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XXXVI.—On the British Diatomaceæ. By JOHN RALFS, Esq., M.R.C.S., Penzance*.

[Continued from p. 111.]

[With a Plate.]

THE frustule in most of the *Cymbelleæ* consists of three portions. The central one is continuous and surrounds the internal colouring matter, and is generally compressed so as to have two surfaces and two ends. The lateral portions are most frequently nearly flat, corresponding to the septa between the joints of the *Conserveæ*; but sometimes they are convex, and then appear on a front view as in *Achnanthes*. In *Isthmia* they are still more developed, and being compressed, look as if they belonged to the front of the frustule.

Striæ which may be present on either the central or lateral parts commonly terminate in puncta or dots. On the central portion they are longitudinal and continued round the ends, are in general strongly marked, and often assist in distinguishing the genera. On the lateral surfaces the striæ are always transverse, less distinct, and frequently numerous and crowded. Sometimes they are very faintly marked, but the more powerful the microscope used in the examination, the greater will be the number of species found to possess them. On this account it is extremely difficult to pronounce whether a species has them or not; and therefore, although they may sometimes assist in the discrimination of species, their absence or presence will not sufficiently distinguish genera.

ISTHMIA, Ag. (Eh.)

Filaments attached; frustules oblique, trapezoid, cellulose, cohering at the angles by small processes.

This genus is easily distinguished by its cellulose structure from all the neighbouring genera, except *Biddulphia* and *Amphitetras*, which agree with it in having the frustules reticulated; but differ inasmuch as their frustules are not oblique, and all the angles are elongated†.

The frustules vary in form, but are always more or less oblique; there is a process at one of the lower angles of each by which it coheres to the next, and in the basal frustule this process forms the stipes by which the plant is attached to other Algæ. The frustules are turgid, and the reticulations of the central portion

* Read before the Botanical Society of Edinburgh.

† To the distinguished botanist M. Montagne, I am indebted for a few frustules of an *Isthmia* from Cayenne (*Isthmia polymorpha*, Mont.), which in some degree connects this genus with *Biddulphia*. It is very minute; the reticulations are obscure, and the frustules are sometimes slightly produced at each of the four angles.

are smaller than those of the sides. On each side of this central portion are seen the lateral surfaces, with their reticulations and striæ arranged transversely. As these lateral surfaces are turgid and compressed, they appear at first sight to form part of the front of the frustule. This may be observed in some slight degree in *Diatoma vulgare*, but not to the same extent as in this genus.

That it is in fact a portion of each lateral surface which is thus seen in front will be found on a careful examination of the exterior; but it is still more evident on a view of the interior of a fractured frustule, when the junctions of the sides with the central portion, marked externally by mere lines of separation, form internally projecting plates or rims.

The mode of growth in this genus is very curious. In *Diatoma*, as well as in most of the *Diatomaceæ*, the plant increases by a division of the frustules; but in this genus, and also in *Biddulphia* and *Amphitetras*, two new frustules are formed within the old one, and, as they enlarge, rupture it, when it falls off. In these the front portion is at first very narrow and merely a broad line, but it increases greatly in breadth until the new frustules are fully formed.

1. *I. enervis*, Eh. Frustules generally much broader than long, the sides with large reticulations, not striated, or else with the striæ between each row of cells. *Isthmia enervis*, Eh. Die Infus. p. 209. t. 16. f. 6; Pritch. Infus. p. 223. f. 183. *Isthmia obliquata*, Hook. Br. Fl. p. 405; Harv. Br. Alg. p. 201. *Isthmia obliquata*, β *tenuior*, Ag. Consp. Diatom. p. 55. *Biddulphia obliquata*, Gray, Arr. p. 294. *Conf. obliquata*, E. Bot. t. 1869.

\beta. subcylindrica.

Ballywater, co. Down, Ireland, Mr. Thompson; Torquay and Ilfracombe, Devonshire; Bracelet Bay near Swansea.

\beta. Torquay, Mrs. Griffiths.

