XIV. *Observations on the West-Indian Chalinine Sponges, with Descriptions of new Species.* By Arthur Dendy, *B.Sc., F.L.S., Assistant in the Zoological Department of the British Museum.* (*Communicated by* Dr. Günther, *V.P.Z.S.*)

Received June 22nd, 1887, read June 23rd, 1887.

[Plates LVIII.–LXIII.]

Contents.

I. *Introductory Remarks.*

The Natural History Museum has recently acquired a number of very interesting specimens of Chalinine Sponges from the West Indies, which, taken together with those already present in the collection, may reasonably be considered fairly representative of the Chalinine fauna of the locality in question.

On looking into the scanty literature of the subject in the endeavour to find names for the various species, I was only able to identify three, viz.:—*Spinosella sororia*, Duchassaing and Michelotti, sp., *Spinosella plicifera*, Duchassaing and Michelotti, sp., and *Siphonochalina procumbens*, Carter, sp., the last mentioned being represented in the collection by one of the specimens examined and named by Mr. Carter himself. I found, moreover, that our knowledge of the subject was in such an extremely unsatisfactory condition that I resolved to include in the present paper descriptions of all the West-Indian species of Chalininæ represented in the collection, making a total of eight species, three old and five new; I propose also to give brief diagnoses and, when necessary, some discussion of the genera under which the eight species fall.

The Chalininæ evidently form a very important element in the West-Indian sponge-fauna, and it is consequently rather surprising that so very little should be known about them. All the works bearing upon the subject, which can be considered of any importance, are comprised in the following brief list:—

1864. *Duchassaing and Michelotti.*—"Spongiaires de la Mer Caraïbe," Natuurkundige Verhandelingen van de hollandsche Maatschappij der Wetenschappen te Haarlem.

1870. *Oscar Schmidt.*—Die Spongien des atlantischen Gebietes.

1877. *Alpheus Hyatt.*—"Revision of the North American Poriferæ.—Part II.," Memoirs of the Boston Society of Natural History, vol. ii. pt. iv. no. v.

1882. *H. J. Carter.*—"Some Sponges from the West Indies and Acapulco in the Liverpool Free Museum described, with general and classificatory remarks," Ann. & Mag. Nat. Hist. ser. 5, vol. ix. pp. 266, 346.

In the first of these publications we find described a large number of sponges; but I may say, in the words of Mr. Carter, "the work is so full of errors, typographical and others, the descriptions so incomplete, and the representations so coarse, that I have hardly ever referred to it without disappointment, still more increased by the evidence that its otherwise rich contents must thus, for the most part, for ever remain unavailable . . . . Now, as it is essential for recognition that the microscopy and spiculation of each sponge should accompany it, if not in illustration, at least in description, so it is evident that in the absence of this alone, to say nothing of the shortcomings of the publication generally, the 'Spongiaires de la Mer Caraïbe' must for ever remain a kind of 'Eldorado,' in which there are a number of good things, but no one can get at them"[1].

Duchassaing and Michelotti describe nineteen species of Chalininæ all under the generic name *Tuba*, and it is very probable that one or two other species described by them also belong to this group. They have since published (in 1870) a pamphlet entitled 'Revue des Zoophytes et des Spongiaires des Antilles;' but this work I have, unfortunately, not been able to obtain.

Professor Oscar Schmidt, in his work on the Atlantic sponges, retains the generic name "*Tuba*" for *Tuba plicifera*, D. & M. (? Lamarck), which he considers a true horny sponge; but the majority of Duchassaing and Michelotti's remaining species of *Tuba* are referred by him to a single species of his own genus *Siphonochalina*, to which species he gives the unnecessarily new name of *Siphonochalina papyracea*. For *Tuba armigera*, D. & M., Schmidt founds the new genus *Cladochalina*[2].

It is doubtful whether Professor Hyatt's work on the North-American Porferæ ought to have been included in the above list at all, as hardly any direct reference is made to the Chalininæ, and no species are described; but it contains much information with regard to the external conditions under which horny-fibred sponges flourish.

Finally Mr. Carter, in his paper on "Sponges from the West Indies and Acapulco," criticizes, as we have seen above, Duchassaing and Michelotti's work, and records a number of species of sponges, amongst which a new species of West-Indian Chalininæ, viz. *Siphonochalina* (*Patuloscula*) *procumbens*, is described, and six old species are identified and more or less fully dealt with.

The species of Chalininæ which I propose to describe in the present paper are especially interesting from two points of view:—(1) they afford excellent illustrations of the great variability in external form to which species of sponges living in shallow, or comparatively shallow, water are subject; and (2) they illustrate in a very striking way the manner in which the siliceous spicules gradually degenerate and ultimately completely vanish as the horny skeleton becomes more and more strongly developed.

[1] *Loc. cit* pp. 267, 268.

[2] *Loc. cit.* p. 35.

The first of these two general laws is very clearly demonstrated in the case of *Spinosella sororia*, D. & M., sp., of which I distinguish three varieties in addition to the typical form (Pl. LIX. figs. 1, 3; Pl. LXIII. figs. 1, 2), and in the case of *Pachychalina variabilis*, mihi (Pl. LX. fig. 2); but as this will be sufficiently clear from the figures and from the descriptions given in the systematic portion of this paper, I shall not consider the question any further in this place.

The second law has already been very strongly insisted upon by Mr. Ridley and myself in our Report on the Monaxonida collected by H.M.S. 'Challenger,' in which we have endeavoured to show that the so-called "Keratosa" have probably descended, polyphyletically, from several distinct groups of siliceous sponges, amongst which the Chalininæ figure prominently. The view that the Keratosa have been derived from siliceous sponges has been gradually gaining favour with naturalists for some time past, and is now, I believe, very generally admitted to be correct. But I have nowhere found quite such strong arguments in its favour as amongst the West-Indian Chalininæ; for here we can trace in different species of the same genus the gradual degeneration and disappearance of the spicules until we come down to forms like *Spinosella maxima*, mihi (Pl. LXI.), and *Spinosella plicifera*, D. & M. (Pl. LVIII. fig. 5; Pl. LX. fig. 1), which sometimes still contain traces of the spicules imbedded in the horny fibre, and apparently on the verge of disappearance, while at other times they contain no spicules whatever; and yet the specimens with spicules and those without are specifically indistinguishable.

It appears that the spicules may persist as vestigial structures long after they have ceased to be of any functional importance, and that they disappear first from the secondary skeleton-fibres. Thus in the genus *Siphonochalina* we have *S. spiculosa*, mihi (Pl. LVIII. figs. 2, 2 *a*; Pl. LXII. fig. 3), with great numbers of well-developed spicules constituting a most important part of the skeleton-fibre, and, on the other hand, *S. ceratosa*, mihi (Pl. LVIII. figs. 1, 1 *a*; Pl. LXII. fig. 2), in which the spicules have almost completely vanished; while *Siphonochalina procumbens*, Carter (Pl. LVIII. fig. 4; Pl. LXII. fig. 1), occupies an intermediate position in this respect, containing several series of fair-sized spicules in the primary fibres and only a sparse single series of similar spicules in the secondaries.

The classificatory difficulties to which this state of things leads are obvious. It is, in fact, no longer possible to draw a sharp line of distinction between the Chalininæ and the so-called Keratosa; for different specimens of one and the same species may or may not contain spicules, while at the same time it is probable that a large proportion of the Keratosa have no near connection with the Chalininæ at all, but are descended from quite different groups of siliceous sponges [1].

Some of these difficulties are well illustrated by a note at the end of Professor

[1] *Cf.* Ridley and Dendy, Report on the Monaxonida collected by H.M.S. 'Challenger,' p. lv *et seq.*

Hyatt's work on the North-American Poriferæ already referred to; he says, "two specimens, pl. xv. figs. 22, 23, were introduced into the plates under the impression that they were species of *Spongelia*, but the microscopical examination of the skeleton shewed them to be spicular. Subsequently I found a specimen identical in every respect with fig. 22, which, however, had fibres free from spicules, and a new examination of the originals of figures 22, 23 was made, disclosing the fact that the perfect imitation of Chalina presented in my first preparation was accidental. This in its turn led me to make renewed researches among the species of *Tuba*, and I now begin to think that I may be obliged to withdraw from the position taken in the first part of this paper, and admit *Tuba* as a genus of Sponginæ. It is very remarkable that there should be any doubt on such a point; but although I have examined more than fifty microscopical sections of different species of *Tuba*, sometimes several preparations to a species, I cannot make up my mind as yet whether the spicules are indigenous or foreign."

