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XLIII.—*On two new British Species of Sponges, with short notices of an Ovigerous Specimen of* Hymeniacidon Dujardinii, *Bowk., and of a Fossil Toxite.* By Robert Hope.

[Plate XVI.]

Of the two sponges which are treated of in the following pages one is believed to be new to science, the other, a species of *Microciona*, has been already shortly described by Mr. H. J. Carter, F.R.S. (Ann. & Mag. Nat. Hist. (4) xiv. pp. 456 and 457), as a form of *Microciona armata*, Bowk.*; but, as Mr. Carter did not specifically distinguish it, and only figured the toxite in embryo, it seems desirable now to redescribe it somewhat more fully, with illustrations of the spiculation, from a fresh specimen which I have been so fortunate as to obtain.

The specimen referred to was taken about the middle of March of the present year (1889) from a heap of scallops fresh landed on the beach at Hastings. They were said by a fisherman to have been dredged in about 25 fathoms off Beachy Head; however that may be, it is certain that they came from the English Channel at no very great distance from Hastings.

This sponge has the spiculation and skeletal arrangement

* *Cf.* Mr. Carter's note, Ann. & Mag. Nat. Hist. (6) iv. pp. 249 and 250.

of Bowerbank's genus *Microciona*, taken in a strict sense, that is to say, of that section of the genus which agrees with the type, *M. atrosanguinea*, in the possession of monactinal megasclera of three kinds, with "navicular" isochelæ and toxites as microsclera. It is in this stricter sense alone that the generic term *Microciona* is used throughout this paper. In all other respects the classification followed is that of Messrs. Ridley and Dendy, to whose diagnoses of the genera &c. in their Report on the 'Challenger' Monaxonida I refer.

I propose for this sponge the specific name of *strepsitoxa* (Gr. στρέφω, I twist), from a peculiarity of the toxa referred to below.

Microciona strepsitoxa, n. sp.

The sponge coats about four square inches of the flat valve of a scallop-shell (*Pecten*, sp.), attaining in the furrows of the shell a maximum thickness of about 1 millim. Its colour, when fresh, was scarlet, but in spirit it rapidly and completely faded to a dead white. Surface, when fresh, smooth; in the dry state hispid, from the projecting ends of the spicular brushes of the skeleton. The oscula are numerous and run deep into the sponge; the pores small and generally distributed over the surface.

The skeletal columns, as usual in the genus, rise vertically from the base to the surface; they are slender at the base and rarely branched, and they end in thick brushes of spicules which, spreading out obliquely in contact with each other, are traversed horizontally by sheaves of long slender styles imbedded in the sponge-substance. As usual also in *Microciona*, the main skeletal spicules increase in length towards the surface of the sponge, the shortest, as a rule, forming the base of the columns.

Spiculation.—Megasclera, three :—

1. Styles, sometimes straight, but generally slightly curved, constricted about one diameter above the base, sometimes smooth, but usually basally spined or tuberculated. They vary greatly in length, ranging from ·480 to ·636 millim., with a few much shorter; breadth ·0105 to ·012 millim. (figs. A, 1 and 2).

2. Straight or slightly curved, tapering, entirely spined styles and tylostyles, varying in length from about ·1 to ·2 millim.; average breadth about ·006 millim. (fig. A, 3).

3. Long, smooth, slender, subclavate styles, from about ·25 to ·31 millim. long by about ·004 millim. broad. With a high power the heads frequently appear slightly roughened (fig. A, 4).

Microsclera, two :—

1. Toxa, very slender, with a short, abrupt, spiral curve in the middle, the extremities long and straight. The tips are generally smooth and very sharp, but in some cases a few very minute spines may be detected on the spicule generally. These spicules range from ·250 up to ·412 millim. in length, the majority measuring between ·3 and ·4 millim., by an average breadth of only ·0015 to ·002 millim. (figs. A, 5 and 6).

There are also a few much smaller toxa, among which are some in which the central curve is comparatively large and the long straight ends absent (fig. A, 7). These last spicules are as stout as the longest; their tips are generally microspined. Two measured were respectively ·091 and ·143 millim. long.

