from this area were of the *carolinensis* type having larger sigmas than chelas. The dimensions of the spicules are: tylotes, mean 166 x 4 μ (range: 146 to 176 μ); styles, mean 168 x 6 μ (range: 157 to 183 μ); sigmas, mean chord length 37.9 μ (range: 21 to 63 μ); arcuate isochelas, mean chord length 24.9 μ (range: 16 to 28 μ).

The species was redescribed by de Laubenfels (1936a, 1950a, 1953b). He noted (1953b: 21) the permeating habitus mentioned above.

Family MICROCIONIDAE Hentschel

Microciona prolifera (Ellis and Solander, 1786) Verrill, 1873.—OI 1002, USNM 23562. This orange-red to dull brick-red, encrusting to lamellate, lumpy sponge was abundant and was collected throughout the year at Stations 1, 2, and 9. Depth was between 0 and 2 meters. Its size ranged from a thin encrustation to a lumpy structure up to 6 cm wide and 9 cm high. Shape is largely governed by environment. On *Sargassum* and *Thalassia* it was usually encrusting. On limestone in areas of current, it was generally lamellate, and on sand substrate it appeared as a sub-spherical mass of short lumpy branches. In this last area it was in a tidal pool and hence little disturbed by currents.

The skeleton consisted of plumose columns of subtylostyles with small heads, echinated by acanthostyles. The microscleres were toxas and palmate isochelas, with an occasional arcuate isochela. There were two categories of subtylostyles, 165-440-529 x 11-19-21 μ and 133-266-402 x 2-4-7 μ. The larger ones were often almost stylote in that the head was so lightly developed. Two categories of acanthostyles also were found, one entirely acanthose 71-87-103 x 5-7-7 μ, and the other with only the head acanthose 116-174-223 x 9-11-12 μ. The palmate isochelas had a mean chord length of 17.1 μ (range: 14 to 20 μ), while the toxas averaged 33.5 μ (range: 16 to 45 μ).

This species was redescribed by George and Wilson (1919: 157) from Beaufort, N. C. They also described a new species, *Esperiopsis obliqua,* in the same paper (page 148): this was said by de Laubenfels (1947: 35) to be conspecific with *M. prolifera.* Wells *et al.* (1960: 218) on the other hand cited evidence that *E. obliqua* is a valid species and restored it to specific rank as *Tenaciella obliqua* since its spicules are enclosed in the spongin fibers rather than echinating them as in *Esperiopsis.* Hartman (1958: 36) wrote an excellent discussion of *M. prolifera* in which the data of previous authors were brought together in tabular form.

EURYPON **CLAVATELLA,** sp. nov. —OI 1030, USNM 23578 (fig. 22).

The holotype is designated as USNM 23578.

Locality and abundance.—One specimen was taken at Station 4, depth 10 meters, on rock and sand bottom.

Shape.—A thin encrustation on limestone.

Size.—Less than 1 mm thick, in patches up to 1 cm square. It was nearly invisible and subsequent investigation undoubtedly will yield more specimens.

Color.—No positive data are available at present. The limestone originally was covered with a vivid purple (lavender-red) substance, even in areas where there was no sponge. This color faded to white and was attributed to a coral. The sponge is drab in alcohol.

Consistency.—Softly fragile.

Surface.—Hispid, which is characteristic of the genus.

Oscules.—None observed.

Ectosomal anatomy.—No specialization.

Endosomal anatomy.—Microcavernous and fleshy. There seems to have been a basal plate of spongin from which vague plumose tracts of spicules rose vertically to the surface, a distance of about 500 μ on the average.

Skeleton.—The vague plumose columns

of spicules were made up primarily of tylostyles and were echinated by smaller acanthostyles. Many tylostyles and styles stand erect on the base between the columns, as do the acanthostyles. The tylostyles measured 249-384-470 x 14-15-21 μ with an average head diameter of 20 μ. The styles averaged 361 x 4 μ (range: 351 to 392 μ). The acanthostyles measured 75-102-145 x 5-6-9 μ, and their head ends averaged 8.4 μ in diameter. The styles possibly represented acanthostyles which lost their spines as they increased in size. In addition, what appeared to be vermiform stylote and tylote spicules were seen in the spicule slide. Some were highly contort. They ranged in mean chord length from 18 x 0.5 to 35 x 2 μ. None was found in the sections, however, and I concluded that they were not proper spicules.

Discussion.—This species resembles most closely *E. clavata* (Bowerbank) Gray, which was redescribed by de Laubenfels (1950a: 79) from Bermuda. However, the great difference in spicule size leads to the conclusion that this is a distinct species. The tylostyles in this specimen only approach one quarter the size of those of *clavata* and the range in size of the acanthostyles, while overlapping to a considerable extent, is much larger in *clavata*. A further difference is the presence of the styles.

If the presence of vermiform spicules is confirmed subsequently and actually they are proper spicules in this species, then it would fall to *Bubaris*. Their absence in pieces containing the basal plate suggests that they were not proper to the specimen.

Thalyseurypon vasiformis de Laubenfels, 1953.—This drab to black, vase-shaped sponge was taken at Station 21 on October 27, 1948. Originally it was described by de Laubenfels (1953a: 525). It was not found during the course of the present investigation.

Family Ophlitaspongiidae de Laubenfels

Carmia macilenta (Bowerbank, 1866) Gray, 1867.—OI 1018, USNM 23559 (fig. 23). This species is new to the Gulf and Caribbean region and therefore a detailed description is warranted. The genus was incorporated into the genus *Mycale* by Topsent (1928: 84); Burton (1956: 129) reported the species from the central eastern coast of Africa.

The genus *Carmia* is considered here to be valid, after the classification of de Laubenfels (1936a: 118).

Locality and abundance.—This sponge was common at both Stations 10 and 11, depth 2.5 meters. It was found on *Sargassum, Thalassia*, and *Ulva*. On October 31, 1957, it was found at Station 11, and on August 13, 1957, it was taken at Station 10. It was taken also in the vicinity of Station 10 in September, 1955, by Dr. John Morrill.

Shape and size.—Generally it was thinly encrusting on the available vegetation, but in Dr. Morrill's specimen it was thickly encrusting (on *Sargassum*). The largest mass was about 2 cm long and 0.5 cm in diameter with the *Sargassum* stem in the middle. In some places thickness exceeded this, and there were, of course, many smaller areas of thin encrustation.

Color.—Orange-red to orange in life; it faded quickly to grey-white in alcohol.

Surface.—Superficially hispid in effect, probably due to numerous tracts of spicules which terminated in surface brushes.

Oscules.—One oscule on the 1955 specimen measured 4 mm in diameter. It was partly closed by a thin sphincter membrane to an aperture 2 mm in diameter. Small oscular openings about 2 mm in diameter were about 3 mm apart in other specimens.

Ectosomal anatomy.—A protoplasmic dermis, supported in large part by tangential tracts of spicules directly beneath it, is present as well as the perpendicular tracts which pierce it.

Endosomal anatomy.—The endosome comprised a region of many dense spicule tracts forming a confused mesh or trellis-work with the mesh size ranging from 70 x 100 to 300 x 500 μ. What little flesh there was, was scattered about the edges of these meshes along the tracts. Here the microscleres were found in profusion. The primary spicule tracts contained 12-20 spicule rows and ranged from 30 to 70 μ in diameter. Secondary spicule tracts containing 5-8 spicule rows, 15 to 25 μ in diameter, also meandered about. The haphazard crossings of these two types of spicule tracts formed the mesh.

Skeleton.—Megascleres consisted of subtylostyles with small heads, plus styles. The subtylostyles averaged 211 x 3 μ with a range from 173 to 256 μ. A few immature

ones measured about 171 x 2 μ. The styles had a mean length of 218 μ (range: 173 to 255 μ). Microscleres included palmate anisochelas in three categories, plus sigmas and toxas. The chord length sizes of the chelas were 13-16.3-18, 22-24.2-31, 40-43.6-46 μ. The sigmas were 35-84.9-96 μ, while the toxas were 53-111-221 μ in length.

Discussion.—Possibly this sponge might constitute a new species in view of some minor differences between it and Bowerbank's description, but I concur with the opinion of the late Dr. M. W. de Laubenfels (personal communication) that these are not enough to separate it from *macilenta* at present.

Family Amphilectidae de Laubenfels

Toxemna tubulata (Dendy, 1905) Hallmann, 1917.—OI 1027, USNM 23595. Several small specimens of this yellow sponge were taken from the surface of *Geodia gibberosa* at Station 11 on October 31, 1957, at 2.5 meters depth.

This sponge was redescribed in detail by de Laubenfels (1936a: 124), but the generic name was incorrectly written as *Toxemma*. He described the shape as massive to amorphous in contrast to Dendy's original description (1905: 105) which stressed cylindrical shape.

The specimens from this area were slender (1 to 2 mm diameter) cylindrical digitate processes rising from the substrate a distance of about 1 cm, thus bearing out the original description. The spicules were styles 244-259.6-297 x 4-4.5-5 μ, and abundant microscleres containing raphides 29-103-230 x 1-1.5-2 μ, sigmas whose chord length measured 13-20.9-29 μ, and toxas which measured 26-33.8-42 μ.

Order (?) Halichondrina Vosmaer

The order is not established firmly and is open to severe criticism. It was discussed by de Laubenfels (1953a: 530) who suggested that the order should be dropped and "most or all of its families be merged with those of the Poecilosclerina." De Laubenfels, however, followed the established classification. It is followed here also.

Family Axinellidae Ridley and Dendy

Axinella polycapella de Laubenfels, 1953.—Beachworn specimens were found at Station 12 during 1957. The species was taken also at Stations 18, 20, 21 and 22 in 1948 and described by de Laubenfels (1953a: 530). It is not now represented by a specimen.