I do not think that there can be much doubt that the spicules observed by Professor Hyatt are to be regarded as "indigenous," and that their presence in some cases and absence in others is to be explained in accordance with the view enunciated above.

The immediate cause of the disappearance of the spicules appears to be the development of the spongin to such an extent as to form by itself a sufficiently strong skeleton. In such a skeleton spicules would probably be not only useless but actually harmful, in that they would tend to make the fibre rigid and brittle when it is desirable that it should be elastic and flexible, in order to facilitate the free contraction and expansion of the various parts of the canal-system, and in order to withstand the action of the waves and currents in the shallow water in which horny-fibred sponges occur.

Spongin appears to develop to a large extent only in warm climates and in tolerably shallow water [1], and under such conditions sponges with a strongly developed horny skeleton are abundant. This general law is well illustrated by the present collection, and also by the sponge fauna of the Eastern Mediterranean and of the Australian area [2].

Concerning the minute anatomy of the Chalininæ I am, unfortunately, not able to give any details in this place, as all the material at my disposal was dry. I have, however, in another paper, given an account of the minute anatomy of a species of *Pachychalina* [3], and Dr. R. von Lendenfeld deals with the subject in the forthcoming paper already referred to.

[1] *Cf.* Hyatt, 'Revision of the North-American Poriferæ,' Part 2, p. 490; and Ridley and Dendy, Report on the Monaxonida collected by H.M.S. 'Challenger,' p. lv.

[2] The Keratosa and Chalininæ of the Australian area are being worked out by Dr. R. von Lendenfeld, who has most kindly forwarded to me a proof of the first part of his paper on the latter group.

[3] Proceedings of the Zoological Society of London, 1887, p. 524.

II. *Description of Genera and Species.*

Genus Pachychalina, Schmidt.

1868. *Pachychalina*, Schmidt, Spongien der Küste von Algier, p. 8.
1886. *Dasychalina*, p. p., Ridley and Dendy, Ann. & Mag. Nat. Hist. ser. 5, vol. xviii. p. 329.

Diagnosis.—Lobose or digitate, solid Chalininæ [1]. Fibres stout, with spicules numerous and arranged polyserially.

This diagnosis is not very satisfactory, but it is the best that I am able to give in the present state of our knowledge; for further information regarding the genus the reader is referred to the Report on the Monaxonida of the 'Challenger' Expedition, p. 19, where the question is fully discussed.

Pachychalina variabilis, n. sp. (Plate LVIII. fig. 3; Plate LX. fig. 2.)

This species is chiefly remarkable from its extreme variability in external form. It is represented in the collection by five large specimens, each of which unites in itself two distinct types of growth, lobose and digitate. The long, subcylindrical, digitate processes may either be united at the base only with the compressed, lobose portions, or they may arise from various parts of the surface of the same, or from the free margin. One very remarkable example consists of a single, crescent-shaped, thick, cushion-like lobe, 19 centim. high, 24 centim. broad, and 5 centim. thick in the middle. The oscula occur thickly scattered over one surface only, and from near the middle of the base, on the side opposite to that on which are the oscula, arises a single, upright, thick, irregular, digitate process, constricted at intervals in a somewhat moniliform manner, with oscula irregularly scattered over the surface, but mostly on one side. This process is a little taller than the lobose portion to which it is attached.

The largest specimen in the collection consists of a great, irregular, broadly expanded lobe, giving off from the base, from the free margin, and from various parts of both surfaces a number of irregular, simple or branched, digitate processes. The oscula occur for the most part scattered irregularly over one surface of the specimen. The height of the entire specimen is about 38 centim., and the greatest breadth 37 centim.; while the average diameter of the digitate processes is about 2 centim.

The colour (in the dry condition) of all the specimens is light yellowish grey, and the texture hard, but fibrous and somewhat elastic. The oscula are large round openings, with slightly raised margins, averaging about 5 millim. in diameter. In the case of the lobose portions of the specimens they are almost entirely confined to one surface, as is usually, if not always, the case in flabellate sponges. Sometimes also they occur uniserially arranged along the margin of the sponge.

The main skeleton (Pl. LVIII. fig. 3) is a very irregular reticulation of strong spiculofibre, containing both a large amount of spongin and a great number of spicules.

[1] The term Chalininæ includes, according to my views, only sponges in which the megasclera, when present, are diactinal, and there are no microsclera.

Primary and secondary lines may be distinguished, but they are very confused, and there is a strong development of longitudinal fibres. The spicules are for the most part polyserially arranged, and occur scattered outside the fibres as well as in them. The spongin is of a very pale colour, it usually forms a thick sheath completely enveloping the spicular axis of the fibres.

The dermal skeleton, like the main skeleton, is a very irregular reticulation, composed of spiculo-fibre of extremely variable thickness and with polygonal or rounded meshes varying considerably in size.

The spicules are long and very slender and somewhat curved; they are apparently undergoing degeneration. Although commonly diactinal (oxeote or strongylote), yet monactinal forms (styli) seem to be occasionally forthcoming; but these are perhaps to be regarded as monstrosities, for the nature of the ends varies much. They measure about 0·126 by 0·003 millim.

The species, as I have already indicated, is interesting chiefly owing to the manner in which it demonstrates how cautiously external form must be used as a guide to classification. Yet, although the different specimens, and even the different parts of the same specimen, differ so much in this respect, still there is a close general resemblance between them all, which, although extremely difficult to express on paper, a careful observer can scarcely fail to detect (*vide* Pl. LX. fig. 2).

Locality. Nassau, Bahamas.

Genus Siphonochalina, Schmidt.

1868. *Siphonochalina*, Schmidt, Spongien der Küste von Algier, p. 7.
1881. *Tubulodigitus*, Carter, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 367.
1882. *Patuloscula*, Carter, Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 365.

Diagnosis.—Tubular Chalininæ; tubes smooth, both inside and out, usually narrow, each with a large round opening at the summit.

For further details with regard to this genus I must again refer to the Report on the Monaxonida collected by H.M.S. 'Challenger,' p. 29.

Siphonochalina spiculosa, n. sp. (Plate LVIII. figs. 2, 2 *a*; Plate LXII. fig. 3.)

The single specimen in the collection (Pl. LXII. fig. 3) consists of about twenty long, upright, cylindrical tubes, united together at the base, and also occasionally anastomosing at points where they come into contact with one another laterally. Height of entire specimen 27 centim., greatest width 21 centim. The tubes are of nearly the same diameter all the way up, but slightly larger at the top, where they measure about 3 centim., than elsewhere; their walls average about 6 millim. in thickness. The outer surface, though smooth, is rather uneven. The true oscula are very small, and occur scattered over the inner surface of the tubes. The colour of the specimen, in its present condition (dry), is light yellowish grey, and the texture is rather brittle.

The main skeleton (Pl. LVIII. figs. 2, 2 *a*) is a network of stout, coarse, spiculo-fibre, composed of very numerous, polyserially arranged, oxeote spicules, united together by rather a small proportion of spongin, which is not sufficient, at any rate in most cases, to form a distinct sheath around the fibre. One can readily distinguish with the naked eye the primary fibres, running at right angles from surface to surface of the tube-walls, and secondary fibres crossing them at right angles, and thus giving rise to a more or less rectangularly meshed but rather irregular reticulation with wide meshes. Towards the outer surface the reticulation becomes closer, owing to the interpolation of new fibres, both primary and secondary, between the old ones. The average diameter of the primary fibres is about 0·06 millim., and of the secondaries somewhat less; both contain a large quantity of imbedded foreign matter, such as grains of sand &c., lodged amongst the spicules. The proper spicules of the sponge also occur fairly abundantly scattered between the fibres as well as in them.

In addition to the primary and secondary fibres thus described, one may trace, on the inner surface of the tube-wall, a system of longitudinal fibres.

The dermal skeleton, on the outer surface of the tubes, consists of a fairly close, polygonally meshed reticulation of stout spiculo-fibre, containing a very large proportion of spicules and but little spongin; the average diameter of the fibres is about 0·03 millim. The ends of the primary fibres of the main skeleton form projecting nodes in the dermal network.

