

greatly rounded caudal, and a much more slender head than that of *vittatus*. This plate is probably a representation of a fish procured by MM. Quoy and Gaimard at Port Western in New Holland, and unless the artist has erred in the form of the dorsal and caudal, it can scarcely be the same with Forster's *pullus*, and is still more evidently distinct from Solander's *vittatus*.

[To be continued.]

LX.—*Descriptions of British Freshwater Confervæ, mostly new, with observations on some of the Genera.* By ARTHUR HILL HASSALL, Esq.

Genus DRAPARNALDIA.

Draparnaldia repetita. Filaments branched, consisting of a repeated series of cells, each of which is composed of five or six cells or utricles which gradually decrease in size from the first or lower cell, which is rounded below, to the last or upper one; a tuft of minutely divided filaments, similar to those of other *Draparnaldia*, arises from the superior cell of the series usually only on one side, but sometimes on both; the different series are not placed in a straight line immediately above each other, but are arranged somewhat in a zigzag or waved manner.

I have only once met with the above species, and then but in small quantity; it is therefore no less rare than it is curious. Each series of cells is an epitome of the entire plant, which consists but of an aggregation of these series. A sketch of it was forwarded to Dr. Greville, who did not hesitate to agree with myself in the opinion of its distinctness.

Draparnaldia elongata. Filaments very slender, ciliated; cells fasciated, usually three times as long as broad.

I once met with a considerable quantity of the above species in a horse-trough near Cheshunt: it is however by no means common.

Draparnaldia sparsa. Filaments highly mucous, very slender, sparingly branched; branches acuminate, not usually ciliated; cells rather broader than long.

This is by no means an uncommon species during the spring and early part of the summer, being attached frequently to dead leaves and sticks. In the fineness of the filaments, in the shortness of the cells, as well as in the excessive mucosity of its filaments, it seems to evince some relation to the genus *Chætophora* (a bad name, as the species of the genera *Batrachiospermum* and *Draparnaldia* are likewise chætophorous).

Draparnaldia condensata. Filaments of considerable diameter, sparingly branched; branches furnished with cilia; cells two or three times broader than long, and usually entirely filled with endochrome, which renders the demarcation of the cells but little apparent.

This is one of the finest and most distinct species of the genus. The only locality at present known for it is in a large fish-pond, opposite Mr. Bosanquet's school for girls, in the parish of Wormley, Hertfordshire.

Genus VAUCHERIA.

Vaucheria aversa. Vesicles sessile, germinate, sometimes ternate, in form resembling a bird's head, the beak or summit of each vesicle being turned in opposite directions, so that a distinct horn or anther is required for each; anther depressed; spores circular, not filling the entire cavity of the capsule.

I have only once met with the above species, but then in considerable quantity and in great perfection. It differs from *Vaucheria sessilis* in the form of the vesicles, and the beaks are turned from and not towards each other as they are in all other species.

Vicinity of Cheshunt.

Vaucheria polysperma. Filaments minute; vesicles subsessile, varying in number from one to five, but usually there are three; in form the vesicles resemble an old-fashioned bill-hook, their beaks are long and point in the same direction; spores circular, not filling the entire cavity of the vesicles.

This species, which is by no means uncommon, may be distinguished from all others known to me by the fineness of its filaments, which are not half so large as those of our other British species. I at first thought that it might be identical with the *Vaucheria ornithocephala* of Agardh, but in that species the vesicles are represented to be pedunculated, and are either two or four in number.

It is remarkable to observe that in this *Vaucheria* there are no distinct horns or anthera, the base of each vesicle before its complete formation appearing to discharge the office of an anther.

Vicinity of Cheshunt.

Vaucheria hamata (syn. *Ectosperma hamata*, Vaucher, Hist. des Conf. d'eau douce, p. 26. pl. 11. fig. 2.). Vesicles solitary, pedunculated, the peduncle being divided at its summit into two short pedicels, one of which bears the spore and its capsule, the other the curved horn.