2. Isochelæ, of the usual navicular type, minute, ·017 to ·019 millim. long (figs. A, 9 and 10).

The columns are composed of the larger kind of styles, No. 1, and are sparsely echinated by the entirely spined spicules, No. 2. The slender subclavate styles, No. 3, lie imbedded in the substance of the sponge, as above stated, generally parallel with and near to the surface. The chelæ and toxites are distributed throughout the sponge-substance, and do not lie in any particular direction as regards the columns or the surface.

The megasclera of this sponge agree very closely in character with those of the other species of *Microciona* proper, and the chela is of the well-known shape which is characteristic of a very considerable number of species in that and other genera; the toxite, on the contrary, is of a peculiar and striking form, which seems to call for a few remarks.

In the other species of the genus, and, so far as I have been able to ascertain, in all the species (with one exception) of similar spiculation in other genera, the toxa lie flat in one plane from end to end; here and there perhaps one may be found with a barely perceptible twist; but in this sponge I have not been able to find one which can be focussed under a ¼-inch objective from end to end at the same time. In the long straight-armed form the twist is nearly confined to the central sinus, and the conformation of this spicule may be roughly imitated by laying a straight piece of wire along a lead pencil and taking one turn round the middle; if then the pencil be drawn out and the wire turned on its axis, it will be found to present in different positions as regards the eye the appearances shown in the figures of the toxites (figs. A, 5 and 6). The wire model would differ from the actual form of

the spicules in one particular, namely, that in the latter the turn of the spiral is usually more or less compressed laterally; that is, the imitation would be closer, if we suppose the pencil to have an elliptical instead of a circular section and the wire to be laid along one of the thinner ends of the ellipse at right angles to the long diameter.

The central twist of these toxa is admirably shown in a photograph from one of my preparations of the sponge, for which I am indebted to the kindness and skill of my friend Mr. J. Howard Mummery, F.R.M.S., and of which the figure A, 8 is a copy.

The smaller toxa (fig. A, 7) do not show this central twist, but neither do they lie in one plane, one turn of a very slack spiral apparently being completed in the whole length, or nearly so, of the spicule.

The only other sponge which, so far as I know, possesses this (that is, the long-armed) form of toxite is *Amphilectus foliatus* (Vosmaer), Bowk. (=*Halichondria foliata*, Bowk., Mon. Brit. Spong. iii. p. 198, pl. lxxiii. figs. 1–5, and iv. p. 106; and Carter, Ann. & Mag. Nat. Hist. (4) 1876, xviii. p. 310, pl. xiii. fig. 10, and pl. xv. figs. 29 *a*, *b*). *Halichondria mutulus*, Bowk. (Mon. Brit. Spong. iii. p. 209, pl. lxxiv. figs. 4–8, and iv. p. 96), in which this toxite is also found, has the same spiculation as *A. foliatus*; and examination of the type preparations (there is no type *specimen* of *H. mutulus*) in the British Museum leads me to conclude that, if not the same sponge, which I think they are, the two forms must be considered merely as varieties of the same species.

Through the kindness of Mr. Carter in lending me his preparation of *A. foliatus* from the N.W. coast of Shetland (*op. et loc. cit.*) I have been enabled to examine its spiculation and compare it deliberately with that of *M. strepsitoxa*. The toxites of the former are a little longer on the average and convey an impression of more luxuriant growth—that is, they are frequently flexuous, and the central twist is often sharper and not seldom even reversed, so as to form a loop, as described by Dr. Bowerbank (*op. cit.* iii. pp. 200 and 211) and figured by Mr. Carter (*l. c.* pl. xii. fig. 10 *b*); the spiral also is often more compressed laterally, and in some few cases it is doubtful if it is present at all. With these slight modifications the spicule is *identical* in the two species.

