Plate CCXVII.

RHODYMENIA? PALMATA, *Grev.*

Gen. Char. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*), having a thick, cellular pericarp, and containing a mass of minute spores, on a central placenta; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered or forming cloudy patches. Rhodymenia (*Grev.*),—from ῥοδεος, *red*, and ὑμην, a *membrane*.

Rhodymenia *palmata*; frond coriaceous or submembranaceous, purple, broadly wedge-shaped, irregularly cleft, palmate, or dichotomous, sometimes repeatedly laciniate; the margin flat and even, sometimes winged with leaflets; granules distributed over the whole frond in cloud-like spots.

Rhodymenia palmata, *Grev. Alg. Brit.* p. 93. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

Sphærococcus palmatus, *Kütz. Phyc. Gen.* p. 409. t. 63. f. 1.

Halymenia palmata, *Ag. Syn.* p. 55. *Ag. Sp. Alg.* vol. i. p. 204. *Ag. Syst.* p. 242. *Spreng. Syst. Veg.* vol. iv. p. 333. *Hook. Fl. Scot.* part 2. p. 107. *Post.* and *Rupp.* p. 18.

Delesseria palmata, *Lamour. Ess.* p. 37.

Ulva palmata, *Dec. Fl. Fr.* vol. ii. p. 12. *With.* vol. iv. p. 123. *Lyngb. Hyd. Dan.* p. 24. *Grev. Fl. Edin.* p. 298.

Fucus palmatus, *Linn. Sp. Pl.* p. 1630. *Huds. Fl. Ang.* p. 579. *Lightf. Fl. Scot.* p. 933. t. 27. *Good. and Woodw. Linn. Trans.* vol. iii. p. 163. *Gunn. Fl. Norv.* vol. ii. p. 69. *Turn. Syn.* p. 175. *Turn. Hist.* t. 115. *E. Bot.* t. 1306. *Hook. in Fl. Lond.* New Series, with a figure.

Fucus ovinus, *Gunn. Fl. Norv.* vol. i. p. 96. *Mohr. Hist. Isl.* p. 245.

Fucus caprinus, *Fl. Dan.* t. 1128. *Esper. Ic.* p. 146. t. 74.

Fucus bullatus, *Fl. Dan.* t. 770.

Fucus rubens, *Esper. Ic.* t. 75.

Fucus dulcis, *Gmel. Hist.* p. 189. t. 26. *(fide Turner.)*

Var. β. *marginifera*; frond oblong, subsimple, proliferous at the margin. (*Tab. Nost. CCXVII.*)

Fucus palmatus, *Stack. Ner. Brit.* p. 54. t. 12.

Ulva caprina, *Gunn. Fl. Norv.* vol. ii. p. 126. t. 6. f. 4.

Var. γ. *simplex*; frond undivided, wedge-shaped.

Halymenia palmata δ, simplex, *Ag. Syn.* p. 36.

Var. δ. *Sarniensis*; frond laciniated, the segments narrow and sublinear.

Fucus Sarniensis, *Mert. in Roth. Cat. Bot.* vol. iii. p. 103. t. 1. *Turn. Hist. Fuc.* t. 44.

Fucus delicatulus, *Fl. Dan.* t. 1190.

Sphærococcus sarniensis, *Hook. Fl. Scot.* part 2. p. 103. *Kütz. Phyc. Gen.* p. 409.

Var. ε. *soboliferus*; frond stipitate, membranaceous, the branches very narrow below, much divided, expanding upwards into wedge-shaped, jagged and laciniate lobes.—(*Tab. Nost. CCXVIII. fig.* 2.)

Rhodymenia sobolifera, *Grev. Alg. Brit.* p. 95. *Hook. Br. Fl.* vol. ii. p. 292. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

Sphærococcus soboliferus, *Kütz. Phyc. Gen.* p. 409.

Halymenia sobolifera, *Ag. Syn.* p. 36. *Ag. Sp. Alg.* vol. i. p. 218. *Ag. Syst.* p. 246. *Hook. Fl. Scot.* part 2. p. 107.

Ulva sobolifera, *Lyngb. Hyd. Dan.* p. 27.

Fucus soboliferus, *Fl. Dan.* p. 1065. *Turn. Hist.* t. 45. *Wahl. Fl. Lapp.* p. 947. *E. Bot.* t. 2133.

Hab. On rocks within tide marks; and on the stems of *Fuci, Laminariæ*, &c. Annual or biennial. Winter and spring. Common on all the British shores. β. and γ. on the stems of *Laminariæ*. ε. on *Fucus serratus*.

Geogr. Dist. Shores of Northern and Arctic Europe. Iceland. Greenland. Eastern shores of North America. Unalaschka. Kurile Islands. Kamskatka. Falkland Islands. Tasmania.

Descr. *Root*, a small disc. *Fronds* solitary or tufted, rising from a more or less evident subcylindrical stipe, from a line to half an inch long, or more, which soon flattens into the wedge-shaped base of the lamina; *lamina* broadly wedge-shaped or fan-shaped, somewhat fastigiate, more or less deeply cloven into numerous segments, which are often again and again divided in a palmate or subdichotomous manner. So variable is the degree of division in different specimens that it is impossible to write a general character which shall embrace all the forms. In some, the frond is quite simple, broadly oval or wedge-form; in others it is cleft into four or five principal segments, the margin emitting leaf-like lobes:—these varieties are usually of large size, 12–18 inches long, of a coriaceous substance and dark colour. Other states (vars. δ. and ε.) are thinner in substance, and excessively divided, the lower segments filiform, the upper split into innumerable narrow ribbons, often not half a line in breadth; these sometimes expand again into wedge-shaped lobes, laciniated at the extremity; and sometimes the whole frond is excessively branched, and none of its divisions more than half a line in breadth; the narrow and laciniate varieties are seldom more than five or six inches in length. *Fructification*; *tetraspores*, half immersed in the frond, forming large cloudy patches dispersed over the whole frond. Besides these, an imperfect *tubercular* fructification (?) is sometimes found, forming circular spots surrounded by a discolouration. Within the circle are congregated innumerable minute, dark-coloured pustules, immersed in the frond, slightly prominent and either empty, or containing a mass of granular endochrome. *Substance* in the larger varieties leathery, in the smaller membranaceous; the latter adhering closely to paper. *Colour*, a purplish or brownish red; sometimes pinky.

Fig. 1. Rhodymenia palmata, var. β.:—*of the natural size*. 2. Portion of the surface with tubercles (?). 3. Section of the frond and *tubercles* (?). 4. Portion of the surface, with part of a *Sorus*. 5. Tetraspores:—*all more or less magnified*.

Plate CCXVIII.

RHODYMENIA PALMATA; *vars. a and ϵ.*

(*For description, see last folio.*)

This and the preceding plate represent three forms of *Rhodymenia palmata*, the well known *Dulse* of the Scotch, and *Dillisk* of the Irish;—and had I figured all the characteristic specimens which my Herbarium supplies, I might easily have extended the illustrations to a dozen plates. To connect Fig. 1. of Pl. CCXVII, with Fig. 3. of Pl. CCXVIII, by a full suite of specimens would require many figures. At first sight it will scarcely be supposed that they can belong to the same plant, and yet these figures by no means exhibit the extreme of variation, for there are varieties more simple than the one and more finely divided than the other. There is one state (var γ.) in which the frond is absolutely a simple elliptical leaf, without any division, or with a faint tendency to lobation at their apex. And there is another (var ϵ.) which is occasionally cut into multitudes of many-cleft ribbon-like segments, in no place more than half a line in width. And yet these two forms can be clearly brought together by specimens of intermediate character.

When such varieties are seen in a dried state in the herbarium, they appear so different that one may anticipate much difficulty in tracing the limits of the species. And it might indeed be difficult to do so with the assistance merely of dried specimens and of the descriptions of authors. But on the shore the collector experiences no such difficulty. If he has once seen and *tasted* a piece of Dulse, the characters, irrespective of form, are too well marked to allow of his puzzling himself with mere variations in outline. And what is very remarkable, the broad and slightly divided varieties may often be found growing side by side with the finely cut narrow ones. I have frequently noticed that where the Dulse grows on rock, it is broad and slightly divided; but when it grows on *Fucus serratus*, on the same rock, it is cut into the form called *sobolifera*. This would seem to prove that habitat had some effect, or, in other words, that the root of this

seaweed was something more than a mere holdfast. Yet epiphytic (or parasitic) attachment has not always the same effect on this plant; for the simplest form of this species is undoubtedly found on the stems of *Laminaria digitata*, and authors give the same stems as a habitat for the finely cut variety, *sobolifera*. My own experience would confine this variety to the stems of *Fucus serratus* and *vesiculosus*.

The extensive list of synonyms given in the description shows a large number of book species formed out of the varieties of this plant. Most of these are admitted by modern authors to be, what I have considered them, merely forms of *R. palmata*. But my var ε. has hitherto, in British works, maintained its place under the name *R. sobolifera*. I can only say that I can in no respect distinguish specimens which I have received from Orkney, the original British habitat of *R. sobolifera*, from others collected on the Irish coast which I have clearly traced, through connecting forms, into the common *palmata*. I am therefore at a loss to know on what character to uphold *sobolifera*. Colour and substance are here too variable to allow of their being taken into account; some of the most pinky and delicately membranous specimens which I possess, have the outline of the true *palmata*, not of *sobolifera*.

In Ireland and Scotland this plant is much used by the poor, as a relish with their food. It is commonly dried, in its unwashed state, and eaten raw, the flavour being brought out by long chewing. On many parts of the west coast of Ireland, it forms the only addition to potatoes, in the meals of the poorest class. The variety which grows on mussel shells between tide marks is preferred, being less tough than other forms, and the minute mussel shells and other small shell-fish which adhere to its folds are nowise unpleasing to the consumers of this simple luxury, who rather seem to enjoy the additional *gout* imparted by the crunched mussels. In the Mediterranean this plant is used in a cooked form, entering into ragouts and made dishes; and it forms a chief ingredient in one of the soups recommended, under the name of "St. Patrick's Soup," by M. Soyer to the starving Irish peasantry.

Fig. 1. Rhodymenia palmata, var *a*. 2. The same, var. ε:—*both the natural size.*

PLATE CCXIX.

CERAMIUM DESLONGCHAMPII, *Chauv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*), —from κεραμος, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *Deslongchampii*; filaments subsetaceous, attenuated upwards, rigid, irregularly dichotomous, with or without lateral ramuli; the apices straight, spreading; articulations colourless, those of the main stems about thrice as long as broad, of the branches and ramuli much shorter; dissepiments opake, scarcely swollen; tetraspores whorled round the joints, prominent; favellæ (?) heaped together, bursting irregularly from the sides of the branches, destitute of involucral ramuli.

CERAMIUM Deslongchampii, *Chauvin, Alg. Norm. J. Ag. Advers.* p. 26. *Wyatt, Alg. Danm.* no. 218. *Hook. et Harv. in Lond. Journ.* vol. vi. p. 410.