"It differs from all the other *Vaucheriæ* by the manner in which it carries its grains. The peduncles which sustain them are very much elongated; they bear at their extremities two little threads, the one curved, into which is inserted the anther; the other, shorter and straighter, carries the grain. This *Conferva* expands its grains at the commencement of spring. I have seen it germinate in such a manner as that I doubt not that these grains are really the seed."—*Vaucher*.

This is an abundant British species: I have met with it repeatedly in the vicinity of Cheshunt and other places during the springs of the past and present years.

Vaucheria repens. Filaments terrestrial; capsules sessile, solitary and avicular, or in the form of a bird's head; anthers curved and placed in close approximation with the capsules.

I have as yet been able only to find but one specimen of this species, which is to be distinguished from *Vaucheria Dillwynii*, the only species near to which it approaches, by the form of the capsules, which in the latter species are spherical.

In a foot-path near Roydon, Essex, February 21st, 1843.

GENUS ZYGNEMA.

Obs. Having recently had the opportunity of re-examining two of the three species of non-conjugating *Zygnemata* described in a previous paper, viz. *Zygnema angulatum* and *Z. intermedium*, as well as many other species not yet described, I have been able not merely to confirm the general accuracy of the statement formerly made of the production in certain species of spores without conjugation of the filaments, but also have ascertained two other particulars in reference to these most interesting productions.

The first of these relates to the fact, that union of the filaments does in some rare cases occur even in those species, in which the rule is, that the spores should be formed without conjunction; and this is nothing more than from analogy might clearly have been expected, nor does it in any way affect the importance or truth of the fact of the formation of spores in separate filaments.

The second particular is one of much interest, and has reference to the circumstance, that in some few instances more than two apparently perfectly formed spores—three, four, or even five—are placed in adjacent cells, and consequently that no empty cells intervene between them, as we should expect to find in all cases, were it an essential, that every true spore should consist of the mingled contents of two cells. But this is only an apparent exception to the law of the formation of spores by

the intermingling of the matter of two cells, which is applicable not merely to the *Zygnemata* but also to true *Confervæ* (*Vesiculaspermæ*) and the genus *Bulbochæte*; for although the mixing of the endochrome of two cells be necessary, *it does not follow that the whole of this should go to constitute a single spore* IN ALL CASES, so that, consistently with the above law, we may arrive at a satisfactory explanation of the juxtaposition of more than two spores, by supposing, that in these comparatively rare instances, *each* spore does not consist of the full amount of the contents of two cells; that where three seeds are adjacent that these are made up of the matter of five cells, that on either side of the terminal spore being empty; that where there are four, of the matter of six cells; and where five, the greatest number I have ever noticed, that these are constituted by the mingling of seven cells.

The above explanation will apply not only to the non-conjugating *Zygnemata*, but also to the group of *Vesiculasperms*, where there are more than two adjacent spores, an occurrence not of greater frequency than amongst the non-conjugating *Zygnemata*.

In one species of *Zygnema* which I have recently met with, and which is described in this paper, yoked and unyoked filaments occur plentifully, the conjugated being however by far the most abundant: the two forms of species would appear to be especially related through this species.

* Spores produced both with and without union of the filaments, but most frequently in the latter way.

Zygnema varians. Filaments of less diameter than those of *Zygnema inflatum*, Vaucher; cells usually four, five or six times as long as broad; spores elongated, formed either with or without union of the filaments, but generally in the former way, and lodged in cells, which become considerably inflated for their reception; extremities of cells inverted.

This species comes very close to Vaucher's *Conjugata inflata*, a species recently found by Mr. Jenner, but differs from it in the size of its filaments, number of spires, form of the inflated cells, as well as in the greater frequency with which union of the filaments takes place.

This species was first noticed by me in the vicinity of Cheshunt, since which time I have seen it amongst *Confervæ* sent by Mr. Ralfs, and within the last few days a very perfect specimen was forwarded to me by Mr. Jenner.

** Spores produced by conjugation.

Zygnema maximum, Annals Nat. Hist. for 1842.

This plant appears to be subject to considerable variety.

