FOUR NEW SPECIES OF MEDITERRANEAN DEMOSPONGIAE AND NEW DATA ON *CALLITES LACAZII* SCHMIDT.

by

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Résumé

Cinq espèces de Demosponges, provenant des eaux superficielles de la côte méditeranéenne d'Israël, sont décrites. Parmi elles, quatre espèces nouvelles : *Didiscus styliferus, Hymerhabdia pori, Hymerhabdia reichi* et *Mycale sanguinea.* L'Eponge aberrante, *Callites lacazii* O. Schmidt, a été redécouverte dans les grottes sous-marines obscures et de nouvelles données sont exposées concernant sa structure et son habitat.

A recent survey of shallow water (0-7 meters) porifera along the Mediterranean coast of Israel, has yielded several new species of sponges and also the aberrant sponge, *Callites lacazii* Schmidt, 1868, which has been encountered anew. The sponges were collected in the course of underwater diving (with the use of SCUBA) from 10 stations along the coast of Israel.

The area surveyed extended from Yavne-Yam (15 km south of Tel-Aviv) to Rosh Haniqra (on the border with Lebanon). The colors of the sponges were recorded immediately upon their withdrawal from the water, in accordance with the color-identification plates in Munsell's Book of Color (Pocket Edition).

Type material for the new species described herewith has been placed in the Collection of Invertebrates of the Zoology Department of the Hebrew University, Jerusalem.

Following is a description of the species.

DIDISCUS STYLIFERUS n. sp.

D. placospongioides s. sp. *styliferus* - Tsurnamal 1968

Thin incrustations (0.5-2.5 mm) which may cover a considerable area (2-37 cm^2) of the substrate. The color is yellow to ocherous

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yellow (2.5 Y 8/4 - 2.5 Y 6.5/8) or a light yellow (10 YR 6/5) and, in many instances - as brown patches scattered over a yellow background. The sponge is more or less smooth but bears narrow, angular ridges which divide its surface into irregular, polygonal sections. These ridges are, for the most part, narrow and low and therefore not easily discernible. Under magnification, however, each ridge is seen to constitute raised rims of a narrow canal, 0.1-0.3 mm deep. The elevated rims overhang and actually cover the canals, into which apparently open the ostia and oscules. Apart from these openings in the covered canals, no other openings are discernible on the surface of the sponge.

Spiculation (Fig. 1, 1-8).

a) Oxeas arched and pointed, arranged mostly in multispicular bundles. Frequently, the oxeas manifest a single swelling at or near the middle ("centrotylote oxeas"). The width of swelling 9-13 μ. In many cases, the oxeas may show two such swellings, either contiguous (Fig. 1, 6) or slightly apart. In *Didiscus styliferus,* the oxeas comprise the main part of the skeleton (dimensions: 120-310×4.5-11 μ).

b) Styles are very long, mostly somewhat curved or bent, rarely straight (660-1320×4-13 μ). Part of the styles is arranged tangentially underneath the surface of the sponge, while the remaining styles are grouped together with the oxeas in bundles which are scattered throughout the body of the sponge. Short styles (150-220 μ) are rare.

c) Tylostyles smooth, robust and relatively short (180-240×9-13 μ). The thickening at the base is not always terminal and occasionally may be multiple (Fig. 1, 4).

d) Strongyles arched, robust and smooth. They are rare in the majority of microscopic preparations and entirely absent in some (92-264×6.7-11 μ).

e) Discorhabdes at times straight and at times slightly curved. They are mostly hispid, their surfaces adorned with numerous short spines. Each spicule bears two differently-sized discs (Fig. 1, 7-8), the smaller of which is closer to the one end of the spicule. The tips of the discorhabdes are mostly blunt, but there are some with pointed tips, similar to the ones described by Dendy (1921) for the species *Didiscus placospongioides.* The discorhabdes are 40-86 μ long and 2.2-5 μ wide; width of the large disc is 10-13 μ and of the small - 6-9 μ.

Discussion.

In surface structure and in general organization of the skeleton, *D. styliferus* very closely resembles *Didiscus placospongioides* Dendy. It differs from the latter species, however, in its encrusting growth form and in some details of the spiculation. Thus, instead of the large oxeas (up to 1400 μ long) described by Dendy (1921, p. 135),