CERAMIUM Agardhianum, *Griff. in Harv. Man.* p. 99.

GONGROCERAS Deslongchampii, *Kütz. in Linn.* 15. p. 735. *Phyc. Gen.* p. 379. t. 46. f. 1.

HAB. On rocks and stones between tide-marks, and on the smaller Algæ. Annual. Spring and summer. Generally distributed round the British coasts. Torquay, *Mrs. Griffiths.* Swansea, *Mr. Ralfs.* Mine Head, Somerset, *Miss Gifford.* Ardrossan, *Rev. D. Landsborough.* Frith of Forth, *Dr. Greville.* Belfast Bay, *Mr. Templeton.* Dublin Bay, *Miss Ball.* Very abundant at Balbriggan, &c., *W.H.H.*

GEOGR. DISTR. Coast of France. Heligoland, *Binder*! Tasmania, *Gunn.*

DESCR. *Root* discoid, occasionally giving off short fibres. *Fronds* densely tufted, from two to four or five inches long, rather thicker than human hair, rigid and with a rough feel, slightly attenuated upwards, branched in a more or less regularly dichotomous order, the angles not very patent. *Branches* much divided, either naked throughout, or giving off, in greater or less abundance, short, simple, or forked, lateral ramuli. These ramuli are distributed in a very irregular manner; sometimes alternate, more frequently secund, and often very densely crowded, especially in the upper portion of the frond, which then becomes very bushy. Sometimes, as represented in fig. 2, the frond is very much distorted; the branches spreading at right angles, and the ramuli variously curved and twisted. *Apices* of the branches straight and spreading, subulate. *Articulations* pellucid, those of the lower part of the stem about thrice as long as broad, of the branches about equalling

their breadth, and of the ramuli gradually shorter; *dissepiments* dark-coloured, cylindrical, or slightly swollen. *Tetraspores* several in each joint, whorled, large, and very prominent. *Favellæ* (?) imperfectly organized, very irregular in form, issuing in dense clusters from the sides of the branches, heaped together, destitute of involucre, containing a fine dark-coloured powder, but no regularly formed *spores*. These favellæ (?) are produced by the same individuals that contain tetraspores. *Substance* rigid, not closely adhering to paper, unless after long steeping in fresh water. *Colour*, a dark brownish purple or blackish red.

A more slender plant than *C. diaphanum*, of a darker colour, and with shorter joints, and further distinguished from that species by the straight tips of the branches, more prominent tetraspores, and above all, by the clustered *favellæ*, bursting in irregular masses from various parts of the stem and branches. I confess that I cannot regard these clusters as a normal fructification, nor am I confident that they are even imperfectly formed favellæ, but rather consider them as crumpent masses of cells, of an anomalous character. From true favellæ they differ in being destitute of involucral ramuli, and also in their structure, the contents being a fine powder compacted together, without trace of *spores*, such as are usually found in these organs.

A distorted variety (fig. 2) frequently occurs among normal specimens, and this is very generally furnished with the anomalous fruit. Some specimens are excessively squarrose, with the stem and branches regularly bent at short distances, and every ramulus divaricating.

Our figure has been printed in too red an ink.

Fig. 1. Tuft of Ceramium Deslongchampii. 2. A distorted frond:—*both of the natural size*. 3. Portion of the main stem. 4. Apex of a branch, with imbedded tetraspores. 5. Fertile joints from the same, with tetraspores *in situ*. 6. Apex of a branch, with crumpent *favellæ* (?). 7. Joints from the same, with *favellæ* (?) and *tetraspores*:—*all more or less magnified*.


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Plate CCXX.

RYTIPHLÆA FRUTICULOSA, *Harv.*

Gen. Char. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute lanceolate *receptacles* (*stichidia*), in a double row. Rytiphlæa (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*; because the surface is transversely wrinkled or striate.

Rytiphlæa *fruticulosa*; stems diffuse, branched from the base; branches divaricating pinnato-dichotomous, set in the lower part with short, horizontal, multifid ramuli; in the upper more or less pinnated with larger, similarly divided branchlets; axils rounded; ceramidia ovate, sessile, densely set; tetraspores in distorted ramuli.

Polysiphonia fruticulosa, *Spreng. Syst. Veg.* vol. iv. p. 350. *Duby, Bot. Gall.* p. 966. *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Harv. in Hook. Br. Fl.* vol. ii. p. 327 (*in part*). *Harv. Man.* p. 86. *Wyatt, Alg. Danm.* no. 132. *Mont. Crypt. Alg.* n. 19. *Fl. Alg.* p. 81. *Mont. Crypt. Canar.* p. 170. *Endl. 3rd Suppl.* p. 46.

Polysiphonia Wulfeni, *Ag. Alg. Medit.* p. 144. *Kütz. Phyc. Gen.* p. 431.

Hutchinsia fruticulosa, *Ag. Syst.* p. 27.

Hutchinsia Wulfeni, *Ag. Sp. Alg.* vol. ii. p. 95.

Grammita Wulfeni, *Bonn. Hyd.* p. 27.

Ceramium Wulfeni, *Roth, Cat. Bot.* vol. iii. p. 140.

Fucus fruticulosus, *Wulf. in Jacq. Col.* p. 159. t. 16. *Crypt. Ag.* p. 56. *Esper, Ic. Fuc.* p. 165. t. 87. *Clem. Ess.* p. 319. *E. Bot.* t. 1686. *Turn. Syn. Fuc.* vol. ii. p. 394. *Turn. Hist.* t. 227.

Hab. In pools left by the tide, growing on the rocky bottom, or on Corallines and other small Algæ. Perennial. Summer. Common on the western and southern shores of the British Islands.

Geogr. Distr. Atlantic and Mediterranean shores of Europe. Northern coasts of Africa. Canary Islands.

Descr. *Root* a mass of creeping, entangled fibres. *Fronds* forming large, globose tufts, often six inches in diameter, composed of a great number of separate stems intertwined together. *Stems* 4–6 inches long, twice as thick as hog's bristle, gradually attenuated upwards, branched from the base and bushy. Main *branches* somewhat dichotomous, spreading at wide angles; the upper and small divisions repeatedly pinnate, or irregularly branched. The lower branches are furnished with alternate, multifid ramuli, a line or two in length and very patent; the upper more regularly pinnate with longer branchlets, which are set with simple or multifid subulate ramuli. Every part of the frond is marked by dark-coloured transverse striæ, set at

short distances asunder (revealing the joints of the internal axis), and the whole surface is reticulated with anastomosing cells. *Fructification*: 1, *Ceramidia*, densely crowded on the ramuli, ovate, sessile; rarely produced: 2, tetraspores imbedded in the multifid, lateral ramuli. *Substance* cartilaginous and firm, the tips of the branches standing out, and each retaining a drop of water when the specimen is lifted into air. *Colour* a dark purple, changing into olive green, and finally to amber-yellow under the influence of sunlight.

I have always thought that in whatever genus we put *Rytiphlæa complanata* of Agardh, in the same we must place not only the *Polysiphonia thuyoides* of British authors, but *P. fruticulosa* also. The internal structure of these plants is identical. They all possess a central jointed axis composed of many tubes, like the frond of *Polysiphonia*, coated on the outside by a broad band of small irregular cells. The surface appears reticulated under the microscope, and marked at short intervals by dark-coloured transverse lines. These characters belong to the frond of *Rytiphlæa*, in which genus Agardh places the first of the three plants in question; while both the latter have hitherto been referred to *Polysiphonia*. As I have already (Pl. CLXX.) adopted Agardh's name for the former, I am now constrained to alter the position of the two latter, and transfer them from *Polysiphonia* to *Rytiphlæa*. These three plants have not only a similar structure, but have so much the same natural habit, that specimens may be found which bring them *inconveniently* near each other. Some specimens of *R. fruticulosa* are very close to some of *R. thuyoides*, and the latter, in like manner, closely approaches narrow states of *R. complanata*. So nearly do they approach, that at one time I regarded them all as merely sportive forms of one species, but this was before I had much opportunity of studying them in a living state. When growing, each possesses characters sufficiently obvious. It is only in a few cases of imperfect or badly dried specimens that the student will find it difficult to decide to which species the specimen should be referred.

The ceramidia of this species are not often found, but when they occur they are generally formed in profusion, almost every twig bearing one or two. They are always borne on less luxuriant specimens than those which yield tetraspores.

Fig. 1. RYTIPHLÆA FRUTICULOSA:—*of the natural size.* 2. Small branch with ceramidia. 3. A ceramidium *in situ.* 4. Small branch from another plant. 5. Ramulus with imbedded *tetraspores.* 6. Tetraspore. 7. Portion of the stem. Section of the same:—*all more or less magnified.*


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Plate CCXXI.

RYTIPHLÆA THUYOIDES, *Harv.*

Gen. Char. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute, lanceolate *receptacles* (*stichidia*) in a double row. Rytiphlæa (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*, because the surface is transversely wrinkled or striate.

Rytiphlæa *thuyoides*; stems erect, rising from creeping fibres, terete; below simple and set with short, spine-like ramuli; above much branched; branches alternate, very erect, bi-pinnate; pinnæ multifid or pinnulate; axils rounded; ceramidia ovate, sessile, densely set.

Polysiphonia thuyoides, *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Wyatt, Alg. Danm.* no. 305. *Harv. Man.* p. 86. *E. Bot. Suppl.* t. 2882.

Grammita rigidula, *Bonnem.*

Hab. In pools left by the tide, growing either on the rocky bottom or on Corallines and other small Algæ. Perennial. Summer. Abundant on the west coast of Ireland. Portrush, *Mr. Moore*. Howth and Balbriggan, *Miss Gower*. Ayrshire coast, *Mr. Thompson and Rev. D. Landsborough*. South coast of England, Devonshire, *Mrs. Griffiths*. Mountsbay and Ilfracombe, *Mr. Ralfs*. Jersey, *Miss White*.

Geogr. Distr. Atlantic shores of Europe.

Descr. *Root*, a widely spreading mass of creeping fibres. *Fronds* from three to six inches high, twice as thick as hog's bristle, forming wide, but not very crowded tufts. *Stems* very variable in division: in some specimens nearly simple, with three or four long, rod-like branches, set with very short pinnulate ramuli; in others naked at the base, but closely and regularly pinnated or bipinnated from the middle upwards, the pinnæ long and virgate, closely pinnulate. Other specimens are excessively bushy, the branches springing from the upper part of the stem in a very irregular manner. In all varieties the branches are remarkably erect, and generally straight, and more or less regularly pinnate or bipinnate. *Ramuli* below simple and subulate, above pinnulate and forked, one or two lines long. The whole frond is marked with transverse striæ at distances about equal to the diameter, and the surface is reticulated with anastomosing cells. *Fructification*; *ceramidia* oblong-ovate, densely crowded on the ramuli, sessile, containing a tuft of pear-shaped spores. *Tetraspores* in distorted ramuli. *Substance* somewhat rigid, between cartilaginous and membranaceous. *Colour*, a fine dark brownish purple, becoming more or less tinted with olive when exposed to sunlight.

