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SPONGES OF THE WESTERN BAHAMAS

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The excellent location and equipment of the Lerner Marine Laboratory at Bimini, in the western portion of the Bahamas (British West Indies), offer exceptional opportunities for the study of fish and other marine life, including sponges. There are certainly more than 30 species of Porifera in this vicinity, although only 29 are here discussed. In June and July, 1948, I devoted a few weeks to field work in and near Bimini; doubtless all the commonest species were thus studied, but rarer forms would certainly be added by any long-continued campaign of collecting. In fact, several small, unidentifiable specimens which were observed in 1948 clearly belonged to other than the 29 that were identified. The commonest species, however, are those that are most likely to play significant parts in the over-all program of the Lerner laboratory, for example, in ecological interrelationship and in physiological experimentation. A principal function of this paper is to render assistance to investigators who are not specialists in the Porifera but who encounter sponges in connection with their research at Bimini. Thus a key to the 14 commonest local sponges is appended.

KEY TO COMMON BIMINI SPONGES

Red	Soft, almost smooth	Fire sponge	<i>Tedania ignis</i>
Red	Red orange, tough, and extremely rough	Coral sponge	<i>Higginsia coralloides</i>
Orange	Concealed in burrows in CaCO ₃	Boring sponge	<i>Cliona vastifica</i>

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Yellow	Long soft cylinders, somewhat conulose; turns black upon dying	Candle sponge	<i>Verongia fistularis</i>
Green	Soft, sometimes branching	Green sponge	<i>Haliclona viridis</i>
Blue	Soft, conulose	Heavenly sponge	<i>Dysidea etheria</i>
Violet	Hollow tubes, somewhat drab	Tube sponge	<i>Callyspongia vaginalis</i>
Drab	Smooth, slippery, shiny	Chicken-liver sponge	<i>Chondrilla nucula</i>
Brown	Not conulose; little odor; many shades and shapes	Dingy sponge	<i>Anthosigmella varians</i>
Brown	Conulose, conules about 3 mm. apart; little odor; bleeds red after death	Bleeding sponge	<i>Oligoceras hemorrhages</i>
Brown	Conulose, conules about 4 mm. apart; strong, disagreeable odor	Stinker sponge	<i>Ircinia fasciculata</i>
Blackish	Not conulose, large oscules on top; often large size over all	Manjack sponge	<i>Spheciospongia vesparia</i>
Blackish	Conulose; conules about 8 mm. apart; strong, disagreeable odor	Loggerhead sponge	<i>Ircinia strobilina</i>
Blackish	Conulose; conules about 3 mm. apart; moderately bad odor	Reef sponge	<i>Spongia officinalis</i>

East of the Lerner Marine Laboratory lies a semi-enclosed lagoon, nearly 2 kilometers in diameter, much of which is only about 1 meter deep. Turtle grass is abundant over the bottom, and large gastropods ("conchs") are amazingly common. In fact, a wealth of animal life inhabits the area, and a large fraction of all the animals are sponges. All the 14 keyed kinds except *Higginsia* are abundant, the *Spheciospongia* and *Ircinia* species being especially large, and the *Tedania* specimens very conspicuous. In addition to the 14 here occur (much rarer) *Haliclona rubens*, *Haliclona molitba*, *Siphonochalina siphona*, *Xytopsene sigmatum*, and *Axociella spinosa*. I studied this area extensively by wading, collecting by hand.

Much farther east, some 20 kilometers from the Lerner laboratory, the water is in general deeper, but the McAdam Shoal is interesting. Here, in water some 4 meters deep, the commercial

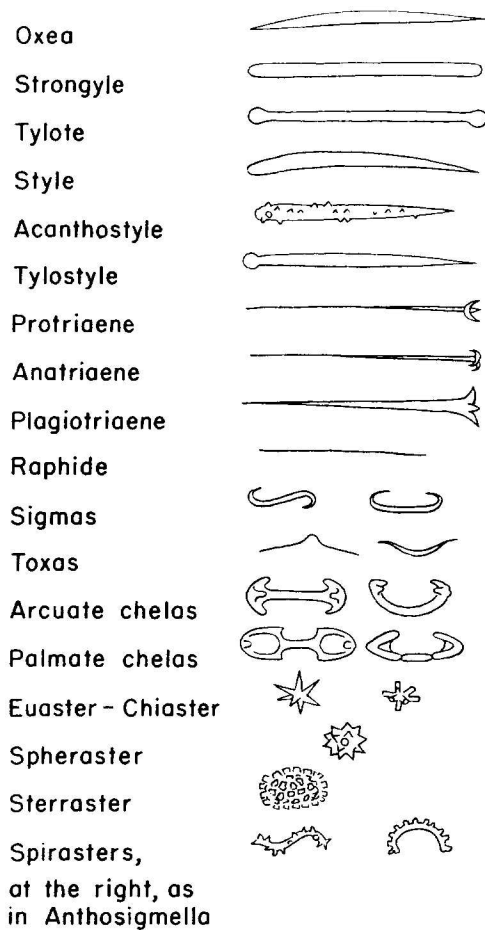


FIG. 1. Spicule types as mentioned in this article.

sponges (*Spongia*) are commonest, *Ircinia* and *Callyspongia* abound, the tubular ones 1 meter high. Here the specimens of *Spheciospongia* are really enormous, up to at least 1.2 meters in diameter, and 1 meter high. This was the only location in which the distinctive and beautiful new species *Ianthella ianthella* was found. I studied this area with the help of a sponge hook, and by dredging.

Except at the east, the Bimini Lagoon is almost enclosed by a series of islands. The southernmost, called South Bimini, is the

largest. South of it, in water about 3 meters deep, sponges are abundant. All the 14 kinds occur, although some are less common than they are inside the lagoon. This locality (off Lovel Creek) was the only one where I found *Higginsia*, and *Cryptotethya*, rare elsewhere, was comparatively common. I studied this area by using the diving helmet, and by dredging.