In his description of *Halichondria foliata* (Ann. & Mag. Nat. Hist. *l. c.*) Mr. Carter mentions that the tricurvate of that sponge was also found in *Microciona armata*, as he knew from a specimen taken at Budleigh Salterton; it is clear that

the specimen there alluded to was that which was described and conjecturally referred to *M. armata* by Mr. Carter in 1874 (Ann. & Mag. Nat. Hist. (4) xiv. p. 457). This statement thus concurs with Mr. Carter's figure (*l. c.* pl. xxi. fig. 27) in fixing the shape of the toxite, and, together with the practical coincidence of the spicular measurements, clearly identifies the sponge described in 1874 with *Microciona strepsitoxa*.

The occurrence of so marked and striking a spicular form in these two sponges cannot but arrest the attention. Its connexion with other forms of toxa seems plain, and it is easy to imagine how it may pass into them; indeed the smaller form of toxite in *M. strepsitoxa* (which I have not observed in *A. foliatus*) appears to be an intermediate form between it and the spined toxa, which are of frequent occurrence in sponges of similar spiculation; yet the long-armed form is sufficiently distinct to make it highly improbable that the two sponges which contain it should be otherwise than closely related to one another, more closely, perhaps, than is either to any other known sponge. At present these two sponges find themselves not only in different genera but in different subfamilies; the skeletal structure of *A. foliatus*, however, but for the absence in it of the spined echinating spicule, agrees most closely with that of some forms of *Clathria* (e. g. *C. compressa*, O. S., Sp. des A. M. Taf. vi. fig. 1), and no doubt *A. foliatus* would find its most natural place in that Ectyonine genus, the presence or absence of the echinating spined style being apparently in this case also, as it is stated by Messrs. Ridley and Dendy to be in the genus *Myxilla* ('Challenger' Monaxonida, p. 129), of comparatively little importance.

The intimate interconnexion which exists between the genera *Clathria*, *Microciona*, and *Rhaphidophlus* is obvious from the remarkable correspondence of their spiculation, independently of the points of resemblance in their skeletal structure. It is perhaps a question of appreciation and convenience (*cf.* 'Challenger' Monaxonida, p. 151) whether their generic separation should be maintained; to unite them, if permissible on other grounds, would be to get rid of some of the difficulties which beset this group of sponges, and the consolidated genus would form a nucleus, around which it may be that other sponges of not very different spiculation would be found to group themselves naturally.

Returning to the peculiar toxite of *M. strepsitoxa*, I have to mention the interesting fact that Mr. Carter has quite lately found at Budleigh Salterton a piece of chert from the Upper

Greensand containing spicules which appear to be identical in shape with the toxa of our sponge, but of much larger size. By Mr. Carter's kindness I am afforded the opportunity of inspecting this specimen.

The spicules in question are five in number and appear as opaque white bodies in the semitransparent matrix; in no case does the full length of both arms appear to be preserved, and the ends are by no means sharply defined, but apparently fade away into the stone in consequence of the disappearance of the white matter which renders them visible. One of these spicules measures about 1·6 millim. in length from the centre of the sinus to the end of one arm; assuming that it possessed another arm of equal dimensions, of which now but a portion is visible, the total length would reach 3·2 millim., or about eight times that of the toxa of *M. strepsitoxa*. The arms are straight and horizontal and the central sinus abrupt and semicircular in shape; the conditions of preservation are not sufficiently good for smaller details to be clearly seen. The other spicules preserved in the stone, which are numerous, are mostly Tetractinellid in character.

It is proposed to deposit a portion of the specimen of *Microciona strepsitoxa* above described, together with microscopical preparations of it, in the Natural-History Department of the British Museum.

The other sponge to be described I received from Mr. H. J. Carter. I regret much that Mr. Carter is unwilling to describe it himself, and it is only because he positively refuses to do so that with much diffidence I undertake the task at his request. In this undertaking I have the great benefit of Mr. Carter's advice and assistance; but he is not responsible, except when it is expressly so stated, for any views which may be put forward.

I refer this sponge very doubtfully to the genus *Trachytedania*, Ridley *; it will be most convenient to describe it first and discuss afterwards the points in which, as it seems to me, it agrees with, and those in which it differs from, the characteristics of this genus.

Trachytedania (?) *echinata*, n. sp.