The spicules are slightly curved, sharp-pointed oxea, measuring about 0·138 by 0·006 millim.

This species appears to be closely related to Esper's *Siphonochalina* (*Spongia*) *tubulosa*[1], from the Cape of Good Hope; but we learn from Ehlers[2] that the spicules of that species are twice as thick as here, and there would also appear to be no foreign bodies in the fibre. The external form is also decidedly different in the two cases, as will be seen by comparison with Esper's figure.

Siphonochalina intermedia[3], Ridley and Dendy, from Port Jackson, Australia, also appears to be closely related, but differs considerably in the condition of the dermal skeleton, in the slender fibre, containing much spongin, and in the absence of the foreign bodies.

Locality. Turk's Island, Bahamas.

Siphonochalina procumbens, Carter, sp. (Plate LVIII. fig. 4; Plate LXII. fig. 1.)

1882. *Patuloscula procumbeus*, Carter, Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 365.

This species has already been pretty fully described, but unfortunately not figured,

[1] Fortsetzungen der Pflanzenthiere, vol. i. p. 196, pl. liv.

[2] Die Esper'schen Spongien, p. 19.

[3] Ann. & Mag. Nat. Hist. ser. 5, vol. xviii. p. 331, and Report on the Monaxonida collected by H.M.S. 'Challenger,' p. 30, pl. vii. fig. 1 and pl. xlvi. fig. 3.

by Carter. As it is a West-Indian species, and is represented in the collection, I must for the sake of completeness include it in this place.

It is described by Carter as follows:—"Cauliform, rhizomatous, procumbent, solid, throwing up thumb-like hollow processes, or simply branched, with large patulous vents; processes short, erect, annularly inflated, increasing in size upwards, and somewhat contracted at the orifice, which is large and circular. Texture resilient. Colour pale amber or deep dark amber, bordering on purple, which is probably the real colour when fresh. Surface smooth, even. Composition fibrous, resilient. Spicule of one form only, viz. acerate, smooth, curved, fusiform, sharp-pointed, 20 by $1\frac{1}{2}$–6000ths inch in its greatest dimensions, small, and scanty. Size of specimen $5\frac{1}{2}$ inches high by $1\frac{1}{2} \times 7$ inches square. *Hab.* Marine. *Loc.* West Indies, Grenada."

There is an authentic specimen of this sponge, from Grenada, in the British Museum, and I am therefore able to add a few observations to the above description. The sponge (Pl. LXII. fig. 1) consists of a dozen short tubes, arising side by side from an elongated, compressed basal portion and mostly fused together laterally. The average diameter of the orifices of the tubes is about 12 millim., and the thickness of their walls about 5 millim.

The skeleton (Pl. LVIII. fig. 4) is a beautifully symmetrical, rectangularly meshed reticulation of stout horny fibre, rather sparsely cored by short, hastately pointed oxea. In the secondary fibres the spicules are arranged uniserially and at some distance from one another; but in the primary fibres they are polyserially arranged and form a continuous axial core. The diameter of the fibres is about 0·07 millim., there being little difference between the primaries and secondaries in this respect. Towards the inner surface of the tube-wall the network becomes irregular and very wide-meshed.

The dermal skeleton is a polygonally meshed reticulation of stout horny fibre, cored by sparse, uniserially arranged, oxeote spicules.

The spicules are rather short, hastately pointed oxea, or tornota, measuring about 0·075 by 0·0042 millim.

As regards the structure of the skeleton this species occupies an intermediate position between *Siphonochalina spiculosa* and *Siphonochalina ceratosa*, from both of which, however, it differs markedly in external form.

Locality. West Indies, Grenada. (Mr. Carter also identifies[1] with this species several specimens from South Australia, collected by Mr. Bracebridge Wilson; but having had the opportunity of examining these specimens, which are now in the British Museum, I cannot agree as to their identity with the types of *Siphonochalina procumbens*.)

Siphonochalina ceratosa, n. sp. (Plate LVIII. figs. 1, 1 *a*; Plate LXII. fig. 2.)

Here, again, there is only a single specimen in the collection, consisting of about twenty

[1] Ann. & Mag. Nat. Hist. ser. 5, vol. xvi. p. 286.

upright, cylindrical, thick-walled tubes, united together in an irregular basal mass and also united laterally in places by the development of horizontal trabeculæ of tissue or by direct fusion of adjacent tubes.

The height of the entire specimen (Pl. LXII. fig. 2) is 24 centim., and the breadth about 30 centim. The tubes are not of the same diameter all the way up, but narrow somewhat suddenly at a distance of about 6 centim. from the top: the diameter of the different tubes varies considerably; that of the orifice of the tubes ranges from 6 millim. (in the case of a young branch) to about 3·5 centim. (in the case of two tubes which have completely fused and have a common aperture), while the average diameter of the orifice in an ordinary full-grown tube may be taken as about 1·5 to 2 centim. The thickness of the walls of the tube averages about 6 millim. The outer surface is smooth but uneven, the tubes being irregularly swollen in some parts and constricted in others. The colour of the specimen (dry) is clear, pale yellow, and its texture is firm but elastic. The true oscula are small, round openings, abundantly scattered over the inner walls of the tubes.

The main skeleton (Pl. LVIII. figs. 1, 1*a*) is a beautifully regular and symmetrical, rectangular and close-meshed reticulation of stout horny fibre, composed as usual of primary fibres running vertically to the surface, and secondary fibres crossing them at right angles. The primaries average about 0·053 millim. in diameter, and the secondaries but little less. The fibres contain a few very small and slender vestigial spicules (Pl. LVIII. fig. 1*a*), apparently on the verge of complete disappearance; these are much more abundant in the primary than in the secondary lines, as is usually the case.

The dermal skeleton on the outer surface of the tubes is represented by a polygonally meshed reticulation of stout, horny fibre, not really distinct from the underlying main skeleton.

The spicules are represented by mere traces of slender oxea, which have been almost completely absorbed.

This beautiful species is characterized chiefly by the large amount of spongin, and the corresponding almost entire absence of spicules of the fibre, thus forming a striking contrast to *Siphonochalina spiculosa*, mihi, which bears a considerable external resemblance to it.

Locality. Nassau, Bahamas.

Genus Spinosella, Vosmaer.

1864. *Tuba*, Duchassaing and Michelotti, "Spongiaires de la Mer Caraïbe," Natuurkundige Verhandelingen van de hollandsche Maatschappij der Wetenschappen te Haarlem, 1864, p. 44.

1870. *Siphonochalina*, pars, Schmidt, Grundzüge einer Spongien-Fauna des atlantischen Gebietes, p. 35.

1885. *Spinosella*, Vosmaer, Bronn's 'Klassen und Ordnungen des Thierreichs,' Porifera, p. 342.

Diagnosis. Simple or branched, tubular Chalininæ, having the inner surface of the tubes smooth, and the outer surface covered with spines, warts, or prominent ridges.

This genus is synonymous with Duchassaing and Michelotti's genus *Tuba* (*loc. cit.*) of which the authors give the following description :—"Ces spongiaires se présentent sous forme de tubes tantôt simples et isolés, tantôt réunis par leurs côtés et prenant une disposition flabellée. La cavité centrale se prolonge jusqu'à la base de la masse, et sa paroi intérieure offre des faisceaux de fibres disposés sous forme de nervures qui après avoir parcouru toute l'étendue du tube, viennent souvent se terminer en dépassant l'orifice, ce qui lui donne une garniture de cils plus ou moins longs; d'autres fois ces nervures ne se prolongent pas sous forme de cils autour de l'ouverture qui alors peut être garnie seulement d'une espèce de frange ou collerette d'un tissu très-mince et très-transparent; chez quelques-uns il n'y a ni cils ni frange, l'orifice du siphon ou tube est alors nu.

"Chez les tuba, les oscules ne s'observent guère sur la face extérieure du siphon; ils sont au contraire agrainés et très-nombreux entre les nervures qui sillonnent la cavité intérieure. Celles qui ont bien conservé leur encroûtement ne présentent même jamais d'oscules sur leur paroi extérieure; ce n'est que lorsqu'elles ont été roulées ou en partie décomposées que l'on aperçoit des oscules sur la face extérieure. D'autres, quoique bien conservées dans toutes leurs parties, semblent présenter aussi des oscules, mais les traces circulaires que l'on observe ne sont que les loges du Zoorthus (*sic*) parasitica.