West of Bimini the Gulf Stream flows, in water that gradually becomes hundreds of meters deep as one goes towards Florida. Here *Spherospongia* and *Anthosigmella* abound, and both kinds of *Calyspongia* are fairly common. There are poor specimens of *Spongia*, and rarely a *Cryptotethya*. Here I found the only Bimini specimens of *Spirastrella*, *Cinachyra*, and *Geodia*. This area was studied, because of its depth, only by dredging, and (indirectly) by walking along shore, collecting macerated specimens cast up in the wrack on shore by the waves. This latter type of study yielded the only 1948 Bimini specimens of *Agelas* and *Cribrochalina*; these are Porifera that certainly occur to the west of the Lerner laboratory.

The sponges of this portion of the Bahamas may be described as follows:

Spongia officinalis* subspecies *obliqua

REEF SPONGE

A.M.N.H. No. 475

This species may also be known as *Spongia obliqua* and was first named (thus) by Duchassaing and Michelotti (1864, p. 38). It is rounded, often of head size, with black exterior but drab or brown interior, and is very spongy. The surface is finely conulose, with conspicuous oscules but minute pores. The ectosome is a tough skin, the interior densely fleshy. The skeleton is a fine network of elastic fibers. Reef sponges are among the less desirable of commercial sponges, but those that were found on McAdam Shoal were exceptionally good quality as reef sponges go.

In late 1939 a contagious disease of sponges swept through the Bahamas, coming from completely unknown sources, perhaps by mutation of some microbe. In early 1940 it spread throughout all the rest of the West Indies and Florida regions. In the Bahamas the survivors have been protected, and therefore have multiplied so that sponges are again becoming fairly common. In Florida the few surviving sponges were sought even more eagerly than before, by the whole sponge-fishing fleet. As a result, commercial

sponges are all but wiped out in the Florida grounds, and in the late summer of 1948, sponge fishing was in complete abeyance.

No scientific record was made as to the relationship of non-commercial sponges to the epidemic. A casual comment was made that non-commercial sponges were unaffected, but it is very likely that the whole background for this remark was that *Spheciospongia* and *Ircinia* species were unaffected. Sponge fishermen tend to ignore virtually all non-commercial sponges except these; specimens of *Spheciospongia* are noticed because of their immense size and abundance, and of *Ircinia* because they look so much like commercial sponges that even a professional must take pains to discriminate between them, especially if the visibility is at all poor.

In July, 1948, I made a reconnaissance of the shallow waters about the Dry Tortugas, Florida. From 1927 to 1936 I found many species of Porifera extremely abundant there. In 1948 the number and size of individuals were as large as ever, but the species were drastically fewer. A few kinds, such as *Spheciospongia*, *Ircinia*, and *Tedania*, had taken over the area. While other factors in the twelve-year gap may have been to blame for the missing species, one does well to suspect the epidemic that killed so many commercial sponges.

Ircinia fasciculata

STINKER SPONGE

A.M.N.H. No. 476

This world-wide, abundant species was first described as *Spongia fasciculata* by Pallas (1766, p. 381). It was transferred to *Hircinia* by Schmidt (1862, p. 34), but *Hircinia* Nardo (1834, p. 714) is a complete synonym of *Ircinia* Nardo (1833, p. 519) and must be discontinued. Article 32 of the International Rules of Zoological Nomenclature says plainly that a generic name, once published, cannot be rejected, even by its author, because of inappropriateness. It has often been customary to call species of *fasciculata* by the later name *variabilis*. It seems clear that the name *variabilis* was applied by Schmidt (1862, p. 34) to sponges of at least two species. Some of them, blue in color, may retain the name *variabilis*. The others, more or less brown, are clearly *fasciculata*. The species is variable in shape, often reaches head size, is brown and very spongy when wet, but stiff and hard when

dry. The surface is finely conulose, with conspicuous dark oscules and small pores. The ectosome is a tough skin, the endosome a dense flesh. The primary skeleton is coarse, with ascending fascicular fibers full of debris, and a few small connectives. There is also the peculiar *Ircinia* skeleton of myriad scattered microscopic filaments.

Ircinia strobilina

A.M.N.H. No. 477

This is called the loggerhead sponge in the Bahamas, but in the Florida region *Spheciospongia* is so denominated. Both are abundant in the West Indian region.

This species was first named *Spongia strobilina* by Lamarck (1816, p. 383) and was transferred to *Hircinia* by Topsent (1933, p. 15). It is here put into *Ircinia* for the same reasons given above for *fasciculata*. It is usually cake shaped, often larger than a pumpkin, black exterior over brown interior (gray if grown in the shade) and is very spongy when wet, but hard and stiff when dry. The surface is very coarsely conulose, with moderately large oscules and pores. The ectosome is a tough dermis, and the interior is fleshy. The skeleton is much like that of *fasciculata* but coarser.

Oligoceras hemorrhages

BLEEDING SPONGE

A.M.N.H. No. 478

This common West Indian sponge was first described by de Laubenfels (1936, p. 16). After it is dead, but not before, it gives off fairly large quantities of a cerise or blood-red exudate. This is not evident in pickled specimens, and is inconspicuous unless the sponge is at least lightly squeezed. This species is of varying massive shapes, often fist size, dull brown, and is softly spongy. The surface is finely conulose, with small oscules and pores. The ectosome is a thin skin, and the endosome is fleshy. The skeleton is a rather large-mesh reticulation of weak fibers that often contain foreign material.

Verongia fistularis

CANDLE SPONGE

A.M.N.H. No. 479

This was first described as *Spongia fistularis* by Pallas (1766, p. 385) and transferred to *Verongia* by Bowerbank (1845, p. 403).

Later authors have put this in the genus *Aplysina*. As originally established by Nardo (1834, p. 714), it had no species, but Schmidt in 1862 (p. 25) used the name *Aplysina aerophoba* for a sponge much like *fistularis*. Many experts have thought that Schmidt should be followed because of Opinion 46 of the International Committee on Zoological Nomenclature that the first species published in connection with the genus becomes *ipso facto* the type, but this opinion also states that the genus contains all the species that come under the generic description as originally published. Schmidt's sponges, with their conspicuous color change, seem too different from Nardo's description to come under it. I judge that Nardo had in mind *Spongia officinalis*, but specimens of poor commercial quality, and therefore have designated British Museum No. 83.12.4.28 as neotype of *Aplysina aerophoba* and of *Aplysina*. This specimen, from Nardo's immediate neighborhood, is *Spongia officinalis* and confirms that *Aplysina* falls in synonymy to *Spongia* Linné (1759, p. 1348).

