

*On RHABDONEMA, and a NEW ALLIED GENUS.*

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THE late Professor Smith was justly entitled to be placed at the head of those whose attention was directed to the Diatomaceæ. Possessed of excellent instruments, and of a mind clear and discriminating as to what the limits of a genus or species were, he was alone qualified, if he had obtained access to authentic perfect specimens, to correct the unavoidable errors of Kützing, or extract what is valuable from the chaotic writings of Ehrenberg; the latter of whom, by his figures of numerous forms of which he had only seen very imperfect specimens, unaccompanied by precise, sufficient diagnostical characters, has done more to cumber the science with a load of useless names than can be rectified for many years to come.

So long as Smith survived, I preferred committing my notes to him to dispose of as he thought proper, his sentiments being in accordance with my own,—that it is better not to publish a new species, or give it a name, than to do so from scanty or imperfect materials which leave both genus and species doubtful. Even now I have some hesitation in writing on the subject, as my views are diametrically opposed to those who consider it necessary to give names to forms which, to the eye, appear distinct, but which have not structural differences sufficient for a specific character; and this alone entitles them to be acknowledged or referred to by others.

In the following I shall endeavour to make the characters as clear as possible.

Smith has first correctly defined and explained the structure of *Rhabdonema*. Each frustule of this genus has two *valves* or ends, which are alike, and marked with moniliform striæ; these valves are separated by several *annuli*, which are cellulate; the annuli project into the interior *septa*, which are open in the middle. These septa are sometimes projected from the whole inner surface of the annulus; sometimes from one half only, and consequently do not then pass beyond the central aperture: the first are called opposite, the last alternate, septa; in either case, each septum is supposed to terminate at the middle; they may be entire, or with openings when they are said to be perforate.

As many merely consult figures, it is necessary that I request my readers to keep the above in recollection; or, if they possess Smith's second volume of the 'Synopsis of British

Diatomaceæ,' to peruse what he says, otherwise my present observations may not be understood. It will be also necessary to bear in mind that, in some other genera, as *Achnanthes*, where there is a dissimilarity between the two valves of the frustule, the one next the point of attachment is termed the inferior valve, the other the superior. These terms I shall have occasion to employ.

Having received lately from Professor Harvey, of Dublin, some Algæ of the group called *Corallinaceæ*, from New Zealand, I washed these thoroughly, in case of any diatoms being mixed with the sand and mud that accumulate about such, and obtained a few only; but two interesting and closely allied forms presented themselves, along with several of Kutzing's species of *Grammatophora*, &c. Both had a resemblance to what I have found in the coarse or sandy portions of Ichaboe guano (imported about two years ago), and of which I distributed some slides under the fanciful but only provisional name of *Gephyria*, as I had not then sufficient materials to clear up its affinities. Of the two from New Zealand, one exhibited a side view which somewhat resembled a species of *Surirella*; the second was elliptic-linear (as if one had compressed a ring), and apparently pierced with numerous pentagonal holes in a double row. These markings sometimes extended to the end of the valve, sometimes stopped half way from the middle. There were also two forms of front views, which it was difficult to connect with the side view peculiar to it.

On afterwards examining the Corallines, I detected a small specimen of *Ballia callitricha*, and creeping on *Corallina officinalis* a little piece of *Polyzonia Harveyana*; on both of these I observed a diatom which resembled closely the genus *Rhabdonema*, but of which the thread was composed of not more than three frustules; this, however, might have arisen from the remainder being broken off, although my present impression is that such an appearance was not accidental. From the scantiness of the materials I succeeded in obtaining only a very small preparation of each; and although I kept them separate, still, in consequence of the previous washing along with the Corallines, a few frustules in both instances had been deposited on, or caught by the Alga, on which the other was parasitical. At first, then, I had some doubts if these two were distinct, as, in both, the valves were furnished with costæ; but the front views exhibited a different appearance, from the septa in the one being rudimentary, while in the other those nearest the valves were marked similarly to these, and scarcely distinguishable from them.

Doubts may arise whether what I have described as costæ on the valve, are not strongly developed septa projected by the adjacent annulus and seen through the valve; and this hypothesis would increase the affinity of the first and third species to the second one. But a careful examination of the first species to be described, where observations can be more easily made than on the other two, leads to a contrary opinion: 1st, the striæ are never seen on the valve except between the costæ; on the lower valve they terminate where the costæ terminate: 2d, I have not been able to detach a single valve so as to exhibit striæ without the costæ, or septa without striæ. The two formations are thus dependent on each other, and the one is indissolubly united to the other; whereas in *Rhabdonema* and *Grammatophora* the septa can be separated, leaving the striated valve by itself.

In all the three species the valve varies considerably in form; so that had I not obtained them in a tolerably separate state, I should have been puzzled whether to combine all into one, or to constitute of them many more species than I have proposed. Indeed, when species of the same genus are much mixed and only known from deposits or dredgings, it is quite impossible to draw any satisfactory conclusions.