From *Rytiphlæa complanata* this species may always be known by its darker colour, cylindrical stems, and generally by a narrower frond. In ramification and general habit there is much similarity. The two may sometimes be found growing in close proximity, and even mixed together, but I have generally observed that *R. thuyoides*, which is the stiffest in substance, usually grows in the shallow parts of the tide-pool, sometimes standing out of the water; while *R. complanata* never dries during the recess of the tide. On the west coast of Ireland this is a very abundant plant, growing on most rocky shores. It forms dense tufts of large size, but is often much stunted, and is only to be found well grown in the deeper pools near low-water mark.

From *R. fruticulosa* the erect habit and more regularly pinnate ramification distinguish it. In some specimens these characters are less strikingly manifest than in others, but it rarely happens that the branching is so patent or irregular as to cause the specimens to be mistaken for one of the former species.

Small specimens of *Polysiphonia nigrescens* much resemble the present species in habit, but are at once known under the microscope, by the very different structure of the frond.

Fig. 1. RYTIPHLÆA THUYOIDES:—*of the natural size.* 2. Branch with *Ceramidia.* 3. *Ceramidia.* 4, 5. Branchlets from different specimens. 6. Portion of the stem. 7. Transverse section of the same:—*all more or less magnified.*

Plate CCXXII.

CORALLINA OFFICINALIS, *Linn.*

Gen. Char. *Frond* filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. *Fructification*; turbinate or obovate, mostly terminal *ceramidia*, pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, or club-shaped, transversely parted tetraspores. Corallina (*Linn.*), — from *Coralium, coral*, which these plants resemble in being of a stony nature.

Corallina *officinalis*; decompound-pinnate; lower articulations cylindrical, twice as long as broad; upper slightly obconical, round-edged, their upper angles blunt; ultimate ramuli cylindrical, obtuse.

Corallina officinalis, *Syst. Ed.* x. p. 805. *Pal. Elench.* p. 422. *Ellis in Phil. Trans.* vol. 57. p. 419. t. 17. f. 12, 13. *Linn. Corresp.* vol. i. p. 201. *Soland. Zoop.* p. 118. t. 23. f. 14, 15. *Esper. Corall.* t. 3. *Berk. Syn.* vol. i. p. 211. *Jameson in Wern. Mem.* vol. i. p. 563. *Turt. Gmel.* vol. iv. p. 671. *Turt. Br. Faun.* p. 211. *Stem. Elem.* vol. ii. p. 439. *Cuv. Reg. An.* vol. iii. p. 305. *Lamour. Cor. Flex.* p. 283. *Lamour. Corall.* p. 127. *Lamk. An. S. vert.* vol. ii. p. 328. 2nd edit. vol. ii. p. 513. *Flem. Brit. An.* p. 514. *Gray, Brit. Pl.* vol. i. p. 339. *Blainv. Actinol.* p. 547. t. 96. f. 3, 3 *a*. *Johnst. Br. Sponges and Lith.* p. 216. *Decaisne, Ess.* p. 107. *Kütz. Phyc. Gen.* p. 388. t. 79. f. 1. *Endl. 3rd Suppl.* p. 48. *Mont. Fl. Alger.* p. 128.

Corallina anglica, *Ger. Herb.* 1572. *Merrett, Pin.* 30. *Raii, Hist.* vol. i. p. 65. *Syn.* 33. no. 1.

Hab. On rocks between tide-marks, extending throughout the whole of the litoral zone, generally growing in rock-pools. Perennial. Winter and spring. Abundant on all the rocky shores of the British Islands.

Geogr. Distr. Throughout the northern Atlantic Ocean and in the Mediterranean Sea. (Extra-European habitats require investigation.)

Descr. *Root*, a widely spreading, calcareous crust. *Fronds* from one to six inches high, twice as thick as hog's bristle, congregated in dense tufts, or spreading in continuous patches over a wide surface of rock, varying much in ramification and general aspect, according to the depth at which vegetation takes place. Well-grown specimens are 4–6 inches high, more or less regularly pinnate, or bi-tripinnate; the pinnæ sometimes rising, in opposite pairs, from every joint; in others several joints intervene between each pair of pinnæ, or one pinna is wholly suppressed. Various irregularities in branching take place from suppression, and some specimens are thus reduced to long naked, alternate or spuriously dichotomous branches; while others are regularly feathered throughout. *Ramuli* slender, cylindrical, obtuse, composed of joints three or four times as long as broad. *Articulations* in the lower part of the stem cylindrical, about twice as long as broad, or somewhat shorter: those of the upper branches more or less pear-shaped or obconical, gradually swelling from the base upwards, slightly compressed, but rounded at the edges, and having the upper angles very obtuse, and not prominent. When the calcareous matter is removed by acid, the surface

appears transversely striate. *Conceptacles* of two kinds: 1, ovate *ceramidia*, pierced with a minute pore, and containing a tuft of transversely parted oblong, tetraspores; these terminate the branches and ramuli, and are of a pearly white colour. 2, slightly urceolate or mamillæform ceramidia of smaller size, springing irregularly from various parts of the articulations, and sometimes so densely crowded as to cover the whole articulation. These probably also contain tetraspores, but those which I examined were empty. The structure is similar to that of *C. squamata*. *Colour*, when growing in deep water or in shade, a dull, and rather dark purple; under sunlight passing through various shades of dull red and yellow to a milk white, which is the common colour of specimens cast on the beach.

This species is abundant on the shores of all countries within the temperate zone of the northern Atlantic, and perhaps it would not be too much to include distant regions of the Southern Ocean and the Pacific, among its habitats. Authors, however, have given distinct names to specimens coming from the south; and too much uncertainty prevails among the exotic species of the genus *Corallina* to allow of our attempting, in the present place, a reconciliation of synonymes. Even on our own shores this plant puts on so many sportive appearances, that it would be easy to form from its varieties numerous species, as distinct as some that have been founded on single fragments coming from abroad. *Colour* has been assumed as a character in describing these plants. Nevertheless it is notorious that the colours of all Corallines are remarkably fugacious, and that all quickly bleach, under the influence of the weather, to a milky whiteness. The *form* of the joints, almost the only tangible character, is subject to very wild variations, so that it is almost impossible, without a very full suite of specimens, to fix the limits of any of these plants. Our figure represents what may be regarded as the normal form of *C. officinalis*, but this is very unlike the stunted variety which occurs near high-water mark. In the latter, the joints are sometimes palmate, and much spread out; and altogether the plant looks so unlike its normal state that it may well be taken, as it has been, for something different.

According to Dr. Johnson, several of the *Melobesiæ* are to be regarded as merely imperfectly developed states of this Coralline.

Fig. 1. CORALLINA OFFICINALIS:—*of the natural size.* 2. Branch with *normal* ceramidia. 3. A Ceramidium. 4. The same, cut vertically. 5. A tetraspore from the same. 6. Branch with *abnormal* ceramidia. 7. Joint from the same, with three ceramidia. 8. Portion of the frond, after maceration in acids:—*all more or less magnified.*


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Plate CCXXIII.

LAMINARIA DIGITATA, *Lamour.*

Gen. Char. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. Laminaria (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

Laminaria *digitata*; stem long, woody, cylindrical, gradually tapering and somewhat compressed upwards, expanding into a leathery, roundish-oblong frond, deeply cleft into many linear segments.

Laminaria digitata, *Lamour. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 20. *Ag. Sp. Alg.* vol. i. p. 112. *Ag. Syst.* p. 270. *Grev. Alg. Brit.* p. 27. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 23. *Wyatt, Alg. Danm.* No. 156. *Endl. 3rd. Suppl.* p. 27. *Post. and Rupr.* t. 12. *J. Ag. Sp. Alg.* vol. i. p. 134.

Laminaria stenoloba, *De Lap. Terr. Neuv.* p. 55.

Hafgygia digitata, *Külz. Phyc. Gen.* p. 346. t. 30. *and* 31.

Fucus digitatus, *Linn. Mant.* p. 134. *Fl. Dan.* t. 392. *Stack, Ner. Brit.* p. 5. t. 3. *Esper, p.* 99. t. 48, 49. *Huds. Fl. Angl.* p. 579. *Lightf. Fl. Scot.* p. 935. *With.* 4. p. 98. *Linn. Trans.* 3. p. 152. *Turn. Syn.* p. 207. *Turn. Hist.* t. 162. *E. Bot.* t. 2274.

Fucus hyperboreus, *Gunn. Fl. Norv.* 1. p. 34. t. 3.

Hab. On rocks in the sea, beyond the reach of the tide, extending to the depth of about fifteen fathoms. Perennial. Winter. Abundant on the shores of the British Islands.

Geogr. Distr. The Icy sea, and Northern Atlantic, from Norway to Spain, and from Greenland to the shores of Massachussetts (*at least*). Kamtschatka.

Descr. *Root*, a conical mass composed of numerous, stout, branching fibres, each of whose branches ends in a flattened disc which takes a strong hold of the rocky bottom. *Stem* from two to six feet long, cylindrical, solid, in large specimens upwards of an inch in diameter near the base, gradually tapering upwards and becoming compressed towards the summit, where it passes into the base of the frond. *Frond* from one to five feet long, and from one to three feet in breadth, deeply cleft from the apex nearly to the base into an uncertain number of linear, strap-shaped, acute or obtuse segments. *Fructification* dark coloured, cloud-like patches, seen on old fronds, consisting of a stratum of innumerable, minute, angular, dark-coloured spores, concealed beneath the surface cells. *Substance* in the stem woody, but flexible, hard and horny when dry; in the frond, leathery. *Structure* cellular; the cells of the central portion of stem and frond very minute; those of the periphery larger; in the frond quadrate, with spherical air-cells at intervals. *Colour*, a fine clear olive, becoming darker in age.

A well known plant, the common *Sea-girdles* or *Tangle*, which grows to a large size on all rocky coasts. Our figure may appear a caricature to persons acquainted only with the plant in the state in which it is usually cast ashore, but I have purposely selected a specimen to illustrate its very curious mode of growth. The root and stem are perennial, but the many-cleft leaf is renewed every season and the old one cast off. Our specimen represents the nearly perfectly formed leaf of the present season and the base of the leaf of last year adhering to the tips of its segments. The mode of growth is as follows: As soon as the existing frond has served its purpose and begins to grow brown, an expansion commences between its base and the apex of the stem. This expansion continues to increase in length and breadth till it has attained a considerable size. We have then a large ovate lobe at the apex of the stem, separated by a deep constriction from the old frond. As yet this lobe is quite entire; but after a while longitudinal splits, commencing near its margin, and continuing towards its centre begin to appear. These widen and lengthen by degrees, and at last the outer ones reach the decaying base of the old frond; a rupture ensues, and the tip of the new segment is free. This process is continued, until, when many segments have thus been formed, the connection between the old leaf and the now nearly perfect new one is so much weakened, that the former adheres by a very small surface, and is soon cast off altogether. Our figure is taken from a specimen in which this is about to take place.