The spiculation of this species is principally of oxeas though a few styles may be found; in addition, two strongyles were found, one 205 x 11 μ from the axis, and the other 168 x 10 μ from the outer area. The spicules measured in the axis consisted of oxeas 230-260.8-297 x 9-10.9-15 μ and two styles 240 x 11 μ and 249 x 12 μ. The oxeas of the outer areas were smaller on the average, measuring 182-243.3-307 x 2-8.2-12 μ, as were the only two styles found. They were 192 x 14 and 187 x 17 μ.

These measurements indicate a greater range in spicule size than is recorded by de Laubenfels; also, the axis seems to have larger spicules than the outer portion. Nevertheless, because of overall morphological agreement, both macro- and microscopic, the specimens are placed here with confidence.

Homaxinella waltonsmithi de Laubenfels, 1953.—This flabellate or palmate sponge was not found during the course of the present investigation but was taken at Station 20, October 26, 1948. It was described originally from the area by de Laubenfels (1953a: 533).

Family Halichondriidae Gray

Halichondria panicea (Pallas, 1766) Fleming, 1828.—OI 1010, USNM 23566 (fig. 20). This sponge superficially is much like *Haliclona permollis* (de Laubenfels 1953b: 20), from which it is set apart by having a special dermal skeleton. It is basically amorphous with the oscules often on volcano-like protrusions 0.5 to 1 cm in diameter. The maximum size found was 20 cm in diameter x 7 cm high.

The color has been recorded as basically yellow (de Laubenfels, 1934), but the specimens found here ranged from light greenish-brown to light green in color, with one specimen pink. This wide range of color is characteristic of the species (de Laubenfels, 1953b). A particularly distinctive characteristic is that the spicules are spread about in confusion in the cavernous endosome. However, in the present specimens there were some vague tracts containing 5 to 8 spicules in cross section. The skeleton is made up exclusively of oxeas with great variation in

Figures 19-20. **19** (top) *Merriamium tortugasensis* de Laubenfels (USNM 23561). **20** (bottom). *Halichondria panicea* (Pallas) Fleming (USNM 23566).

size. In this case they were between 73 x 2 and 575 x 12 μ.

Because of the similarity between *H. panicea* and *H. bowerbanki* Burton (1930), the specimens collected were examined in detail in regard to the dermal reticulation and sizes of dermal and endosomal spicules. Hartman (1958: 33-34) pointed out that *H. panicea* has "a very regular network of multispicular tracts" with occasional spicules lying across the oblong areas made by the tracts, while *H. bowerbanki* is different; its multi-spicular tracts "when present, are widely spaced and divide up the dermis into larger areas, . . . further subdivided by a pattern of overlapping individual spicules." In addition he pointed out that the dermal spicules of *panicea* are smaller than those

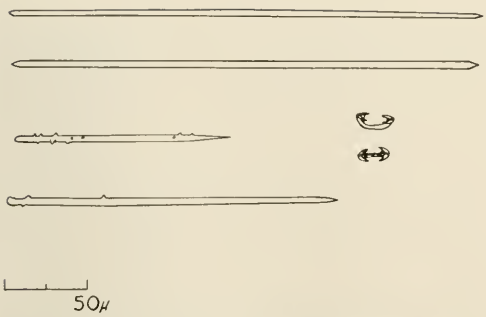


Figure 21. Spicules of *Merriamium tortugasensis* de Laubenfels.

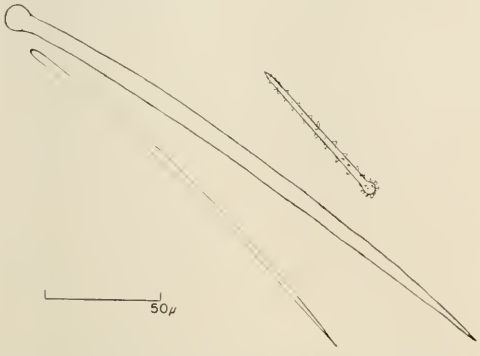


Figure 22. Spicules of *Eurypon clavatella*, sp. nov.

of the endosome while dermal spicules of *bowerbanki* are the same size or larger than the endosomal ones.

Concerning Hartman's first difference, I must point out that while he seems to be right, the judgment must be made extremely cautiously and after several dermal areas of the specimen have been observed. Individual areas or fields of *panicea* may closely resemble *bowerbanki* and probably the reverse is also true.

Dermal spicule size also may be variable. The average size of the dermal spicules in various specimens was from 1.0 to 74.2 μ smaller than the endosomal ones, the mean average difference being 37.7 μ. Another specimen collected at the same spot as the specimen with the least difference showed an average difference of 55.5 μ. The mean length of the endosomal spicules ranged from 307 to 409 μ, while the dermal spicule average ranged from 264 to 364 μ, thus showing the great variability of the specimens within the species.

The species was found in abundance during the fall of the year at Stations 2 and 11, and at a depth of 5 meters in the Panama City area. Substrate was either sand or grass

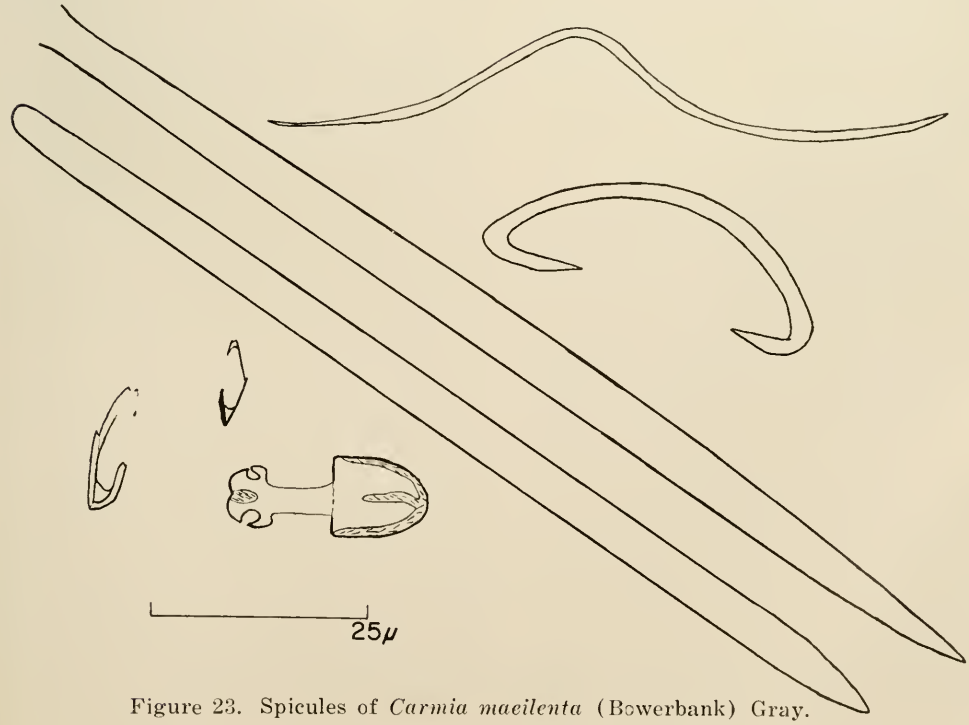


Figure 23. Spicules of *Carmia maeilenta* (Bowerbank) Gray.

flat. Data from seven specimens are represented.

Halichondria melanadocia de Laubenfels, 1936.—OI 1022, USNM 23590. This very dark brownish, amorphous sponge was taken from a steel buoy opposite the Shipyard in Panama City by staff of the Florida State University Oceanographic Institute. It had a few small finger-like processes extending from the surface. These were about 1 cm high and 0.5 cm in diameter. Its skeleton and architecture placed it in the genus *Halichondria*. The spicules were oxeas 144 x 2 to 460 x 13 μ. The mean size of the endosomal ones was 308.0 x 8.7 μ and the mean size of the ectosomal spicules was 320.5 x 7.4 μ. In view of the great range of size the difference between the means is not considered significant; the overall mean size is 314.3 x 8.0 μ. This greatly overlaps the range given by de Laubenfels (1936a: 134).

Family SEMISUBERITIDAE de Laubenfels

RHAPHISIA **MENZELI**, sp. nov.—OI 1042, USNM 23588 (fig. 24).

The holotype of this species is designated as USNM 23588.

Locality and abundance.—One specimen, taken at Station 2, Bay Mouth Bar, Alligator Harbor, on March 4, 1957. Depth was 1.5 meters and substrate was sand.

Shape and size.—Basically a sub-spherical mass 3 cm in diameter and 2 cm in height.

Color.—The exterior was lavender to a depth of about 0.5 cm. The interior was brown.

Consistency.—Soft and spongy.

Surface.—The surface was covered with closely set lamellate projections, like flattened conules, each in turn bordered by minute conules less than 1 mm in height. The lamellate projections generally were less than 1 mm apart. The overall appearance was fuzzy.

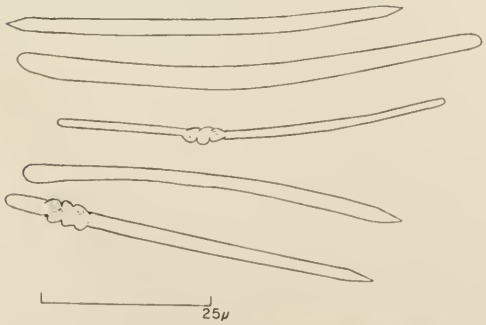


Figure 24. Spicules of *Rhaphisia menzeli*, sp. nov., showing two spicules centrotylote as is occasionally the case with each type.

Oscules.—One oscule was partially hidden by the encircling projections or lamellate conules; it was 3 mm in diameter. The oscules were difficult to locate due to the nature of the surface.

Odor.—Even in alcohol there was a distinct fetid odor about this sponge.

Ectosomal anatomy.—No specialization; the spicule tracts from the endosome entered the lamellate protrusions and branched to form their skeleton.

Endosomal anatomy.—The endosome was microcavernous and confused. There were primary spicule tracts ascending to the surface. These contained 10 to 12 spicules per cross section and ranged from 38 to 46 μ in diameter. There were also secondary tracts containing 3 to 7 spicule rows, 15 to 23 μ in diameter. The secondary tracts were sometimes parallel, and sometimes vertical, to the surface, very close to a primary tract and connected to it by a trellis of spicules. These trellises sometimes appeared to create a curious entwining effect between the two tracts. The random crossings of these tracts formed meshes 70 x 70 to 535 x 460 μ. The flesh was confined to the region of tracts or interconnecting spicules.