Perhaps it might have been sufficient to unite the species I have to notice to *Rhabdonema*; but the valves are not only furnished with costæ, but these costæ are differently arranged on the two valves; whereas in all true species of *Rhabdonema*, the two valves are precisely similar to each other, and without costæ. If the two genera be combined, the character must be enlarged, and then it will be no easy matter to exclude by it other genera which all agree are distinct. I have therefore thought it preferable to separate the new one under the name of

#### EUPLEURIA.

Filaments compressed or arcuate, continuous, attached. Frustules annulate, indefinite; annuli plane, cellulate or striate on their circumference; septa opposite or alternate, rudimentary or perforate. Valves ovate, elliptical, or arcuate, with one median and several lateral costæ; inferior with the costæ and striæ disappearing below the extremities of the valve, superior with them reaching to the extremity: striæ moniliform, oblique.

1. *Eu. pulchella*; annuli as broad as the flat valves, cellulate; septa all rudimentary.

*Hab.* New Zealand, on *Polyzonia Harveyana*.

Annuli numerous, about 11 in '001, with about 15 cells in '001. Septa apparently wanting, but from the external appearance of the frustule, they seem to exist, although in a very rudimentary state, and to be alternate; they have consequently no perforations. Valves the breadth of the annuli, flat, usually more or less ovate and acuminate, sometimes linear-oblong. Striæ only between the costæ, oblique, about 80 in '001, easily seen with a quarter-inch object-glass.

2. *Eu. ocellata*; annuli as broad as the nearly flat valves, finely striate; the septa contiguous to the valves, perforate.

*Hab.* New Zealand, on *Ballia callitricha*.

Annuli numerous, about 18 in '001, with about 40 striæ in '001. Septa opposite, those nearest the valves composed of costæ similar to what are seen on the valves, but with the interstices open; the rays on the front view (formed by the subjacent septa) diverging from the lower valve, and converging from the upper one, indicate that these openings enlarge, while the septa themselves become narrower and fainter as they approach the middle of the frustule, where they are evanescent or rudimentary. All the annuli do not project the septa simultaneously; those next the valves do so first, the last projected being the most remote: a frustule, therefore, may present itself which has only the annulus next the valve provided with septa, and one solitary example occurred where even then they had not been formed or were wanting; when this takes place, the species can scarcely be distinguished from the following one, except by the flatness of the valve, the coarser striæ on the annuli, and the breadth of the annuli as compared with the valve. Valves nearly flat, not perceptibly broader than the annuli, elliptic linear or sometimes slightly lunate, rounded at each extremity. The striæ are so faint that I have not been able to observe them satisfactorily.

Mixed with this, and parasitical along with it, are several frustules of what at first sight resembles a minute *Himantidium*; but I have not yet ascertained its side view, and as its genus is as yet doubtful, it is unnecessary to allude to it further.

3. *Eu. incurvata*; annuli conspicuously narrower than the very convex valves, delicately striate; septa entire.

*Hab.* West coast of Africa (among guano from Ichaboe, 1855).\*

\* I would not have introduced this species had I not seen many front as well as side views of it, as it is seldom that any certain conclusion can be obtained from deposits, dredgings, or guanoes. As an instance of a mistake occurring in that way, I may allude to *Pleurosigma compactum*, Grev.,

Annuli few, about 5 in '001, with about 50 striæ in '001. Septa apparently opposite and rudimentary, or if present are not marked by costæ or perforations. Valves very convex, arcuate, or somewhat linear and lunate, considerably broader than the annuli, the entire frustule presenting the appearance of a little bridge (*Gephyria*) with a low parapet on each side. Striæ oblique, only between the costæ, very much fainter than in *Eu. pulchella*, but not seemingly much more numerous (from 36 to 40 in '001), although requiring careful illumination and an object-glass of high power ( $\frac{1}{8}$ -inch) to exhibit them.

In all these the median line or costa is not quite straight, but slightly bent in a zigzag manner, the lateral ones being generally alternate and proceeding from the angles of the median one. In the inferior valve the median line projects slightly beyond the lateral ones, and there usually forms a little knob.

I have not attempted to measure the distances of the striæ or annuli with accuracy; the numbers I have assigned are therefore more to be considered as relative, and probably are very different from what others may determine them to be.

I shall now give the generic character of *Rhabdonema* slightly restricted from what is given by Smith, with abridged characters of all the known species.

#### RHABDONEMA, Kütz.

Filaments compressed, continuous, attached, or stipitate. Frustules annulate, indefinite; annuli plane, cellulate on their circumference; septa opposite or alternate. Valves similar,

which is a genuine species of *Amphiprora*. This was first found copiously in the living state, and properly understood by Mr. Ralfs, of Penzance; and as the specific name given by Dr. Greville is quite inapplicable to an *Amphiprora*, I have no hesitation in changing it to *A. Ralfsii*.