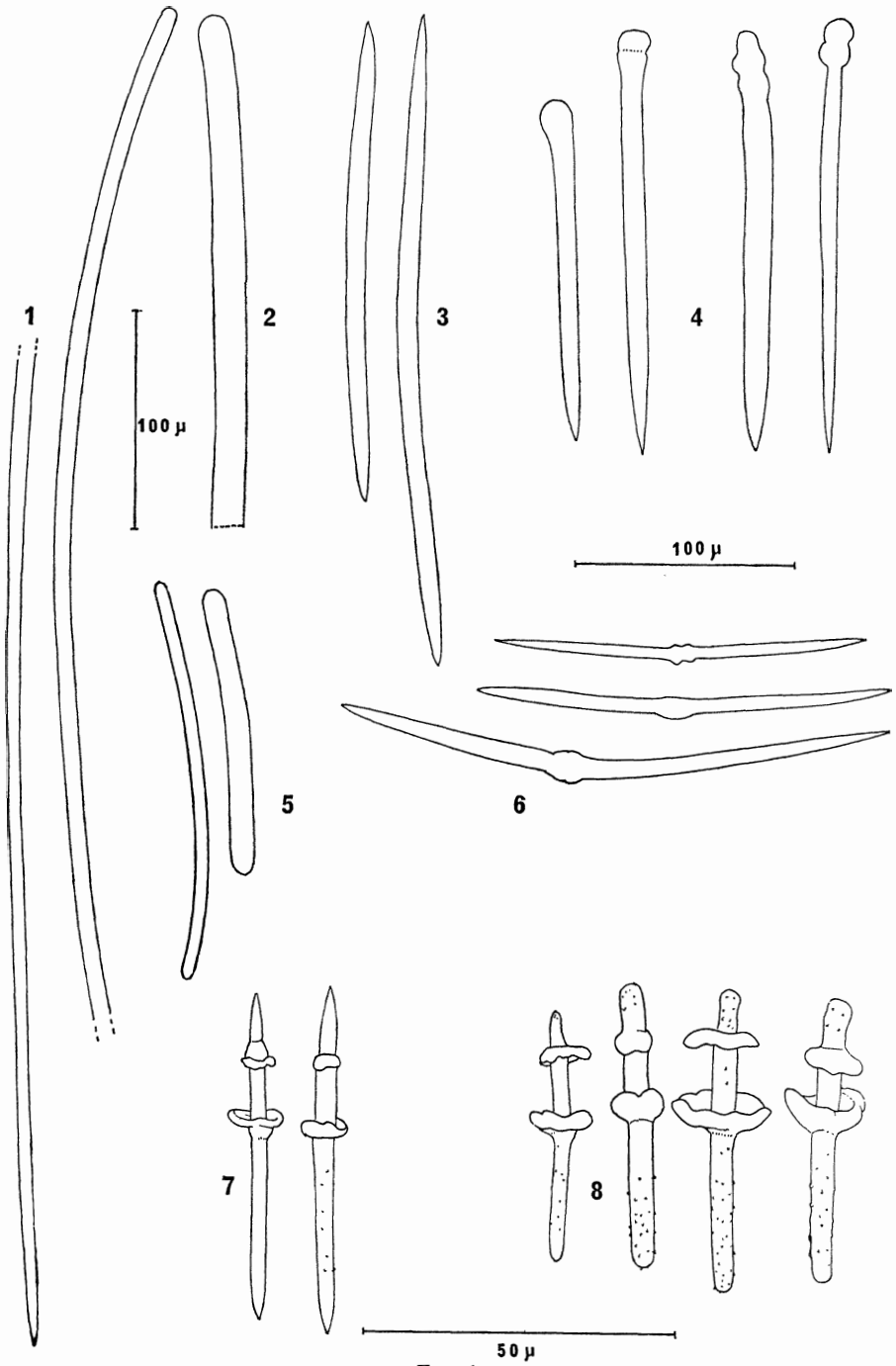

FIG. 1
Didiscus styliferus n. sp.

1 - long style; 2 - base of a thick long style; 3 - oxeas; 4 - tylostyles; 5 - strongyles; 6 - centrotylote oxeas; 7- discorhabds with pointed tips; 8 - blunt tiped discorhabds.

D. styliferus bears styles of similar dimensions. In addition, the dsicorhabdes are, for the most part, shorter than those of *D. placospongioides* and their tips are blunter. The presence of strongyles in the majority of specimens of the new species is also a differentiating characteristic, albeit of lesser significances.

Burton (1936, p. 23) mentioned a small specimen of *D. placospongioides* which was collected at a depth of 90 meters near Alexandria (Egypt) and which he believed to have migrated from the Red Sea to the Mediterranean through the Suez Canal. Examination of this specimen (kept at the British Museum 35.8.20.107) revealed that its large spicules are not oxeas but styles and that the tips of the majority of discorhabdes are blunt. This specimen, therefore, clearly belongs to the new species *D. styliferus* and the known distribution of this sponge is thus southeastern part of the Mediterranean (Egypt and Israel).

Along the Mediterranean coast of Israel, *Didiscus styliferus* occurs on the shaded ceilings and walls of caverns, nips and caves, but it can also be encountered on the floors of nips and caverns (Tsurnamal, 1968) where it accompanies the spherical sponge *Chrotella cavernosa* (Lamarck), which is probably of Indo-Pacific origin. The sponge develops in places where the water movement is moderate. The colonies coat the surfaces of rocks but also encrust sessile organisms, particularly acorn-bernacles (*Balanus* sp.) and various sponges.

HYMERHABDIA PORI n. sp.

