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X.—Contributions to the knowledge of the freshwater sponges. with remarks by H. J. Carter, F.R.S. &c.

Dr. F. Vejdovsky

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Figs. 37 and 38. Plocamium coccineum, Lyngb.

(Spirit-material.)

Fig. 37. Young fruit-rudiment at the period of fertilizable maturity. A spermatium has conjugated with the extended trichogyne. $\times 150$.

Fig. 38. Longitudinal section through a still younger fruit-rudiment, the apex of the trichogyne of which has not yet got free. An internal tissue-cell (*a*) has developed, as a secondary side-branch, a three-celled carpogonial branch (*e e c*), and itself become developed into the auxiliary cell, extending a conjugation-process towards the ventral part of the carpogonium. The trichogyne is much inflated in a clavate form above the neck before, breaking through the surface of the thallus with its dense cuticle, it protrudes as a long thin hair. $\times 400$.

Fig. 39. Caulacanthus ustulatus, Kütz.

(Spirit-material.)

Longitudinal section through a young fruit-branch: *mm*, central axis. A side-branch of this central axis bears laterally on a joint-cell (*d*) the carpogonial branch (*e e c*). The lowest cell of this grows into a sterile rhizoidiform thread. The uppermost cell has developed into the carpogonium; its ventral part has become segmented off after fertilization, and has grown out into a single ooblastema-thread, which, branching abundantly, coils itself about the central axis. At \times originated another ramified side-branch of the ooblastema-thread, which spread out upon the under surface of the central axis, but has been omitted in the figure for the sake of distinctness. $\times 400$.

X.—*Contributions to the Knowledge of the Freshwater Sponges.* By Dr. F. VEJDOVSKY, of Prague. With Remarks by H. J. CARTER, F.R.S. &c.

[Plate VI.]

THE above is a translation of the Title of a memoir communicated by Dr. F. Vejdovsky to the Society of Science in Prague, on the 12th October last, and since printed in the Bohemian language, with the following *Résumé* in German:—

RÉSUMÉ*.

In my monograph of the freshwater sponges of Bohemia† I left two questions, among others, open, to be answered by subsequent investigations.

The first question relates to the multiform "*Ephydatia*

* Translated from a separate impression of the Memoir sent by the author to Mr. H. J. Carter, F.R.S.

† "Revisio Faunæ Bohemicæ. Pars I. Die Süßwasserschwämme Böhmens." Von Dr. Franz Vejdovsky in Prag (mit 3 lithographirten Tafeln). Abhandl. d. k. Böhm. Gesellsch. der Wiss. Folge 6, Band xii.



Fig. 1.

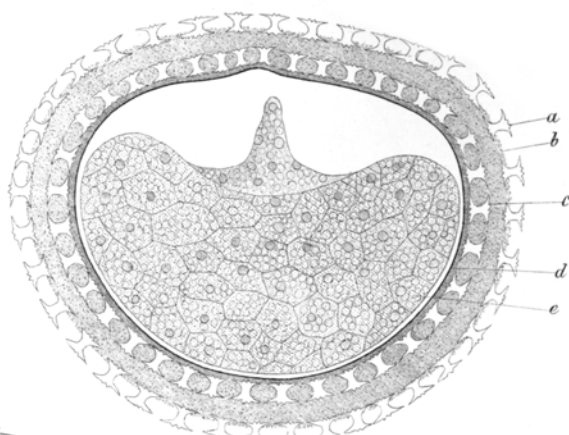


Fig. 2.

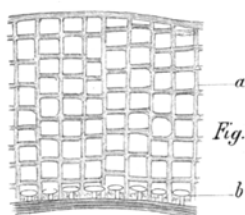


Fig. 6.

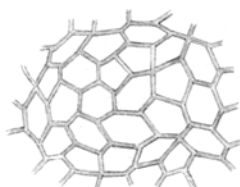


Fig. 4.