"Toutes les espèces de ce genre sont d'un jaune assez clair et présentent le plus souvent à leur surface extérieure un léger encroûtement de même couleur; quand cet encroûtement a disparu par une circonstance quelconque, cette face extérieure paraît criblée de trous plus ou moins grands qui sont les orifices extérieurs des caveaux qui parcourent l'épaisseur des parois.

"Les espèces du genre tuba habitent en général les eaux profondes, et c'est surtout à la suite des gros temps qu'on peut les recueillir sur le rivage."

Vosmaer in 1885 (*loc. cit.*) substituted the generic name *Spinosella* for *Tuba*, as he found that the latter had already been used by Fabricius and Lea. He gives the following diagnosis of the genus:—"Platte, dünne Lappen, welche oft allmählig in weite, dünnwandige Röhren übergehen. Oft auch verästelt. Eine Seite (innen) ziemlich glatt, die andere (äussere) mit zahlreichen langen, dornartigen Fortsätzen. Nadeln in Bündeln. Spic. indic. ac^2." This diagnosis is scarcely so satisfactory as the original description, though it has the advantage of brevity. I do not know a single species of the genus which forms "platte, dünne Lappen;" so far as my experience goes they are not only often, but always, tubular, as originally described by Duchassaing and Michelotti. Mention of the spicules in the generic diagnosis is superfluous, as oxeote spicules (=ac^2, Vosmaer) are characteristic of all the Chalininæ alike (when spicules are present), and, indeed, even of the entire family Homorrhaphidæ[1]; moreover, it so happens that in the genus *Spinosella* the spicules may dis-

[1] *Cf.* Ridley and Dendy, Ann. & Mag. Nat. Hist. ser. 5, vol. xviii. p. 326; Report on the Monaxonida collected by H.M.S. 'Challenger,' p. 1.

appear altogether, leaving only the horny fibre, a circumstance to which I have already referred, and with which I shall have to deal more fully later on.

Duchassaing and Michelotti have arranged the species of the genus in three groups, according to the nature of the mouth of the tube, as follows:—

- Orifice du Siphon fortement cilié.
  - Tissu fin, surface extérieure munie de processus spiniformes encroûtés.
    - Tuba. Sancta crucis.
    - „ Sororia.
    - „ Conica.
    - „ Lincata.
    - „ Megastoma.
    - „ Bursaria.
    - „ Armigera.
  - Tissu grossier, surface extérieure hérissée de pinceaux de fibres non encroûtés.
    - „ Digitalis.
    - „ Incesta.
    - „ Pavonina.
    - „ Crispa.
- Orifice du Siphon plutôt frangé que cilié . . . . . .
  - „ Longissima.
  - „ Vaginalis.
  - „ Lævis.
  - „ Subenervia.
  - „ Plicifera.
  - „ Scrobiculata.
- Orifice nu, c. à d. n'offrant ni cils ni pinceaux bien formés, ni frangés .
  - „ Irregularis.
  - „ Sagoti.

The material at my disposal is sufficient to show in a very conclusive manner that this arrangement of the species is a very unsatisfactory one. There is in the collection a specimen of *Spinosella* (*Tuba*) *sororia*, var. *elongata*, mihi, consisting of about thirty tubes, some of which are "ciliated" at the orifice while others are "naked." Indeed, this appears to be a character of but slight importance and even of extremely doubtful specific value, and it is, consequently, rather surprising that so practised an observer as Mr. Carter should have adopted it [1], more especially considering that Schmidt [2] had already come to the same conclusion as myself with regard to its value and for a precisely similar reason.

The genus *Spinosella* is very closely related to Schmidt's *Siphonochalina*, and it is an open question whether or not the two should be united. The degree of development of the spines on the surface varies much even within the species. Thus, in my variety *elongata* of Duchassaing and Michelotti's species *sororia*, the spines are almost entirely obsolete, while in the typical form and in other varieties of the same species they are strongly developed; and yet, as will be seen later on, there are so many

[1] Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 278.

[2] Spong. atlant. Gebiet. p. 34.

connecting-links between the variety in question and the spinose specimens, that it is impossible to make a specific distinction between them.

It is, however, very convenient to keep the two genera distinct, and I have therefore not united them [1].

The first species described by Duchassaing and Michelotti is "*Tuba Sancta crucis*;" but this is not even figured, and we have only a very meagre description of the external form. The second, however, viz. *Spinosella* (*Tuba*) *sororia*, is recognizable with tolerable certainty from the figure.

Spinosella sororia, Duchassaing and Michelotti, sp. (Plate LVIII. fig. 7; Plate LIX. fig. 1.)

1864. *Tuba sororia*, Duchassaing and Michelotti, Spongiaires de la Mer Caraïbe, p. 46, pl. viii. fig. 1.

1870. *Siphonochalina papyracea*, Schmidt, Spong. atlant. Gebiet. p. 33.

This species is shown by the British Museum collection to be an extremely variable one, and it is very probable that several of the forms described by Duchassaing and Michelotti as distinct should be united with it, as already pointed out by Schmidt (*loc. cit.*) in his valuable remarks on the subject.

I cannot, however, agree with Schmidt in suppressing Duchassaing and Michelotti's name and giving a new one, viz. *Siphonochalina papyracea*, to a species which has already received far too many. I have therefore retained the specific name *sororia*, which represents the first recognizable species of Duchassaing and Michelotti's genus *Tuba*, and propose to describe in this place four well-marked varieties of the species, all of which agree so closely with one another in microscopical structure and are connected by so many links that it is impossible to separate them specifically.

The typical form (Pl. LIX. fig. 1), agreeing closely with Duchassaing and Michelotti's original figure, is represented by several specimens. The one which I have selected for description consists of a number of long tubes united together in an irregular basal mass. The whole sponge is compressed and fan-like, but this condition may be partly due to artificial pressure. The tubes vary in length from 8 to 16 centim., and in greater diameter from 2 to 3·5 centim.; they may be entirely free from one another except at the base, or more or less united laterally. The inner surface of the tubes is smooth and appears strongly veined, the venation being due to an unusually strong development of the main skeleton reticulation in the places where it occurs. The outer surface is strongly spined. The spines average about 7 millim. in length, and are caused by projections given off obliquely outwards and upwards from the longitudinal veins just mentioned. Around the margin of the tubes the ends of the veins project freely, and cause the orifice to appear "ciliated." The true oscula are small and circular, and abundantly scattered on the inner surface of the tubes.

[1] *Cf.* Ridley and Dendy, Report on the Monaxonida collected by H.M.S. 'Challenger,' p. 29.

The main skeleton (Pl. LVIII. fig. 7) is a well-developed, more or less polygonally or subrectangularly meshed reticulation of stout horny fibre. The fibre is stouter and the reticulation closer in the veins than elsewhere. The average diameter of the fibre is about 0·04 millim., but there is a good deal of variation in this respect; it is sparsely cored by slender oxeote spicules, which are much more abundant in the primary than in the secondary lines, being commonly arranged in the former in a somewhat plumose manner, while in the secondary lines they are for the most part scattered singly.

The dermal skeleton is a polygonally close-meshed reticulation of slender fibre, averaging in diameter about 0·012 millim.; cored occasionally by single spicules. On the inside of the tubes there is no dermal reticulation distinguishable, as such, from the main skeleton.

The spicules are slender oxea, usually slightly curved, measuring about 0·082 by 0·0025 millim.

Locality. West Indies.

Spinosella sororia, var. dilatata, nov. (Plate LVIII. fig. 6; Plate LXIII. fig. 2.)

This variety may be disposed of very briefly; it is represented in the collection by one fine specimen (Pl. LXIII. fig. 2), which differs from the typical form of the species in its more luxuriant and bushy habit and in the much greater width of the larger tubes.

The specimen in question is 35 centim. in greatest breadth and 21 centim. high. The tubes vary greatly in size; the larger ones are more or less compressed, and the largest measures 11·5 centim. across the longer diameter of the mouth. The spines on the outer surface of the tubes are very strongly developed and very sharply pointed; but the venation on the inner surface is not nearly so strongly marked as in the typical forms. Otherwise there are no differences worthy of note. The dermal skeleton is represented in Plate LVIII. fig. 6.

Locality. Bahamas.

Spinosella sororia, var. fruticosa, nov. (Plate LIX. fig. 3.)