This mode of growth appears common to all the Laminariæ, in many of which Mrs. Griffiths has been the first to observe it; and I take this opportunity of expressing my warmest thanks to that lady for a magnificent suite of the present species, exhibiting the growing frond in all stages of its developement.

Fig. 1. Plant of LAMINARIA DIGITATA, (small), just before casting the frond of the previous season. 2. Young seedling plant:—*both of the natural size.* 3. Section of the frond, with spores and air cells in *situ.* 4. Spores:—*both magnified.*

Plate CCXXIV.

DASYA ARBUSCULA, *Ag.*

Gen. Char. *Frond* filamentous; the *stem* and *branches* mostly opake, irregulary cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*), containing *tetraspores* ranged in transverse bands. Dasya (*Ag.*), from δασυς, *hairy*.

Dasya *arbuscula*; stems much and irregularly branched, beset on all sides with short, divaricating, dichotomous ramuli, scarcely tapering upwards; articulations from two to four times longer than broad; apices spreading, rather obtuse; stichidia elliptic-oblong, mucronate; ceramidia urceolate, with a long, cylindrical neck.

Dasya arbuscula, *Ag. Sp. Alg.* vol. ii. p. 121. *J. Ag. Symb.* p. 33. *J. Ag. Alg. Medit.* p. 118. *Harv. Man.* p. 98. *Endl. 3rd Suppl.* p. 44. *Mont. Ann. Sc. Nat.* vol. xv. p. 173.

Dasya Hutchinsiæ, *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Harv. in Mack. Fl. Hib.* part 3. p. 210.

Ceramium Boucheri, *Duby, 2nd Mem.* p. 15. *Crouan, in Desm. Pl. Crypt.* no. 302 and 303.

Conferva arbuscula, *Dillw.* t. G. (but not t. 85).

Hab. On rocks, at the verge of low water-mark; a more slender variety frequently dredged in from four to six or eight fathoms water. Annual. Summer. Not uncommon on the shores of the West of Ireland, and the North and West of Scotland. Particularly fine in Bantry Bay, *Miss Hutchins.* Rare in England. Salcombe, and the Land's End, *Mr. Ralfs.* Mewstone, Plymouth, *Rev. W. S. Hore.*

Geogr. Distr. Atlantic Shores of France and Spain. Mediterranean Sea.

Descr. *Root*, a small disc. *Fronds* from one to three or four inches high, as thick as hog's bristles, irregularly much branched in a manner between alternate and dichotomous; sometimes all the main divisions are pretty regularly dichotomous; sometimes regularly alternate; the lesser branches are generally alternate, much crowded to the apices, and decompound above, the whole habit of the plant being strikingly bushy. *Stem* and *branches* opake, inarticulate, marked with irregular cells. *Ramuli* densely covering all parts of the frond except the older parts of the stem, directed to every side, one to two lines long, somewhat rigid, of nearly equal diameter throughout, divaricate, several times forked, the axils patent, articulate, their articulations from two to four times longer than broad, cylindrical. *Ceramidia* (rather rarely formed) borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, roundish-urceolate, the apex produced

into a long cylindrical neck; spores minute, of various shapes, densely crowded into a spherical mass. *Stichidia* borne on the ramuli, elliptic-oblong, with a sharp point, laxly cellular, containing three or four rows of roundish tetraspores. *Tubes* in the stem five, surrounding a cavity. *Substance* rather crisp, becoming soft on exposure, and closely adhering to paper in drying. *Colour* variable; sometimes clear crimson-lake; at other times more or less tinted with brown or yellow, and sometimes dark brown. In all cases the frond discharges a fine crimson powder on maceration in fresh water.

This pretty plant was originally discovered by Messrs. Hooker and Borrer on the shores of the Orkney Islands, and has been found at various places along the western shores of Britain, to the extremity of the Land's End. Its most abundant stations, are on the west of Ireland, in several bays of which coast it reaches a large size. On the Continent it has been found along the coasts of France and Spain, and in the Mediterranean.

There are two principal varieties of this species; one of them found on rocks near low-water mark, the other dredged in deeper water, and often on a sandy or shingly bottom, or among *Zostera*. In the first, which is represented in our figure, the frond is more robust and bushy, the branches more regularly alternate, and the colour frequently very dark. But this last character varies according to minor circumstances of each locality. This variety is frequently found in fruit, the *pods* being more commonly found than the *capsules*. In the second variety the stems are more slender, the branches much divaricated, and the order of branching more or less dichotomous, while the ramuli are less dense, and more squarrose, and so far as I know, always barren. At first sight such specimens might pass for a different species, but there are innumerable intermediate forms.

The *D. scoparia* of the Cape of Good Hope, and *D. collabens* of New Zealand nearly resemble this species in habit, but differ by some seemingly essential characters.

Fig. 1. Dasya arbuscula:—*of the natural size.* 2. A branch bearing *stichidia.* 3. Ramulus from the same, with two *stichidia.* 4. Tetraspore. 5. Branch bearing *ceramidia.* 6. A *ceramidium* from the same, on its stalk. 7. Transverse section of the stem:—*all more or less magnified.*

Plate CCXXV.

DASYA VENUSTA, *Harv.* (*n. sp.*)

Gen. Char. *Frond* filamentous; the *stem* and *branches* mostly opake, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing *tetraspores* ranged in transverse bands. Dasya (*Ag.*), —from δασυς, *hairy.*

Dasya *venusta*; frond pyramidal, decompoundly pinnate; the branches clothed with exceedingly slender, flaccid, many times dichotomous, attenuated ramuli; articulations five or six times longer than broad; stichidia pedicellate, ovoid, much acuminate; ceramidia ovate-urceolate, with a protruding mouth.

Dasya venusta, *Harv. in Herb. T. C. D.*

Hab. Cast on shore. Annual. Summer and Autumn. Very rare. Discovered on the shores of Jersey, by *Miss White* and *Miss Turner.*

Geogr. Distr. ——?

Descr. *Root*, a small disc. *Stem* three or four inches long, as thick as hog's bristles, undivided, but furnished throughout with numerous alternate, lateral branches, the lowest of which are longest, the rest gradually shorter towards the apex. *Branches* undivided like the stem, and like it furnished with a second series of lesser branches which likewise diminish in length towards the extremities; these again, in large specimens, bear a third series; each set being smaller and more slender than the preceding. The main stem is generally bare of ramuli; but all the branches and their divisions are clothed with very slender and flaccid, jointed ramuli, one or two lines in length, and very many times dichotomous: these rapidly diminish in diameter at each successive forking, and at length are reduced to cob-web thinness at the extremities. *Axils* acute. *Articulations* cylindrical, five or six times as long as broad. *Ceramidia* borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, ovate-urceolate, gradually tapering into a conical neck, containing a dense, globose mass of small spores. *Stichidia* borne on the ramuli, pedicellate, ovate, much acuminate, with a long acute point, containing three or four rows of roundish tetraspores. *Substance* very tender and flaccid, strongly adhering to paper in drying. *Colour*, a fine crimson-lake. In fresh-water it gives out a crimson powder.—Sometimes the ramuli are tipped with linear-lanceolate, pod-like bodies, full of minute granules; apparently *antheridia* (fig. 4).

In the year 1846 I received from Miss White a small specimen of this plant, which at that time I laid aside, as a variety of *D. ar-*

buscula; and a short time afterwards Miss Turner supplied me with a fine specimen that at once convinced me that the plant was different from *D. arbuscula*, but left me in doubt whether it ought not to be referable to the *D. corymbifera* of J. Agardh. Of that species I possess a small morsel on talc, and as far as I can decide from an imperfect fragment, our plant is different; and it is also abundantly different from any other *Dasya* with which I am acquainted. In the byssoid fineness of its ramuli it approaches *D. elegans*, but differs in habit and in the form of its *stichidia* and *ceramidia*. The habit of our new plant is indeed rather that of *Pol. byssoides* or of *Seirospora Griffithsiana* than of any *Dasya* known to me, and may be said to be intermediate in aspect between those two beautiful plants. The conical outline is very characteristic; but it is on the extreme slenderness and repeated division of the ramuli, and the shape of the stichidia that I chiefly rely for its diagnosis.

I am much indebted to Miss White and Miss Turner for specimens of Jersey Algæ, and I would willingly discharge a portion of the debt by inscribing the present beautiful plant with the name of its fair discoverer, could I determine to which of the ladies the merit belongs. But as this point is doubtful, I have chosen a specific name which is at the same time descriptive of the elegance and grace of the plant and, in its derivation, allusive to the fairer portion of creation in general.

Fig. 1. Dasya venusta; the *natural size*. 2. A ramulus bearing *stichidia*. 3. A *ceramidium* on its stalk. 4. Apex of a ramulus, bearing *antheridia*:—all highly *magnified*.

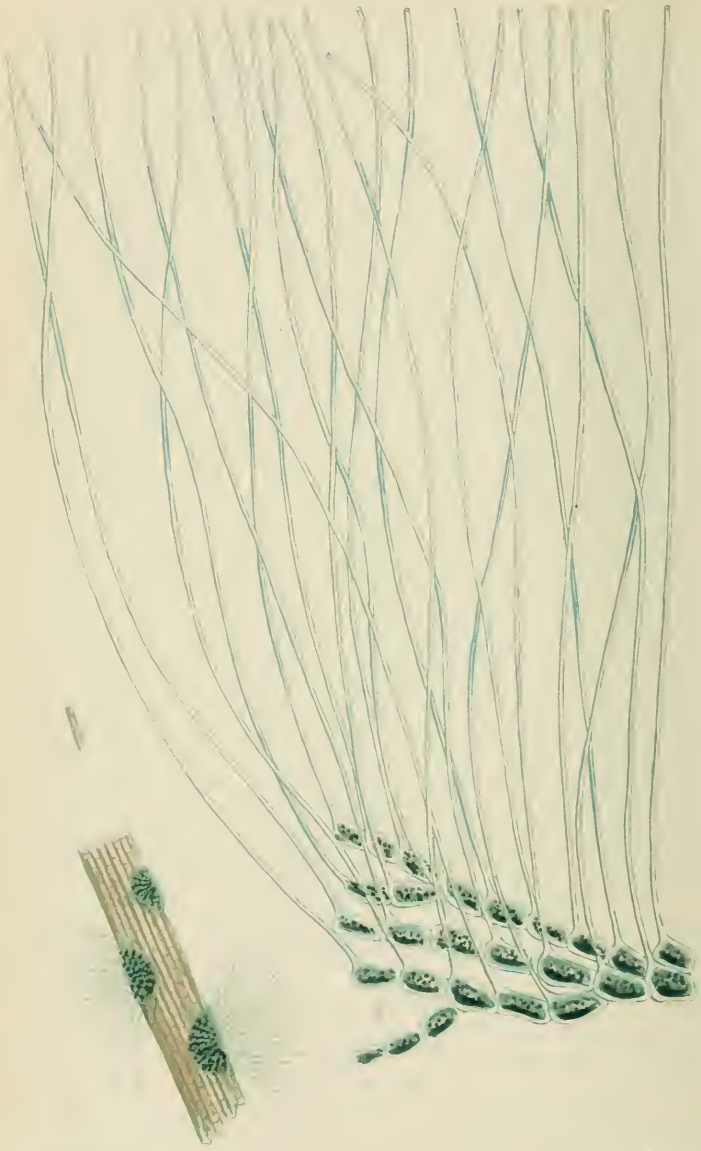

Plate CCXXVI.