Verongia fistularis is cylindrical, candle size, yellow and spongy alive, but black, stiff, and brittle when dry. The surface is conulose, with a few small oscules; the pores are microscopic. The ectosome is a thin but definite skin, the endosome densely fleshy. The skeleton is a coarse reticulation of fibers that have a distinct large pith or core. The sponge turns first blue violet, then black, as it dies and dries, or in alcohol.

Dysidea etheria

HEAVENLY SPONGE

A.M.N.H. Nos. 466, 480

This was first described by de Laubenfels (1936, p. 28). It is amorphous, often of fist size, sky blue, and is spongy when alive but fragile when dry. The surface is conulose, and the openings are inconspicuous. The ectosome is a thin dermis, the endosome fleshy. The skeleton is a reticulation of fibers that are loaded with foreign material.

Ianthella ianthella, new species

TYPE MATERIAL: Holotype, A.M.N.H. No. 465, collected July 6, 1948, at McAdam Shoal, 12 kilometers east of the town of Bimini, British West Indies, 5 meters deep. Another specimen is A.M.N.H. No. 481.

DESCRIPTION: The shape is massive. The size of each of four specimens was about that of a human head. Several smaller, fist-sized fragments were found. All the specimens were collected by means of a sponge hook within an area of about an acre. The color in life is a vivid carmine red exterior, with a bright lemon yellow interior. Upon dying it slowly turns black. The consistency in life is firm but somewhat spongy. When dead it becomes stiffer; dried specimens are first like leather, finally almost stony hard. The surface is beset with peculiar conules, 7 mm. apart and 3 to 4 mm. high, but not pointed; instead each has an apical, bulb-like knob. Ridges connect the conules, leaving flattened or even concave polygonal areas between them. The oscules and pores are inconspicuous. The ectosome is a definite dermis, distinctly set off in color as well as in morphology. The endosome is densely fleshy, with small flagellate chambers and comparatively small canals. This flesh is amazingly resistant to bacterial action, even long after death must have ensued. An odor of putrefaction appears within a day after removal from water, but sections of the sponge exhibit remarkably little alteration from the appearance in life. The flesh of *ianthella* has a peculiar cheese-like reaction when it is cut with a knife. The skeleton is a chiefly dendritic conglomeration of fibers which are often a little more than 50 microns in diameter. Each fiber has a central pith, which occupies about one-third of its total diameter, and in this pith are numerous objects that certainly seem to have been living cells at the time that the sponge was collected.

The genus *Ianthella* is sharply characterized by these cells within the hollow fibers; no other genus of Porifera has this trait. Other species of *Ianthella* have the peculiar cheese-like consistency and resistance to bacteria; no sponges in other genera have these traits so pronouncedly developed. The species *ianthella* has a skeleton that is more dendritic than is true of many other specimens of the genus. The type of the genus is *flabelliformis*, and it has a reticulate skeleton. It is possible that all the other species that have been published prior to 1948 are really synonyms of *flabelliformis*; if so, then the genus has two published species, the one chiefly reticulate, the other (from Bimini) chiefly dendritic. The differentiation of the present species depends more upon color than upon skeletal pattern. No other specimens of *Ianthella* have at all the peculiar combination of dark red ectosome with the lemon yellow endosome; *flabelliformis* seems always to have been

yellow throughout when alive, turning black after death. The species *ianthella* is, however, most distinctive of all in regard to the peculiar surface conules, with their knob-like terminations. The specific name *ianthella* is selected because there is considerable reason to expect that a new generic name may need to be found for this remarkable sponge. It is my desire that this species shall still show in its name its relationship to the genus *Ianthella*, even if it must eventually be removed to another genus.

Haliclona rubens

A.M.N.H. No. 487

This was first described as *Spongia rubens* by Pallas (1766, p. 389) and transferred to *Haliclona* by de Laubenfels (1936, p. 40). From 1927 to 1936 I found this species abundant around Tortugas, but in 1948 could not find a single specimen there. The only specimen found in the Bahamas in 1948 was collected while wading at the extreme south end of the Bimini group of islets, in about 1 meter depth. Whereas the typical shape for this species is ramose, the Bahaman specimen is hemispherical, fist size, the typical somewhat dull carmine red, and of spongy consistency. The surface is even, with abundant but minute fiber ends protruding; the oscules are scattered, 2 to 4 mm. in diameter, the pores small and numerous. There is no ectosome, and the endosome is reticulate, somewhat bread-like. The skeleton contains loose spicules and fibers that are densely cored with spicules, all of which latter are small oxeas about 4 by 110 microns in size.

***Haliclona molitba*, new species**

The Bimini specimen, A.M.N.H. No. 486, was found growing on eel grass in the lagoon east of the Lerner Marine Laboratory June 30, 1948. I found this species to be common in the Bermudas in the summer of 1947.

HOLOTYPE: Here designated as No. 1948.8.6.15, British Museum.

TYPE LOCALITY: Near Flatts, Bermuda, collected August 7, 1947.

DESCRIPTION: This species is amorphous, usually finger sized or smaller, vivid purple or violet, and very softly spongy, extremely compressible. It is superficially smooth, but somewhat punctiform, with oscules up to 1 mm. in diameter, and pores so large as

to be easily confused with the oscules; they are very numerous. There is no ectosome, and the endosome is chiefly a conspicuous fibroreticulation with scattered bits of flesh on it. The primary fibers are 30 microns in diameter, the secondary fibers are only about half as large, and the meshes are quite irregular in outline. All the fibers are lumpy and contain spicules, although short regions in them may be aspiculous; at the most there are about three spicules per cross section of fiber. Remarkably few spicules occur loose in the flesh; nearly all are embedded. The spicules are simple oxeas about 2 by 100 microns.