This variety, of which there are two specimens in the collection, again differs from the typical forms in its bushy habit, and the spines on the surface are again very strongly developed. The tubes, moreover, are cylindrical and somewhat narrow in diameter; their walls are thicker than in the typical form, and the venation on the inner surface is strongly marked.

The specimen (Pl. LIX. fig. 3) which I consider as most typical of the variety measures 30 centim. in greatest breadth, and 27 centim. in height; the diameter of the mouth of the largest tube is 3 centim., but this is somewhat exceptional.

Both specimens are remarkable for the presence of a fine calcareous deposit or crust on the outer surface of the tubes, which gives them a peculiar greyish-white appearance. When treated with hydrochloric acid it effervesces strongly, and on mi-

croscopical examination it is seen to consist of a finely granular precipitate, mixed, however, with larger particles apparently derived from the breaking-up of various calcareous organisms. This calcareous precipitate is not confined to the surface of the sponge, but occurs also within the horny fibres of the skeleton in the form of very abundant granules. There can be no doubt that it has been deposited from solution in the surrounding water.

There is also in the collection another variety of the species, not, however, sufficiently distinct to require a varietal name, which possesses a great quantity of a similar finely granular deposit in the skeleton-fibres. Duchassaing and Michelotti further inform us that "un encroûtement calcaire très-mince, facile à détruire, lequel est appliqué sur un réseau très-fin formé par les fibres de la surface," exists in their tribe, "Spongiæ Heterogenæ," whatever these may be, comprising the sole genus *Callyspongia*. It appears also to exist in *Tuba vaginalis*, in which "la surface extérieure est légèrement encroûtée effervescente avec les acides et armée de tubercules aigus, comprimés latéralement et encroûtés à leur surface." The presence of a calcareous deposit is hardly, however, a character which can be considered of any classificatory importance.

Spinosella sororia, var. elongata, nov. (Plate LXIII. fig. 1.)

This variety is represented in the collection by several fine specimens. It differs from the typical form in having the tubes much elongated and rather narrow; moreover they are cylindrical and approximately of the same width all the way up. The margin of the tube is usually, though not always, smooth, and the spines on the outer surface are almost entirely obsolete. The venation on the inner surface of the tubes is in most cases not discernible.

The specimen (Pl. LXIII. fig. 1) which I have selected as the type of the variety consists of about thirty tubes, most of which present the characters described above, while a few closely approach the typical form and show the spines around the margin and on the outer surface of the tube and the longitudinal venation on the inner surface quite distinctly. The entire specimen is somewhat compressed, as also are the outer specimens of this variety in the collection. This compression may be in part artificial; but I do not think that it is entirely so. The sponge measures 24 centim. in greatest breadth, and about 30 centim. in height. The diameter of the widest tube is 3 centim. at the mouth, but this is above the average. The tubes are often united laterally for a greater or less portion of their length.

Almost all the specimens of this variety are infested with very numerous zoanthid polyps, which cause the outer surface of the tubes to appear as though perforated by very abundant small oscula. The polyps themselves, in the dry condition, are of a white colour, and evidently contain a very large amount of calcareous matter, as they effervesce very strongly on the application of hydrochloric acid. They are evidently

the same as those referred to by Duchassaing and Michelotti, viz., "*Zoanthus parasitica.*" Another slight variety of the species, already referred to by me as containing a large quantity of the calcareous precipitate, is also infested by this polyp.

Spinosella plicifera, Duchassaing and Michelotti, sp. (Plate LVIII. fig. 5; Plate LX. fig. 1.)

1813. ? *Spongia plicifera*, Lamarck, Annales du Muséum d'Histoire Naturelle, tome xx. p. 435.
1864. *Tuba plicifera*, Duchassaing and Michelotti, Spongiaires de la Mer Caraïbe, p. 53, pl. x. fig. 2.

Duchassaing and Michelotti describe the species as follows:—"Espèce commune, mais dont on ne connaît aucune bonne figure, car la planche de Seba citée par Lamarck se rapporte à une autre espèce. L'orifice du siphon est plutôt frangé que cilié, et la paroi intérieure offre des nervures encore bien distinctes.

"La couleur du tube à nervures obsolete (subnervia) est jaune-clair tant à l'état vivant qu'à l'état sec. Sa surface ne présente pas d'encroûtement.

"Elle habite les Antilles."

Whether or not this species is the same as that described by Lamarck (*loc. cit.*), under the name "*Spongia plicifera*," it appears to me to be impossible to decide with any degree of certainty.

According to Schmidt[1] there would appear to be no spicules at all in the skeleton-fibre, for he includes the species amongst his "Ceraospongiæ," retaining for it the generic name *Tuba*; he says "Die meisten der unter dieser Gattung in den '*Spongiaires de la Mer Caraïbe*' beschriebenen Arten sind gar keine Hornschwämme, sondern Chalineen, und mit Bestimmtheit kann ich nur eine einzige Art als einen ächten Hornschwamm anerkennen, die *Tuba plicifera* (Sp. de la M. C., Taf. x. 2). Es scheint einer der gemeineren Schwämme der Antillen zu sein, seltener bei Florida vorzukommen, auch die grössere Tiefe zu lieben und unter diejenigen zu gehören, die nach schweren Stürmen ausgewaschen am Ufer gefunden werden. Er erreicht die Höhe von $1\frac{1}{2}$ Fuss bei einem Durchmesser von $\frac{1}{4}$ bie $\frac{1}{3}$ Fuss und führt seinen Namen von den höchst unregelmässigen Kämmen und thalartigen Vertiefungen der äusseren Oberfläche. Die meisten Exemplare sind monozoisch, Personen, doch kommen auch solche vor, wo an der Basis sich eine Knospe entwickel that. Stöcke aus mehr Personen bestehend, scheint es nicht zu geben."

Mr. Carter[2], however, identifies with the species a specimen which does contain spicules in the fibre:—"The specimen of *T. plicifera* is composed of thick ridged fibre, with a circular fringed orifice, about 10 inches high by 5 inches in diameter; and that of *T. eschrichtii*, which is long and trumpet-shaped, is more or less covered with a remarkably irregular form of the outgrowth mentioned, about $16\frac{1}{2}$ inches high and $3\frac{1}{2}$ inches in the longest diameter at its orifice, which is elliptical and *not* fringed.

[1] Spong. atlant. Gebiet. p. 28.
[2] Ann. & Mag. Nat. Hist. ser. 5. vol. ix. p. 366.

All three specimens have the same light fawn-colour, and all three the same kind of acerate spicule; that of *T. plicifera* is 18 by $\frac{2}{3}$–6000ths inch, and that of *T. eschrichtii* 18 by $\frac{1}{2}$–6000ths inch, in their greatest dimensions respectively, so that it is finest in the thickest fibre, but very scanty in all three.

"Each specimen presents a young one at its base, which is *blind* at the free end (that is, without orifice)."

In the specimen from the Bahamas which I am about to describe, I have not succeeded in detecting any spicules at all; but, on the other hand, there is in the collection of the British Museum a microscopical preparation labelled in Professor Schmidt's handwriting "*Tuba* D. et Mich. (*plicifera* ?)," and in this preparation there are traces of spicules in the fibre still quite distinct, but very slender and apparently on the verge of disappearing.

Whether or not there were spicules in the specimens examined by Duchassaing and Michelotti, we cannot, of course, tell; but in the fragment of the skeleton reticulation figured by them none are visible.

It might here be urged that we ought to distinguish two species—one with spicules, however few and vestigial, and one without any spicules at all. But it is impossible to draw such a hard-and-fast line in this particular case, which is simply an excellent illustration of the manner in which the spicules gradually disappear as the horny fibre becomes more and more strongly developed; and it is better to say of the species that the spicules are either present in a vestigial condition, and in very small numbers, or else entirely absent.

The single specimen in the collection (Pl. LX. fig. 1) is 43 centim. in height and 20 centim. in greatest breadth; and the outer surface is thrown into strongly developed transverse folds, while the inner surface is irregularly pitted. The tube is at first single, but at a distance of 12 centim. from the top it bifurcates into two. These two remain connected externally almost up to the margin, but the two apertures are quite distinct. Each aperture is approximately circular and provided with a delicate fringe; the one measures about 8 centim. in average diameter, the other only about 7·5 centim. The specimen is of a light brownish-yellow colour.