In most species of *Conjugata*, at the period of reproduction, a number of contiguous cells of one filament unite with the opposed cells of another filament, but the arrangement is different in specimens of this species in its ordinary state; in these it is usually only every second or third pair of cells which conjugate, and as soon as this conjugation is about to take place a very curious phænomenon occurs: the spherical granules contained within the spiral coil of the pair of cells which have united increase in size and deepen in colour, while at the same time those contained in the intermediate cells which have not conjugated become much smaller than they were previous to the union. The filaments with the cells thus united appear to the unassisted eye to be striated or banded. The above account, as well as the description given in the 'Annals' for September, apply to the species in its ordinary condition. Two varieties of it however occur: in the first the filaments do not differ in any material respect from the ordinary ones, but all the cells of each filament unite to form spores, as in other *Zygnemata*; this they do also in the second variety, but in it there are fewer spiral coils, usually six or seven, and these are filled with much larger granules than those of either of the previously mentioned conditions. The filaments of this variety, which may possibly be a distinct species, from the small number of the spires and large size of the granules, resemble in all save diameter those of *Zygnema nitidum*. In all the varieties, the spores are slightly oval, and are less than the calibre of the cell which contains them, the cavity of which they therefore do not fill.

Zygnema interruptum. Filaments of considerable length, and intermediate in diameter between those of *Z. maximum* and *Z. nitidum*; cells at the period of conjugation rather longer than broad, previous to this however they are frequently not half so long as broad; spiral coils numerous; spore oval, equalling in breadth the diameter of the cell, but not producing any inflation of it.

This fine species comes next to *Z. maximum* in size. It is estranged from *Z. nitidum* by the larger diameter of the filaments and the greater number of its spiral coils, these being not less than eight or ten; while from *Z. belle*, to which it bears considerable resemblance, it may be distinguished by a comparison of the filaments, which are considerably the largest in *Z. interruptum*; the number of spiral tubes is also somewhat greater in this. As in *Z. maximum*, in its ordinary condition, it is only every second or third pair of cells which unite, the granules, as in it, become likewise largest in the cells which have conjugated.

Zygnema rivulare. A variety of this species, described in the 'Annals' for September 1842, is sometimes met with during the autumn in water-courses, which differs from the ordinary condition of the species in having cells varying in length from twice to four times their diameter, and in being of a deep green colour. The species in its ordinary state is generally found attached to stones, and in streams near the margin where the current is slow. In specimens procured from such places the filaments are of a yellowish green colour, and the cells much longer. There is no question of the specific identity of the variety with the species proper.

Zygnema æstivum. Filaments of less diameter than those of *Z. quininum*; cells usually about four times as long as broad, but sometimes much longer and occasionally shorter. A single spiral tube occupies the cells, passing from side to side in right lines.

This species is by no means uncommon, and was for a long time confounded by me with the *Z. quininum* of Ag., from which it differs in its smaller filaments, longer cells, and peculiar zigzag disposition of the single spiral tube.

Cheshunt.

Genus MOUGEOTIA.

Mougeotia brevior. Filaments about equal in diameter to those of *Mougeotia genuflexa*; cells usually twice as long as broad, but sometimes nearly four times as long. Conjugation angular, without the intervention of tubes.

I do not think that there can be any question of this being specifically distinct from *M. genuflexa*, to which species its filaments however bear considerable resemblance, owing to the endochrome being of the same yellowish green colour.

Vicinity of Cheshunt.

Mougeotia dubia. Filaments about equal to those of *M. genuflexa* in diameter; cells usually either four or eight times as long as broad, but mostly only four times. Conjugation angular and without the intervention of transverse tubes.

This species may possibly be merely a variety of *M. genuflexa*, a doubt which I have indicated in the provisional name.

Vicinity of Cheshunt.

Mougeotia flava. Filaments about equal to those of *M. major*; cells varying in length from rather better than twice to nearly five times their diameter, but being generally three or three and a half times as long as broad. Conjugation angular, without the intervention of tubes.

The above appears to be one of several species which have all been confounded under the name of *M. genuflexa*.

Vicinity of Cheshunt.

Mougeotia quadrangulata. Filaments of less diameter than those of *M. cærulescens*; cells usually six times as long as broad; sporangium quadrangular.