The species *molitba* is set off from others of the large genus *Haliclona* by its high ratio of spongin to spicule in the very elastic fibers. It is probably closest to *Haliclona palmata*, originally described as *Spongia palmata* by Ellis and Solander (1786, p. 189), but *palmata* is yellow, where *molitba* is violet, and *palmata* has numerous spicules that are not in the fibers. The name *molitba* is altered from a Bermudan designation, and has no translation from Latin or Greek.

Haliclona viridis

GREEN SPONGE

A.M.N.H. No. 488

First described as *Amphimédon viridis* by Duchassaing and Michelotti (1864, p. 81) and transferred to *Haliclona* by de Laubenfels (1936, p. 42). This abundant sponge is often amorphous, but under favorable conditions may become ramose, with branches up to 15 cm. tall. It is green when alive, but fades upon preservation, and its consistency is soft, weakly spongy. Its surface is much like that of *Haliclona rubens*. There is no ectosome, and the endosome is reticulate, with fibers up to 100 microns in diameter. There are many spicules in the fibers and many outside them as well; these are oxeas about 6 by 150 microns.

***Haliclona longleyi*¹**

A.M.N.H. No. 489

This sponge was found in the western Bahamas in 1948 only

¹ The species *longleyi* probably will not remain permanently in the genus *Haliclona*. When this genus is later revised, we must erect a new genus, *Neopetrosia*, to have *longleyi* as genotype, differing from *Haliclona* by having a smoother surface, more brittle consistency, and other more important differences which we are not yet ready to discuss.

as a macerated specimen, cast up on the beach just west of the Lerner Marine Laboratory. It is ramose, of thick finger size, bleached nearly white (but dull yellow green in life) and is brittle, nearly as hard as cardboard. The surface is smooth, somewhat velvet-like, with conspicuous oscules and abundant small pores. There is no ectosome, and the endosome is a reticulation of tracts that are packed with spicules. The latter are oxeas about 3 by 120 microns in size.

Cribrochalina infundibula

A.M.N.H. No. 490

This sponge was first described by Schmidt (1870, p. 36) from the West Indies, with the spelling *infundibulum*, but agreement in gender of the adjective species name with the feminine noun genus name requires the spelling *infundibula*. The only specimen found in the western Bahamas in 1948 was a macerated specimen cast up on the beach just west of the Lerner Marine Laboratory. It is a vase or funnel, almost liter-capacity size, bleached nearly white, and is somewhat spongy in consistency. The surface is rough, and there is no ectosome. The endosome is fibroreticulate, and the fibers are cored with many rows of small oxeas. The funnel shape serves to distinguish *Cribrochalina* from its close relative *Haliclona*.

Siphonochalina siphona, new species

TYPE MATERIAL: Holotype, A.M.N.H. No. 468, collected July 1, 1948, in the lagoon east of the Lerner Marine Laboratory, at a depth of somewhat less than 1 meter. Another specimen is A.M.N.H. No. 483. There was in one place a bed of hundreds of specimens of this sort, and others were widely scattered over many acres but difficult to find.

DESCRIPTION: This sponge has the form of hollow cylinders or tubes about 1 cm. in outside diameter, walls about 1 mm. thick, total height often about 5 cm. The basal mass from which the tubes arise is regularly buried beneath the sand, and its total size was never satisfactorily ascertained. It is common for masses of tubes to rise so crowded that they almost touch, and indeed they sometimes not only do touch but fuse laterally at the point of contact. The color is a dull yellow brown, and the consistency is toughly spongy. The surface is relatively smooth. The oscules

may or may not be represented by the apical openings, usually 8 mm. in diameter, of the tubes. All other openings, pores or oscules, are abundant but minute. There is no special ectosome at all, and the endosome is filled with a dense, fine-meshed reticulation of fibers. These consist of a spongin which has much of the same appearance and consistency as the spongin of the commercial sponges, but each fiber is packed with spicules. The fiber diameter is often about 20 microns. The rounded meshes are often only 50 microns in diameter. There is no sharp differentiation of primary fibers, so that one might regard all the fibers as secondary, which is the situation that obtains in the genus *Hippiospongia*. The spicules are simple oxeas, often curved, 2 by 135 microns in size.

The generic allocation of *siphona* is extremely perplexing. The resemblance of the spongin to that found in species within the Order Keratosa renders difficult even the selection of the correct order. Within the Keratosa many fibers become packed with spicules that were picked up from the environment rather than produced by the sponge in which they are found. There is no guarantee that the spicules in the fibers of *siphona* are proper; they too may be foreign, but the universality of their occurrence renders it probable that they are proper. Even assuming this, other problems remain.

The genus name *Siphonochalina* must be employed with great hesitation. It was set up by Schmidt (1868, p. 7) with a diagnosis that obviously includes the present species: pronounced tubular shape and fibers cored with simple oxeas. This combination of characters is also extremely typical of many species of the genus *Callyspongia*. This latter genus is further set off by its possession, whether tubular or solid, of a special dermal skeleton, a fine-meshed network within coarser fibroreticulate structures. Certainly very numerous specimens that have been identified as of the genus *Siphonochalina* are really *Callyspongia*. The critical matter concerns Schmidt's type; which sort of sponge was it? His description gives no clue, and so far as I can ascertain he left no specimen designated as type. Topsent (1925, p. 713) redescribed some specimens identified by Schmidt as *Siphonochalina coriacea* (which is the genotype), but Topsent also neglects to describe the ectosome. If this means that there was no ectosome, then the genus is suitable to receive this Bahaman species.

The species *siphona* differs from *coriacea* in spicule size, inas-

much as the latter's oxeas are described as 5 by 105 microns (by Topsent); *coriacea* is Mediterranean. Further comparisons seem hopeless at present. There are a score of names in the genus, but each of them may be a *Callyspongia* and most of them probably belong to *Callyspongia*. I have studied in the field the sponge faunas of quite a few regions of the world, and—for example in the British Museum—have studied collections from many more regions. When I have studied regions where supposed species of *Siphonochalina* have been reported, I have found many *Callyspongia* but nothing like *siphona*, confirming my suspicion that there are few or no names which properly should remain in *Siphonochalina*. The species *siphona* appears to me to be radically different from any other sponge that I have ever seen, and it is conceivable that a new genus may yet need to be erected to receive it.