Skeleton.—The spiculation may be regarded as being comprised of a single category but with much individual variation. Some were simple, smooth, sharp-pointed oxeas 75-106-178 x 3-4-5 μ, while others which might be considered immature or microxeas were 89-94-98 x 1-1.3-2 μ. The larger spicules frequently had a wide variation of shape. Not uncommonly they were centrotylote, and some were also stylote and strongylote.

Discussion.—All the sponges now in *Rhaphisia* except the type species, *R. laxa* Topsent (1892, xvii), and *R. myxa* de Laubenfels (1951: 263), from Hawaii, have much larger spicules than those of this specimen. *R. myxa* is clearly closest to the Gulf form in physical characteristics, differing primarily in color, mesh size, and smooth surface. The viscous nature of both of the above species was not particularly noted in this specimen, possibly because it was received preserved in alcohol.

The species is named in honor of Dr.

R. Winston Menzel of the Oceanographic Institute, Florida State University, who inspired and helped greatly in the completion of this work.

Family Hymeniacidonidae de Laubenfels

Hymeniacidon heliophila (Wilson, in: Parker, 1910) de Laubenfels, 1936.—OI 1013, USNM 23581. This orange-pink sponge was found thickly encrusting on the stone jetties at St. Andrews State Park, Panama City, Florida, throughout the year. The elongate, conical processes characteristic of the species (de Laubenfels, 1950a; Parker, 1910) were not in evidence except for slightly elevated rounded protrusions. Patches of the sponge 20 cm in diameter and 2 cm in height were found. In some places it was so abundant that it practically covered the surface of the rock. The broad area of attachment and the tidal currents in the channel undoubtedly were responsible for this variation of shape.

The skeleton was composed exclusively of styles 128-278-345 x 2-4-5 μ. These spicules were somewhat smaller than usual. The nature of the conulose surface, the color, and the structure, identify the specimens as *H. heliophila.*

It was redescribed by Wilson (1911), George and Wilson (1919), de Laubenfels (1936a, 1950a), and by Wells *et al.* (1960).

Order Hadromerina Topsent
Family Spirastrellidae Hentschel

Spheciospongia vesparia (Lamarck, 1814) Marshall, 1892.—OI 997, USNM 23547, USNM 23580. This is the common "loggerhead sponge" of the Tortugas. It is massive and cake-shaped, growing as large as 60 cm in diameter and 40 cm high. Consistency when wet is cork-like, but after drying the sponge becomes woody. The color is creamy brown to dark brown. The spiculation consists of tylostyles averaging 386 x 9 μ (range 214-482 μ), and rare spirasters, mean length 13 μ (range: 9-18 μ). Most of the spirasters had three contortions or bends.

It was found abundantly throughout the year at Stations 1 and 10, and was also recorded from Stations 20 and 21 (de Laubenfels, 1953a) thus giving a depth range in this area between 2 and 13 meters. Substrate is rock, generally soft limestone of the Tampa type.

This species was redescribed in detail by de Laubenfels (1936a: 140).

Spirastrella coccinea (Duchassaing and Michelotti, 1864) de Laubenfels, 1936.—OI 1033, USNM 23598. This thinly encrusting, red-brown to orange sponge fades to grey or white in alcohol. Its spiculation is of tylostyles plus abundant spirasters in the cortex (de Laubenfels, 1936a: 143).

Several small patches, 1 cm in diameter and 1 to 2 mm in height, were found on pieces of limestone dredged at Station 7, November 3, 1957, depth 9.5 meters. The color was orange in life.

The tylostyles were 134-227.5-287 x 3-4.2-5 μ in size while the spirasters averaged 16 μ (range: 9 to 40 μ) though only one was found of the largest size. In general the maximum seemed to be about 24 μ. Thus the megascleres seem to be smaller than de Laubenfels' (1936a) 6 x 360 μ record while the microscleres are larger than his 12 x 2 to 20 x 4 μ report. In addition the spirasters, while abundant in the sponge, did not "pack" the ectosome as he indicated.

These differences do not seem great enough to justify describing it as new; therefore it is left here with some reservation.

Spirastrella coccinopsis de Laubenfels, 1953.—This was not found during the course of the present investigation but was taken at Station 20 on October 26, 1948, and reported by de Laubenfels (1953a: 537) as a dubious new species. He indicated that it may be synonymous with *S. coccinea* since it differs primarily in color and size.

Anthosigmella varians (Duchassaing and Michelotti, 1864) de Laubenfels, 1936.—OI 1032, USNM 23594. This dingy brown sponge has a multitude of shapes, sometimes elongate and cylindrical, at other times massive or amorphous. Its consistency was compared to that of cheese by de Laubenfels (1949a).

The spiculation was reported by de Laubenfels (1949a: 19) as consisting of tylostyles 360 x 6 μ, typical spirasters, and spirasters that are essentially C-shaped with blunt, knob-like protrusions arranged only along the convex side. It is reported as a hard sponge to identify because often these "typical C-shaped" spirasters are rare or even wanting, though in some cases they do form

the bulk of the microscleres (de Laubenfels, 1953a: 539).

This sponge was found at Station 7, depth 9.5 meters, on a rock bottom. It was grey and formed (encrusted) around a worm tube. In alcohol its color was drab brown or brownish grey.

The spiculation was somewhat different in the endosome and ectosome. The tylostyles of the endosome were 278-376.4-460 x 4-5.7-7 μ while those of the ectosome were smaller, measuring 240-326.2-412 x 4-5.3-7 μ. In addition, the normal spirasters of the endosome, 7-19.3-31 μ, were larger than those of the ectosome which were 4-13.0-31 μ. The C-shaped spirasters were confined largely to the ectosome, only a few being found in the endosome. They were 7-9.9-15 μ in size.

The species also was recorded from Station 20 on October 26, 1948, by de Laubenfels (1953a).

Halicometes stellata (Schmidt, 1870) Topsent, 1898.—USNM 23571. Small portions of this species were collected in the Panama City area by Dr. Meridith Jones during the early part of 1958. The specimens were encrustations, 0.5 to 1.5 cm in diameter and 2 to 5 mm in height and are numbered I-II and 3E3 in Dr. Jones' collection. No color or ecological data were available for these specimens.

Because of the small size of the specimens, virtually all of the material was used in making sections and spicule mounts.

The tylostyles, a few of which tend to be stylote, were 211-569.1-1015 x 3-7.1-12 μ which is in good agreement with de Laubenfels' (1950a: 99) Bermuda report, though the microscleres were somewhat larger than he reported. The oxyspheraster averaged 26.4 μ (range: 18 to 33 μ), while the chiasters averaged 12.8 μ (range: 7 to 22 μ).

The minute size of the specimens and the difference in microsclere size lead the author to place this sponge here with some reservation.

Family Placospongiidae Gray

Placospongia carinata (Bowerbank, 1858) Vosmaer, 1902.—OI 1043, USNM 23582 (figs. 25, 27). This is an encrusting species whose surface is hard, almost stony, and is divided by cracks and ridges into roughly polygonal areas. It was common at Station 10, depth 3 meters, encrusting on limestone in patches up to 10 cm in diameter and 3 mm thick. It was collected August 13, 1957.

Color in life was orange, while in alcohol it was brown. The surface was relatively smooth, but broken up by the above-mentioned polygonal plates, about 12 x 20 mm in size. The cracks along the raised ridges which separated the polygonal areas were about 1 mm wide and were assumed to contain both oscules and pores.

The ectosome consisted of a dense, stony cortex of microscleres firmly bound together by fibrous or protoplasmic structures. The endosome, what little there was, contained tracts of megascleres which penetrated the base of the cracks, thinned out, and finally lined the wall of the lumen which was formed by the edges of the crack coming together at its apex. These tightly packed megasclere tracts were about 350 μ in diameter in the endosome and thinned to about 125 μ across the narrow neck of the crack, before it widened in the ridge area to form the lumen. After following the walls of the lumen, the thin megasclere tracts came together in the opening of the crack to form a thick mass of megascleres and finely microspined spirasters which looked as if they were too large for the opening and thus folded back into the lumen, forming another smaller lumen within the spicule mass. The diameter of this mass in the crack mouth was 285 to 385 μ. Sections look similar to Vosmaer's figure (1902: Pl. II, fig. 5).

The megascleres were tylostyles averaging 729 x 10 μ (range: 359 to 910 μ). The main, cortex-building microsclere was a selenaster, mean size 57 x 68 μ (range in diameter: 53 to 76 μ). Selenasters look similar to sterrasters but arise in a different fashion. Juvenile selenasters appear as two basic types of spirasters: the first is finely microspined and varies in shape from a kidney bean to a short and often bent microstrongyle, size range 7-10-14 μ; the second is a somewhat larger, highly contorted spiraster with long, 4 to 9 μ, often dichotomous spines. Its overall measurements were 15-20-24 x 13-16-22 μ while the shaft was between 4 and 7 μ in diameter. In addition, there were all sizes of immature selenasters, some with long sharp spines and older ones with the spines shorter and seemingly more closely packed.

De Laubenfels (1936a: 153) reported *P. melobesoides* Gray from the Tortugas but since his specimen showed only a few tylostyle fragments and mature selenasters, his identification was only tentative. Possibly he actually found a specimen of this same species though this is impossible to tell from his slide.

P. carinata heretofore has been reported only from the Indo-Pacific (see Vosmaer and Vernhout, 1902) and from Madagascar (Levi, 1956b). In view of this distribution possibly we might be dealing with a new species. However, because of close agreement with descriptions of previous workers, this sponge is tentatively placed here.