Ehrenberg considers the 'Eng. Bot.' figure to belong to the next species, but I have no doubt that it is intended for this plant, of which it is a very good representation. The highly magnified figures in 'Eng. Bot.' undoubtedly represent it; those that are less magnified are too broad for the frustules of his *I. obliquata*, whilst under a low power this species appears striated like them.

The trivial name *obliquata*, which was originally applied to this species, should I think have been retained; but, on account of the celebrity of Ehrenberg's work, I have not thought it expedient to change his name.

Under this species, as I am informed by Mr. Dalrymple, Ehrenberg gives no synonyms and only one habitat,—Gothen-

berg. I believe, however, that most of the habitats assigned by him to *I. obliquata* will prove to belong to this species.

The frustules are generally from two to three times broader than long, but sometimes they are nearly equal in length and breadth. This is more particularly the case in the newly-formed frustules. The front or "broad transverse band" of British works generally occupies from one-quarter to one-third of the frustule, and its reticulations are roundish and very much smaller than those of the sides. This portion is separated from each lateral portion by a rather broad line formed by the junction and inflection of the two portions. The cells bordering on this line are not remarkably larger than the other cells in this band.

The cells in the lateral surfaces are of a square form and are arranged in regular transverse lines separated from each other by pellucid lines, which viewed from within form ridges and are as truly striæ as those in the next species, and under a low power the frustule appears with numerous close striæ as seen in the figure in 'Eng. Bot.,' which I have already referred to this species.

Mrs. Griffiths has sent me two forms from Torquay; one like that described above, the other with frustules much smaller and broader, and so turgid as to be nearly cylindrical. Of this latter I have seen but a very small portion, and am uncertain whether it is a young state of this species or wholly distinct.

PLATE VIII. fig. 1. *a*, *Isthmia enervis*; *b*, variety β .

2. *I. obliquata*, Ag. (Eh.) Frustules rather broader than long, the front with a series of large cells along each separating line, the sides with but few and rather distant striæ. *Isthmia obliquata*, Eh. Die Infus. p. 209. t. 16. fig. 5; Pritch. Infus. p. 223; Ag. Consp. Diatom. p. 55?; Kutz. Synop. Diatom. in Linnæa 1833, p. 579. t. 16. fig. 69?

Carnlough Bay, co. Antrim, *Mr. Moore, Dr. Drummond, and Mr. Thompson.* *Mr. Moore* has also gathered it in the co. of Wicklow.

This and the preceding species have been so confused, that I quote the above synonyms with some doubt. Ehrenberg considers Kützing's figure to belong to this species; and as it exhibits series of larger cells bordering the separating lines, I have quoted it under this plant, but I am by no means certain whether it is intended for it.

On examining recent plants of *Isthmia* gathered at Ilfracombe in October last, it appeared to me that all my specimens belonged to *I. enervis* of Ehrenberg and not to his *I. obliquata*, and Mr. Dalrymple having compared one of them with Ehrenberg's figure, ascertained that my supposition was correct. About the same time a very valuable packet of Irish *Diatomaceæ* was sent to me by Mr. Moore, amongst which I was much pleased to find

the real *I. obliquata* of Ehrenberg. I afterwards received from Mr. Thompson the same plant gathered at the same habitat.

The same confusion of the two species seems to prevail abroad, as a specimen sent me by Mrs. Griffiths, gathered in Sweden by Dr. J. E. Arcschoug, who calls it *I. obliquata*, is undoubtedly the *I. enervis*. As the two species when compared are very distinct, their confusion may perhaps be in great measure owing to the mistake of Ehrenberg in referring the figure in 'Eng. Bot.,' and also all the habitats recorded before the publication of his work, to his own *I. obliquata*.

The frustules are usually not so wide in proportion to their length as in *I. enervis*; they are generally a little broader than long, often about equal, and I have sometimes observed them even rather longer than broad: in other respects their shape resembles the preceding species.