Callyspongia fallax

A.M.N.H. No. 485

This sponge was first described by Duchassaing and Michelott (1864, p. 57). It is a branching or ramose sponge; its relatively solid cylinders are about 2 cm. in diameter, but irregular in size and in shape of cross section, as well as crooked. The branches are often about 10 to 20 cm. tall. The color is a pale violet in life and health, but drab specimens occur, possibly pathological; this species turns drab upon dying. The consistency is very spongy. The surface is smooth, with scattered small oscules and abundant minute pores. The ectosome includes a network of spongin fibers about half the size of the fibers of the endosome, in a single sheet over the entire surface, its meshes between a fifth and a half as large as the meshes of the endosomal skeleton. The endosome is a three-dimensional reticulation of strong spongin fibers with rather scanty protoplasmic structures dispersed throughout. The skeleton also includes minute oxeote spicules, chiefly embedded in the fibers.

Other ramose or branched, bush-like sponges of a similar lavender color occur in the West Indian region, especially *Haliclona variabilis*; also the somewhat richer colored *Haliclona molitba* must be kept in mind in this connection.

From all these others, if they do now or in the future should ever occur in the vicinity of the Leiner Marine Laboratory, one may discriminate by study of the surface layer. Members of the genus

Callyspongia do have the fine dermal fiber net, or small-meshed net inside the meshes of the coarser net. Members of the genus *Haliclona* have no special ectosome at all.

There is some possibility that *fallax* may be conspecific with the following species, *vaginalis*; if so, it would fall in synonymy, because the name *vaginalis* is earlier. It is here, however, still maintained (although with hesitation) that the solid specimens of *Callyspongia* are specifically distinct from the hollow ones.

Callyspongia vaginalis

TUBE SPONGE

A.M.N.H. No. 484

This species was first described as *Spongia vaginalis* by Lamarck (1814a, p. 436) and transferred to *Callyspongia* by de Laubenfels (1936, p. 56).

Rarely this sponge comprises a single hollow cylinder or narrow vase, but usually one finds six or more such tubes rising from a single small base. They are fairly often in a single plane, but radiate a little like a fan. Where two tubes touch laterally they often coalesce. The tubes are usually about 5 cm. in outside diameter, with walls 5 to 10 mm. thick. The color in health is violet; dead specimens fade to drab, and all or portions are frequently found in the field to be drab. These may be pathological or already moribund; the skeleton is so durable that it persists after death and disintegration of its protoplasmic precursor. The consistency is very spongy. The surface is smooth, or, more often, it is even but elevated into coarse, cone-shaped protrusions. These should not be confused with the conules of keratose sponges. For the latter, the skin is lifted over protruding fiber ends. For *Callyspongia* the entire sponge structure grows out into the large conular elevation.

The oscules may be regarded as being the huge apical openings of the central hollows, or instead may be regarded as being the many openings, about 4 mm. in diameter, from the walls into the central cavity or cloaca. The pores are the myriad minute openings in the external surface network.

The ectosome is a fine net within the meshes of a coarse fiber reticulation, as described above for the species *fallax*. The endosome and spicules are also as in *fallax*.

Agelas sparsus

A.M.N.H. No. 482

This was first described as *Ectyon sparsus* by Gray (1867, p. 515) and transferred to *Agelas* by de Laubenfels (1936, p. 74). The only specimen found in the western Bahamas in 1948 was a macerated specimen cast up on the beach just west of the Lerner Marine Laboratory. Dried, macerated specimens of *sparsus* look amazingly like similarly prepared sponges of the commercial varieties, are massive to amorphous, often double fist size, drab, and very spongy. The surface is undulating, full of many small apertures. The ectosome is a sort of skin, and the endosome a dense fibroreticulation. The spicules are acanthostyles of a distinctive sort, with the spines arranged in a series of nodes. All or nearly all of these spicules protrude from the abundant spongin fibers, only the head of the spicule being embedded in the fiber.

Xytopsene sigmatum, new species

TYPE MATERIAL: Holotype, A.M.N.H. No. 469, collected July 1, 1948, in the lagoon east of the Lerner Marine Laboratory, at a depth of about 50 cm. It is also represented by A.M.N.H. No. 491.

This species was found growing in sand where there was no eel-grass close by and seemed to be rather common in the southern portion of the lagoon, but was difficult to find. Only the bright orange tips (with the oscules) would show above the level of the sand, all the rest being buried. Actually the main mass of the sponge is firmly attached to rock. It is not known if the partial covering by sand is to be expected, or if it is merely accidental.

DESCRIPTION: The species *sigmatum* is amorphous to massive with the conical elevations several centimeters high, the whole mass about fist size. The color is bright golden orange and the consistency softly spongy. Upon handling or dying, great quantities of colloidal exudate are given off. The oscules are about 4 mm. in diameter (but contractile); the pores are minute and abundant. There is a slight skin-like dermis. The endosome is chiefly in confusion, but there are some spicule-packed tracts scarcely to be called fibers, and the deeper portions of the sponge contain considerable quantities of sand and other foreign material. The spicules consist of megascleres and microscleres. Of the former there seems to be but one sort, a tylote with each end about

equally enlarged and rounded. The size is often 4 by 220 microns, but may reach 340 microns in length. The microscleres comprise two sizes of sigmas, the larger 60 microns in chord measurement, the smaller ones 15 microns in chord measurement. There are also chelas, 20 microns long, probably to be regarded as arcuate, but verging towards the palmate in shape.

The species *sigmatum* is the only one so far described and located in this genus that has sigmas. The other three species are all found in the Indian Ocean, and Australian region, and have larger megascleres, but very similar shape. All three are more or less pinkish or red rather than yellow.

Axociella spinosa

A.M.N.H. No. 492

This species was first described as *Microciona spinosa* by Wilson (1902, p. 396) from Puerto Rico. It was transferred to *Axociella* by de Laubenfels (1936, p. 113). Only one specimen of this sponge was certainly collected in the western Bahamas in 1948, on July 3, in the lagoon east of the Lerner Marine Laboratory, at a depth of about 1.5 meters. It was a thin crust on another sponge. On the same day a crab was collected, having a very thin red crust on its shell, and it may be that this crust was a second specimen of *spinosa*, but the material was too scanty for sure identification.