OCHLOCHÆTE HYSTRIX, *Thw. MSS.*

Gen. Char. *Frond* disciform, adpressed. Filaments cylindrical, radiating from a central point, irregularly branched, consisting of a single series of cells, each of which is most commonly produced above into a rigid inarticulated seta. *Endochrome* green. *Fructification* unknown. Ochlochæte (*Thw., MSS.*)—from ὄχλος, a *multitude*, and χαίτη, a *bristle*.

Ochlochæte *Hystrix*; plant very minute, pale green, hoary from its numerous rigid setæ.

Hab. On stems of grasses &c., in a lake of brackish water, called "The Little Sea," near Wareham, Dorset, *Rev. W. Smith*; also in fresh-water ditches near Bristol, upon the leaves of mosses; very rare. *G. H. K. Thwaites.*

Descr. *Plant* disciform, frequently irregular in its outline, very minute, pale green, hoary from the multitude of rigid setæ with which it is covered. *Filaments* closely adpressed and adhering firmly to the substance on which the plant may be growing; radiating from a central point, irregularly branched, and frequently cohering laterally. *Cells* oblong, each usually furnished with a very long rigid tubular diaphanous seta. *Endochrome* granular, green. The fructification has not been observed. It is possible that the fresh-water specimens from the neighbourhood of Bristol may prove specifically distinct from the Wareham plant.

For the present we have placed *Ochlochæte* with the *Chætophoreæ*, from which family, however, it will eventually have to be removed, since it differs from *Chætophora* (that is, the typical species *C. elegans*,* Ag.) and *Draparnaldia* in some important

* *Chætophora elegans*, Ag. in the state of fruit is evidently the *Gongrosira sclerococcus* of Kützing, whilst the same species with *opseospermata* appears to be the *Chætophora longæva* of Carmichael. From the inspection of an authentic specimen of *Chætophora pisiformis*, Ag., kindly given to me by my friend, the Rev. M. J. Berkeley, I have ascertained that this species is by no means congeneric with *C. elegans*, Ag., but has the fruit and setæ of *Coleochæte*, from which genus it would seem to be separated only by its erect, free, not adpressed filaments: and there can be little doubt, therefore, that *Chætophora tuberculosa*, Ag., is equally allied to *Coleochæte*. *Chætophora Berkeleyi* of Dr. Greville, and *C. pellita*, Lyngbye, have already been figured in the present work under the names respectively of *Leathesia Berkeleyi*, Harv., and *Cruoria pellita*, Fries; the former being closely allied to *Elachistea*, especially to *E. scutulata*, Fries; and the latter having an affinity rather with the *Nostochineæ*.—*Thwaites.*

particulars. The genera *Ochlochæte*, *Bulbochæte*, and *Coleochæte*, are very closely allied to *Tiresias*, Bory, (*Œdogonium*, Link; *Vesiculifera*, Hassall,) and bear the same relation to it that *Draparnaldia*, *Chætophora*, and *Stygeoclonium* do to the genus *Ulothrix*, of Kützing, (*Sphæroplea*, Berk., *Lyngbya*, Hassall). In the former of these two groups of plants the setæ, when present, are rigid continuous tubes; and the fruit, so far as has been observed, is not contained within an original cell of the filament, but each *sporangium* is in a new cell, formed, it is true, by the elongation of an original cell, but subsequently separated from it by a septum: this occurs in *Tiresias*, *Bulbochæte*, and *Coleochæte*. In *Draparnaldia*, on the contrary, and its immediate allies the diaphanous prolongations of the filaments are septate, each consisting of a series of elongated cells. The *sporangia*, also, in *Draparnaldia glomerata*, Ag., and *Chætophora elegans*, Ag., in which species we have observed them, are formed within the original cells of the ramuli, causing the latter to assume a moniliform appearance. Quaternate *opseospermata*, which are most probably gemmæ, likewise occur in these species, as well as in those of the genus *Stygeoclonium* of Kützing.

[I am indebted to Mr. Thwaites for the above description, and for a beautiful figure from which our plate has been prepared.—*W.H.H.*]

Fig. 1. Fronds of OCHLOCHÆTE HYSTRIX:—*natural size*. 2. The same, *magnified*. 3. Small portion of a frond:—*very highly magnified*.


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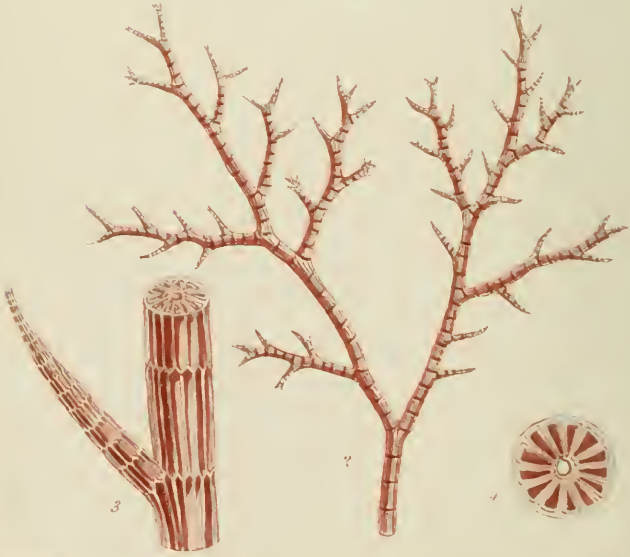
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Plate CCXXVII.

POLYSIPHONIA SUBULIFERA, *Ag.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. Polysiphonia (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *subulifera*; filaments setaceous, quickly becoming flaccid, flexuous, irregularly much branched; branches alternately decompounded, spreading, the lesser divisions long and rod-like; ramuli scattered, patent, subulate, simple or rarely bi-multifid; articulations visible in all parts of the frond, variable in length, many striate; tubes about thirteen, containing a coloured bag, and surrounding a narrow cavity.

Polysiphonia subulifera, *Harv. in Hook. Journ. Bot.* 1*st Series*, vol. i. p. 301. *Wyatt, Alg. Danm.* no. 178. *Harv. Man.* p. 86. *Endl.* 3*rd Suppl.* p. 46 (no. 96).

Hutchinsia subulifera, *Ag. in Bot. Zeit.* 1827, p. 638. *Ag. Sp. Alg.* vol. ii. p. 97.

Hab. Dredged in four to five or ten fathoms water, generally on Nullipore banks. Annual. Summer. Torquay, very rare, *Mrs. Griffiths.* Weymouth, "parasitical on *Rytiphlæa pinastroides* and *Polyides rotundus*, between tide-marks," *Miss White.* Belfast Bay, *Mr. Templeton.* Carrickfergus and Roundstone, at the latter place very abundant, *Mr. M'Calla.*

Geogr. Distr. Adriatic Sea, *Agardh.* Coast of France, *Lenormand!*

Descr. *Root* a disc, generally accompanied by grasping fibres, or else small discs rising from the lowest parts of the stems and branches. *Fronds* densely tufted, from four to six or eight inches in length, as thick as, or somewhat thicker than, hog's bristle, gradually attenuated to a point, much and irregularly branched. Main divisions irregularly forked, soon breaking up into a multitude of branches, which stand out from each other towards every side, and are repeatedly divided alternately. Lesser branches frequently long, rod-like, and subsimple, set, like the larger divisions, with short, awl-shaped, spine-like scattered ramuli. These ramuli are one or two lines long, patent, acute, and generally simple. In a young state all the apices terminate in colourless, byssoid fibres. *Articulations* varying much in length in different specimens and in different parts of the same specimen; sometimes nearly uniformly as long as broad, sometimes twice or thrice as long, many tubed. *Tubes* in the stem thirteen. *Substance* at first crisp, but quickly growing flaccid in the air. *Colour* a dark full red,

becoming brown, and sometimes even black in drying. In fresh water this plant gives out a dark brown liquid. I have never seen fructification of either kind.

This species, though sometimes found, as at Weymouth, between tide-marks, much more commonly grows at a considerable depth, so as to escape notice altogether, except when accidentally thrown ashore after storms, or when sought by dredging. It was first described by Agardh, who gathered specimens of it at Venice, but had been found many years previously by the late Mr. Templeton, in Belfast Lough. In the herbarium of that gentleman, the specimens remained undescribed until 1840, when I recognised them, and introduced that Irish habitat into the Manual. *P. subulifera* had, however, previously, in 1833, been found in England by Mrs. Griffiths and Mr. Borrer. It appears to be much more abundant on the coast of Ireland, especially in Roundstone bay, where, on different occasions, I have dredged it in considerable quantities.

Its peculiar thorny habit, well expressed by the specific name, is so unlike that of any other British species of equal size, that it cannot well be confounded with any. To the naked eye it bears a greater resemblance to young specimens of *Rytiphlæa fruticulosa* than to anything else, but is more slender and flaccid, and readily known at all times by the distinctly articulate stem and branches, which have, both externally and internally, a very different structure.

Fig. 1. Polysiphonia subulifera:—*of the natural size.* 2. Portion of a branch. 3. Joints and ramulus from the same. 4. Transverse section of the stem:—*all more or less magnified.*

Plate CCXXVIII.

POLYSIPHONIA GRIFFITHSIANA, *Harv.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. Polysiphonia (*Grev.*),—from πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *Griffithsiana*; stem rigid, attenuated, alternately branched; branches long, patent, subsimple, furnished with numerous subdichotomous or alternately divided, slender, patent, flaccid ramuli; articulations of the stem, branches, and ramuli about once and a half or rarely twice as long as broad, with straight tubes; siphons in the stem four, with four alternate secondary ones; capsules broadly ovate, sessile.

Polysiphonia Griffithsiana, *Harv. Man.* p. 91.

Hab. On the smaller Algæ between tide-marks. Annual. September. Parasitical on *Polyides rotundus* at Torquay, *Mrs. Griffiths*. Isle of Portland, *Miss White*.

Geogr. Distr. South coast of England.

Descr. *Root* a small disc. *Fronds* laxly tufted, four to five inches long, and nearly as much in expansion. *Stem* undivided, set throughout its length with alternate, spreading branches, the lowest of which are longest, the rest gradually shorter upwards, giving the whole frond a pyramidal outline. *Branches* like the stem, beset with a second and third series of alternate lesser branches, the last of which are more or less furnished with dichotomous, flaccid, slender ramuli. All parts of the frond are conspicuously jointed; the articulations of the stem are from one and a half to twice as long as broad, marked with about five tubes, two of which are much narrower than the rest; those of the branches are about once and a half as long as broad, with two tubes only. A transverse section of the stem shows four primary and four secondary tubes. *Ceramidia* ovate, sessile, scattered on the ramuli. *Colour* a full red, inclining to brownish in drying but not much altered by fresh water. *Substance* rather rigid in the stem and branches, flaccid in the ramuli.