Soft incrustations, 1-1.5 mm thick, which cover areas of 4-9 cm^2. The color is orange-red (2.5 YR 6/12) or yellow-orange (7.5 YR 7/10).

Irregular, laterally-compressed ridges or pointed papillae, 3-5 mm long, project from the surface of the incrustation. From the surface of one sand-covered specimen, rose cylindrical oscular extensions, 10-22 mm long and 1.5-3 mm thick. The pointed tips of the spicules project from the surface of the sponge and particularly from the mentioned papillae and oscular extensions.

Spiculation (Fig. 2, 9-13).

a) Long styles straight or slightly curved, their tips narrowing gradually to a point (750-1550×13-20 μ, and mostly 1100-1300×18-19 μ).

b) Short styles bent near their base to form an obtuse angle of 140°-160° (224-600×13-17 μ, mostly 300-450 μ long).

c) Long strongyles bent or slightly curved (237-1080×17-22 μ, mostly 260-290 μ long), much fewer than the styles.

d) Short and bent strongyles or toxostrongyles whose tips occasionally taper slightly to the sharpness exhibited by oxeas. A few

twisted strongyles were also encountered. The dimensions: 196-380 ×6.7-11 μ.

e) Oxeas slightly curved or bent at the middle, their tips pointed (106-870×3.5-4.4 μ).

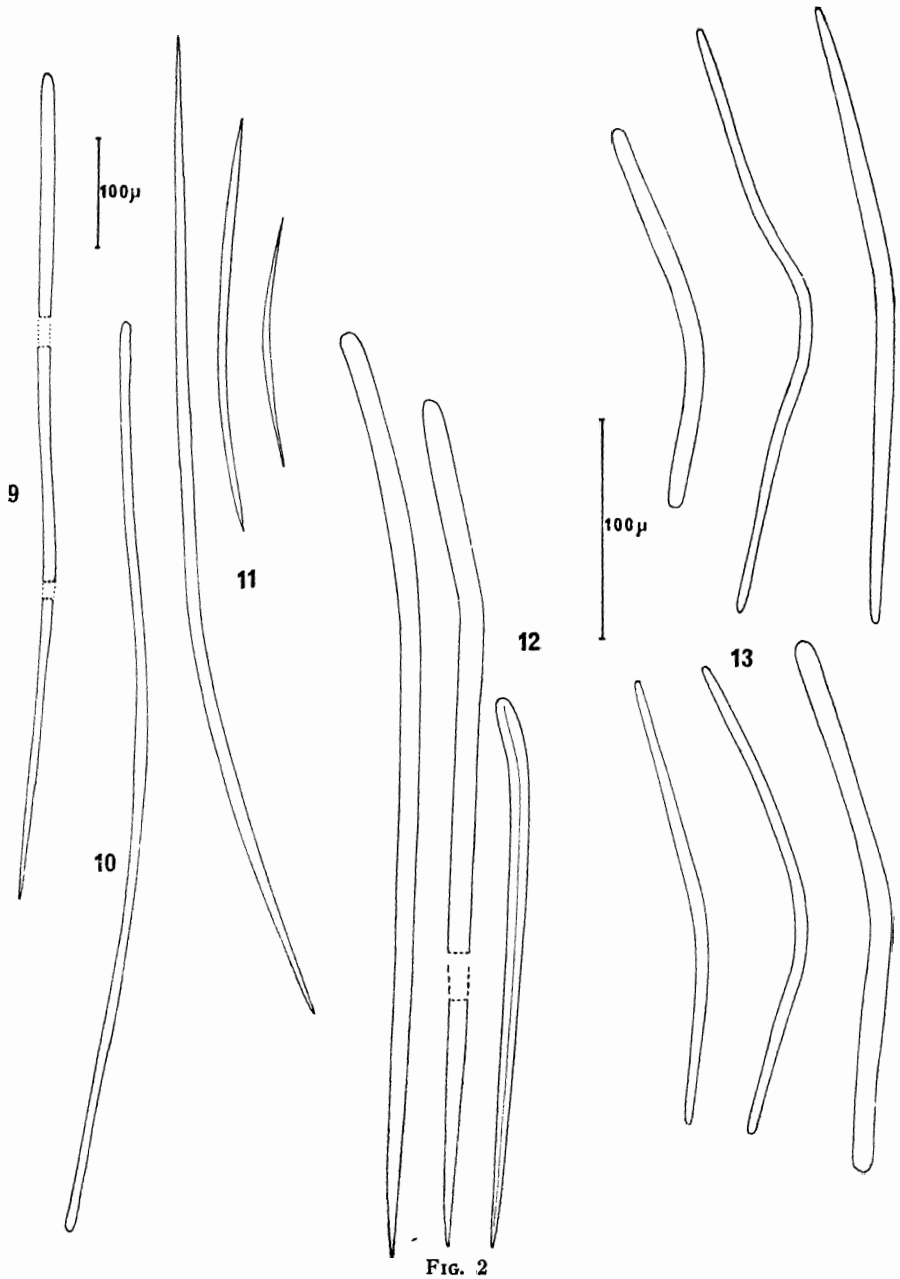

FIG. 2
Hymerhabdia pori n. sp.