The present species is encrusting, almost paper thin, red, and of mediocre consistency. Its surface is minutely spiny, with only extremely minute openings. It is so thin that one can scarcely differentiate ectosome from endosome or vice versa. The skeleton comprises smooth subtylostyles (7 by 240 microns) for megascleres, with toxas (60 microns) and palmate isochelas (15 microns) for microscleres. In Wilson's specimen, some of the styles were more than twice as thick as those in the Bimini specimen, but many were about as thin, and in other respects the agreement is quite close.

Tedania ignis

FIRE SPONGE

A.M.N.H. No. 493

This species was first described as *Thalysias ignis* by Duchassaing and Michelotti (1864, p. 83) and transferred to *Tedania* by

Verrill (1907, p. 339). It is superabundant through the West Indies and notorious for the skin irritation that many people obtain whenever they touch it. This dermatitis is evidently of chemical origin and may be compared to the effects of poison ivy (*Rhus toxicodendron*).

The shape is amorphous to massive, often fist size but occasionally even head size, bright red externally, but somewhat paler and duller inside, soft and easily torn. The surface is smooth. The oscules are often over 1 cm. in diameter and characteristically are raised on conical elevations several centimeters high. The pores are noticeable and abundant. The ectosome is a denser flesh than the endosome and is packed with special spicules. The endosome is rather like a crumb of bread with only vague spicular tracts. The dermal megascleres are tylotes about 4 by 185 microns, heads microspined. The endosomal spicules are smooth styles about 6 by 215 microns. The microscleres are microspined raphides, 1 micron or less in thickness, and up to about 135 microns long.

Pseudaxinella rosacea

A.M.N.H. No. 494

This species was first described as *Axinella rosacea* by Verrill (1907, p. 341). It is common in the Bermudas, but only two specimens were found in the western Bahamas in the summer of 1948. It is massive. The two Bimini specimens were cylindrical, but this form seems never to occur in Bermuda. They were of large finger size, red to orange red, and spongy. The surface is coarsely roughened, and each protrusion is in turn covered with yet smaller protrusions. The oscules and pores occur in the valleys between the elaborate and abundant protrusions. There is no special ectosome, and the interior is a rather confused mass of spicules, with some spongin fibers. The protoplasmic structures very readily come off the skeleton when the sponge is dead. There are two sorts of spicules, oxeas and styles, each about 5 by 150 microns, but with considerable variation.

Higginsia coralloides

A.M.N.H. Nos. 470, 495

This species was first described by Higgin in 1877 (p. 291) and seems to be a very widely distributed sponge, even occurring in

the Eastern Hemisphere. In the western Bahamas it seems to be most abundant at depths of more than 3 meters, especially south and east of Bimini. I collected it July 3, 1948, while using the diving helmet. It is ramose, with branches 2 to 3 cm. thick and up to 20 cm. high; bright red orange in color and toughly spongy in consistency. The surface is compound roughened, as in the preceding species, with protrusions 2 to 5 mm. high that are in turn covered by smaller protrusions. The oscules and pores are in the valleys between the protrusions and are very inconspicuous. There is no special ectosome. The endosome is plumose, with an axial skeleton that is surrounded by radiating, plumose tracts or fibers. The skeleton comprises both spongin fibers and abundant spicules, many of which echinate the fibers or are at surface brushes or tufts. The megascleres are medium sized, say 16 by 360 microns, and include both styles and oxeas. The microscleres are rather strongly spined raphides, about 2 by 80 to (rarely) 3 by 150 microns in measurement.

Spheciospongia vesparia

MANJACK SPONGE

This was first described as *Alcyonium vesparium* by Lamarck (1814b, p. 78) and was transferred to *Spheciospongia* by Marshall (1892, p. 32). This abundant West Indian sponge grows to a larger size than does any other sponge in the world. East of Bimini, especially near McAdam Shoal, specimens were observed to be well over a meter in diameter, great, massive, cake-shaped sponges, dark brown or black, and cork-like or woody in consistency. The surface is rather smooth, not at all conulose. The oscules are chiefly on the top, and very large, even as much as 7 cm. in diameter. There are clusters of holes on the sides of the sponge. Each cluster is a sieve over a large canal that is a little more than a centimeter in diameter, the sieve comprising a dozen or more holes, each about 2 mm. in diameter. It is not clear whether these sieve-covered canals are inhalent or exhalent, probably the former. There are many minute, pore-like surface openings in addition to the larger ones. The ectosome is a dense cortex about 3 mm. thick. The endosome is coarsely cavernous, with huge canals, 10 to 40 cm. long and often nearly 3 cm. in diameter. There are spicule-packed tracts some 2 or 3 mm. in diameter, but most of the spicules are just packed densely throughout

the flesh. The megascleres are tylostyles 9 to 10 microns in diameter, 400 to (rarely) 600 microns long; 10 by 450 is a common size. The microscleres are rare and difficult to find, often occurring only at the extreme surface; they are spirasters some 12 to 15 microns long.

Juvenile specimens of *Sphaciospongia* are sometimes little more than black, finger-sized hollow cylinders. Others are thumb-like, sieve covered, and dark brown.

Spirastrella coccinea

A.M.N.H. No. 498

This was first described as *Thalysias coccinea* by Duchassaing and Michelotti (1864, p. 84). It is an encrusting sponge, often paper thin but spreading indefinitely laterally. It is red to reddish brown in color and of mediocre consistency. It is smooth, with only very minute oscules and pores. The ectosome is packed with the microscleres; the endosome contains some microscleres, but chiefly megascleres in confusion. The latter are tylostyles about 6 by 360 microns. The microscleres are spirasters 2 by 12 to 4 by 20 microns in size.

Most of the common, thin, red orange, or red brown encrusting sponges around Bimini seem to belong to *Spirastrella*, but some other genera do occur, such as *Axociella*, and look very much like *Spirastrella*.