*A. Ralfsii*; F. V. narrow, elliptical, deeply constricted; V. twisted equally from end to end; striæ about 53 in '001.—*A. didyma*, Sm. Brit. Diat., t. 15, f. 125? (excl. the name and char.)—*Pleur. compactum*, Grev., M. J. V., t. 3, f. 9 (name and char. erroneous).

*Hab.* Penzance; *J. Ralfs*. Cumbræ; *R. Hennedy*. Dredged also in various places in the Clyde by Mr. Hennedy and Rev. Mr. Miles.

The figure given by Smith is equally characteristic of this species, and of what Dr. Gregory calls *A. Lepidoptera*; but if the number of striæ, 72 in '001, be not an error of the press for 52, it can be neither. Dr. Greville describes the striæ as "obscure," which they are under a bad object-glass; but they are as conspicuous and as few in '001 as in *Pleur. Estuarii*, which usually in this country accompanies it, both in the normal and distorted shells; the latter of which has both ends bent in the same direction, a structure that occurs in some other species of that genus.

elliptical, ecostate, with a median line, striate. Striæ transverse, moniliform.

SECT. I. *Septa entire.*

1. *Rh. arcuatum*, Kutz. ; septa opposite ; striæ not reaching to the end of the valves.

*Hab.* Shores of Europe, Africa, and North America.

To this belongs *Tessella catena* of Ehrenberg.

2. *Rh. minutum*, Kutz. ; septa alternate ; striæ reaching to the extremities of the valves.

*Hab.* Shores of Europe and North America.

To this belongs *Tessella catena* of Ralfs.

SECT. II. *Septa alternate, with perforations along the middle between the margin and central aperture.*

3. *Rh. Adriaticum*, Kutz. ; septa with one oval perforation.

*Hab.* Shores of Europe, North America, Asia Minor, Mauritius, and Ceylon.

Probably more diffused than any other species. To it belongs *Tessella catena* of Bailey.

4. *Rh. mirificum*, W. Sm. ; septa with several (3 to 12) irregular perforations.

*Hab.* Shores of Ceylon and Mauritius.

In this species the openings in the septa are irregular in form, and reach from the upper to the lower margin of the annulus ; while the portions of the septa that separate these are narrow, and resemble bars which are either straight across or slightly oblique. When two such septa cohere, the perforations seem to extend from the one end to the other, and are then in no instance, as far as I have seen, fewer than seven, including the central opening, but usually are much more numerous (20 to 25).

In my preliminary remarks I have alluded to *Achnanthes*. I may here take this opportunity of stating that *A. brevipes* of Kützing, which has a rather short stipes and valves with acute extremities, has been found lately (November, 1857), by Mr. Okeden, at Neyland, in South Wales. This is referred by Smith to *A. longipes*, on account of the presence of costæ on the valves, along with moniliform striæ: to this there is no valid objection ; but, in that case, it ought to be noticed as a well-marked *variety*, and the word "obtuse," in reference to the valves, deleted from the specific character, as by no means applicable to this form of the species. Mr. Okeden has also found (March, 1857) at Neyland the *A. parvula* of Kützing ! a species which must be removed from

the section in which Kutzing has placed it (from using an inferior microscope), as the striae are very conspicuous with a good lens, being as few as 33 or 34 in '001. It differs from the true *A. brevipes* of Agardh, by the elliptic-oblong obtuse valves; from *A. subsessilis* by the usually numerous frustules and the distinct and somewhat elongated stipes; and from both by the much finer striae.

REMARKS on the GENUS "RHIZOSOLENIA" of EHRENBURG.

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AMONG the remarkable forms lately detected in *Ascidia* and *Noctiluca*, specimens have been found of some which appear to belong to the genus *Rhizosolenia*, of Ehrenberg.

Having had, in this case, as in that of *Chaetoceros*, an opportunity of examining the species in a tolerably perfect state, we hope to be able to exhibit the true character of several more of those fragmentary and unsatisfactory forms which Ehrenberg, in his various works, and particularly his 'Microgeologie,' has, as we conceive, too hastily and injuriously to science, erected into genera and species.

The characters given by him of the genus *Rhizosolenia* are "lorica tubular, with one extremity rounded and closed, while the other is attenuate and multifid, as if terminating in little roots." He describes five species, some of which do not at all agree with the above characters; and the late Professor Bailey added a sixth under the name of *R. hebetata*. The greater part of these supposed species are, as we believe, only fragments of the silicious organisms we are about to describe, or of kindred species, and to enable the reader to judge of the correctness of our views, we have given copies of several of Ehrenberg's published figures, as well as figures of all our newly-discovered perfect forms.

Ehrenberg's five species are\*

1. *Rh. Americana*, from Virginian earth. Of this he gives no less than eleven figures, most of them certainly not belonging to this genus.

\* These species (and a sixth clearly not belonging to it) are described in Kutzing's 'Species Algarum,' p. 24, where the references to Ehrenberg's works or papers, in which they first appeared, are to be found.