This very interesting species I for a long time confounded with the *M. cærulescens* of Capt. Carmichael, an error which I was enabled to correct through the kindness of Mr. Ralfs, from whom I have received more than one fine specimen of that production.

The present species differs from *M. cærulescens* in having finer filaments as well as in the form of the sporangium. In *M. cærulescens* the sporangium is somewhat cruciform, while in *M. quadrangulata* it is quadrangular.

Found in the early part of the spring of the past year (1842), at High Beech, Epping Forest.

Mougeotia parvula. Filaments as slender as those of *V. bombycina*; cells usually six times as long as broad; endochrome imperfectly divided into two roundish masses; spores circular, lodged in the transverse tubes.

I at first regarded the above species as the *Zygnema ordinarium* of the Rev. M. J. Berkeley, but that gentleman informs me that the filaments of his species exceed in diameter those of *Z. elongatum*, a much more robust *Conferva* than mine.

Vicinity of Cheshunt.

Vesiculifera vernalis. Filaments more robust than those of *V. Mulleri*; cells usually six times as long as broad; spores circular, contained in inflated cells, which are somewhat narrower at one extremity than the other.

This species, which I have twice found since the commencement of the present year (March 4th, 1843), once at High Beech and again near Waltham Abbey, approaches very closely to *V. Mulleri*, from which it may be known, however, by its stouter filaments as well as the less regularly spherical form of the seed-bearing cells.

Genus SPHÆROPLEA.

Since the publication of my papers on the *Vesiculasperms*, in which some remarks occurred relative to the reproduction of the genus *Sphæroplea*, I have received some very interesting observations respecting one of the species of that genus from Mr. Ralfs of Penzance, which I cannot do better than transcribe in the writer's own words.

"I believe you to be quite correct about the *Vesiculaspermæ*,

and the specimens I sent from Ilfracombe, *V. princeps*, were an example of its truth. Subsequently to calling your attention to the vegetating spores, I found these to elongate and divide into two joints, the rudiments of the filaments, but I cannot agree when you consider the *Sphæropleæ* to have spores similar to those of the *Vesiculaspermæ*. In the *Conjugatæ* and *Vesiculaspermæ*, the mass as it approaches to maturity becomes denser and appears of a more homogeneous texture. In *Sphæroplea*, on the contrary, the granules are larger and more distinct in its advanced state, and my experience distinctly proves these granules to separate and move about with a very rapid motion resembling that of animals. This motion I first had an opportunity of seeing in *Draparnaldia tenuis*, and found it to agree with Agardh's description in all respects, excepting that I did not see them rupture the cells to escape.

"At Ilfracombe in June last, for the first time, I gathered *Sphæroplea crispa*, and examining the specimens within a few minutes after they were gathered, I perceived to my surprise some of the round masses, after escaping from the top of the filaments, separate into several largish granules, of which each of these masses was composed, and these then to dart about with rapid motion; and in order to have witnesses, I called up the people of the house where I was lodging and told them to look into the microscope and tell me what they saw, and they said that numerous minute insects were darting about amongst the filaments of the plant. On my mentioning the circumstance to Mr. Borrer, he informed me that many years ago he had observed the same thing to take place in the *Conferva bicolor*, and that Mr. Dillwyn, on his relating it to him, said that he supposed 'the plant had taken physic for worms;' and this tended to confirm me in the opinion of the identity of *Sphæroplea crispa* with the *Conferva bicolor* of 'English Botany'.

"Subsequently on gathering the plant at Dolgelly, I observed the granules, which are slightly angular, move, but only slowly, and a few days after, when I gathered some in order to show the motion of the granules to my friend the Rev. T. Salway, I was unable to detect any motion at all."

In a second communication Mr. Ralfs further observes, "I omitted in my last to give Mr. Berkeley as another observer of the motion, &c. of the granules in *Sphæroplea crispa*. When I found it at Ilfracombe I immediately sent off a specimen to Mr. Berkeley, and it was not until the next day that I discovered the activity of the granules, of which I the same day informed Mr. Borrer on sending him a specimen. Some time afterwards I received an answer from Mr. Berkeley with

sketches of his and my plants, and against his sketch is written "the granules separate into most active Zoosperms." Thus (supposing the *Conferva bicolor* to be the same) we have three different observers noticing the motion in this plant, neither of us being aware at the time of its having been noticed by the others."