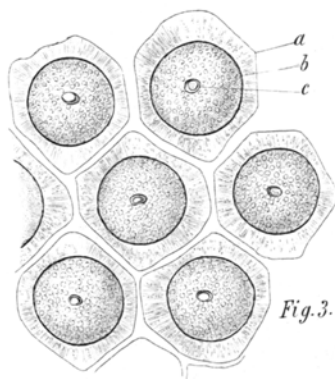


Fig. 3.

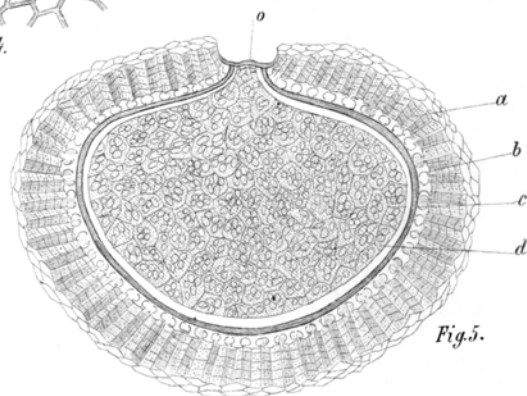


Fig. 5.

Mülleri," of which I distinguished "Forma A," "Forma B," and "var. *astrodiscus*." From observations made recently from fresh materials on "Forma B," this must be recognized as a distinct "good" species, for which I propose the name of *Ephydatia amphizona*.

The other question relates to the external parenchymatous envelope of the gemmules. I had previously found this in most of the indigenous species—*Euspongilla lacustris*, *E. jordanensis*, and *Ephydatia fluviatilis*. It remained still undecided whether corresponding envelopes were present on the gemmules in "*Ephydatia Mülleri*" and *Trochospongilla erinaceus*.

Having been able during the last vacation to investigate the above-mentioned forms in the fresh state, I can now furnish satisfactory information upon this question also.

I. *Ephydatia amphizona* (syn. *E. Mülleri*, Forma B) was obtained from the Juvorka brook near Soběic (Ostromeř), with the same characters that I have described in my monograph. Nevertheless the structure of the gemmules is quite different, and divergent from all allied forms. Fig. 2 shows a nearly median longitudinal section through a gemmule. In this we see the following layers:—

1. Externally, an outer layer of amphidisci (*a*), which project with their columns and distal terminal disks freely from the parenchymatous layer (*b*), while the proximal terminal disks are inserted into the upper parenchyma.

2. A tolerably thick parenchymatous layer (*b*) contains in its base the other layer of amphidisci (*c*), which is closely applied to

3. The brown chitinous membrane (*d*).

4. The inner space of the gemmule contains the germinal corpuscles (*e*).

Consequently *Eph. amphizona* is especially distinguished by the double layer of amphidisci in the parenchymatous envelope of the gemmules from *Eph. Mülleri*, var. *astrodiscus*, which, as I have recently convinced myself, possesses only a single layer of amphidisci in a feeble parenchymatous layer. As this latter form is also characterized by the form and habit of the exclusively hispid skeleton-spicules, it may be indicated by Lieberkühn's original name, *Ephydatia Mülleri**.

Whether the form indicated in my monograph as "*Eph. Mülleri*, Forma A," and as characterized by the peculiarly formed amphidisci, is to be regarded as a variety of the above-

* [*M. mirabilis*, Retzer, presents "a triple armature of amphidisci," according to Marshall, in a paper of which a translation will appear in our next number.—ED.]

mentioned species, or as a distinct species, I cannot at present decide with certainty.