9 - long style; 10 - long strongyle; 11 - oxeas; 12 - short styles; 13 - short bent strongyles.

Discussion.

Hymerhabdia pori differs from the other species of the genus which possess erect papillae. This new species differs from the Indo-Pacific species *H. conulifera* Dendy 1905, in possessing strongyles and lacking trichodragmas and from the Mediterranean species *H. papillosa* Sarà and Siribelli 1962, in carrying both long strongyles as well as short and bent strongyles (lacking in the species from the coast of Italy).

The species differs from *Hymerhabdia reichi* n. sp., also common along the coast of Israel (see below), in possessing toxostrongyles (missing in *H. reichi*) and by the fact that its large styles are considerably longer than those of *H. reichi*. *H. intermedia* Sarà and Siribelli, from the Bay of Naples, has bent strongyless but *H. pori* differs from this species in bearing also oxeas and in lacking the subterminally swollen tylostyles or styles of *H. intermedia* (Sarà and Siribelli, 1960).

Two other species of *Hymerhabdia,* which are reported from the western Mediterranean (Topsent 1935; Sarà and Siribelli 1962), bear tylostyles instead of the styles of the new species and also differ from it in other respects.

The great variety of its spicules (5 types) and the manner of its growth, distinguish *H. pori* also from the other species of the genus which have been described from various regions of the globe.

Hymerhabdia pori has so far been collected only from the coast at Caesarea (50 km north of Tel-Aviv). Its colonies extend across the walls of semi-shaded caverns, but one large colony was encountered also on the surface of an illuminated horizontal rock.

HYMERHABDIA REICHI n. sp.

Soft incrustations, 1-8 mm thick, which cover areas of 4-85 cm^2. Laterally-compressed ridges or pointed papillae project from their surfaces and lend the incrustations a tuberculated appearance. The color is orange-red (2.5 YR 6/10 - 10 R 6/10) to orange-yellow (7.5 YR 7/10). The tips of the spicules (discernible under magnification) project from the surface of the sponge and particularly from the ridges and papillae. A scattering of small (0.2-0.4 mm) and rounded oscules is interspersed between the projecting papillae or near their bases. In the majority of cases, the colonies of *H. reichi* are found in association with polychaetes of genus *Polydora,* whose soft tube ends elevate slightly from the surface of the sponge. Apparently, the tubes of *Polydora* which are situated perpendicularly to the surface of the sponge, support the overlying sponge and enable it to develop thicker incrustations than other sponges of the same species which are not in association with the polychaete.

Colonies of *H. reichi,* which are in association with a large number of polychaetes, develop into thick incrustations whose superficial ridges and papillae mostly conjoin to form a continuous surface.

Spiculation (Fig. 3, 14-16).

a) Styles long, straight or slightly bent, and sharp-tipped (400-720×4.4-10 μ). The style, at times, does not sharpen uniformly towards the tip but rather shows an abrupt attenuation near its end, with the terminal portion again tapering gradually to a point.

b) Strongyles, less frequent than the styles, are straight or slightly curved and occasionally even twisted (280-520×6-9 μ).

c) Oxeas, curved and sharp-tipped, are of two size categories: large (400-600×3.5-11 μ) and small (100-130×2.2-4.4 μ).

Discussion.

Colonies with erect papillae are not usual for the genus *Hymerhabdia*. Only three other species show this character: *H. conulifera* Dendy from the Indian Ocean, *H. papillosa* Sarà and Siribelli from Naples and the new species *H. pori* from the coast of Israel. The species under discussion differs from *H. conulifera* (Dendy, 1905) in lacking trichdragmas and by bearing strongyles; from the species *H. papillosa,* in the presence of strongyles and in having shorter styles (400-720 μ vs. 560-1920 μ); and from *H. pori,* in having smaller styles and lacking the short, curved strongyles of the latter.

The spicules of *H. reichi* differ also from those of other species of genus *Hymerhabdia* (showing encrusting manner of growth) which have been described from various regions of the globe.

Hymerhabdia reichi is prevalent along the coast of Israel and its colonies are encountered on the ceilings of shaded caverns and nips as well as under stones in shallow waters. Young colonies of this sponge, which have not yet developed a continuous incrustation but rather form an irregular network of tuberculated stripes, appear mainly in March-May. Young or small colonies do not form associations with polychaetes and such association perhaps constitutes a requisite for the attainment of large size (?).

MYCALE SANGUINEA n. sp.