If there be no fallacy connected with the above highly interesting remarks, and it can scarcely be supposed that there is any, since the singular motion of the granules into which each of the larger masses found in *Sph. crispa* is said to separate, is not only attested by so many able observers in our own country, but was likewise especially witnessed in this same species by Agardh himself, for the *Conferva zonata*, one of the three species more particularly submitted by him to examination is assuredly none other than the *Conferva bicolor* of 'English Botany,' and this again, it is equally certain, is the *Sph. crispa* of the Rev. M. J. Berkeley as well as *Conferva lucens* of Mr. Dillwyn. It would appear that I have erred in regarding the large condensed masses of endochrome found in the cells of *C. zonata* as true spores, an opinion which I at no time entertained without a degree of misgiving. Nevertheless I still think that I am correct in ascribing the formation of these masses to the intermingling of the contents of adjacent cells in the same filament, whereby fecundation may be supposed to be effected, and which intermingling I have shown to occur so invariably in the *Vesiculaspermæ* *.

The only undoubted species which can at present be referred to the genus *Sphæroplea* is the *Conferva zonata* of Weber, and this would appear to present a threefold relation with other freshwater Confervæ; first, with the *Conjugatæ* in the excessive mucosity of its filaments; secondly, with *Vesiculasperms* in its attenuated filaments and in the intermingling of the contents of two cells; and lastly, with the branched Confervæ in the other particulars of its reproduction, amongst the species of which group it should find its station.

The following species, if not to be regarded as a *Sphæroplea*, should be referred to the genus *Lyngbya*, and which differs but slightly, and perhaps not in any material respect, from *Sphæroplea*.

Sphæroplea? vermicularis. Filaments very mucous, floating, of a light green colour, in diameter but little exceeding those of *Vesiculifera bombycina*; cells usually not quite so long

* I am now able to add my own testimony to the correctness of the above remarks. In my specimens, however, the synspores did not escape at the top of the filament, but by apertures in the cells occasioned by their bursting.

as broad, but sometimes much longer and slightly inflated ; endochrome at the period of reproduction becoming moulded into spherical masses similar to those of *Sphæroplea zonata*.

This species may generally be met with throughout the year in boggy pools at High Beech, Epping Forest.

Genus MELOSEIRA.

The reproduction of this genus does not hitherto appear to have been at all understood ; I believe, however, from the occurrence of vesicles on the filaments similar to those of the *Vesiculaspermæ*, that it will find its true position with these. In the tapering of the filaments, in the absence of gloss on them, and in the possession of strongly marked points, the *Meloseiræ* likewise resemble the *Vesiculaspermæ*, from which they differ principally in the excessive fragility of their filaments, by which they evince an affinity with diatomaceous productions.

The only species in which I have noticed these vesicles is in the *Meloseira varians* of Agardh ; a production which I was led, from the presence of the vesicles, to describe as new in the paper upon the *Vesiculasperms* under the name of *V. composita*. Kützing however figures them with his *Meloseira orichalcea*, a species which I was so fortunate as to find in considerable quantity in the vicinity of Cheshunt in the autumn of the last year.

Since these descriptions were written I have had the pleasure of receiving some of the plants described from Mr. Ralfs and Mr. Jenner, the habitats for which I subjoin :—*Draparnaldia sparsa*, Penzance, Mr. Ralfs : *Mougeotia quadrangulata*, Penzance, Mr. Ralfs ; Fisher's Castle, Tunbridge Wells, and Broadwater Forest, Mr. Jenner : *M. parvula*, Penzance, Mr. Ralfs ; near Cross-in-hand, Waldron, Mr. Jenner : *Vesiculifera vernalis*, near Tunbridge Wells, Mr. Jenner ; Penzance, Mr. Ralfs : *Sp. vermicularis*, Penzance, Mr. Ralfs.

The following species described in this paper were recorded on the wrapper of the 'Annals' for August 1842 :—*Draparnaldia sparsa*, *D. elongata*, *D. repetita*, and *Sp. vermicularis*.



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