An elegant plant with a good deal the habit of small specimens of *P. violacea*, but known at once from that species by the distinctly jointed stem marked by straight tubes. It moreover resists the action of fresh water for a longer time, and the colour is also different. Some specimens of *P. elongella* have a slight look of

our plant, but usually their peculiar ramification sufficiently marks these species.

P. Griffithsiana was discovered by Mrs. Griffiths in 1837, and has not since been found at Torquay. But I have had the satisfaction of receiving a specimen from Miss White from the Isle of Portland, agreeing in all essential characters with the Torquay plant. I have not compared either with continental specimens, and possibly this plant may be found under some other name in the works of continental botanists. As far as we yet know, however, it is confined to the south shores of England.

Fig. 1. Polysiphonia Griffithsiana :—*of the natural size.* 2. One of the secondary branches and portion of a primary branch. 3. *Ceramidium* attached to a ramulus. 4. Joints from the stem. 5. Transverse section of the stem :—*all more or less magnified.*

Plate CCXXIX.

FUCUS CANALICULATUS, *Linn.*

Gen. Char. *Frond* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. Air-vessels, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical conceptacles, containing paricta! *spores* or *antheridia*, or both. Fucus (*L.*),—from φυκος, a *sea-weed*.

Fucus *canaliculatus*; frond linear, narrow, channelled on one side, without mid-rib or air-vessels, dichotomous; receptacles terminal, bipartite.

Fucus canaliculatus, *Linn. Syst. Nat.* vol. ii. p. 716. *Fl. Dan.* t. 214. *Gm. Hist.* p. 73. t. 1. A. f. 2. *Lightf. Fl. Scot.* p. 917. *Velley*, t. 1. *With.* vol. iv. p. 99. *Turn. Syn.* p. 242. *Turn. Hist.* t. 3. *Sm. E. Bot.* t. 823. *Lamour. Ess.* p. 20. *Lyngb. Hyd. Dan.* p. 6. t. 1. *Ag. Sp. Alg.* vol. i. p. 96. *Ag. Syst.* p. 279. *Hook. Fl. Scot.* part 2. p. 96. *Grev. Fl. Edin.* p. 284. *Grev. Alg. Brit.* p. 18. *Hook. Br. Fl.* vol. ii. p. 268. *Harv. in Mack. Fl. Hib.* part 3, p. 169. *Harv. Man.* p. 21. *Wyatt, Alg. Danm.* no. 102. *Kütz. Phyc. Gen.* p. 352.

Fucus excisus, *Linn. Sp. Pl.* p. 1627. *Mant.* p. 508. *Fl. Lapp.* p. 366. *Gunn. Fl. Norv.* vol. i. p. 96.

Pelvetia canaliculata, *Dne. An. Sc. Nat.* 1845, p. 12.

Fucodium canaliculatum, *J. Ag. Sp. Alg.* vol. i. p. 204.

Hab. On rocky sea-shores, between high-water mark and half-tide level. Perennial. Summer and autumn.

Geogr. Distr. Atlantic shores of Europe and North America.

Descr. *Root*, a conical expansion, half an inch or more in diameter. *Fronds* densely tufted, from two to six inches or more in height, one to two or three lines in breadth, nearly of equal breadth throughout, deeply channelled on one side, and rounded on the other, many times dichotomous in a tolerably regular manner; the apices generally bifid. *Receptacles* terminating the branches, narrow-cuneate, either deeply cloven or bipartite, swollen, tubercular, containing numerous immersed conceptacles. *Spores* elliptical, at length separating, by a transverse division, into two sporules. *Substance* very tough and leathery. *Structure* dense. *Colour*, a clear olive when young, becoming brownish or foxy in old age, the receptacles at length greenish-yellow.

This species begins to vegetate on the very edge of high-water mark, often in places where it is only wet by the spray. In such situations it attains a dwarfish size, seldom reaching more than an inch or two in height, but the specimens sometimes arrive at

maturity and produce fruit. Between this, its extreme limit, and the level of half-tide, the main crop is developed, the fronds attaining a greater size with the increasing depth of water; but beyond half-tide we rarely, if ever, meet with *Fucus canaliculatus*. It evidently requires by its organization, exposure to the atmosphere for a considerable period each day. Unlike most of its congeners it rarely covers wide spaces of rock, but more commonly grows in scattered tufts in places where, on the recess of the tide, the water rapidly drains off. It thus shows, in all its habits, a peculiar adaptation for drought, and its tough and close texture admirably fit it for long resisting the drying effects of sun and air. Still, it often becomes quite dry and crisp in a hot summer's day, and yet recovers life and flexibility on the return of the tide. None of our marine plants are less variable in character. Its channelled stem is always recognisable, and its ramification, if the frond be not injured, is invariably dichotomous. In cases of accidental injury, however, the wounded parts become proliferous and throw out numerous branches without order, converting such specimens into dense bushes.

Fig. 1. FUCUS CANALICULATUS :—*of the natural size.* 2. Part of a receptacle, with its immersed conceptacles. 3. Section of portion of the same, one of the conceptacles cut through. 4. A spore. 5. Some of the filaments which accompany the spores :—*all more or less highly magnified.*


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Plate CCXXX.

CALLITHAMNION ROSEUM, *Lyngb.*

Gen. Char. *Frond* rosy, or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. Callithamnion (*Lyngb.*),—from καλος, *beautiful*, and θαμνιον, a *little shrub*.

Callithamnion *roseum*; stems much and loosely branched; secondary branches long, flexuous, subdistichously plumulate; plumules lax, with a roundish outline, crowded towards the tops of the branches, simply pinnate; pinnæ long, spreading, curved; articulations of the stem and branches four and five times as long as broad, more or less filled with veins; those of the pinnæ twice or thrice as long as broad; tetraspores elliptical, four or five on each pinna, from the lower joints; favellæ tufted.

Callithamnion roseum, *Lyngb. Hyd. Dan.* p. 126. t. 39 (?). *Ag. Sp. Alg.* vol. ii. p. 164. *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Harv. in Mac. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 106. *Wyatt, Alg. Danm.* no. 44. *Endl. 3rd Suppl.* p. 34.

Phlebothamnium roseum, *Kütz. Phyc. Gen.* p. 375. t. 44. f. 1.

Ceramium roseum, *Roth, Cat. Bot.* vol. iii. p. 145. *Ag. Syst.* p. 139.

Conferva rosea, *E. Bot.* t. 966. *Dillw.* t. 17 (??).

Hab. On rocks and the larger *Fuci*, near low-water mark; frequently in æstuaries, or muddy places. Annual. Summer. Not uncommon.

Geogr. Distr. Atlantic shores of Europe.

Descr. *Fronds* densely tufted, three or four inches long. *Stems* as thick as hog's bristle at the base, in young plants pellucid, but in old, opake and full of veins, or internal fibres, excessively branched and bushy; the branches alternate, repeatedly divided. Lesser branches somewhat virgate, set throughout their length, at nearly every joint, with alternate simply pinnated plumules, of roundish or ovate outline. *Pinnæ* long, more or less incurved, either quite simple, or furnished with one or two small pinnulæ near the apex. *Articulations* of the stem and branches four or five times as long as broad, or more, somewhat swollen at the joints; those of the lesser branches and ramuli gradually shorter. *Endochrome* nearly filling the tube. *Tetraspores* elliptical, sessile on the inner faces of the pinnæ, one at each of the four or five lowermost joints. *Favellæ* generally terminating truncated branches, two or more together: sometimes several united in a berry-like mass. *Colour* in young specimens a fine purple-lake, in old brownish, becoming brighter in fresh-water. *Substance* membranaceous and soft, closely adhering to paper, but not gelatinous.

Callithamnion roseum is one of the longest described of the genus, and ought therefore, one would think, to be the best known. But, as with many old species, several plants which are now distinguished, were formerly confounded under this name, and thus it becomes a doubtful matter to which of the modern species the original synonyme *roseum* attaches. The species was first defined by Roth in his Catalecta. I have seen no specimen of the plant of this author, and the *type* which I have adopted, and here figure, is derived from a specimen received from Mr. Dawson Turner, and compared many years ago by that gentleman with Roth's plant, and from another sent by Mr. Borrer, as the plant of English Botany. These two specimens agree with each other and also with the specimens published by Mrs. Wyatt, in Algæ Danmonienses. As far, therefore, as the British flora is concerned, our notions of *Cal. roseum* are tolerably definite. It would be very desirable were our plant compared with the herbaria of continental authors.

Fig. 1. CALLITHAMNION ROSEUM :—*of the natural size.* 2. A pair of plumules and three articulations of a branch. 3. Part of a pinna, with tetraspores. 4. A small branch, bearing a cluster of favellæ. 5. Binate favellæ. 6. Joints from the lower part of the stem :—*all more or less highly magnified.*

Plate CCXXXI.

CALLITHAMNION POLYSPERMUM, *Ag.*

Gen. Char. *Frond* rosy, or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. Callithamnion (*Lyngb.*),—from καλος, *beautiful*, and θαμνιον, a *little shrub*.

Callithamnion *polyspermum*; tufts globose; filaments slender, delicate, loosely much-branched, irregularly divided below, distichously plumulate above; plumules long and narrow, simply pinnate; pinnæ short, simple, patent, acute, spine-like; articulations of the branches with a very narrow coloured tube, four or five times as long as broad, of the ramuli short; tetraspores globose, lining the inner face of the pinnæ.

Callithamnion polyspermum, *Ag. Sp. Alg.* vol. ii. p. 169. *Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Harv. in Mack. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 140. *Endl. 3rd Suppl.* p. 34.

Callithamnion Grevillii, *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Harv. Man.* p. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 215.

Callithamnion roseum, *Grev. Fl. Edin.* p. 311 (*not of Br. Fl.*)

Callithamnion purpurascens, *Johnst. Berw. Fl.* vol. i. p. 240.

Phlebothamnium polyspermum, *Kütz. Phyc. Gen.* p. 374.

Hab. On various Algæ between tide-marks, frequently on *Fucus vesiculosus* and *F. serratus*. Annual. Summer. All round the coast.

Geogr. Distr. Atlantic shores of Europe.

Descr. *Root* discoid, small. *Tufts* globose, one to three inches in diameter, dense. *Filaments* capillary, excessively branched; *stem* zigzag, with short articulations, traversed by a few fibres but not thereby rendered opake, irregularly divided, and either somewhat bare or well furnished with alternate, secondary branches. *Branches* long and slender, zigzag, bearing a second or third series, the latter alternately plumulate with considerable regularity. *Plumules* usually long and narrow, simply pinnate, or occasionally the upper part more compound. *Pinnæ* usually short, patent, subulate, sometimes recurved, in luxuriant specimens so far lengthened that the outline of the plumule becomes ovate. *Articulations* of the branches 4–5 times as long as broad, with a very narrow bag of endochrome; of the ramuli twice as long as broad, fully coloured. *Tetraspores* usually lining the inner faces of the pinnæ, globose. *Favellæ* of large size, in dense clusters, bursting from the rachis of a distorted plumule. Occasionally the place of tetraspores is occupied by round bodies (antheridia? or rather viviparous tetraspores) formed of innumerable minute cells, strung together. *Colour*,

a brownish red, sometimes purplish. *Substance* membranaceous, adhering to paper. On being re-moistened, the frond exhales the odour of violets.