Family CLIONIDAE Gray

Cliona celata Grant, 1826.—OI 999, USNM 23567. This is the common yellow boring sponge of the region, which outgrows its burrows to form tall, massive, cylindrical, papillate chimneys. Its galleries are 1 to 4 mm in diameter. Its papillae are the same diameter and 1 to 4 mm in height. Its skeleton consists entirely of tylostyles which, in this case, were 285-372-399 x 5-7-9 μ.

Early authors sometimes mentioned spirasters in connection with young specimens, but Old (1941) found none and redescribed the species with the megascleres only. De Laubenfels (personal communication) field-identified some of these specimens as *celata* rather than *C. caribboea* Carter. He also described both species for field identification (1953b).

The species was found abundantly throughout Alligator Harbor and vicinity and was taken specifically at Stations 1, 2 and 3. Depth in no case was over 2 meters.

Cliona caribboea Carter, 1882.—This species was not found during the present investigation but was taken at Station 21 on October 27, 1948, and reported by de Laubenfels (1953a).

It is much like *celata* and may be mistaken for it. The main distinguishing character is burrow or papilla size, which is on the average much coarser. The burrows and papillae reach a diameter and height of 4 to 6 mm, or about 2 mm larger than those of *celata* (de Laubenfels, 1936a, 1953b). The spicule size is about the same, though *caribboea* is reputed to have slightly thinner tylostyles (de Laubenfels, 1950a).

Cliona truitti Old, 1941.—OI 1024, USNM 23568. This boring sponge was collected from oyster reefs in Alligator Harbor, Station 3, by Dr. R. Winston Menzel. It was boring small holes and galleries 1 to 2 mm in diameter in the shell of *Crassostrea virginica* Gmelin at an intertidal depth.

The skeleton was composed of tylostyles 142-180-212 x 4 μ, finely spined microxeas 68-90-109 x 2-4-5 μ, and finely spined spirasters 7-11.2-14 x 2-2.4-4 μ which often were distinctly angulated one to three times, but sometimes straight.

Cliona vastifica Hancock, 1849 (?).—OI 1025, USNM 23569. This is a boring sponge found on an unidentifiable beachworn fragment of shell at Station 2, Bay Mouth Bar at Alligator Harbor, during October, 1956. It was found by Dr. R. Winston Menzel and Mr. R. T. Damian. Depth was intertidal.

Papillae protruding from the galleries were 0.5 to 1 mm in diameter and less than 1 mm high.

The megascleres were tylostyles 153-245.5-278 x 3-4.8-7 μ. The microscleres were composed of finely spined or smooth microxeas and spirasters. The microxeas were 64-84.2-115 x 2-2.6-4 μ while the spirasters were 11-24.2-29 x 2-2.4-3.3 μ (shaft diameter) and were distinctly angulated one to four times.

Although the tylostyle and microxea dimensions neatly fit Old's (1941: 11) tabulation, the spirasters seem slightly too large. In addition, the specimens I have examined of *vastifica* had fairly fine microspines on the spirasters, but in this specimen the microspines on the spirasters were so coarse that they almost doubled the diameter of the spiraster at points where they occurred. For this reason this sponge is only tentatively placed here.

Cliona lampa de Laubenfels, 1950.—OI 1023, USNM 23591. This is a boring sponge which permeates the substrate instead of excavating galleries as other boring sponges do. The color is a distinctive brick red.

The species was reported by de Laubenfels (1953a) from Station 22 and was found also during the course of the present investigation at Station 1, August 4, 1957, by the author. It was identified immediately in the field by the late Dr. M. W. de Laubenfels who was accompanying the expedition. Its host in this case was a large coral, *Siderastrea siderea* (Ellis & Solander), which looked

normal except that it was red to a depth of about 0.5 cm instead of being its usual yellow-brown color.

The skeleton consisted of tylostyles 153-210.7-240 x 2-3.9-6 μ with heads 4-5.8-7 μ in diameter, and abundant microscleres of two categories. There were finely microspined microxeas 77-92.0-105 x 2-2.4-3 μ and straight streptasters 5-8.1-13 x 1-1.9-2.2 μ. These size ranges greatly overlap those given by de Laubenfels (1950a: 110) in his original description. They are, however, somewhat larger than his. In view of the permeating habitus, straight spirasters, and de Laubenfels' previous record in the area, the differences are not sufficient to justify designation as a subspecies.

The skeleton of this species is similar to that of *C. vastifica* and might be mistaken for it. The primary differences are the permeating, as against excavating, habitus and the straight streptasters of this species. The spirasters of *vastifica* are distinctly angulated.

Cliona viridis (Schmidt, 1862) Gray, 1867. —OI 1029, USNM 23593 (fig. 28). This is a light yellowish-brown, thickly encrusting to amorphous sponge, soft in texture, whose base dimensions were 3 x 2 cm and height was 1 cm. It held much shell detritus, especially near the base, which may have been there as substrate. The spiculation consisted exclusively of tylostyles 210-296-440 x 1-5-7 μ whose heads averaged 8 μ (range: 4 to 11 μ diameter). There were no microscleres.

The specimen was found in Alligator Harbor in the vicinity of Station 3, depth 1 meter, on March 4, 1957, by Mr. Raymond T. Damian.

This sponge was described as *Suberites undulatus* by George and Wilson (1919: 140) from Beaufort, N. C. It was placed *incertae sedis* by de Laubenfels (1947: 34), primarily because no specimens could be found during his stay at Beaufort. He noted also that dead specimens of *Microciona prolifera* that have lost their flesh spicules would come to a residual spiculation approaching that of *S. undulatus*.

The most striking, and only important difference so far noted, is that of color. George and Wilson's specimen was light grey while this one is a light yellowish-brown. This difference is not considered significant and the specimen was identified originally as *S. undulatus*.

The finding of George and Wilson's original type specimen of *S. undulatus* by Wells *et al.* (1960: 232) and their subsequent synonymizing it with *Cliona viridis* necessitates placing my specimen here.

Order Epipolasida Pallas
Family Tethyidae Gray

Tethya aurantia (Pallas, 1766) Topsent, 1900.—OI 1020, USNM 23577. This was an orange, subspherical, tuberculate sponge 4 to 6 cm in diameter and the same in height. The endosome was olive-drab in color.

The megascleres were strongyloxeas and small styles, some of which showed the subtylostylote modification. The strongyloxeas in the ectosome averaged smaller than those of the endosome, though their range was greater. The styles were confined to the ectosome.

The mean size of the ectosomal strongyloxeas was 1221 x 21 μ (range: 765 to 1828 μ), while the endosomal ones averaged 1326 x 25 μ (range: 1010 to 1775 μ), though a few immature strongyloxeas were found here averaging 553 x 7 μ. The styles were 144-253.4-452 x 4-7.9-11 μ.

The microscleres were composed of spherasters, 32-76-107 μ in diameter, microspined chiasters 9-13-18 μ, and microspined oxyasters 12-17-25 μ.

This species was abundant throughout the year at Station 10, depth 2.5 meters, on a limestone substrate. The species also was reported from Station 1 but this station is not now represented by a specimen.

The specimens are placed here because of the small styles which characterize the ectosome. Only one other species, *T. extensa* Hentschel, from Australia, has styles of the same order of magnitude as this species, but the spicules of *extensa* are fully 200 μ longer than those of the Apalachee Bay specimens.

Order Choristida Sollas
Family Ancorinidae Gray

Unimia trisphaera de Laubenfels, 1953.—This spherical, dark mahogany sponge was not found during the course of the present investigation. It was reported from Station 20 only where it was taken October 26, 1948. It was described by de Laubenfels (1953a: 546).

Stelletta grubii Schmidt, 1862.—OI 1004,

USNM 23575, USNM 23603. This is the "oyster sponge" which plays host to, and probably protects from fouling organisms, the sponge oyster *Ostrea permollis* Sowerby. This relationship first was recorded by the author (1958). This sponge is mistaken easily for *Geodia gibberosa* (Lamarck) which was erroneously reported to play host to the oyster (Menzel, 1957). It is easily distinguished from *Geodia* by its lack of sterrasters in the cortex. All oyster sponges collected to date have been this species. It is common throughout the year at Stations 1, 2, and 4, and was collected previously at Station 20 (de Laubenfels, 1953a). Depth range is 1 to 13 meters.

The skeleton of this species contains very long oxeas, plagiotriaenes and anatriaenes as well as a microsclere population containing finely microspined oxyeuasters plus eutylasters which are finely microspined at the tips of the tylote-ended rays. The megascleres of the ectosome were a little longer than those of the endosome while the microscleres of the ectosome were smaller than those of the endosome.

In the ectosome the long oxeas were 1100-1317-1560 x 12-27.6-36 μ. The plagiotriaenes were 815-984-1170 x 10-23.2-38 μ with clads 48-79.5-105 μ long. Only one anatriaene 1416 μ long was found, while the shaft diameter on broken individuals was 10-13.2-19 μ and the clad length was 38-59.4-86 μ. The fairly rare oxyeuasters were 4-11.5-15 μ, while the eutylasters were 11-12.1-18 μ.

In the endosome the oxeas were 885-1258-1450 x 9-18.1-38 μ with plagiotriaenes 565-906-1100 x 9-15.4-34 μ, clads 29-60.4-96 μ, and anatriaenes 675-1062-1415 x 10-14.5-29 μ with clads 19-45-86 μ long. The oxyeuasters were 7-12.9-22 μ and the eutylasters were 11-16.3-22 μ in diameter.

This species was redescribed in detail by de Laubenfels (1950a) from Bermuda.

Family Geodiidae Gray

Geodia gibberosa Lamarck, 1815.—OI 1015, USNM 23564. This massive to lobate, basically dirty-white sponge was abundant at Stations 4, 7, and 11 throughout the spring and fall. It is often a mass of knobby fist-like projections up to 50 cm in diameter with individual knobby projections measuring up to 10 x 5 x 20 cm high. The projections are often packed closely together and the effect is somewhat like a bushel of potatoes, closely packed, all standing on end.