II. *Trochospongilla erinaceus* was found in cushion-like stocks in a deep side-water of the Elbe, near Neratovic. The inferior layers of the lamellæ contain extraordinarily numerous gemmules, seated close together, as shown in fig. 3. The longitudinal section through a gemmule (fig. 5) presents the following interesting characters :—

1. The inner chitinous membrane is very thick and layered (fig. 5, c).

2. The very depressed amphidisci (b) are in direct connexion with the chitinous membrane.

3. The layer representing the parenchymatous envelope of the other Spongillidæ is peculiarly modified in *Trochospongilla*. When the surface of the gemmule is examined it appears to be composed of five- or six-sided prismatic spaces (fig. 4). Longitudinal sections, however, show that this layer consists of tall hollow columns (fig. 6), which are divided by transverse walls into a number of air-chambers. The walls are firm, not very flexible, shining, and probably composed of a chitinous substance. The interior space becomes filled with air.

The whole of this outer envelope evidently forms an aerostatic apparatus as a means of the more ready transportation of the gemmule, and perfectly corresponds to the natatory rings of the statoblasts of the freshwater Bryozoa.

Whether the North-American species with smooth-edged amphidisci, *Meyenia Leidii* and *M. gregaria*, possess corresponding envelopes, must be ascertained from fresh material. I cannot detect the air-chamber layer in the dry *Meyenia Leidii* transmitted to me for comparison by the kindness of Mr. H. J. Carter.

III. *Ephydatia fluviatilis*, aut., I have also obtained from the neighbourhood of Soběic (Ostromeř), out of stagnant water, and found that it agrees perfectly in its characters with the sponges of the same species that I have described in my monograph.

By the kindness of Mr. H. J. Carter also, I have been enabled to compare the English specimens of this species with our indigenous ones, and from this comparison it appears that the English "*Meyenia fluviatilis*, Carter," is identical with my *Ephydatia fluviatilis*.

EXPLANATION OF PLATE VI.

Fig. 1. *Ephydatia amphizona*, n. sp.; gemmule very slightly magnified.

Fig. 2. The same species. A nearly median longitudinal section (magn.

Zeiss V. oc. 2, obj. C). *a.* External amphidiscus-layer; *b.* Granular parenchymatous layer; *c.* Inner amphidiscus-layer; *d.* Chitinous membrane; *e.* Germinal corpuscles.

Figs. 3-6. Trochospongilla erinaceus, Ehr.

Fig. 3. Arrangement of the gemmules in the intermediate layers of the lamellæ. *a.* Air-chamber layer, representing the natatory ring of the statoblasts of the freshwater Bryozoa; *b.* Chitinous capsule; *c.* Aperture of the gemmule.

Fig. 4. Structure of the air-chamber layer on the surface.

Fig. 5. Median longitudinal section through a gemmule (magn. Zeiss V. oc. 2, obj. C). *o.* Aperture; *a.* Air-chamber layer; *b.* Amphidiscus-layer; *c.* Chitinous capsule; *d.* Germinal corpuscles.

Fig. 6. Longitudinal section of the air-chamber layer (magn. Zeiss, oc. 2, obj. E). *a.* Air-chambers; *b.* Amphidiscus-layer.

Remarks by H. J. CARTER, F.R.S. &c.