Thick (2-35 mm), soft encrusting sponges which cover areas of 10-1820 cm^2; rarely also as small, sphaeroid or tuberous masses. The color is a deep red (5.0 R 4/14) or occasionally red-orange (10 R 4/10). At the margins of the large incrustations i.e., in the younger and thinner areas, the coloration is sometimes a light brown violet (5.0 R 6/2), with interspersed red or red-orange spots as afore-described. Thin (young) incrustations of a brown-violet color and bearing a red punctation were also encountered independently and some of these were in various stages of color transition, with red becoming

increasingly the dominant color (concentrating in the endosome) till the deep coloration of the thick incrustations was attained.

The surface of the sponge is smooth or of a somewhat uneven and occasionally tuberculated appearance. In many cases, the thick-encrusting colonies are found in association with polychaetes (*Polydora* sp.) whose tube openings are closely juxtaposed on the surface of the sponge and contribute to its uneven appearance. Rounded oscules (0.3-0.5 mm in diameter) are scarce on the surface of the sponge and for the most part are not easily discernible.

Ectosome.

A dermal membrane, perforated by numerous ostia (26-80 μ in diameter), which is easily detachable and removable. There is no tangential dermal skeleton. The ends of the spicule bundles (fibers) reach the dermal membrane and the tips of the terminal subtylostyles occasionally project some 20-60 μ above the surface.

Endosome.

The layer underneath the dermal membrane is profusely lacunated. Multispicular bundles traverse the body of the sponge, branching and reaching the external membrane.

Spiculation (Fig. 3, 17-19).

a) Subtylostyles (and occasionally also a few styles) straight but rarely curved or slightly bent (200-330×2-6.5 μ, mostly 210-260 μ long). The basal thickening variable in shape, mostly terminal and elongated or elliptical, but occasionally irregular. The axial canal is wide and at times comprises more than 1/4th the thickness of the subtylostyles. Usually the axial canal broadens within the basal thickening into a bladderlike structure. The tips bear elongated points but there are also subtylostyles with blunt or abbreviated tips.

b) Anisochelas small, 12-15 μ long. Very infrequently, longer anisochelas (up to 24 μ) are also encountered. Anisochelas are abundant in the majority of specimens, but in some (collected from the ancient harbor of Acre) this type of spicule is so rare to easily misidentify the sponges as belonging to the genus *Tylodesma*.

c) Sigmas C-shaped or rarely S-shaper, 29-45 μ long. In specimens with very few anisochelas, the sigmas are somewhat shorter than usual, attaining a length of only 26-33 μ.

Discussion.

Mycale sanguinea differs from the heretofore-described species of *Mycale* in the shape and the small dimensions of the anisochelas (which are mostly of uniform size) and also in the absence of toxas and raphides, so common in many species of genus *Mycale*.