The specimens sent me are three, all in the dry state, viz. one, the largest, in a cup-shaped hollow of a piece of red sandstone rock, measuring 23 × 18 millim.; another, smaller, also

* Proc. Zool. Soc. 1881, p. 122, and 'Challenger' Monaxonida, p. 57.

on the same rock; and the third on the valves of a small bivalve shell.

Mr. Carter writes:—"I found this sponge first beside a patch of *Microciona spinarcus* on a clay boulder which had fallen from the New Red Sandstone cliff" [at Budleigh Salterton] "into the landwash close to low-water mark, and afterwards on a mass of small *Pecten*-like shells drawn up about ten miles off Budleigh Salterton by a fishing-hook. When fresh it presents the appearance of a thin, sooty-black, slimy layer, extending irregularly in leprous-like patches, almost as thin as silver paper, on the surface of clay boulders; becoming brown-black when dry and assuming the form of a thin cuticle with glistening surface irregularly papillated and pierced by the pointed ends of spicules; vents very small, scattered over the surface here and there."

The pores now visible are few, minute and generally scattered; on the specimen on the shell one or two areas of small extent are observable in which the surface is reticulated; whether the intervals of the rete are occupied by pores or not I cannot determine.

In the dry state the ectosome is tough, comparatively thick, and very dark coloured.

The *skeleton* consists of branched columns of slightly curved styles rising vertically from the base to the surface. At their origin these columns are formed of compact bundles of spicules pointing straight upwards and entirely imbedded in fibre; very shortly the points of the spicules begin to protrude at a small angle, and the columns are echinated besides by smaller entirely spined styles (hence the proposed specific name); finally the columns terminate by the main spicules spreading out in somewhat scanty brushes, which support and partly penetrate the ectosome. In the branches the spicules spread out in flattish somewhat fan-shaped brushes. The ectosome contains large numbers of smooth tylota lying in horizontal bundles parallel to the surface; these last also occur at the base of the sponge and sparingly throughout the choanosome in the intervals of the columns.

Spiculation.—Megasclera, three, viz.:—

1. Styles curved, chiefly towards the larger end, spined at the base and, more slightly, for about halfway up the spicule; average measurements about ·26 × ·009 millim. (fig. B, 1).

2. Smaller, entirely spined, straight styles, tapering from base to point; average measurements ·097 × ·009 millim. (fig. B, 2).

3. Smooth straight tylota, rounded and slightly inflated

at each end; measuring on the average about ·188 × ·005 millim. (fig. B, 3).

Microsclera (?).—There are present in places, chiefly near the surface of the sponge, a few long and exceedingly fine styles, sometimes microspined at the base. They are very few and appear to be local in their distribution in the sponge and wanting altogether in many parts of it; probably they are to be looked upon rather as varieties or immature forms of the megasclera.

From what has been stated it will be seen that this sponge agrees with the species of the genus *Trachytedania* in the possession of a skeleton composed mainly of spined styles and smooth tylota; that genus also already comprises as one of its two species a thin incrusting sponge, *T. spinata* (P. Z. S. 1881, p. 122), with a skeletal structure of the kind which is frequently present, with some comparatively slight modifications, in sponges of that habit, and closely similar to that of the sponge under consideration. There is, however, no echinating spicule in *T. spinata*, and it is by the possession of a special spicule of this nature, the straight, entirely spined styles, that *T.* (?) *echinata* differs most markedly from the other two species of the genus.

In some groups of the family Desmacidonidæ, R. & D., this seems to be a feature of minor importance (see 'Challenger' Monaxonida, p. 129, and *suprà*, p. 337); whether it is so also in this case, the data afforded by so small a series of forms appear to me insufficient to base a decision on them. The absence of trichites would present another point of divergence from the diagnosis of the family Tedaniinæ, R. & D. ('Challenger' Monaxonida, p. 50), if the few long and fine spicules which are present here be, as seems most likely, merely modifications of the megasclera; this difference, however, seems of less importance, as the same doubt as to the nature of the "rhaphides" in the closely allied genus *Tedania* is expressed by Messrs. Ridley and Dendy ('Challenger' Monaxonida, p. 56); the oxeote spicules, smooth or microspined, which are present in some of the species of *Tedania* and which are noted in Dr. Gray's original diagnosis (P. Z. S. 1867, p. 520), are absent both in this sponge and in the other species of *Trachytedania*, the fine spicules in the latter, whatever their nature, being respectively stylote (P. Z. S. 1881, *l. c.*) and "oxeote slightly thicker at one end than the other" ('Challenger' Monaxonida, p. 57). It may be remarked that what may perhaps be homologous spicules abound in some species of the Clavulinæ (e. g. *Suberites*