The foregoing translation of a "Résumé" in German, which is appended by Dr. Franz Vejdovsky to his "Contributions to the Knowledge of the Freshwater Sponges," read at the Society of Sciences in Prague on the 12th of October last, and subsequently published in the Bohemian language, is of much interest, because it points out additional instances of what has been seen in other freshwater sponges, viz. *Parmula Batesii*, *Spongilla nitens*, and *S. alba* ('Annals,' 1881, vol. vii. pp. 99, 89, and 88, pl. v. figs. 1 and 3, respectively), together with a new variety in structure. Thus, in his *Ephydatia amphizona* (syn. *Eph. Mülleri*, forma B) we have an illustration (Pl. VI. fig. 2) of what occurs in the statoblasts of the two former, viz. a layer of statoblast-spicules on each side of the "crust" ('Annals,' l. c. p. 83), here composed of the "microcell-structure" (*ib. ib.* pl. v. fig. 2, *a*); while in his *Trochospongilla erinaceus* (*Spongilla erinaceus*, Ehr.) is another example of what occurs in *Spongilla alba* ('Annals,' l. c. p. 88), viz. a mixture of spicules with the "microcell-structure," but in a new form, that is, instead of the crust being composed of microcell-structure charged with statoblast-spicules only, as in *Spongilla alba*, it is made up of comparatively large cells, like that in *Spongilla nitens*, &c. ('Annals,' l. c. pl. v. fig. 3, *i*), arranged in a columnar form, but traversed by full-sized skeleton-spicules of the species, and finally united to a layer of birotulates which are fixed to the "chitinous coat" (Pl. VI. figs. 5 and 6), yet so tenderly that, whether on account of this or the intermingling of the ends of the skeletal spicules which project beyond the cell-structure with the rest of the sponge, it very often happens that, in endeavouring to extricate the whole statoblast, the cellular crust &c. remains, while the chitinous coat and its layer of birotulates (amphidiscs) come away without it.

At least this is the result of my examination of several of the statoblasts taken from specimens of this sponge which Dr. Vejdovsky kindly sent me; but of course I am aware that in his illustration (Pl. VI. fig. 5) the *simple* fact of the arrangement of the parenchyma around the statoblast in hexagonal columns perpendicularly to the layer of birotulates on the chitinous coat alone is represented.

As yet I have been able to see this arrangement in fragments only, partly from the cell-structure being so intricately traversed by the skeletal spicules of the species and partly from its diffuse extension here and there beyond the surface of the capsule, recalling to mind that which is seen in *Spongilla fragilis*, Leidy = *S. Lordii*, Bk., to which Mr. Potts of Philadelphia directed my attention in the slide of this species which he kindly sent me in 1881.

Being better informed now on the subject than I was when I stated that *Spongilla erinaceus*, Ehr., of central Europe was "identical" with *Meyenia Leidii*, Bk., of Pennsylvania in North America ('Annals,' 1883, vol. xii. p. 331), I am now able to point out that they are different, viz. that whereas the crust in *Meyenia Leidii* is composed of microcell-structure enveloping the layer of birotulates which is fixed to the chitinous coat and separately surrounded by a capsule of smaller-sized spicules than those of the skeleton, although of the same form, viz. more or less spined and abruptly pointed, that of *Trochospongilla erinaceus* is surrounded by the comparatively large-cell structure first pointed out by Dr. Vejdovsky (*l. c.*), traversed by the long, fusiform, spined, sharp-pointed skeletal spicules of the species, as above described. In the American variety (for we can hardly call the differences specific, although it should be considered distinct and still retain its original name) the crust is sharply defined and separated from the surrounding spicular layer, while, as we have seen, in *Trochospongilla erinaceus* it is traversed by the skeletal spicules of the species which, with their outer points and diffuse cellular parenchyma here and there, intermingle with the surrounding tissue of the sponge. As I have before stated, however ('Annals,' *l. c.* p. 331), the first specimen of *Meyenia Leidii* from the Schuylkill river, kindly sent me on a slide by my friend Mr. Potts, bears, in addition to the smaller spicules around the statoblast above mentioned, others, viz. skeletal ones, almost identical with those of *Trochospongilla erinaceus*, thus still keeping up the almost endless variety in character of the Spongida generally. Other peculiarities of *Trochospongilla erinaceus* are the grey instead of the usual yelk-like colour and substance of the germinal contents of the statoblast;

the larger size of the "spherical cells" containing the germs, and their comparative tenacity, so that even in the broken section after desiccation these contents present a granular appearance instead of the usual homogeneity, from the unruptured state of these cells.

Through the great kindness of Dr. Vejdovsky I am in possession not only of a copy of his publications on the Fresh-water Sponges of Bohemia, but of specimens mounted and unmounted of *Ephydatia amphizona* and *Trochospongilla erinaceus*, so that I am able to confirm the interesting facts which he has stated and illustrated respecting these sponges.