The skeleton is a very well-developed reticulation of stout horny fibre; but there appear, as I have already stated, to be no spicules. The main skeleton (Pl. LVIII. fig. 5) is, for the most part, very symmetrically arranged, consisting of a rectangularly meshed reticulation of stout primary and secondary fibres. The primary fibres are but little stouter than the secondaries, which latter average about 0·08 millim. in diameter. The meshes of the reticulation, when seen in vertical longitudinal sections, appear oblong in shape, the secondary fibres forming the longer side of the oblong. From various points on both primary and secondary fibres of the main skeleton spring much slenderer fibres, which branch and anastomose in an irregular manner, so as to form a kind of additional reticulation spread between the meshes of the principal one. The diameter of these

additional fibres is about 0·013 millim. Towards the inner surface of the tube the main skeleton becomes extremely irregular in its arrangement.

A special dermal skeleton is, as usual, developed only on the outer surface of the tube, where it consists of a polygonally-meshed reticulation of comparatively slender fibre, averaging about 0·025 millim. in diameter, but varying considerably in this respect. The fibre throughout is very pale and transparent.

The species may be readily recognized by its very remarkable and characteristic external form. As no satisfactory figure has yet been given of it, that of Duchassaing and Michelotti being very poor, I have thought it desirable to take the present opportunity of giving one.

Locality. Bahamas.

Spinosella maxima, n. sp. (Plate LXI.)

There are two large specimens of this remarkable species in the collection and one smaller one. The latter presents certain minor differences from the other two and may be best regarded as a slight variety.

The largest specimen is a great irregular mass, composed of about twenty tubes of various shapes and sizes, all united together at the base and some also united laterally at points of contact. Sometimes the tubes are constricted at the mouth, and sometimes they are much expanded so as to become funnel-shaped. The wider ones are commonly compressed. The largest orifice, which is much compressed, measures about 36 centim. in width, but this is formed by the lateral fusion of at least four different tubes which have all a common orifice. The orifice of the smallest tube, on the other hand, measures not quite 1 centim. in diameter. The total height of the entire specimen is 45 centim. and the greatest breadth nearly 50 centim.

The outer surface of the sponge is aculeated by extremely numerous, closely placed, blunt, spinous processes, of various lengths up to about 1·25 centim. The margin of the orifices is extremely thin and papyraceous and delicately veined in a dendritic manner. The colour of the specimen, which is of course a mere skeleton, is pale yellow and the texture is firm and hard but elastic. The true oscula are irregularly scattered over the inner surfaces of the tubes.

The main skeleton is composed of strong horny fibre, of very various diameter, completely destitute of spicules. The arrangement is very irregular, but one can distinguish between a large-meshed reticulation of very stout fibres and very irregular meshes, and a smaller-meshed reticulation of fine fibres which take their origin from the stouter ones and also from an irregular network. The stouter fibres average about 0·12 millim. in diameter, and the fine ones about 0·013 millim.

On the outer surface of the tubes there is a well-developed dermal skeleton, composed of a reticulation of stout horny fibres with comparatively small, rounded meshes. Here, again, there are no spicules.

The smaller of the two large specimens (Pl. LXI.) differs slightly in external appearance from the one just described. The tubes are broader in proportion to their length, and more inflated, narrowing towards the mouth. The spinous processes on the surface also show a strong tendency to become confluent, and frequently form longer or shorter ridges, running in various directions, with deep grooves between. This tendency to form ridges is visible also to a certain extent in the larger specimen, but is not nearly so well marked.

Locality. Nassau, Bahamas.

The third specimen in the collection, already referred to as belonging to a slight variety, consists of a single wide tube, 24 centim. in height and about 8 centim. in diameter across the mouth. It is now of a dirty greyish-yellow colour. It differs from the types in two respects:—(1) the processes on the outer surface are not nearly so strongly developed, being represented by low warts and ridges; (2) there still exist within the fibre a very few vestigial oxeote spicules, apparently in the last stages of absorption. The specimens agree so closely in other respects that it is impossible to separate them specifically; so that we have here, as in the case of *Spinosella plicifera*, an excellent illustration of the gradual replacement of spicules by spongin.

Locality. Jamaica.

Spinosella velata, n. sp. (Plate LIX. fig. 2.)

The single specimen in the collection (Pl. LIX. fig. 2) consists of five irregularly cylindrical or somewhat compressed tubes of various sizes, united together at their bases, and two of them also united laterally at points where they come into contact with one another. The height of the sponge is 19 centim., and the greatest breadth 13 centim. The largest tube measures about 45 centim. in diameter at the top. The actual aperture of the tube, however, is very much reduced in size by the presence of a broad, horizontal, circular diaphragm, which projects inwards from the wall of the tube at a distance of some two or three millimetres below the free margin. This diaphragm is the most characteristic feature of the species and that from which the specific name has been derived. It exists in all the tubes, but is more developed in some than in others, and is broadest in the largest tube, measuring 1·5 centim. in greatest width. The free margin of the three larger tubes is only slightly irregular in outline and not spinose, while that of the two smaller tubes is distinctly spinose. The diaphragms also are for the most part smooth, but bear spinous processes on the upper surface in the case of the two smaller tubes. The outer surface of all the tubes is distinctly spinose.

The true oscula are small and circular and occur abundantly scattered over the inner surface of the tubes. The walls of the tubes are marked with a distinct series of longitudinal veins.

The main skeleton consists for the most part of an irregular reticulation of fairly

stout horny fibre, but in parts a distinctly rectangular arrangement is visible. Both the primary and secondary lines are cored by oxeote spicules, which are fairly abundant in the primary fibres, but scarce in the secondaries. The longitudinal veins above mentioned are, as in the case of *Spinosella sororia*, due to local concentrations of the skeleton reticulation. The fibres of the skeleton average in diameter about 0·044 millim., and there is no noteworthy difference between the primaries and secondaries in this respect.

A special dermal skeleton, distinguishable from the underlying main skeleton, appears, as usual, to be developed only on the outside of the tubes. It consists of an irregularly, polygonally meshed reticulation of slender horny fibre cored by fairly abundant oxeote spicules.

The spicules are slightly curved, sharp-pointed oxea, measuring about 0·1 by 0·0045 millim., when found perfect; a large proportion of them, however, appear to be undergoing absorption and are much slenderer. A few spicules occur scattered outside of the fibres.

It will be seen that in most respects this species comes very near to the typical forms of *Spinosella sororia*, but it is at once marked off from that species, and, indeed, from all other species of Chalininæ with which I am acquainted, by the presence of the very remarkable diaphragms in the orifices of the tubes.

Locality. Bahamas.

III. EXPLANATION OF THE PLATES.

PLATE LVIII.

Fig. 1. *Siphonochalina ceratosa*. Portion of main skeleton as seen in section at right angles to the surface; ×25. *p*, primary fibres; *s*, secondary fibres.

Fig. 1 *a*. *Siphonochalina ceratosa*. Portion of the above; ×115. *p*, primary fibres; *s*, secondary fibres; *sp*, spicules.

Fig. 2. *Siphonochalina spiculosa*. Portion of main skeleton as seen in section at right angles to the surface; ×25.

Fig. 2 *a*. *Siphonochalina spiculosa*. Portion of the above; ×115.

Fig. 3. *Pachychalina variabilis*. Portion of main skeleton as seen in section at right angles to the surface; ×25.

Fig. 4. *Siphonochalina procumbens*. Portion of main skeleton as seen in section at right angles to the surface; ×25. *p*, primary fibres; *s*, secondary fibres.

Fig. 5. *Spinosella plicifera*. Portion of main skeleton as seen in section at right angles to the surface; ×25. *p*, primary fibres; *s*, secondary fibres; *a*, reticulation of very fine fibres lying between the stouter ones.

Fig. 6. *Spinosella sororia*, var. *dilatata*. Portion of dermal skeleton as seen in surface section; ×25.

Fig. 7. *Spinosella sororia*. Portion of vertical section showing the arrangement of the main skeleton; ×25.

PLATE LIX.

Fig. 1. *Spinosella sororia*, $\times\frac{1}{2}$.

Fig. 2. *Spinosella velata*, $\times\frac{1}{2}$.

Fig. 3. *Spinosella sororia*, var. *fruticosa*, $\times\frac{1}{2}$.