(*Halichondria*) *farinaria*, Bowk., *Cliona celata*, Hancock) and are also to be found, though sparingly, in *Iophon* and *Myxilla*.

On the whole it seems best, notwithstanding these discrepancies, to refer this sponge provisionally to *Trachytedania*; the only alternatives, apparently, would be either to create a new genus for its reception or to consider it an abnormal form of *Myxilla* or *Iophon*: there is not, I think, sufficient warrant for the first course, and for the last it would be necessary to assume the loss of two forms of microsclera.

Mr. Carter has pointed out to me the general resemblance of this sponge to, and the partial correspondence of its spiculation with that of, *Hymeniacidon Dujardinii*, Bowk., which latter he is disposed to identify with *Myxilla? rubiginosa*, O. S. (Sp. des Adriat. Meer. p. 72), of which again *M. olivacea*, O. S. (*op. cit.* pp. 11 and 83) is in all probability only another name. In specimens of *Hym. Dujardinii*, Bowk., from the English Channel, the long cylindrical spicules are exceedingly numerous, while the only other kind of spicule, the spined style, is rare. That the latter nevertheless represents the main skeletal spicules and the former those of the dermal skeleton seems probable from their respective positions in the sponge-substance, as well as from their forms. This view seems to receive confirmation from a preparation of a sponge of this species which Mr. Carter has kindly lent me, labelled "*Hymeniacidon Dujardinii*, Bk., ovigerous, Vigo Bay." It contains dark yellow circular bodies, which Mr. Carter informs me are embryos, still in the substance of the sponge. The embryos contain numerous spicules, but of one form only, namely, entirely spined styles similar in character to those of the sponge, but not above one quarter of their length and breadth. In the rest of the sponge the tylota are as numerous and the styles as rare as in the British specimens above mentioned. The fact seems worth recording; I do not know whether the inference may be drawn from it that the styles are the oldest, and therefore the main skeletal spicules of *Hymeniacidon Dujardinii*, which it is in process of losing altogether. If so, it would be a degenerate form, the nearest affinities of which would, I suppose, be difficult to determine. Prof. Oscar Schmidt apparently places his *Myxilla rubiginosa* in the neighbourhood of *Tedania* and between that genus and the Desmacidinæ (Atlant. Sp.-Fauna, p. 44)—that is, in very much the same position as appears to be occupied by *Trachytedania? echinata*.

The foregoing pages testify *passim* to the obligations I am under to Mr. H. J. Carter, F.R.S., for the liberal loan of speci-

mens and preparations and valuable assistance and advice; my thanks are also due to Dr. Albert Günther, F.R.S., for kind permission to refer to the British Museum Collection, as well as to Mr. R. Kirkpatrick, in charge of the sponges therein, for ready and effectual assistance in doing so.

EXPLANATION OF PLATE XVI.

A. *Microciona strepsitoxa.*

Figs. 1 & 2. Main skeletal spicules.
Fig. 3. Echinating spicule.
Fig. 4. Subclavate style.
Figs. 5 & 6. Long toxites.
Fig. 7. Smaller form of toxite.
Fig. 8. Long toxites; from a photograph, to show central twist.
Figs. 9 & 10. Isochelæ, front and side views.

[Figs. 1–7 magnified 260 diameters; figs. 9 & 10 magnified 850 diameters.]

B. *Trachytedania* (?) *echinata.*

Fig. 1. Main skeletal spicule.
Fig. 2. Echinating spicule.
Fig. 3. Tylote spicule.

[Figs. 1–3 magnified 260 diameters.]