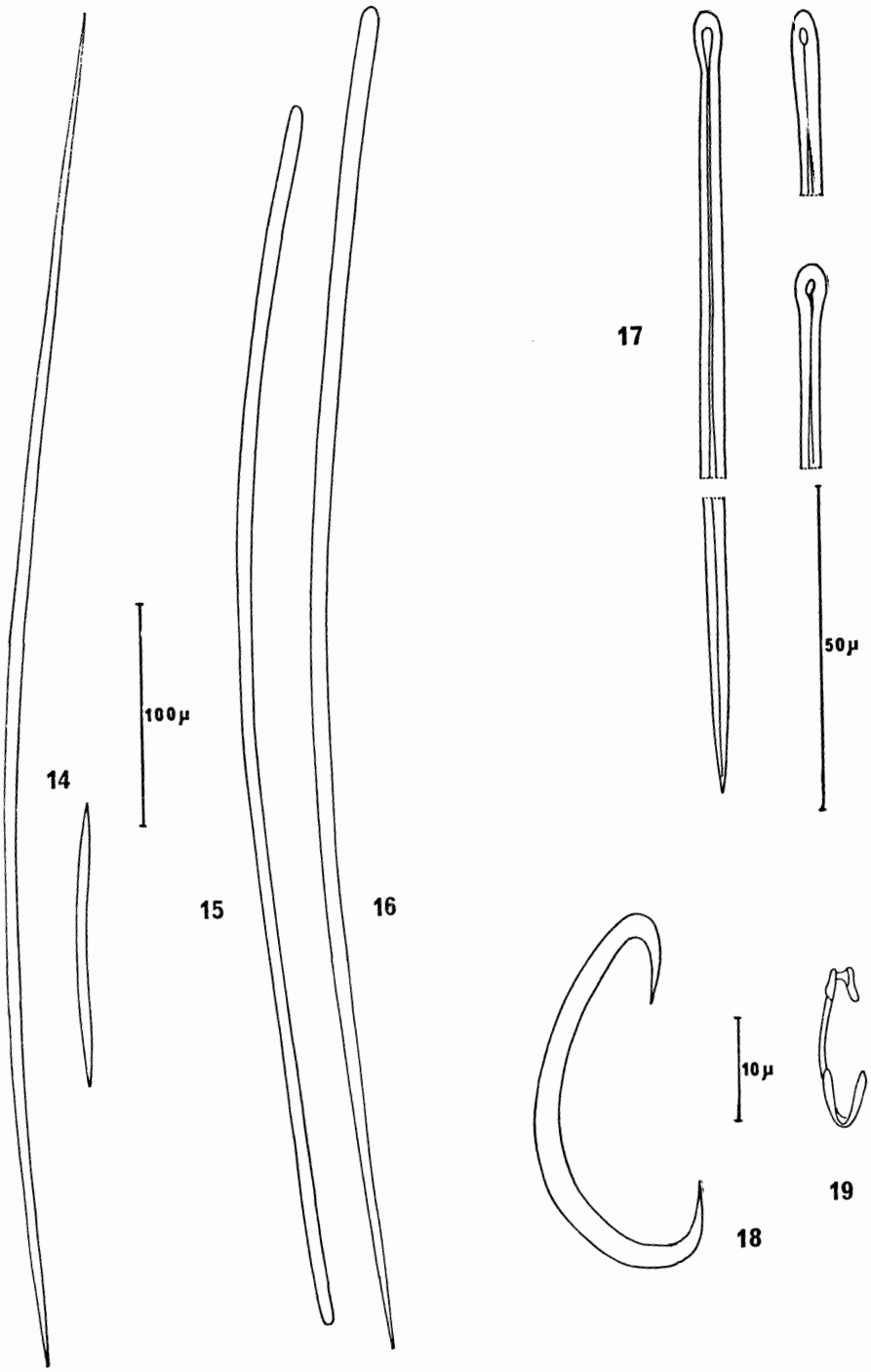

FIG. 3

Hymerhabdia reichi n. sp.

14 - oxeas; 15 - long strongyle; 16 - long style.

Mycale sanguinea n. sp.

17 - subtylostyles; 18 - sigma; 19 - anisochela.

By its red color and absence of toxa and raphids *M. sanguinea* resembles *Mycale rotalis* (Bow.) but this last mentioned species is clearly distinguished from the new species by possessing 3 types of anisochelas and 2 of sigmas while *M. sanguinea* bears only one type of each spicule.

Judging by the dimensions of the spicules, *M. sanguinea* shows affinity to *Mycale fistulifera* (Row) (=*Esperella fistulifera* Row 1911) from the Red Sea as well as to the tropical species *Mycale microsigmatosa* (Arndt) prevalent along the coasts of West Africa and the tropical coasts of the American continent; however, the sigmas and anisochelas in the latter species are larger than in the new species and the three species also differ in coloration and external appearance.

It would seem that *M. sanguinea* belongs to the complex of species of genus *Mycale* which possess small anisochelas but comparatively large sigmas. This complex has been noted by Burton (1956) and includes, according to him, several tropical species which occur within a globe girdling belt whose latitudinal limits are 40° north to 40° south.

Mycale sanguinea is prevalent along the coast of Israel. The sponge develops on rocks, bivalves, colonies of the bryozoan *Schizoporella errata* (Waters), pier struts, submerged metal objects and on marine algae and phanerogams. The sponge prefers illuminated to semi-shaded sites, at depths which usually do not exceed 1.5-3 meters. Colonies of this species attain large size at sites where the water movement is sub-moderate. In many instances, large colonies of the sponge are found in association with polychaetes of genus *Polydora,* whose numerous, soft tubes contribute considerably to the volume of the incrustations. The tube openings of the polychaetes protrude above the surface of the sponge and at times lend it a rough-tuberculated appearance. The exact nature of this association has not been elucidated, but it is possible that the presence of numerous polychaetan tubes is what enables the sponge to form especially thick incrustation.

The tubes seem to constitute a sort of "supporting tissue" for the body of the sponge, thus complementing the role of its own spicule bundles. Ovoidal embryos (330×466 μ to 400×530 μ) were detected in various colonies during May-November. Their presence during the winter months was not ascertained.

In the water spaces of the sponge there are found occasionally shrimps of the following species; *Athenas nitescens* (Leach), *Alpheus audouini* Coutière and *Synalpheus hululensis* Coutière.

CALLITES LACAZII O. Schmidt, 1868.

In his study on sponges of the coast of Algiers, O. Schmidt (1868: 16-17) described an unusual new species and genus, which he named *Callites lacazii.* The description was based on a single specimen collected by Lacaze-Duthiers near La Calle. To date, unfortunately, no other specimen of genus *Callites* has been encountered and the situation has been further complicated by the loss of the holotype

(Topsent 1945, 12). In the original description of Schmidt, important details are missing on the organization and structure of the sponge, neither is there any information on the habitat of this species. Various investigators (de Laubenfels 1936; Topsent 1945) have therefore found themselves hardpressed to reach a decision concerning the taxonomic position of the genus *Callites*.

Our rediscovery of this sponge in dark caves on the coast of Israel, enables its redescription and the presentation of further and more precise data on its structure and ecology. Moreover, it now becomes possible to establish a neotype for the species *Callites lacazii*.

Description.