The megascleres consisted of huge oxeas well over 1.5 mm, most of which were broken; orthotriaenes or plagiotriaenes with rhabds over 1 mm long but also broken, with clads 23-46 μ long; protriaenes all over 1 mm but broken, with clads 130-230 μ long; and, in one specimen, tylostyles 107-162-290 x 1-3-4 μ, and styles of mean size 225 x 5 μ (range: 205-246 μ).

The microscleres were composed of sterrasters (mean diameter: 62 x 60 μ; range 53-69 μ); oxyeuasters 12-18-21 μ; and oxyasters 4-6-9 μ in diameter.

This species was collected also at Station 20, October 26, 1948, and reported by de Laubenfels (1953a: 551). The species was redescribed in detail by de Laubenfels (1936a, 1950a).

We do not know at present whether the sponge oyster invades this species, as previously reported. Extensive collections and experiments are being carried on at the Oceanographic Institute, Florida State University, by Mr. Milton Forbes to determine the exact relationship between oyster and sponge, and the degree of specificity which governs it. As previously reported in this paper, *Ostrea permollis* has so far been found only in the sponge *Stelletta grubii* in this area. A few specimens of the sponge without the oyster also have been taken.

Family Craniellidae de Laubenfels

Cinachyra alloclada Uliczka, 1929.—OI 1048, USNM 23597. The shape of this species is recorded as sub-spherical and its color is recorded as yellow (de Laubenfels, 1936a).

One specimen was taken at Station 13 from sand and mud bottom, March 10, 1957, by N. Hulings and A. N. Sastry.

The shape of this specimen was like that of a child's top, with a convex upper surface. It appeared to be a piece ripped out of a spherical sponge, including the rounded surface and part of the endosome which tapered to a point, showing the radiate structure of the sponge nicely. Size was 3.5 cm in diameter and 3 cm in height (*i.e.*, radius to apex of pointed part of endosome). Color was yellow-brown; it faded somewhat in alcohol.

The convex upper (outer) surface was covered with numerous large pits 1-3 mm in diameter and 4 mm or more in depth.

The skeleton consisted of huge oxeas, sinuous broken-up anatriaenes, and protriaenes of about the same length as the oxeas. There were two sizes of oxeas found; the first averaged 3094 x 28 μ (range: 2731-4552 μ), and the second had a mean size of 1414 x 9 μ (range: 1155-1683 μ). The anatriaenes had clad lengths measuring 38-61-99 μ while the protriaenes had clad lengths measuring 64-84-180 μ. The microscleres were composed of sigmaspires with tylote ends 9-13-16 μ.

This specimen is placed here since the sigmaspires were within the 12-18 μ range of the species and because some of the triaenes were of the "Kudu" type (de Laubenfels, 1936a: 175). Had the range fallen into the 17-20 μ category and had the clads of the triaenes not been of the "Kudu" type, the specimen would then fall to *C. cavernosa* (Lamarck).

Possibly *alloclada* is conspecific with *cavernosa* as de Laubenfels suggested (1953a: 552), but in view of the distinctive spicule type which characterizes *alloclada,* I suggest keeping them separate until better evidence is available.

Figures 25-26. **25** (top). *Placospongia carinata* (Bowerbank) Vosmaer (USNM 23582). **26** (bottom). *Craniella crania* (Muller) Schmidt (USNM 23555).

Craniella crania (Muller, 1776) Schmidt, 1870.—OI 1012, USNM 23555 (figs. 26, 29). This species tends to be globular, but may take other forms in shallow water; my specimens are subspherical to semicylindrical in shape. Color is usually grey-brown or drab; the surface is usually hispid and often feels and looks like coarse, heavy felt. The structure is usually radiate internally.

The spiculation consisted of very long thin oxeas 444-881-1736 x 8-12-15 μ, and of anatriaenes and protriaenes in the same size range. Most were broken in slide preparation. In addition there was a microsclere population of sigmoid spirasters 11-13-16 μ. There were also enormously long, slender root spicule anatriaenes at the base of the sponge. They were 2 to 6 μ in diameter and had clads which measured 31-35.0-44 μ.

This species was found commonly at Stations 8 and 10, and one was also dredged at Station 14. This gives a depth range in this area from less than 1 to 6 meters, and a range in substrate from oyster shell to rock, and to sand.

This species was described in detail by George and Wilson (1919: 142) as *Tetilla laminaris,* which was made synonymous with *C. crania* by de Laubenfels (1947: 34-35). It was also redescribed under its correct name by de Laubenfels (1949b: 25). Wells, *et al.* (1960: 236) restored *laminaris* to specific rank as *Craniella laminaris,* differentiated from *C. crania* principally on the basis of growth form, color, and habitat, though the sigmoid spirasters were reported as slightly smaller than those of *C. crania.* I do not feel that such action is warranted on the limited qualitative impressions reported by them. More quantitative data are needed. For this reason I have taken what I consider to be the more conservative course since spiraster size and habitat, as indicated by the presence of root spicules, might indicate the specimen as *laminaris,* while color and shape do not.

CRANIELLA CINACHYRA (de Laubenfels, 1936) *new combination.*—OI 1021, USNM 23572 (fig. 30).

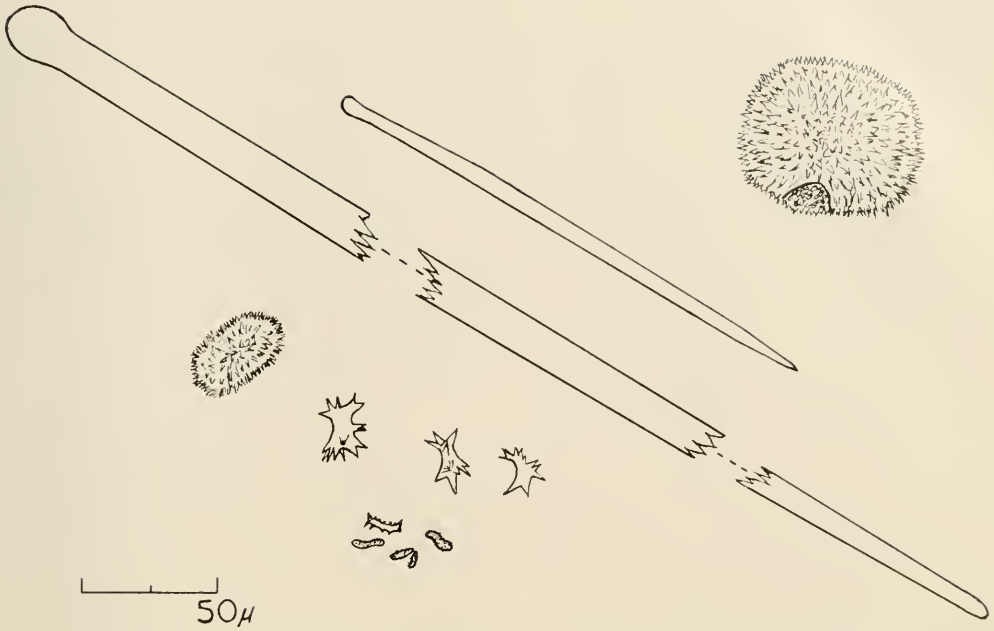


Figure 27. Spicules of *Placospongia carinata* (Bowerbank) Vosmaer.

This specimen was taken off Dog Island in 1956, perhaps in the region of the University of Miami Station 20. It was received in dry condition with no ecological data. It is an oval cake-shaped mass 10 x 8 cm in diameter and 3 cm high. Dry color is yellowish-gray. Technical difficulties and weather conditions prevented work off Dog Island during the course of the investigation and this species was not encountered again.

The megascleres consist of long oxeas, some of which were as thin as 4 μ and quite sinuous, and of prodiaenes and protriaenes 1.4-2.8 μ in diameter which appeared relatively rare. All the megascleres were over 1 mm in length; most were broken in the preparation of slides so that it was impossible to ascertain the total length. The microscleres are sigmaspires whose ends are slightly rounded, often tylote. Chord measurement indicated they were 7-9.4-11 μ in size.

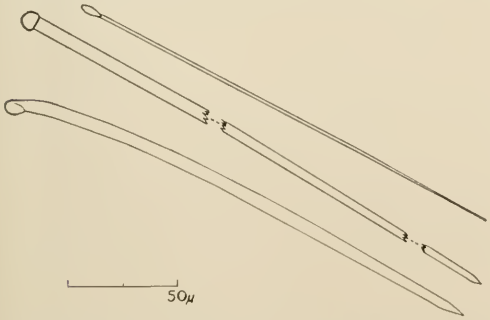


Figure 28. Tylostyles of *Cliona viridis* (Schmidt) Gray.

This specimen originally was identified as *Trachygellius cinachyra* by me and rechecked after the contention of Wells (personal communication) that there were triaenes in it which had been missed. Subsequent investigation yielded what are interpreted to be pieces of triaenes but only a few had unbroken, recognizable clads. The investigation of de Laubenfels' original section slide revealed the presence of triaenes, although in his spicule slides only fragments of triaenes could be found. I could not get any good data on the size of the anatriaenes in de Laubenfels' section, since they were within spicule tracts and had to be observed by focusing up and down; also, the section itself contains only three or four which can be demonstrated.