While on this subject, I would add that on the 29th of November last I received for examination some specimens of the bottom-sediment of some lakes near Pictou, in Nova Scotia, from Mr. A. H. McKay, B.A., B.Sc., Principal of the Pictou Academy; and in that of "Earlton Lakes" I found, besides spined skeletal spicules, birotulates identical with those of *Meyenia Leidii*, together with others like those of the North-American form of *Spongilla lacustris* and those of the statoblasts &c. of Mr. Potts's? *Meyenia crateriformis*, so that, in a geographical point of view, the freshwater species of Pennsylvania are in all probability to be found also in Nova Scotia.

P.S.—Since the above was written I have also received from Mr. Henry Mills, of Buffalo, N. Y., a letter dated 25th December last, in which he states the same fact of some of the North-American freshwater sponges as that from Bohemia, described and illustrated above by Dr. Vejdovsky under the name of *Ephydatia amphizona*. Mr. Mills's letter is accompanied by two specimens, viz. one from Ischua Creek, Cattaraugus Co., N. Y., and the other from Bear Creek, Iowa, in which I have been able to confirm what he has stated. He also notices a third locality, viz. the Calumet Creek, sixteen miles south of Chicago, adding that "all these have the biserial arrangement of the birotules in the outer coat of the statoblast."

Of what *specific* value the bi- and triserial rows of birotulates may be I am not prepared to say, as I find them also in the statoblasts of *Meyenia fluviatilis* of Bombay, wherein the crust of those that are fully developed is very thick, and often shows *three* birotulates *end to end*, although not so numerous, so regular, or so uniform in arrangement as in the *innermost* row; indeed I should say the outer ones were scattered, particularly those of the *outermost* row—recalling very much to mind the

enormously long birotulates of Mr. Potts's *Heteromeyenia angyroserma* ('American Naturalist,' Dec. 1883, p. 1296, fig. 13, e, f), in which one set are very long indeed and the other comparatively short; thus the former project much beyond the latter on the statoblast, which renders its surface correspondingly irregular. Nor is the size *alone* of the cells of the parenchymatous structure of any use specifically, as I find from a variety of *Spongilla fragilis* just (12th January) received from Mr. Potts, in which there are all sizes mixed together like the bubbles in froth.

XI.—*A Reply to the Remarks of Prof. Duncan on a Paper entitled "Contributions to the Actinology of the Atlantic Ocean."* By G. LINDSTRÖM.

IN the 'Annals and Magazine of Natural History' for December 1883, Prof. Duncan has thought proper to criticise a paper of mine which was published in 1877. Prof. Duncan, who during the interval of seven years "felt no disposition" to "reply" to me, now finds it necessary not only to "reconsider" my paper, but to use language by no means consistent with the quiet tone that ought to prevail in scientific discussions.

Prof. Duncan seems to think* that I, convinced of my errors, especially through his writings, ought to have recanted my statements long ago, and admitted that they were erroneous. I have not done so—first, because I am not convinced that I am wrong to the extent Prof. Duncan supposes; secondly, because I could not admit facts solely upon the dictum even of Prof. Duncan himself; thirdly, because I have not had occasion to revert to this matter specially until now, when I am compelled by Prof. Duncan's uncalled-for attack, much against my will, to turn from more urgent occupations.

Premising that a great part of his criticism consists of a recapitulation of remarks already made by Pourtalès and Moseley, and with which zoophytologists have been long conversant, I shall now try to reply to the points put forward as Prof. Duncan's own animadversions.

Caryophyllia Pourtalesii, Duncan.—I was led to give this

* "I hoped that time would bring some remarks from him. . . . These researches [of Duncan, Pourtalès, and Moseley] might have modified Prof. Lindström's views; but as they do not appear to have done so," &c. (Ann. & Mag. Nat. Hist. Dec. 1883, pp. 361, 362).