Slightly tough, friable masses of a tuberous or flattened pincushion shape, 5-12 mm thick and 2-5 cm long. The masses cover areas of 3-11 cm^2. The surface of the sponge is fairly smooth, but under high magnification, the projecting tips of the closely-packed spicules are observed. The surface of the sponge also bears slight depressions which are of a lighter color than the rest of the sponge. The surface coloration is light brown-yellow (7.5 YR 6/6 - 10 YR 6/6) whereas the depressed areas are a pale yellowish (10 YR 9/3).

Oscules are rare, occurring within the mentioned surface depressions they are elliptic or almost rounded (1.2-2.2 mm in diameter). The center of the oscular opening is 1-3 mm deep and bears sieve-like perforations. The ostial openings are minute and discernible only under magnification, their shape elliptic or rounded (80×80 - 135 ×92 μ). In section, it is possible to distinguish between a thin, dense ectosome (130-400 μ) and the more loose endosome. The endosome bears multispicular tracts of large oxeas, occasionally accompanied by styles or strongyles. The spicules in the tracts are held together by small amounts of spongin and are arranged more or less in parallel to the longitudinal axis of the tract (fiber). Apart from the mentioned primary tracts which traverse the body of the sponge from base to ectosome, there are also secondary tracts as well as single spicules, which transversely interconnect the primary tracts, the whole constituting an irregular skeletal network.

Spiculation (Fig. 4, 20-28).

a) Large oxeas pointed, slightly curved or almost straight (600-690×22-28 μ). In part of these spicules, the one end splits into numerous points or into a rosette of short, secondary points (20-48 μ), thus giving rise to polyaxonid spicules (Fig. 4, 25-26). The axial canal opens sometimes at the pointed tips of the spicules, lending them the appearance of hollow, thick-walled tubes.

In spicule preparations of the sponge, one occasionally encounters spicules shaped like a many-rayed "aster" (sphaeraster) and indeed Schmidt presents a description and drawing of such asters. These forms, however, are not a specific type of spicule but rather the broken-up tips of polyaxonid spicules which have snapped immediately below