The above findings justify the transfer of this species to the genus *Craniella*. The lack of any anatriaenes in my slides presents some difficulty but the close morphological agreement between this specimen and my specimens of *C. crania*, with the exception of sigmaspire size, could easily lead one to

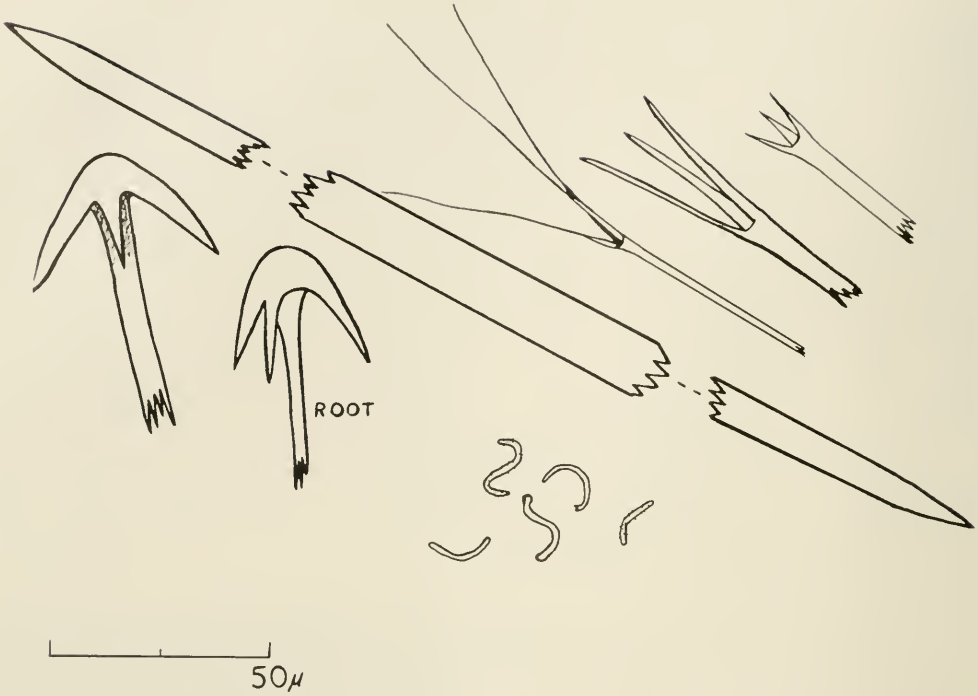


Figure 29. Spicules of *Craniella crania* (Muller) Schmidt.

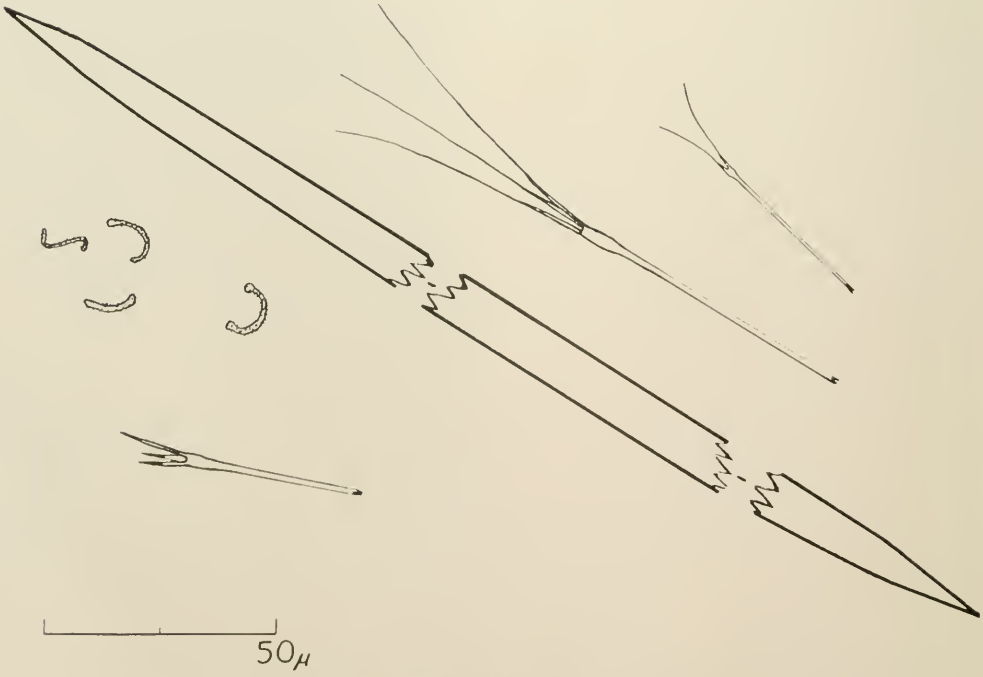


Figure 30. Spicules of *Craniella cinachyra* (de Laubenfels), new comb.

place it there. Indeed, possibly this species is conspecific with *C. crania.* This would go far toward explaining de Laubenfels' apparent error in identifying *cinachyra* as *crania* (Wells *et al.,* 1960: 233). At present however, I feel that the more conservative course should be followed until the problem is resolved clearly by further work.

The above discussion raises some question as to the finding of *Trachygellius cinachyra* by Wells *et al.* (1960: 233) off North Carolina. Those specimens should be reexamined for triaenes and their proper systematic position determined.

Order Carnosa Carter
Family Chondrillidae Gray

Chondrilla nucula Schmidt, 1862.—OI 1050, USNM 23599. This is the "chicken liver" sponge. It is flat to lobate in shape and does not look or feel like the usual concept of a sponge, but is smooth, slippery, and shiny. It has the consistency of cooked egg white or raw liver. The color is usually pale drab. It has no spongin skeleton and no megascleres; its only spicules are spherasters which in this case averaged about 30 x 20 μ in diameter (range: 14-36 μ). These spherasters were not round as is shown by the two axial measurements.

It was found on another sponge August 13, 1957, at Station 10, depth 3 meters, by Dr. John Morrill. The species was redescribed in detail by de Laubenfels (1950a: 133).

CLASS CALCISPONGIAE

Order Syconosa de Laubenfels
Family Scyphidae de Laubenfels

SCYPHA **ACANTHOXEA,** sp. nov.—OI 1035, USNM 23602 (fig. 31).

The syntypes of this species are designated as USNM 23602.

Locality and abundance.—Relatively abundant in the Panama City region and was found on steel buoys at a depth of less than 1 meter.

Shape and size.—A small cylinder or ball 2 to 5 mm in diameter and 1 to 4 mm long. The average size was 2 mm in diameter and 4 mm in length.

Color.—Greenish-white.

Surface.—Hispid.

Oscules.—Single, apical, 0.3 to 0.5 mm diameter.

Figure 31. Distinctive acanthose oxeas of *Scypha acanthoxea,* sp. nov. Other spicule types are not illustrated.

Flagellate chambers.—350 x 70 to 525 x 250 μ.

Ectosomal anatomy.—No specialization except for tufts of oxeas perpendicular to the surface. They are located in the distal ends of the flagellated chambers and give the sponge the hispid effect. There was no actual ectosome. The distal part of the flagellated chambers was naked, except for the spicule tuft.

Endosomal anatomy.—Triaxon spicules were strewn between the flagellate chambers forming a skeleton. The rays of some projected into the central spongocoel as did the rays of the few tetraxons present. The structure was typical of the genus.

Skeleton.—Six categories of spicules were present. There were three sizes of triaxons, some of which had at least one ray that was sinuous. Among them were a few tetraxons of the same size categories. The three sizes were measured on the basis of the length of their individual rays. Their ray lengths were: 58-144.7-220 μ, 58-90.1-115 μ, and 29-44.1-86 μ. In addition there were two classes of regular oxea, *i.e.* the dermal spicules. They were 527-727.6-1169 x 8.6-9.0-9.6 μ and 229-333.4-489 x 2-6.4-9.6 μ.

There was one further category of oxea: *i.e.,* with one end normal or slightly swollen and the other coarsely acanthose for about one-fourth the length of the spicule. The acanthose part varied from about one-tenth the length in long ones to a very short one that was virtually completely acanthose. These were 345-728.6-2299 x 3-4.3-7 μ. They are considered primarily coronal spicules though two or three have been seen

sticking into, and even completely through, the spongocoel.

Discussion.—There do not seem to be any other members of the genus that have oxeas or axon rays that match these specimens, nor are there any other members of the genus with such acanthose-ended oxeas. I think these traits constitute good criteria for designation of a new species. The species is named for the peculiar acanthose spicule which characterizes it.

Credit is due to Dr. Willard Hartman of the Yale Peabody Museum who first pointed out these queer, relatively rare spicules to me.