A common species, but variable in its characters, and gradually approaching *C. roseum* on the one hand, and *C. Hookeri* on the other. Our plate represents what we regard as the typical form, or *idea*, of the species. It is remarkable for the short, awl-shaped, simple pinnæ, beaded, on the inner face, with globose tetraspores. From this I formerly distinguished *C. Grevillii* by a plumule of broader and shorter outline, whose uppermost pinnæ were pinnulate at top. A more intimate acquaintance with the species of this genus, and an examination of a profusion of specimens exhibiting numerous variations from the original type of *C. polyspermum*, but all more referable to it than to any other species, have made me cautious of admitting the value of the characters I had formerly considered belonging to *C. Grevillii*. I now regard that species therefore as an imperfectly developed form of *C. polyspermum*, whose uppermost pinnæ are passing into the state of plumules.

C. polyspermum more frequently grows on the coarser *Fuci* than any other species, and sometimes clothes them with densely set, globose tufts, which in old age become blended together, concealing the greater part of the plant on which they grow. The finest specimens I have received were collected at Mount Edgecombe, by my liberal Plymouth correspondents, Messrs. Hore, Rohloff, and Cocks.

Fig. 1. CALLITHAMNION POLYSPERMUM:—*of the natural size.* 2. Portion of a branch, with four plumules. 3. Pinnæ with tetraspores. 4. Plumule with favellæ. 5. Favellæ detached. 6. Pinna with antheridia? 7. Joints from a branch. 8. Joints from the lower part of the stem:—*all more or less magnified.*

Plate CCXXXII.

GIGARTINA PISTILLATA, *Lamour.*

Gen. Char. *Frond* cartilaginous, either filiform, compressed or flat, irregularly divided, purplish red; the *axis*, or central substance, composed of branching and anastomosing longitudinal filaments; the *periphery* of dichotomous filaments laxly set in pellucid jelly, their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles* containing, on a central placenta, dense clusters of spores (*favellidia*) held together by a network of fibres; 2, *tetraspores* scattered among the filaments of the periphery, or aggregated in dense, immersed sori. Gigartina (*Lam.*), —from γιγαρτον, a *grape stone*, which the tubercles resemble.

Gigartina *pistillata*; frond compressed, stipitate, flabellately branched; branches repeatedly forked, with wide, rounded axils, naked, or pinnated with short, horizontal ramuli; apices acute; tubercles solitary or in pairs, on the ramuli; tetraspores chained together, in immersed sori, forming distortions in the branches.

Gigartina pistillata, *Lamour. Ess.* p. 49. *Grev. Alg. Brit.* p. 146. *Hook. Br. Fl.* vol. ii. p. 300. *Harv. Man.* p. 75. *Endl. 3rd Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 402. t. 70. f. 1. *Mont. Fl. Algier.* p. 99.

Sphærococcus gigartinus, *Ag. Sp. Alg.* vol. i. p. 274. *Ag. Syst.* p. 224.

Fucus pistillatus, *Gmel. Fuc.* p. 159. t. 12. f. 1. *Lam. Diss.* p. 51. t. 27.

Fucus gigartinus, *Linn. Syst. Nat.* vol. ii. p. 719. *Good. and Woodw. Linn. Trans.* vol. iii. p. 183. t. 17. f. 3, 4. *E. Bot.* t. 908. *With.* vol. iv. p. 111. *Turn. Syn.* vol. ii. p. 280. *Turn. Hist.* t. 28.

Fucus Œderi, *Esper*, t. 135.

Ceramium gigartinum, *Roth, Cat.* vol. iii. p. 109.

Hab. On rocks, near low-water mark. Perennial. Winter. Very rare. Coast of Cornwall, in several places. Discovered by the *Hon. Dr. Wenman* before 1800. St. Ives, *Stackhouse.* Penzance, *Brodie.* Padstow, *Miss Hill.* Rocks under St. Minver, at the mouth of the Padstow River, *Mrs. Griffiths.* Mount's Bay, *Dr. M'Culloch.* Whitsand Bay, *Dr. Jacob* (1829); *Mr. Gilbert Sanders* (1848), &c. Jersey, *Miss Turner.*

Geogr. Distr. Atlantic shores of France and Spain. Mediterranean sea.

Descr. *Root* a broad, fleshy disc. *Fronds* densely tufted, two to six inches high, compressed, rising with an undivided stem or stipe to the height of one or two inches, then branched in a fan-like manner; the branching normally dichotomous, and repeatedly forked, but from some of the internodes being very short, or altogether suppressed, various irregularities in branching occur. All the divisions are very patent, with wide, rounded axils; and the ultimate branches gradually taper upwards, and end in an

acute point. Barren specimens and those which produce tetraspores, have the forked branches usually naked; in tubercle-bearing individuals, on the contrary, they are pinnated with short, horizontal, simple or forked ramuli, two to three lines long. *Tubercles* borne on the ramuli, either at their apices or more commonly below the point, which projects like a horn, solitary, or two or more together, usually very abundantly produced. *Tetraspores* contained in dark coloured swellings of the branches immersed in the substance; each sorus of large size, thick, containing innumerable chained cruciate tetraspores. *Substance* cartilaginous, shrinking very much in drying. *Colour*, a dull purplish or brownish-red. It does not adhere to paper in drying, unless after long steeping in fresh water.

For splendid specimens, fresh from the sea, of this very rare Alga, I am indebted to Mr. Gilbert Sanders of Plymouth, who was so fortunate, towards the close of last year, as to re-discover an old habitat where the plant had been sought for many years, and not found since 1829. From one of Mr. Sanders' newly gathered specimens our figure has been taken.

The characters of this species are so strongly marked, especially when in tubercular fruit, as is commonly the case, that it can scarcely be mistaken for anything else. In habit *G. mammillosa* comes nearest to it, but the channelled frond of that species affords a sufficient character. Barren specimens, or specimens with tetrasporic fruit, have rather the aspect of very narrow individuals of *Chondrus crispus*, but they seldom occur except in company with unmistakable forms.

All the specimens received from Mr. Sanders bore tubercles. I have since been favoured by Dr. Cocks, with specimens well furnished with tetraspores. The latter are contained in very dense sori, something resembling nemathecia, sunk in the substance of the frond.

Fig. 1. GIGARTINA PISTILLATA:—*of the natural size.* 2. Part of a branch with fertile ramuli. 3. Section of a tubercle. 4. Spores from the same. 5. Section of a sorus. 6. Tetraspores from the same. 7. Transverse semi-section of a small portion of the frond:—*all more or less highly magnified.*


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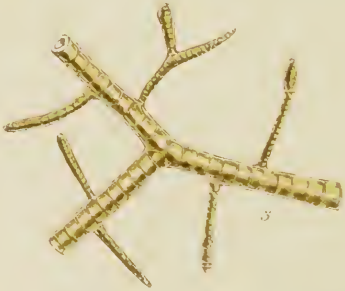
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Plate CCXXXIII.

ECTOCARPUS LANDSBURGII, *Harv.* (*n. sp.*)

Gen. Char. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. Ectocarpus (*Lyngb.*), —from εκτος, *external*, and καρπος, *fruit*.

Ectocarpus *Landsburgii*; filaments dark-brown, tenacious, intricate, much branched; branches irregularly forked, divaricated, zigzag, bristling with numerous short, spine-like, horizontal ramuli; articulations shorter than broad, the endochrome filling the cell, and recovering its shape on being moistened, after having been dried.

Hab. Dredged in deep water, in land-locked bays; rare. Annual. Summer. Lamlash, Isle of Arran, *Rev. D. Landsborough*. Roundstone Bay, Galway, *W. H. H.*

Geogr. Distr. Shores of Scotland and Ireland.

Descr. *Filaments* capillary, one or two inches in length, densely entangled in small tufts, or rolled together in masses, irregularly much branched, of about the same diameter from the base to the apex. *Branches* spreading at very wide angles, dichotomous, or alternate, the lesser divisions very patent, horizontal, or recurved. *Ramuli* short, spine-like, horizontal, simple, or forked, not half a line in length, now thinly, now thickly scattered over the branches, rarely opposite. *Articulations* shorter than broad, filled by a coloured bag; the dissepiments and border very narrow. *Substance* tenacious, membranous, not closely adhering to paper, and not affected by long steeping in fresh water. *Colour*, a dark brown.

The first specimens which I received of this curious little plant were dredged by my friend the Rev. D. Landsborough in Lamlash Harbour, a circumstance which I record in the specific name; pleased with the opportunity thus afforded me of connecting Mr. Landsborough's name with the botany of an island whose history and natural beauties it has been to him a labour of love to illustrate by his pen.*

The ramification of our *E. Landsburgii* so nearly agrees with that of *E. distortus*, Carm., that I felt disposed, at first, to regard it as that species. But a careful comparison of both

* Arran, a poem in six cantos; and Excursions to Arran, with reference to the natural history of the island. By the Rev. D. Landsborough:—Edinburgh, 1847.

plants, placed side by side on the table of the microscope, has convinced me of their perfect distinctness. In *E. distortus* the endochrome is small, leaving wide dissepiments and colourless borders; the substance is exceedingly tender, and the branches break up into innumerable frustules when re-moistened. In fact, it is impossible to trace the ramification from the extreme *rottenness* of the moistened frond. In *E. Landsburgii* on the contrary, the endochrome completely fills the cavity; the dissepiments are mere lines; and the substance is exceedingly tough, and may be kept in fresh water for hours or days, without injury. These characters appear to me sufficient. We must also bear in mind that *E. distortus* is a littoral species, while our new species has only been found by dredging in deep water. It appears to be of rare occurrence. Mr. Landsborough found only a few small tufts; nor was I much more fortunate in collecting it at Roundstone. It is satisfactory to know, however, as establishing the character of the species, that the specimens from the west of Ireland agree in all respects with those from Scotland.

Fig. 1. Ectocarpus Landsburgii:—*of the natural size.* 2. A branching portion. 3. Part of the same. 4. Transverse section of the stem:—*all more or less highly magnified.*

Plate CCXXXIV.

JANIA CORNICULATA, *Lamour.*

Gen. Char. *Frond* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification* urn-shaped *ceramidia*, formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores*. Jania (*Lamour.*),—I suppose from *Janira*, one of the *Nereides*.

Jania *corniculata*; articulations of the principal divisions obconical, compressed, their upper angles sharp and prominent; those of the uppermost ramuli cylindrical, filiform.