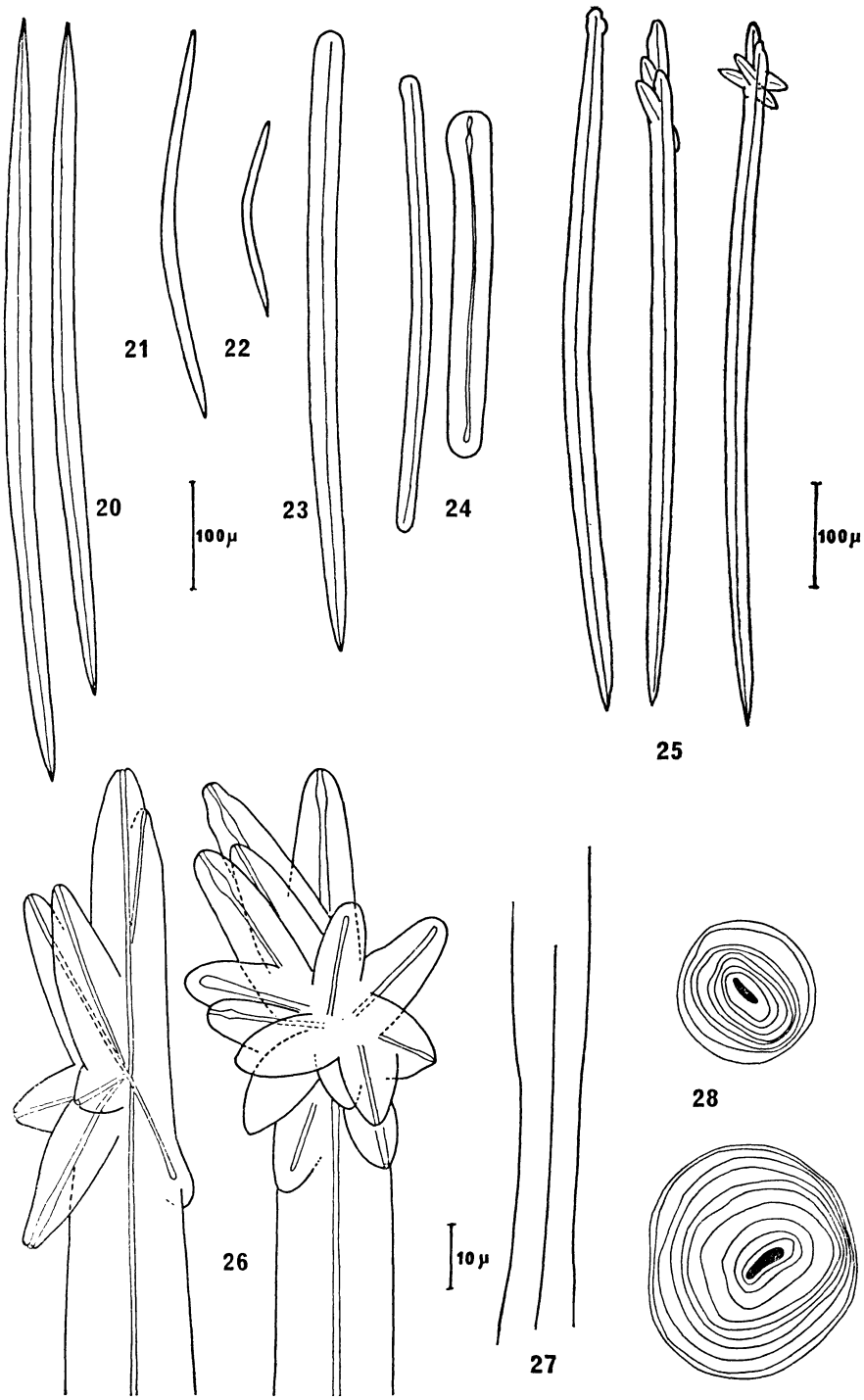

FIG. 4

Callites lacazii Schmidt.

20 - large oxeas; 21 - medium-sized oxea; 22 - small oxea; 23 - style; 24 - strongyles; 25 - polyaxonid spicules; 26 - tips of polyaxonid spicules under high magnification; 27 - raphids; 28 - « concentric discs ».

the ramification point of the subsidiary axes. In other words, upon breaking up of the spicule, the fragment bearing the rosette of spicular tips resembles an aster. The large oxeas, in their various configurations, are arranged mostly in elongated tracts, 2-7 spicule rows per tract. The spicules in the tract are conjoined by a small amount of spongin, thus giving rise to primary multispicular "fibers" which wind their way within the endosome, from the base of the sponge to the ectosome. These elongated bundles are interconnected by single oxeas or by short, secondary spicular bundles (of 2-3 spicules each) which are interspersed randomly between the primary bundles, but mostly in a more or less transverse position. Such networks of multispicular fibers may occasionally occur also in the ectosome but here they are arranged tangentially.

b) Styles and strongyles (Fig. 4, 23-24) shorter and mostly thicker than the large oxeas, occurring together with them in the aforedescribed spicular tracts. The dimensions: 320-580×20-37 μ. These types of spicules are less frequent than the oxeas.

c) Medium-sized oxeas are curved or bent at the middle (295-480×12-17 μ). This type of spicule is rare in spicule preparations and is found accompanying the previously-mentioned spicule types within the multispicular tracts.

d) Small oxeas (Fig. 4, 22) are curved or bent at the middle (155-224×5-9 μ) and are concentrated mainly in the ectosome (cortex), where they aggregat mostly perpendicularly to the sponge surface but occur also in other orientations. Small oxeas are scattered also within the endosome.

e) Raphides (Fig. 4, 27) are slim, straight or slightly curved (105-250×0.8-1 μ). They are very abundant in the sponge tissue, particularly in the endosome. O. Schmidt did not describe this type of spicule.

In spicular preparations, discs of 11-68 μ in diameter are occasionally discerned (Fig. 4, 28) which bear a pattern of concentric circles. Such "concentric-discs" were described by Schmidt (1868:15) also between the spicules of another sponge, *Pachastrella monilifera*. Topsent (1894:382), in his discussion of this sponge, maintains that such "concentric-discs" are nothing more than spicule fragments. This is apparently true also for the discs appearing in preparations of *Callites lacazii*.

Discussion.

By its spiculation and body organization, genus *Callites* rightly belongs to the order Poecilosclerina. Insofars as only a single species of this genus is recognized to date, there is no way of ascertaining whether the polyaxony shown by oxeas of *C. lacazii* is a defining character at the specific or rather at the generic level. In this connection, it is interesting to note that one the species of genus *Endectyon* has styles embossed with "crowns of spines" (Burton 1930, p. 492), a characteristic which is morphologically reminiscent of the

polyaxony in *Callites lacazii* (although possibly deriving differently). Such styles are not typical for the entire genus *Endectyon* but occur only in the species *Endectyon delaubenfelsi* Burton.

Callites lacazii is prevalent in the dark parts of underwater caves on the coast of Rosh-Haniqra (near the border with Lebanon), where it occurs at depths of 1.8-3 m. So far, this sponge has not been encountered in other regions along the coast of Israel. Within the underwater caves, numerous masses of *Callites* are found attached to the walls, at a distance of 2-6 meters from the entrance and interspersed among the encrusting colonies of the sponge *Diplastrella ornata* Rützler and Sarà.

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Summary

A description is given of five species of Demospongiae from shallow waters along the Mediterranean coast of Israel. Of these, four are new species: *Didiscus styliferus, Hymerhabdia pori, Hymerhabdia reichi* and *Mycale sanguinea.* The aberrant sponge, *Callites lacazii* O. Schmidt, has been encountered anew in dark underwater caves and new data are provided on its structure and habitat.

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