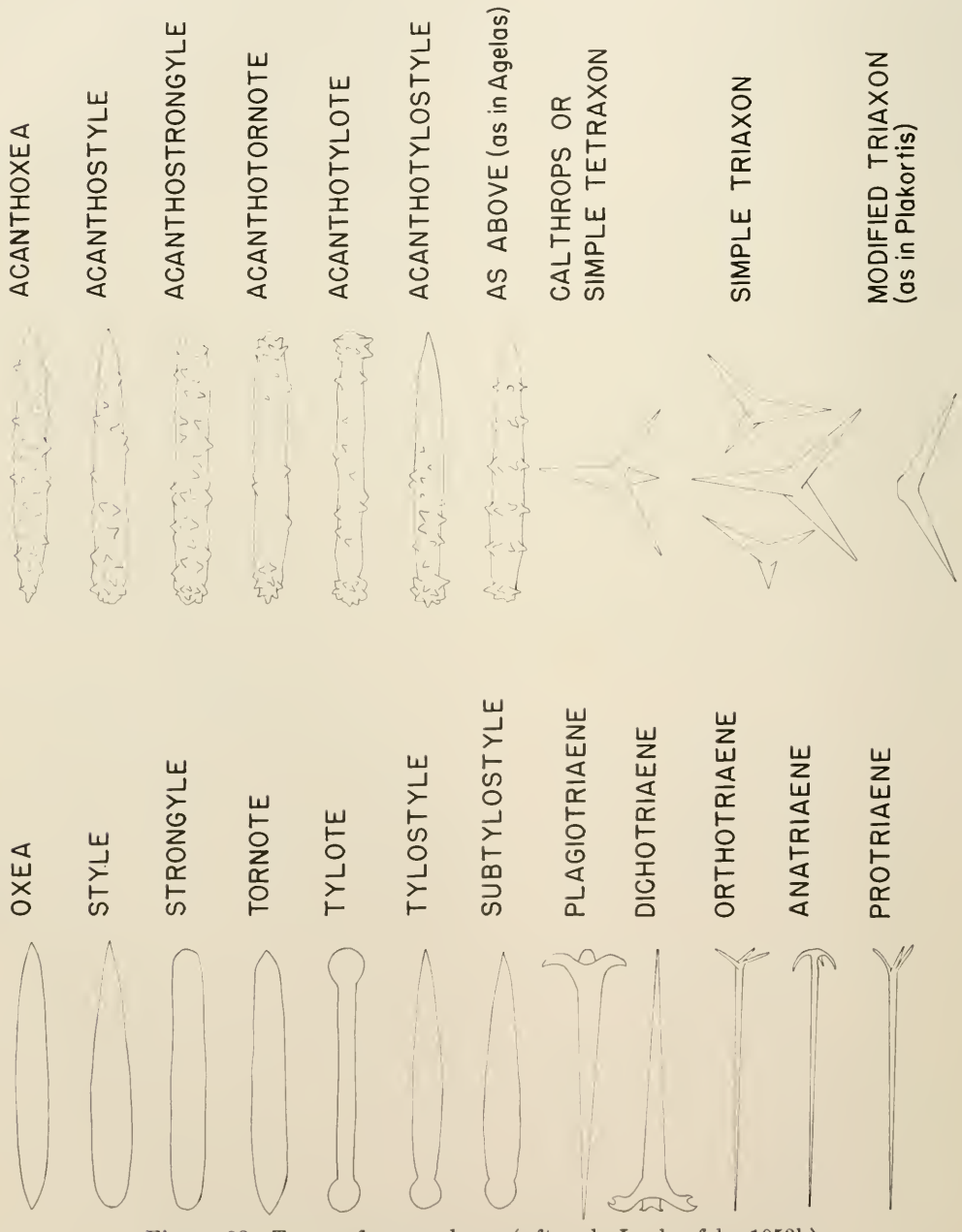


Figure 32. Types of megascleres (after de Laubenfels, 1953b).

Order Asconosa de Laubenfels
Family Leucosoleniidae Minchin

Leucosolenia canariensis (Miklucho-Maclay, 1868) Dendy and Row, 1913.—OI 1041, USNM 23600. This sponge's small yellow trellis-work of ascon tubes, each 1 mm in diameter, forms masses up to 3 or 4 cm in diameter. It is identified readily by its lemon yellow color which is retained in alcohol, and by its pronounced ascon structure. It contains only simple triaxon spicules.

The species was abundant at Station 10, depth 3 meters, on October 13, 1957, where it was growing on *Sargassum*. Identification was verified by de Laubenfels (personal communication).

This is the only record of the sponge for this area though de Laubenfels reported and described it from the Tortugas (1936a: 201) and Bermuda (1950a: 149).

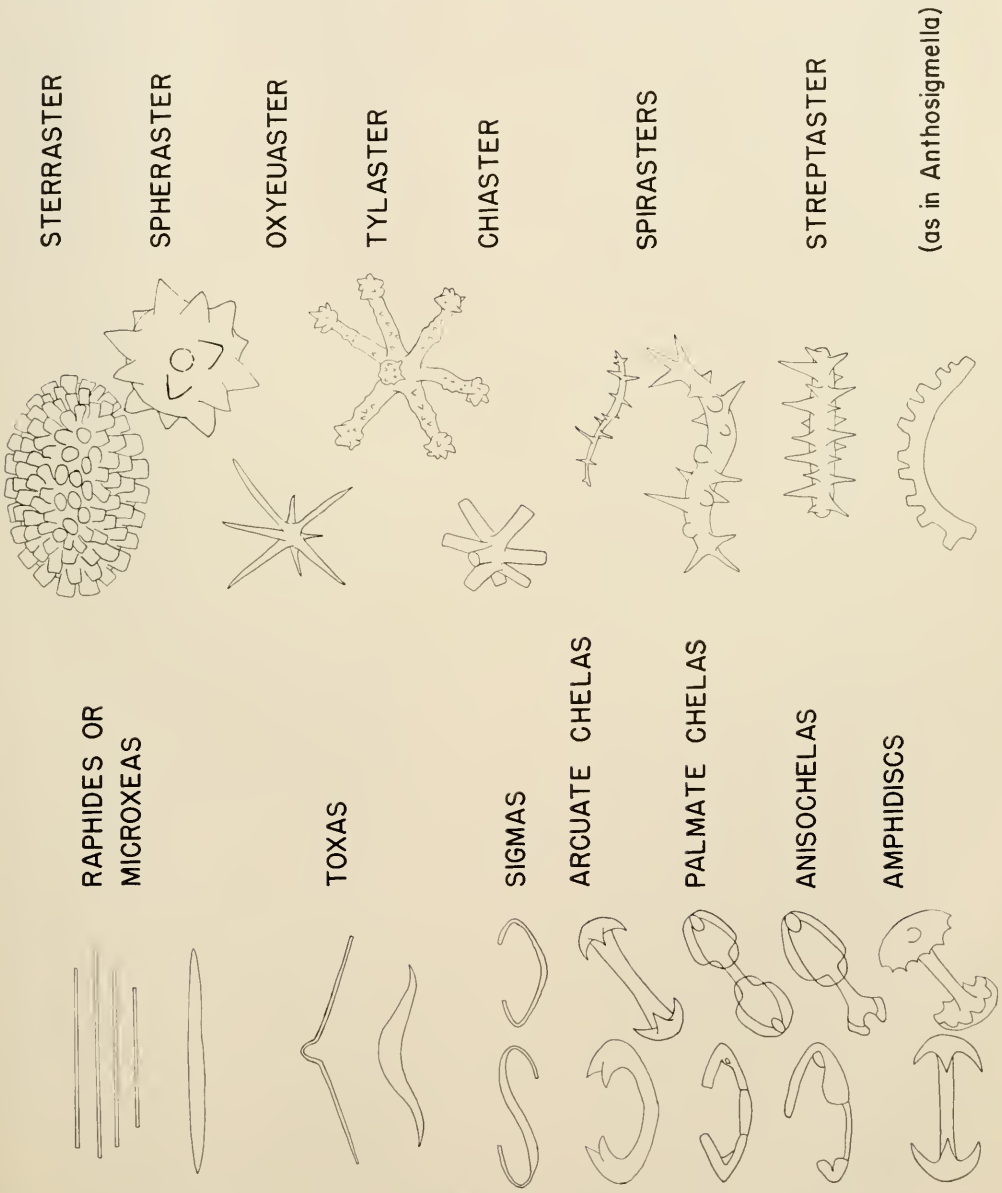


Figure 33. Types of microscleres (after de Laubenfels, 1953b).

V. Artificial Key to the Species

Most spicule types encountered are illustrated in Figures 32 and 33. De Laubenfels (1948, 1953b) and Hyman (1940) may be referred to for further explanation and illustration of the terms used in this key.

1. Proper spicules of silica or calcium carbonate present 19
   Proper spicules absent 2
2. Spongin fibers present 3
   Spongin fibers absent, color in life purplish-red, brighter than maroon ..... *Halisarca purpura*
3. Skeleton a network of fibers 4
   Skeleton fibers tree-like; they branch but seldom or never anastomose. Color dull red, shape massive to amorphous, triaxon spicules of spongin ..... *Darwinella joyeuxi*
4. Flagellate chambers spherical or ovate and small, generally 50 microns or less in diameter 5
   Flagellate chambers sack-shaped and large, generally over 50 microns in diameter 17
5. Fibers show little evidence of stratification or axial specialization, often opaque, often spongy when dry and may soften when returned to water 6
   Fibers markedly stratified, very evident axial specialization, often with pith; when once dry they remain hard and brittle permanently 15
6. Main fibers not trellised or fascicular 7
   Main fibers trellised or fascicular, persistently brittle once dry; sharply set off by the presence between the skeletal fibers of filaments akin to spongin, 3 to 10 microns wide and about 1 mm long; sponge has strong sulfur or garlic odor 12
7. Primary fibers "cored" with foreign material; secondary fibers not so cored 8
   Huge ramifying subdermal cavities, great emphasis on the uncored secondary fibers so that the primary (cored) fibers are rare or wanting 11
8. Normal structure and flesh in sponge; flagellate chambers normally placed 9
   Peculiar structure in that the flagellate chambers are scarcely more than holes punched in thin sheets of tissue ..... *Aulena columbia*
9. Shape subspherical with widely distributed oscules each on a lobate protrusion; color drab to black ..... *Spongia barbara*
   Shape massive to cylindrical 10
10. Shape tends toward being an inverted truncated cone; color drab to black ..... *Spongia graminea*
    Shape tends to be cylindrical to vase shape; color white with lavender tints ..... *Spongia* sp.
11. Long wall-like ridges between subdermal canals; considerable areas (over canals) that are relatively smooth valley-like plains ..... *Hippiospongia lachne*
    Areas between subdermal canals restricted to small island-like areas so that the surface appears covered by tubercles ..... *Hippiospongia gossypina*
12. Shape ramose to lobate; color brown to brownish white; conules 2 to 4 mm apart 13
    Vase or cake shape; conules 4 to 12 mm apart 14
13. Branch ends acute, or pointed ..... *Ircinia fasciculata*
    Branch ends bluntly rounded ..... *Ircinia ramosa*
14. Vase-shaped; reddish or white with reddish tinge; conules 4 to 8 mm apart ..... *Ircinia campana*
    Cake-shaped; grey; conules 6 to 12 mm apart ..... *Ircinia strobilina*
15. Exceedingly ramose; predominant color in life dull yellow though the upper side may be light brown; fibers contain a central conspicuous pith extending their entire length 16
    Ramose to amorphous or lamellate; color in life dark purple (may be covered with yellow sheen); fibers may appear slightly cored with foreign material (they contain distinctive small cells especially in the central pith region) ..... *Ianthella ardis*
16. Color in life dull yellow or grey, slowly turning reddish or carmine, or drab upon death or in alcohol ..... *Verongia longissima*
    Color dull yellow with upper side light brown, quickly turns dark purple on death or in alcohol ..... *Verongia* sp.
17. Both primary and secondary fibers cored with foreign material 18
    Primary fibers so cored, but secondary fibers clear; shape lobate to ramose; color light brown to rosy red ..... *Euryspongia rosea*