Anthosigmella varians

DINGY SPONGE

A.M.N.H. No. 499

This species was first described as *Thalysias varians* by Duchassaing and Michelotti (1864, p. 86) and was transferred to *Anthosigmella* by de Laubenfels (1936, p. 143). It is extremely abundant in the vicinity of the Lerner Marine Laboratory. It has quite a variety of shapes, sometimes elongate and cylindrical, again merely massive or amorphous. Some specimens are nearly as large as a human head, but fist or finger-sized specimens are more common. The color is a dingy brown, varying from dirty dark yellow to walnut brown. The consistency is mediocre, or perhaps to be compared to that of cheese. The oscules and pores are very small. The ectosome is denser than the endosome and is packed with spicules whose points are often directed towards the

surface. The endosome is moderately cavernous, the solid portions being packed with megascleres in confusion. These spicules are tylostyles about 6 by 360 microns; rarely they are styles or centrotylote styles. The microscleres are very distinctive. They are essentially spirasters with blunt, knob-like protrusions instead of the usual sharp spines. They have usually only one C-shaped curve but sometimes a more normally twisted spiral shape. In most spirasters the spines form a spiral that twists around the axial rod, or are so numerous that they cover it. In *varians* they usually make a simple row that does not wind around the axial rod. Typically they are arranged only along the convex side of the spicule. In Florida I have found specimens of *varians* in which about half the microscleres seemed to be nearly like normal spirasters, but the exact figure is problematical because the typical, peculiar *varians* microscelere looks rather like a formal spiraster when it is viewed from the convex side. In the vicinity of the Lerner Marine Laboratory nearly all the specimens had almost exclusively the typical *varians* microscleres.

Cliona vastifica

BORING SPONGE

A.M.N.H. Nos. 472, 497

This species was first described by Hancock (1849, p. 343). It is widely distributed throughout the world, although in most of the Americas it is greatly outnumbered by *Cliona celata* and other species. At Bimini the only boring sponge seems to be *vastifica*. Its galleries or tunnels are about 0.8 mm. in diameter, and often so abundant that they are only 3 mm. apart, center to center. Unlike *celata*, *vastifica* seems never to grow on up out of the calcareous material in which it bores; *celata* often makes huge head-sized masses. The color of *vastifica* is orange rather than yellow; of course the consistency is obscured by the boring habitus. The surface, the oscules, and the pores are all minute structures at the openings to the galleries. There is, for the same reason, no sharp distinction between ectosome and endosome. The spicules are tylostyles 2 by 220 to (commonly) 4 by 300 microns. The microscleres are of two sorts, long, thin, microspined raphides and short, more heavily spined microxeas, say 10 to 20 microns long.

***Cryptotethya crypta*, new species**

TYPE MATERIAL: Holotype, A.M.N.H. No. 473, collected July

3, 1948. Numerous other specimens were collected in June and July, both east and west of Bimini, including A.M.N.H. No. 500.

That this species has not previously been found in spite of its relative abundance may be owing to its tendency to grow almost or quite buried. We used a dredge that bit into the bottom in 1948. In places where the dredge readily brought up specimens, none could be seen with the water-glass nor when walking over the bottom using a diving helmet.

DESCRIPTION: This is an amorphous sponge, often of fist size, or slabs 4 by 7 by 12 cm. The color is blackish green to drab. The consistency is wood-like. The surface is given over to low convex areas, somewhat suggestive of the surface of *Tethya*, which is interesting inasmuch as the megascleres are so much like those of *Tethya*. The pores and oscules are minute, yielding the so-called lipostomous condition. This would be an expected concomitant of successful growth under sand, because sand would occlude larger openings. The surface over the lumps is smooth, even slippery, and glossy. There is a fibrous cortex or ectosome, but so vague that its thickness, perhaps about 1 mm., is difficult to measure. The endosome contains some foreign matter, such as sand grains, and ascending tracts that are densely packed with spicules. There is one such tract for each dermal convexity; the tract diameter is over 1 mm., and their distance apart is about 5 mm. The megascleres are strongyloxeas as in *Tethya*, about 20 by 900 microns. There are two sorts of microscelere: abundant chiasters about 15 microns in diameter, and less common larger asters about 40 microns in diameter. These latter have only a few rays, say 7 to 14, and most of these rays are just barely but definitely branched at their distal ends.

In 1936 (p. 161) I put *Cryptotethya* in the family Jaspidae. The present specimen seems enough like *Tethya* for one to think it belongs in the family Tethyidae. It is more like *Tethya* than are the other two species of the genus, both of which are instead more like *Jaspis*, with definite oxeas instead of strongyloxeas. Furthermore they had only the chiasters; it may well be that a new genus should be erected for this Bimini sponge.

Cinachyra cavernosa

A.M.N.H. No. 501

This species was first described as *Tethya cavernosa* by Lamarck

(1814b, p. 70) and was transferred to *Cinachyra* by Topsent (1931, p. 5). In 1948 I found this only to the west of Bimini at 5 to 10 meters. It is massive to subspherical, often of fist size, bright golden yellow or orange, and cartilaginous in consistency. Its surface is strongly hispid, with large concavities, often large enough to contain grains of rice or even small beans. Many of these have proved to be porocalyces, that is to say, inhalent chambers from which many pores open. Most or all of the oscules are quite small. The ectosome is a fibrous cortex, the endosome radiate, spicule packed, and dense. The spicules are chiefly enormous oxeas, but a few slender protriaenes and anatriaenes occur. The microscleres are microspined sigmaspires, about 15 to 20 microns long.

Geodia gibberosa

A.M.N.H. No. 502

This species was first described by Lamarck (1815, p. 334). In 1948 I found this species only to the west of Bimini, at 5 to 10 meters depth. Like *Cinachyra* it may occur in shallow water. It is massive to subspherical, often of fist size, occasionally larger. It is fundamentally white, but usually soiled by its environment. It is stony hard. The surface is rather smooth, with little clusters of pinprick-sized holes. Some of these may be inhalent, others exhalent. The ectosome is a hard armor, made of billions of siliceous sterrasters held together by tough fibers. It is not thought that these fibers should be called spongin. The endosome is semi-radiate, much confused. The megascleres are giant oxeas and orthotriaenes of the same size range (diameters 30 or more microns, lengths several millimeters). The dermal sterrasters are about 50 microns in diameter; the endosomal spicules include juvenile sterrasters, a few oxyeuasters about 30 microns in diameter, and many spherasters only 2 to 5 microns in diameter.