In the central portion, close to the lines which separate it from the lateral portions, is a single series of large reticulations, in shape somewhat triangular and having their base next to the lines: in this way a beautiful beaded appearance is produced. The sides have the reticulations much smaller than in *I. enervis*, less square, and not arranged so regularly in lines. They have also a few rather distant but conspicuous transverse striæ; not, as in *I. enervis*, alternate with the reticulations, but containing from two to four irregular series of reticulations between them: this latter circumstance, combined with the more minute reticulations and broader lines, gives this species so much more decidedly the appearance of being striated. The striæ frequently anastomose.

PLATE VIII. fig. 2. *Isthmia obliquata*.

BIDDULPHIA, Gray.

Filaments attached; frustules siliceous, quadrilateral, minutely reticulated, cohering by their alternate angles, and thus forming a zigzag chain; the angles are equal and elongated into tooth-like projections.

Agardh founded his genus *Odontella* upon *Diatoma auritum*; in that plant however I am unable to find any character by which it may be distinguished as a genus from *Biddulphia*. It is fortunate that the latter name has a prior claim, as it will prevent the confusion which might otherwise arise, as Ehrenberg and Meyen have applied Agardh's name *Odontella* to a genus belonging to the *Desmidiæ*.

I have already observed under *Isthmia* that its structure is similar to that of the present genus. *Biddulphia*, like that genus, has reticulated turgid frustules, which cohere by the elongated angles. *Biddulphia* has also the lateral portions so inflated that

they seem a part of the front of the frustule, the central portion appearing like a band between them. The mode of growth in this genus is also similar, but it differs in having all the angles elongated and equal.

The filaments are attached by one of the angles of the basal frustule. At first the frustules are connected with each other at both the adjoining angles, and as these angles are elongated, a small vacant space is inclosed between the connecting processes of the frustules. Ultimately, and after a partial separation has taken place, they cohere only by the alternate angles and form a zigzag chain.

1. *B. pulchella*, Gray. Frustules distinctly reticulated; lateral surfaces with one or three rounded projections between the angles, and marked with a few distant striæ, which appear to arise from the depressions between the projections. Gray, Nat. Arr. of Br. Plants, vol. i. p. 294: Kutz. Syn. Diatom. p. 610. *Diatoma Biddulphianum*, Ag. Consp. Diatom. p. 54; Harv. Br. Alg. p. 201. *Conserva Biddulphiana*, Eng. Bot. t. 1762! (upper figures)*.

Southampton, Miss Hill; Ilfracombe.

It is brownish when recent and becomes paler in drying.

Filaments elongated, attached; frustules generally broader than long, but varying much in figure as the central portion, which is at first very narrow, gradually increases in size until it becomes broader than long. The lateral portions have at least one, and sometimes in the larger specimens three rounded projections, between the angles. None of these project so much as the angles, and the central one is larger than the others, which are often nearly flat. From the intervals between the projections, striæ proceed to the line which separates the central portion from the lateral one; generally these striæ are single, but sometimes two proceed from the same point and diverge from each other as they approach the central portion. The striæ are often united by irregular anastomosing lines; there is frequently also a line surrounding the base of the projecting angles. Between the striæ the lateral portions are cellulose, exactly like the central.

This cellulose structure is easily observed under a moderate power of the microscope. The angles are rounded, and occasionally constricted at their base, but more frequently not so. There is no constriction at the junction of the lateral portions with the central one.

This species is a most beautiful microscopic object.

PLATE VIII. fig. 3. *Biddulphia pulchella*.

2. *B. aurita*. Frustules very minute; cellulose structure indistinct; lateral portions without striæ. *Diatoma auritum*, Lyngb.; Ag. Syst.

* The lower figures seem to have been drawn from *Diatoma teniaforme*.

p. 6; Grev, in Hook. Br. Fl. p. 404; Kutz. Syn. Diatom. p. 585. *Odontella aurita*, Ag. Consp. Diatom. p. 56; Harv. Br. Alg. p. 201; Berk. in Eng. Bot. t. 2842. fig. 2. (excellent).

On marine algæ. East-Bourne, Sussex, Mr. Jenner.

Frustules very minute, quadrilateral, varying from nearly square to twice as long as broad. This difference depends upon the breadth of the central portion or band, which is narrowest in the newly-formed frustule, and broadest at the time two new frustules are formed, whilst the lateral portions remain nearly of the same size in all the stages of growth.