PLATE LX.

Fig. 1. *Spinosella plicifera*, $\times\frac{4}{7}$.

Fig. 2. *Pachychalina variabilis*, $\times\frac{2}{5}$.

PLATE LXI.

Spinosella maxima, $\times\frac{3}{4}$.

PLATE LXII.

Fig. 1. *Siphonochalina procumbens*, $\times\frac{1}{2}$.

Fig. 2. *Siphonochalina ceratosa*, $\times\frac{1}{2}$.

Fig. 3. *Siphonochalina spiculosa*, $\times\frac{1}{2}$.

PLATE LXIII.

Fig. 1. *Spinosella sororia*, var. *elongata*, $\times\frac{1}{2}$.

Fig. 2. *Spinosella sororia*, var. *dilata*, $\times\frac{1}{2}$.

Fig. 3.

Fig. 2

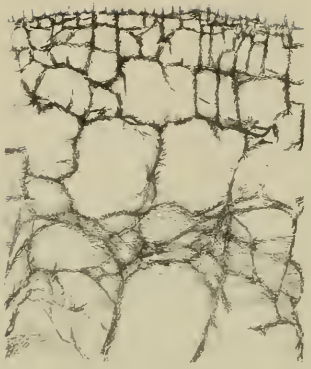


Fig. 1

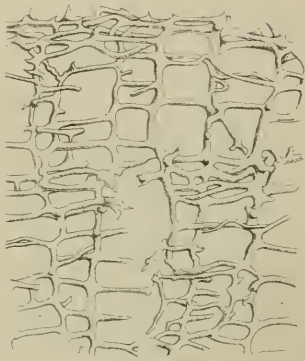


Fig. 4.

Fig. 2a

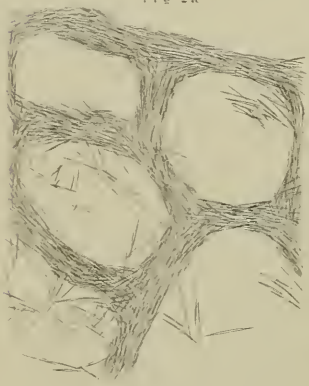


Fig. 1a

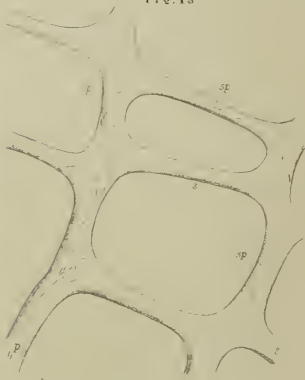


Fig. 7

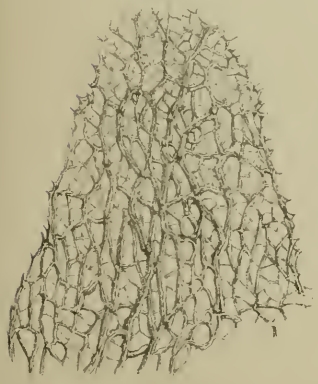


Fig. 6

Fig. 5.

Mintern Bros. del et. lith.

PACHYCHALINA, SIPHONOCHALINA, SPINOSELLA.

Fig. 1.

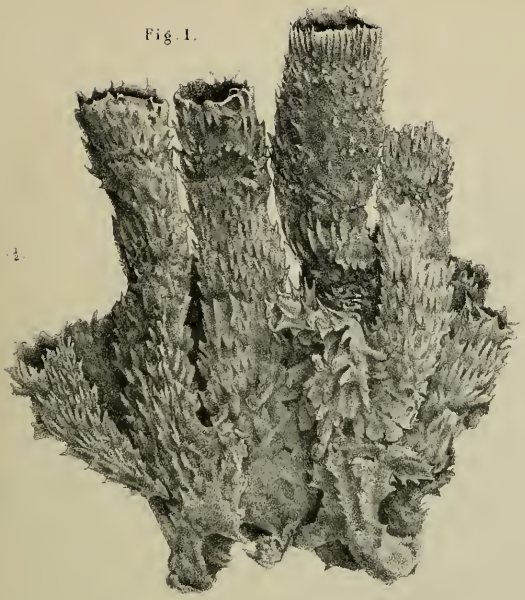


Fig. 2.

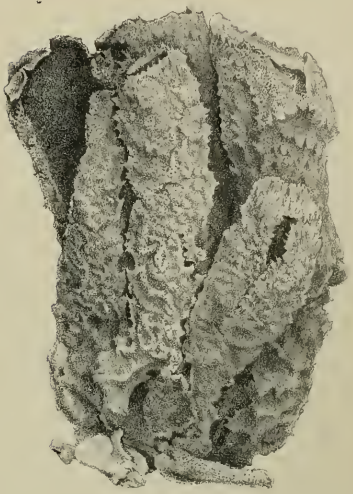
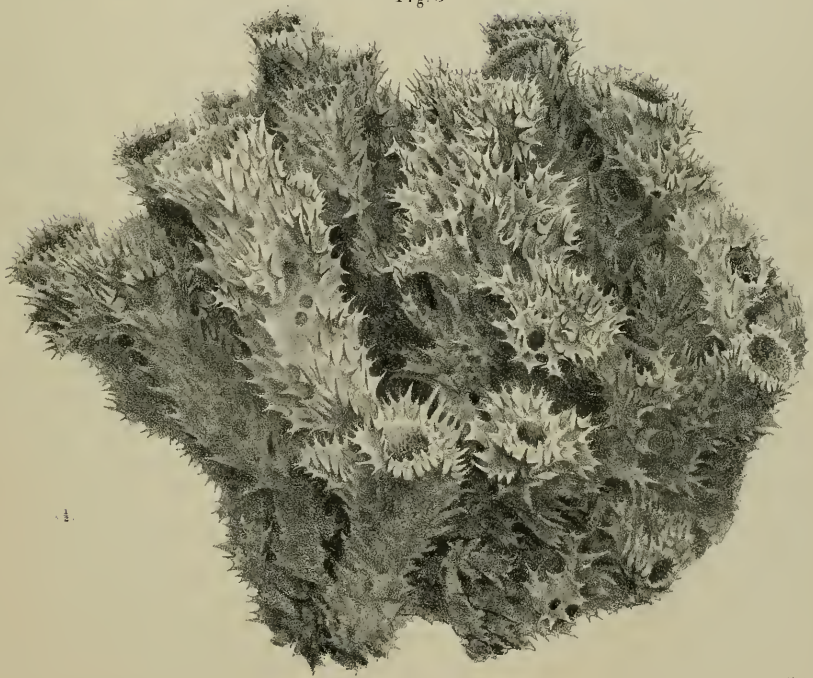


Fig. 3



Mintern Bros. del et lith.

FIG 1 SPINOSELLA SORORIA.
„ 2 „ VELATA.
„ 3 „ SORORIA var FRUTICOSA.

Fig. 1.

× 4/7.