Chondrilla nucula

CHICKEN-LIVER SPONGE

A.M.N.H. Nos. 474, 503

This was first described by Schmidt (1862, p. 39). It is extremely abundant, not only at Bimini but also throughout the West Indies, particularly in very shallow water. It is subspherical to amorphous; large specimens seem encrusting because they grow

far laterally. The thickness is usually about 5 cm., but the width may be many times as great. The color is always dull, varying from pale drab to dark. The consistency is cartilaginous. The surface is slippery, shiny smooth. The oscules are several centimeters apart, may open to 2 mm. but close readily and then can scarcely be found. The ectosome is a dense cortex; the endosome is sharply defined but nearly as dense. The skeleton is chiefly a colloidal gel, but microscleres are present. These are spherasters about 30 to 40 microns in diameter.

There is a Mediterranean sponge named *Chondrosia reniformis* by Nardo (1847, p. 23). It may be that this is merely a *nomen nudum* in Nardo, in which case credit should be given to the first recognizable description, which is Schmidt (1862, p. 40). This species is like *Chondrilla nucula* except that it has been said to have no spicules at all. Now we must throw its nature open to question.

In 1948 near the Lerner Marine Laboratory I found specimens of this sort in which spicules were so rare that at first I could not find any. Sections studied under the microscope revealed none. The usual technique in searching for spicules is to boil out a small fragment with fuming nitric acid and examine the debris. I did this and there were no spicules. Then it so happened that Prof. Werner Bergmann boiled out a larger quantity of this sponge, which I had considered to be a *Chondrosia*. From about a cubic centimeter of sponge he obtained a suspension, which was centrifuged, and in the precipitate there were literally hundreds of *Chondrilla*-type spherasters.

Are *nucula* and *reniformis* congeneric or even conspecific? What would one find by similar wholesale study of Mediterranean specimens of certainly *reniformis*? If the two are congeneric, the name *Chondrilla* must fall to the earlier *Chondrosia*. It may be that both names may be retained, on the slender margin of separation that in *Chondrilla* the spicules are abundant, and in *Chondrosia* they are very rare. On this basis we would have *Chondrosia reniformis* in the western Bahamas, the thirtieth species collected in 1948.

BIBLIOGRAPHY

BOWERBANK, J. S.

1845. Observations on the Spongiadae. Ann. Mag. Nat. Hist., vol. 16, pp. 400-410.

DUCHASSAING DE FONBRESSIN, P., AND G. MICHELOTTI

1864. Spongiaires de la Mer Caraïbe. Haarlem Natuurk. Verh. Mij., vol. 21, pp. 1-124.

ELLIS, J.

1786. The natural history of many curious and uncommon zoophytes. . . . described by the late Daniel Solander. London, pp. 1-206.

HANCOCK, A.

1849. On the excavating powers of certain sponges belonging to the genus *Cliona*. Ann. Mag., London, ser. 2, vol. 3, pp. 321-348.

HIGGIN, T.

1877. Description of some sponges obtained during a cruise of the steam yacht "Argo" in the Caribbean and neighboring seas. Ann. Mag. Nat. Hist., ser. 4, vol. 14, pp. 291-299.

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

- 1814a. Sur les polypiers empâtés. Ann. du Mus., Paris, vol. 20, pp. 370-386, 432-458.
1814b. Suite des polypiers empâtés. Mem. du Mus., Paris, vol. 1, pp. 69-80.
1815. Suite des polypiers empâtés. *Ibid.*, vol. 1, pp. 162-168, 331-340.
1816. Histoire naturelle des animaux sans vertèbres. *Ibid.*, vol. 2, pp. 1-568.

LAUBENFELS, M. W. DE

1932. Physiology and morphology of Porifera. Carnegie Inst. Washington Publ., no. 435, pp. 37-66.
1936. A discussion of the sponge fauna of the Dry Tortugas in particular, and the West Indies in general, with material for a revision of the families and orders of the Porifera. *Ibid.*, no. 467, pp. 1-225.

LINNÉ, C. VON

1759. Systema naturae. Stockholm, Laurentii Salvii, vol. 2, Vegetabilia.

MARSHALL, W.

1892. Spongiologische Beiträge. Festschrift 70, Wiederk. Geb. Leuckart, pp. 1-36.

NARDO, G. D.

1834. De spongiis. Isis, coll. 714-716.
1847. Osservazioni anatomiche sopra l'animale marino detto volgarmente. Rogone di mare, Atti Istituto Veneto, vol. 6, pp. 267-268.

PALLAS, P. S.

1766. Elenchus zoophytorum. The Hague, Comitum apud Petrum va Cleef, pp. 1-451.

SCHMIDT, O.

1862. Die Spongien des adriatischen Meeres. Leipzig, pp. 1-88.
1868. Die Spongien der Kueste von Algier. Leipzig, Engelmann, pp. 1-44.
1870. Grundzuege einer Spongien Fauna des atlantischen Gebietes. Leipzig, pp. 1-88.

TOPSENT, E.

1925. Étude de spongiaires du Golfe de Naples. Arch. Zool. Paris, vol. 63, pp. 623-725.
1931. Eponges de Lamarck conservées au Muséum de Paris. [Part 1.] Arch. du Mus., Paris, ser. 6, vol. 5, pp. 1-56.
1933. [The same. Part 3.] *Ibid.*, ser. 6, vol. 10, pp. 1-60.

VERRILL, A. E.

1907. Porifera of the Bermuda Islands. Trans. Acad. Arts. Sci. Connecticut, vol. 12, pp. 330-344.

WILSON, H. V.

1902. The sponges collected in Porto Rico in 1899 by the U. S. Fish Comm. Steamer "Fish Hawk." Bull. U. S. Fish Comm., Washington, 1900, vol. 20, pt. 2, pp. 375-411.