The reticulations of the frustules are so very minute, that they can only be perceived by employing the highest power of the microscope after the colouring matter is removed*.

The lateral portions are constricted at their junction with the central one, and are destitute of striæ; I have never seen more than one convex projection between the angles, which are also more elongated and less rounded at the point than those of the preceding species.

It will be observed that this species differs from *pulchella* in the same manner as *Isthmia enervis* does from *I. obliquata*, namely in the absence of striæ. But *Biddulphia aurita* also differs from *B. pulchella* in its smaller size, in the obscure reticulations of the frustule, and by the constriction at the junction of the lateral portions with the central one.

A specimen of this species from the Cape of Good Hope, given me by Mr. Harvey, has the cellulose structure rather more evident than the Sussex specimens.

PLATE VIII. fig. 4. *Biddulphia aurita*.

AMPHITETRAS, Eh.

Filaments 4-sided; frustules reticulated, cubiform, cohering by one of the angles and forming a zigzag chain.

Filaments attached by one of the angles of the basal frustule; frustules cubiform, rectangular, or more frequently with all the angles slightly produced, reticulated, cohering irregularly by one of their angles so as to form a zigzag chain.

This genus agrees with *Isthmia* and *Biddulphia* in the reticulated structure of the frustules; in the great size of the lateral surfaces, between which the central portion appears like a band; in the produced angles, which are situated entirely in the lateral portions; and in cohering at the angles and thus forming a zigzag chain. It also agrees with these genera in their peculiar

* Mrs. Griffiths employs nitric acid for the purpose of removing the colouring matter. This method is on some accounts preferable to that of burning, especially as it is less liable to injure the frustules; it takes however more time, whilst the other requires only a few minutes.

mode of growth already described, two new frustules being gradually formed within the old one; but it differs from *Isthmia* in having all its angles equal, and from both in having a four-sided and not a compressed figure.

1. *A. antediluviana*, Eh. Frustules nearly square, lateral surfaces with the cells arranged in a radiate form. Pritch. Infus. p. 442.

Parasitic on the smaller marine algæ. Ilfracombe, Devonshire; and by the Mumbles Light-house near Swansea.

It is of a dirty-brown colour when recent and becomes paler in drying.

Filaments elongated, frequently containing thirty frustules in a chain; frustules minute, nearly equal in length and breadth; each lateral portion has four slightly produced angles and no intermediate projections, and its cells are rather large and somewhat radiate.

On a lateral view the figure is quadrangular with concave sides, and at each angle there is either a round opening, or a large and more strongly marked cell which presents the appearance of one.

The central portion is four-sided, and its reticulations, which are smaller, are frequently arranged in lines.

Mrs. Griffiths aptly compares the figures of the separated frustules to bales of cloth made up with bands for exportation.

PLATE VIII. fig. 5. *a*, *Amphitetras antediluviana*; *b*, frustules deprived of their colouring matter; *c*, lateral view.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Nov. 22, 1842.—Wm. Yarrell, Esq., Vice-President, in the Chair.

The following descriptions of new species of *Nerites*, collected by Mr. Cuming in the Philippine Islands, by M. C. A. Récluz, were read.

Observation.—By length is meant the distance from the summit of the spire to the external base of the columella; by breadth, the diameter formed by the extremities of a line which should pass from the anterior to the posterior side; and by convexity or thickness, the distance comprised between the most convex parts of the columella and of the last whorl.

Second Section of the Genus.—Shells smooth, or striated lengthwise; outer lip without teeth and without furrows internally; columella not notched at the summit; columellar lip sharp, or crenulated at the margin. *Neritina*, Lamarck.

* *Orbiculatae seu subhemisphaericae*.

1. *NERITA LABIOSA* (Sowerby). *N. testâ orbiculari, posticè angustâ, fornicatâ, crassâ, maximâ, striatâ, fusco-viridescente, nigro et rufo obsolete variegatâ; anfractibus duobus ad suturam com-*