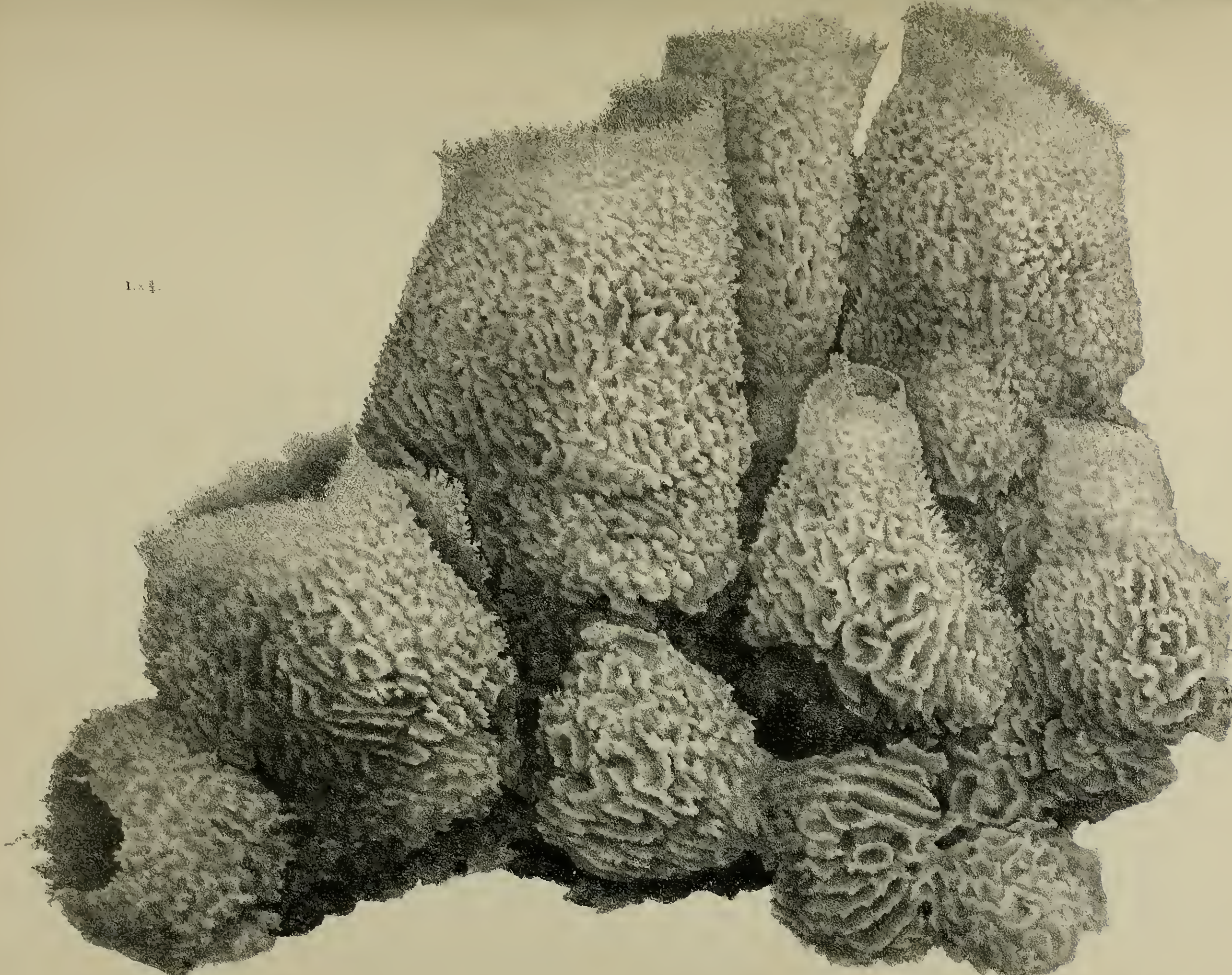
Fig. 2.

× 2/3.

Mintern Bros. del et lith.

FIG. 1. SPINOSELLA PLICIFERA
„ 2. PACHYCHALINA VARIABILIS

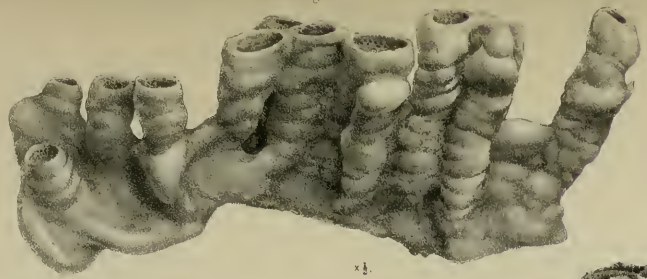
1. × $\frac{3}{4}$.



SPINOSELLA MAXIMA

Mintern Bros. imp.

Fig. 1



×½.

Fig. 3.

×½

×½

Fig. 2

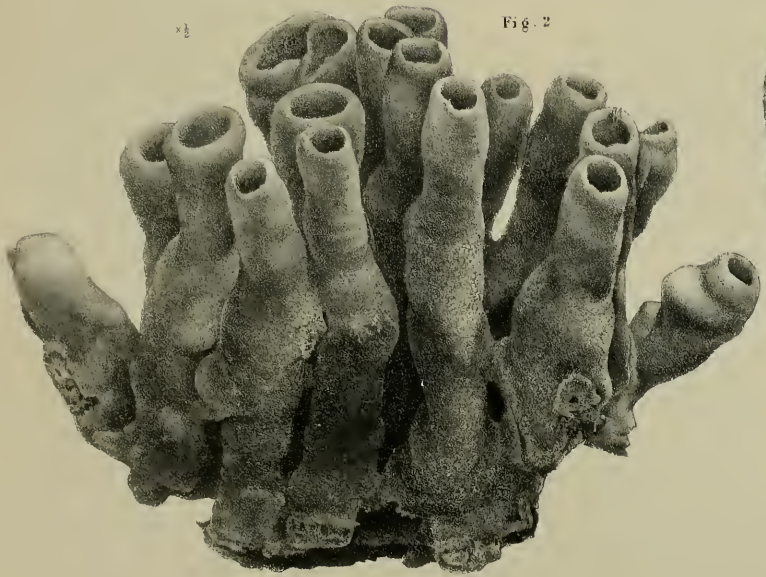


FIG 1 SIPHONOCHALINA PROCUMBENS
„ 2 „ CERATOSA
„ 3 „ SPICULOSA

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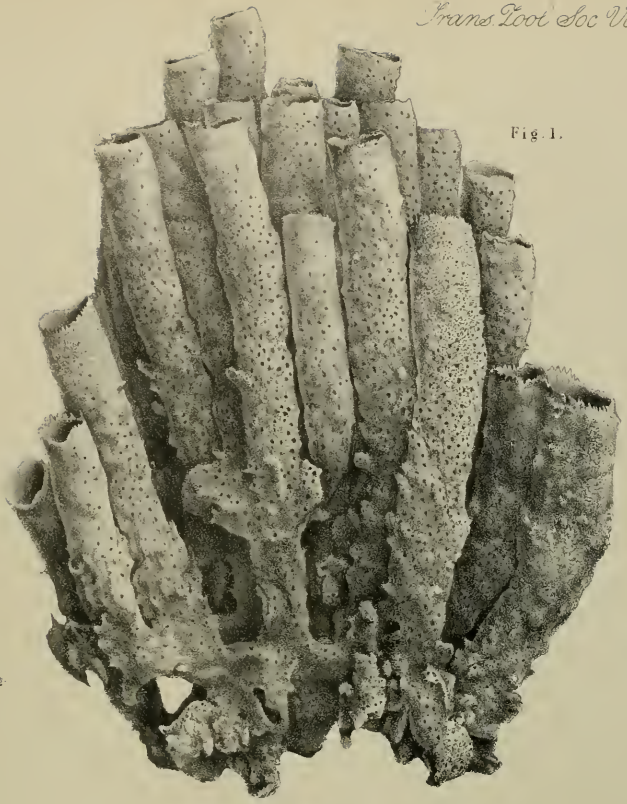
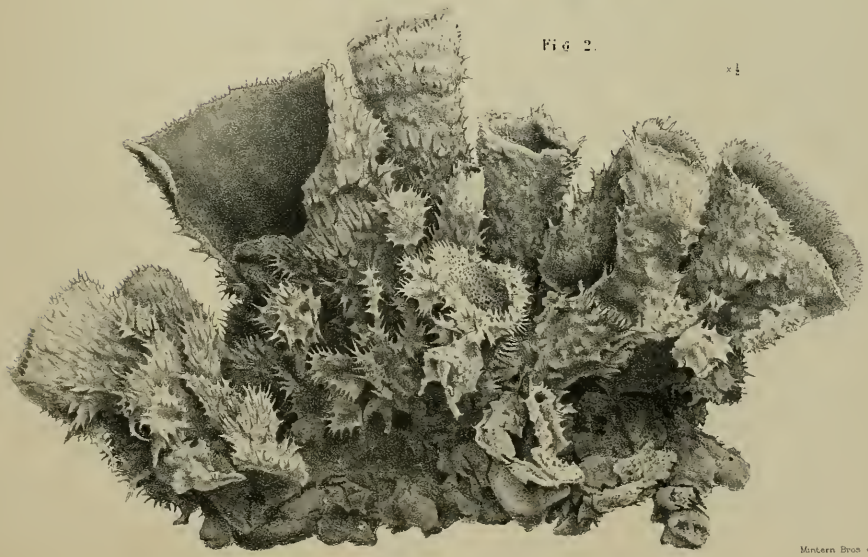
Fig. 1.



×½

Fig 2.



×½

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FIG. 1 SPINOSELLA SORORIA, VAR ELONGATA.
„ 2 „ „ „ DILATATA