18. Color orange to pink-red ..... *Dysidea crawshayi*
Color sky blue ..... *Dysidea etheria*
19. Calcareous spicules present 20
Siliceous spicules present 21
20. Color greenish white; sycon with rare acanthoxeas ..... *Scypha acanthoxea*
Color yellow; asconoid ..... *Leucosolenia canariensis*
21. Megascleres as well as microscleres present 22
Only microscleres, spherasters present; color white, consistency cartilaginous; surface smooth and shiny like cooked egg-white ..... *Chondrilla nucula*
22. Tetraxons absent as megascleres 23
Tetraxons present as megascleres 60
23. Diactine megascleres present only 25
Monactines and/or diactines present as megascleres 24
24. Monactines and diactines present as megascleres 36
Monactine megascleres present only 42
25. Diactine megascleres only, no microscleres 26
Diactine megascleres plus microscleres 34
26. No dermal specialization; reticulation of endosome merely continues to surface 27
Dermal mesh or reticulation smaller, or a definite special dermal skeleton present 30
27. Skeleton of oxeas only 28
Skeleton mainly of oxeas, but with a strong tendency for the larger ones to be strongylote or stylote ..... *Haliclona* sp.
28. Sponge light green to grey-brown; encrusting to massive with digitate processes; oxeas about 120 microns long and some few may be strongylote or stylote ..... *Haliclona viridis*
Sponge lavender to brownish grey or red 29
29. Sponge brownish grey to lavender; thickly encrusting to massive and amorphous; oxea length averaging about 150 microns; skeleton regularly reticulate ..... *Haliclona permollis*
Sponge dull red even when dry; shape ramose ..... *Haliclona rubens*
30. Dermal mesh smaller than that of the endosome; sponge a light brown hollow tube with oxeas the only spicules ..... *Callyspongia vaginalis*
Definite special dermal skeleton, tangent 31
31. Sponge white or light brown fingerlike fistula rising from a flat basal mass; fistula 2-4 mm diameter and 2-4 cm high; skeleton consists of oxeas only; endosome wanting in the fistula giving it the form of a slender hollow tube ..... *Rhizochalina oleracea*
Sponge encrusting to massive or amorphous though it may have slender finger-like processes (less than 2 cm high) standing erect on its surface 32
32. Sponge white; encrusting with a few finger-like processes rising from the surface; skeleton of oxeas only, though some verge towards strongyles ..... *Adocia neens*
Sponge light greenish-brown (occasionally pink) to yellow, light green or brown 33
33. Color yellow to light green (occasionally pink) to light greenish-brown ..... *Halichondria panicea*
Color dark, brownish ..... *Halichondria melanadocia*
34. Megascleres are tylotes only 35
Megascleres are oxeas only; repent ramose; color yellowish green to cream; dermal mesh smaller than endosomal; spiculation of oxeas about 100 microns long plus microxeas and raphides, many of which are bent to simulate toxas ..... *Callyspongia repens*
35. Shape a small hollow fistula up to 5-7 mm in diameter about 1 cm high; spiculation of tylotes, arcuate isochelas and sigmas; color white ..... *Coelosphaera fistula*
Shape amorphous with conical elevations; spiculation of tylotes; arcuate verging to palmate isochelas; two sizes of sigmas; color bright orange ..... *Xytopsene sigmatum*
36. Diactine and monactine megascleres only, no microscleres; color bright red to orange-red; shape ramose; distinct axial modification in branches: spiculation of styles and oxeas ..... *Axinella polycapella*
Diactine and monactine megascleres plus microscleres 37
37. Tylotes comprise part of megasclere population 38
Tylotes not found as part of the megasclere population 39
38. Color orange to pink-red; shape encrusting to massive; spiculation of tylotes and styles

(which may be subtylostylote to a slight extent) plus roughened raphides as microscleres ... *Tedania ignis*

Exterior color yellow to brownish-green; interior color yellow; shape permeating to encrusting and sometimes massive and amorphous; spiculation of tylotes and slightly bent styles plus sigmas and arcuate isochelas as microscleres ... *Lissodendoryx isodictyalis*

39. Megascleres comprised of tornotes and acanthostyles, plus arcuate isochelas as microscleres; color fire red in life; amorphous ... *Merriamium tortugasensis*

No tornotes in the megasclere population ... 40

40. Spicules all under 500 microns in length ... 41

Spicules over 1 mm in length common; spiculation of huge strongyloxeas (many over 1 mm long), styles about 200-250 microns long, plus microscleres consisting of spherasters, chiasters and oxyasters; shape subspherical and tuberculate; color orange ... *Tethya aurantia*

41. Spiculation of oxeas, styles, and strongyles, plus microxeas or immature oxeas; all spicules basically oxeas but with wide variation in form; exterior color lavender, interior color brown; shape amorphous ... *Rhaphisia menzeli*

Spiculation of slightly acanthose, slightly bent styles and strongyles, plus toxas and predominantly palmate isochelas (a few are arcuate); color bright orange; shape encrusting ... *Holoplocamia delaubenfelsi*

42. Monactine megascleres only present, no microscleres ... 43

Monactine megascleres plus microscleres present ... 49

43. Both tylostyles and styles present, with acanthostyles; shape thinly encrusting ... *Eurypon clavatella*

Tylostyles or styles present, but not both ... 44

44. Styles only present ... 45

Tylostyles present, with or without acanthostyles ... 46

45. Shape flabellate to palmate with a special axis; color bright orange-red; spicules styles about 220 x 10 microns in size ... *Homaxinella waltonsmithi*

Shape thickly encrusting to massive and amorphous; color orange-pink; spicules styles 130-350 microns long and 2-5 microns wide ... *Hymeniacidon heliophila*

46. Tylostyles plus acanthostyles present; vase-shape; color black ... *Thalyseurypon vasiformis*

Tylostyles only present ... 47

47. Sponge soft; light yellowish brown; shape encrusting to amorphous ... *Cliona viridis*

Sponge boring or massive cylindrical; consistency corky; color yellow in life; surface papillate ... 48

48. Surface papillae or galleries 1 to 4 mm in diameter and height ... *Cliona celata*

Surface papillae or galleries 4 to 6 mm in diameter and height ... *Cliona caribboea*

49. Plain styles present ... 50

Plain styles absent ... 52

50. Plain styles present with or without subtylostyles ... 51

Plain styles plus tylostyles present, plus spherasters and chiasters as microscleres ... *Halicomites stellata*

51. Plain styles the only megascleres, plus raphides, toxas, and sigmas as microscleres ... *Toxemna tubulata*

Plain styles plus subtylostyles with very faint heads; microscleres palmate anisochelas, toxas and sigmas; shape encrusting; color orange to orange-red ... *Carmia macilenta*

52. Subtylostyles with faint heads, plus acanthostyles, palmate isochelas, and toxas; shape encrusting to lumpy and lamellate; color dull brick red to orange-red ... *Microciona prolifera*

Tylostyles the only megascleres present (often there are large microxeas, some of megasclere size) ... 53

53. Boring sponges; microxeas often approaching megasclere size ... 54

Non-boring sponges; no microxeas present ... 55

54. Spirasters distinctly angulated ... *Cliona vastifica*

Spirasters not distinctly angulated but more or less rod shaped ... 55

55. Boring galleries in shells of molluscs; microxeas mostly 70-120 microns long, spirasters sometimes slightly angulated ... *Cliona truitti*

Substrate of coral or limestone not bored but permeated by a fine network of sponge tissue to a depth of 2-5 mm; color brick red; spirasters straight and rod shaped ..... *Cliona lampa*

56. Only one type of microsclere; spirasters present 57
Sterrasters abundant as armor, plus spirasters; surface divided into polygonal plates ..... *Placospongia carinata*

57. Color reddish brown to orange or bright crimson 58
Color grey or light brown 59

58. Color orange or red-brown; shape encrusting ..... *Spirastrella coccinea*
Color bright crimson; shape massive and amorphous ..... *Spirastrella coccinopsis*

59. Color grey; shape encrusting to amorphous; generally with two types of spirasters, one normal and the other C-shaped ..... *Anthosigmella varians*
Color light yellow-brown to dark suede; shape massive to cake-shaped; consistency woody when dry ..... *Spheciospongia vesparia*

60. Both tetraxons and large oxeas, *i.e.* oxeas over 500 microns in length 61
Tetraxons without oxeas, tetraxons equi-rayed and acanthose near ends, subtylostyles also present and long (up to 2 mm); thin styles but no microscleres *Cyamon rickersi*

61. Tetraxons are calthrops, also there are microxeas, oxyeuasters, tylasters, chiasters, and peculiar tri-sphaeroid streptasters ..... *Unimia trisphaera*
Tetraxons are not calthrops but triaenes 62

62. Only one type of microsclere present 63
More than one type of microsclere present 65

63. Surface with large pits 4-6 mm wide and deep; color yellow to yellow brown; some triaenes of the "Kudu" type; microscleres sigmaspires ..... *Cinachyra alloclada*
Surface without pits; no "Kudu" type triaenes 64

64. Microscleres sigmoid spirasters 11-16 microns chord length; color grey to brown; surface often felted ..... *Craniella crania*
Microscleres sigmoid spirasters 7-11 microns chord length; dry color yellowish-grey ..... *Craniella cinachyra*

65. Microscleres are sterrasters, especially in stony cortex, and oxyeuasters ..... *Geodia gibberosa*
Microscleres are eutylasters and rare oxyeuasters; no sterrasters ..... *Stelletta grubii*

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VIII. ABSTRACT

A survey of the sponge fauna of the Apalachee Bay region of the Florida Gulf Coast was made during 1956-57. Collections were included from the Panama City, Florida, area. Sixty-five species in forty-seven genera were found, including seven hitherto undescribed species: *Callyspongia repens, Coelosphaera fistula, Eurypon clavatella, Halisarca purpura, Holoplocamia delaubenfelsi, Rhaphisia menzeli, and Scypha acanthoxea.* In addition, *Trachygellius cinachyra* de Laubenfels 1936 was transferred to the genus *Craniella.* A detailed key to the sponges of the area is included.