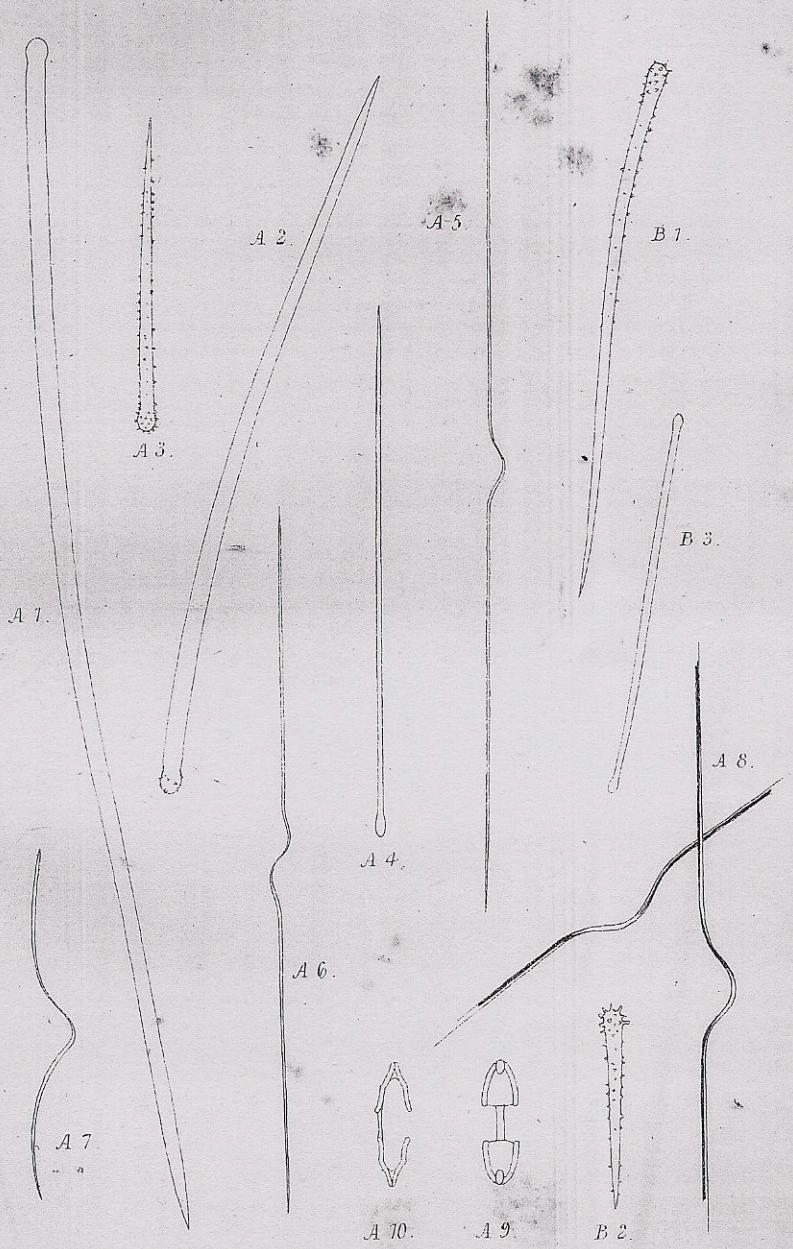
XLIV.—*On a Method of Defence among certain Medusæ.*

By J. Walter Fewkes *.

The Siphonophora, in common with other Medusæ, as is well known, possess a very powerful organ of defence in the stinging-cells, also called lasso-cells and nematocysts. There is reason to believe that there may be at least one other method of protection adopted by these animals. I propose this evening to lay before you the evidence of the existence of this second method of defence made use of by these animals, and to open the discussion of the homologies of the structures in which this new means of protection is lodged.

It may be well to anticipate what follows by the statement that the new method of defence is that of discolouring the water by the emission of coloured pigment from certain chromatic cells on the bracts, and that these cells bear relationships and perhaps are homologous with the nematocysts in

* From the Proc. Bost. Soc. Nat. Hist. vol. xxiv. pp. 200–208.



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