Jania corniculata, *Lam. Cor. Flex.* p. 274. *Corall.* p. 123. *Gray, Nat. Ar. Br. Pl.* vol. i. p. 339. *Flem. Brit. Anim.* p. 514. *Johnst. Spong. and Lith.* p. 227. *Decne. Ess.* p. 111. *Endl. 3rd Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

Corallina corniculata, *Linn. Syst.* p. 806. *Pal. Elench.* p. 424. *Ellis and Soland. Zoop.* p. 121. *Turn. Br. Faun.* p. 212. *Lam. An. s. Vert.* 2nd Ed. vol. ii. p. 517.

Hab. Parasitical on the smaller Algæ, in rock pools between tide-marks, and in 4–5 fathoms water. Perennial? Summer. Southern shores of England and Ireland. Jersey, *Miss Turner*.

Geogr. Distr. Atlantic and Mediterranean shores of Europe.

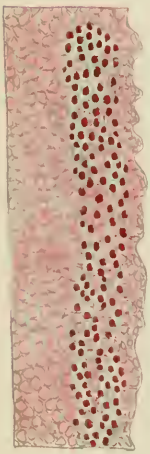
Descr. *Fronds* densely tufted, one or two inches high, repeatedly dichotomous, fastigiate, the branches spreading, gradually attenuated towards the apex. In young specimens the branching is always regularly forked, but older specimens frequently show in their lower parts a disposition to become pinnated, from lateral opposite ramuli issuing from their joints. These ramuli, as well as the terminal forkings, are much narrower than other parts of the frond. *Articulations* of the principal branches twice or thrice as long as broad, tapering to the base, gradually enlarged upwards, compressed, their upper angles more or less produced, sometimes extending at each side into a long conical horn; articulations of the lesser branches and ramuli cylindrical. *Ceramidia* urn-shaped, in the upper axils. On maceration in acid, transverse striæ become visible in the articulations.

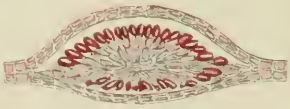
The genus *Jania*, if we confine it to the dichotomously branched species, may be allowed to stand as distinct from *Corallina*—at least in habit;—but it must be admitted that the two genera approach very nearly, if they do not rather merge one in the other. Had we only to consider European forms we might think differently. But the shores of warm countries, and espe-

cially of Australia, yield beautiful species, having the pinnated habit of *Corallina* with the *antennated* fruit (if so I may call it) of *Jania*. These form the section of *Jania*, called *Haliptilon* by Decaisne, and I have already figured, on *Corallina squamata*, fruit which, did it occur on an Australian specimen, would entitle the individual furnished with it to a place in the subgenus *Haliptilon*.

Jania corniculata differs from the more common *J. rubens* chiefly, if not altogether, in the form of the lower articulations; much as *Corallina squamata* differs from *C. officinalis*. The species has been generally kept up by all authors, since the time of Ellis, who first distinguished it. On the British shores it is most common on the southern coast, while *J. rubens* is found all round the island.

Fig. 1. Jania corniculata :—*of the natural size*. 2. Portion of the branching stem. 3. Portion of another stem, becoming pinnated. 4. Ceramidium and ramuli. 5. Articulation of the stem after maceration in acid :—*all more or less magnified*.





W.H.H. del et lith

Plate CCXXXV.

NITOPHYLLUM GMELINI, *Grev.*

Gen. Char. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores*, grouped into definite *sori* or spots, variously scattered over the frond. Nitophyllum (*Grev.*),—corruptly formed from *nitor*, to *shine*, and φυλλον, a *leaf*.

Nitophyllum *Gmelini*; frond short-stalked, fan-shaped, with a roundish outline, variously cleft into broadly wedge-shaped segments, waved, curled, rather rigid, marked near the base (and sometimes over the surface) with vague, vanishing nerves; spots of tetraspores linear, confined to the margin.

Nitophyllum Gmelini, *Grev. Alg. Brit.* p. 82. *Hook. Fl. Brit.* vol. ii. p. 288. *E. Bot. Suppl.* t. 2779. *Wyatt, Alg. Danm.* no. 65. *Harv. in Mack. Fl. Hib.* part 3. p. 193. *Harv. Man.* p. 58.

Aglaiophyllum Gmelini, *Mont. Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443. *Endl. 3rd Suppl.* p. 52.

Delesseria Gmelini, *Lamour. Ess.* p. 36.

Hab. On rocks, and the larger Algæ, near low-water mark, and at a greater depth. Annual. Summer. South of England; particularly large and abundant near Plymouth. North and west of Ireland. Howth, *Miss Gower*. Jersey, *Miss White and Miss Turner*.

Geogr. Distr. Atlantic coasts of France and Spain.

Descr. *Root* a small, conical disc. *Stem* from a quarter to half an inch in length, cylindrical and cartilaginous below, soon becoming compressed, and then expanding into the wedge-shaped base of the frond. *Frond* two to six inches in length, and as much or more in breadth, flabelliform, with a roundish outline, either nearly entire, with the margin cut into shallow lobes, or deeply cleft into numerous broad segments, which are either jagged or subdivided in a dichotomous manner; and sometimes cut into narrow ribbons. *Segments* cuneate at base, widening upwards, their apices rounded, or angularly cut. The *margin* is generally much undulated. From the base of the frond there issue numerous branching veins, which ramify over the surface, and gradually become fainter upwards; these in some specimens are faint, and soon lost, and in others are strongly marked and evident, even in the upper segments. *Tubercles* either confined to the margin, or scattered over the disc of the upper lobes, hemispherical, depressed, containing a large tuft of dark-red spores. *Tetraspores* disposed in linear *sori*, always placed just within the margin of the frond, and following its curvature. *Colour* a full deep-lake, becoming a bright pink in drying. *Substance* crisp, and somewhat rigid, crackling in the fingers; becoming flaccid in fresh-water. *Cells* of the surface large, irregularly hexagonal.

From all the British species of *Nitophyllum*, except *N. laceratum*, this handsome plant may be at once distinguished, when in tetrasporic-fruit, by the marginal position of the sori; from *N. laceratum* it can only be known by difference in form, in substance, and, in some measure, by its brighter colour. The usual narrow varieties of *N. laceratum* are so different from any state of *N. Gmelini*, that we should hardly anticipate the occurrence of individuals of doubtful characters, which seem to stand almost equidistant from either species. And yet some luxuriant specimens of *N. laceratum* so nearly approach the cloven varieties of *N. Gmelini*, that in a dried state especially, they are apt to deceive even a practised eye. When the plants are freshly gathered indeed, they are most easily separated,—*N. Gmelini* being known by a peculiarly crisp, rigid feel, and *N. laceratum* by softness, and at the same time toughness. The colour of the latter is more purple, and often reflects prismatic colours; and the nerves are much more clearly defined than in *N. Gmelini*.

Fig. 1. Nitophyllum Gmelini:—*of the natural size.* 2. Portion of the frond, with a marginal *sorus.* 3. *Tetraspores*, from the same. 4. Portion of the frond with tubercles. 5. Section of one of the tubercles:—*all more or less highly magnified.*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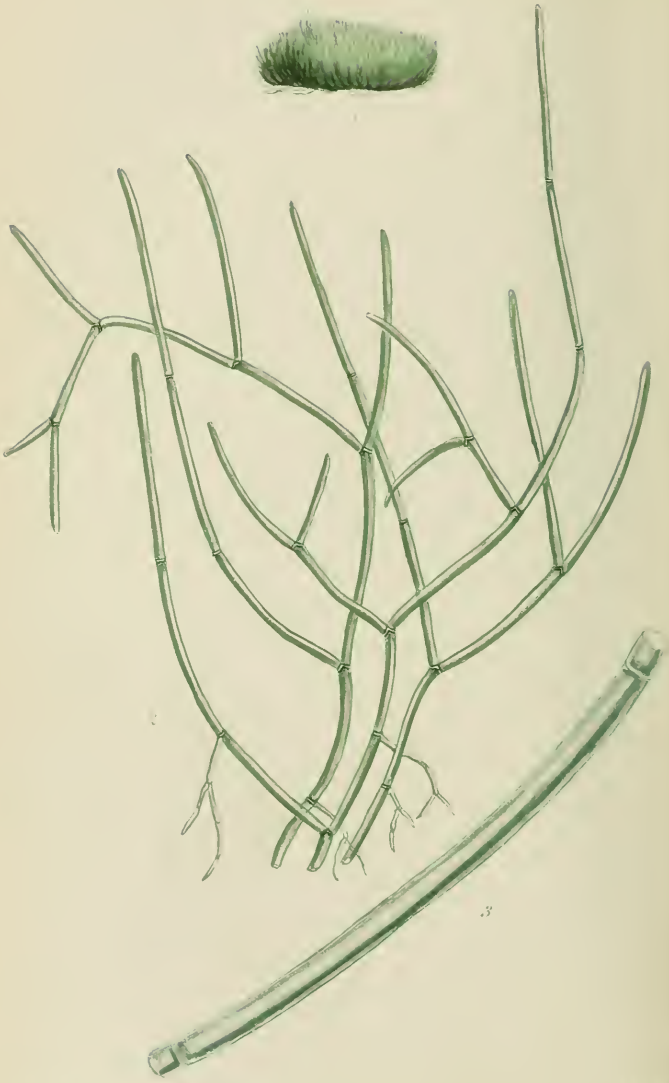
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Plate CCXXXVI.

CLADOPHORA REPENS, *J. Ag.*

Gen. Char. *Filaments* green, jointed, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper, ciliary motion. Cladophora (*Kütz.*), — from κλαδος, a *branch*, and φορεω, to *bear*.

Cladophora *repens*; forming dense, cushion-shaped or globular tufts; filaments short, capillary, rigid, densely matted together, rising from root-like fibres; slightly branched; branches erect, subsimple, or forked, naked, or with a few distant, secund ramuli; articulations cylindrical, very long (ten to twenty times as long as their diameter).

Conferva repens, *J. Ag. Alg. Medit.* p. 13.

Œgagropila simplex, *Lenorm. in Herb. T. C. D.* (!)

Hab. Thrown on shore after a gale. Annual? Summer. Jersey, *Miss Turner*.

Geogr. Distr. Shores of the Mediterranean Sea. Atlantic coast of France, *Lenormand*!

Descr. *Tufts* very dense, an inch or two in breadth, and about half an inch in thickness, globose or oblong, cushion-like, composed of innumerable, capillary filaments, closely matted together. The filaments are at first decumbent, connected by root-like fibres, which form the substratum of the tufts; from the decumbent filaments issue, at the joints, erect branches, half an inch in length, simple, or once forked, and either naked or furnished with a few simple, distant, secund ramuli. Each branch consists of about four or five, rarely more, articulations; and each ramulus usually of one, rarely of two articulations. The articulations are therefore of great length, as compared with their diameter; in our specimen the length is frequently as much as twenty times the breadth:—they are cylindrical, and the diameter at the tip of the branches is as great as at the base. The *colour* appears to have been a dark green; it is dingy and somewhat olive-green in the dried state. The substance is rigid, and the plant does not adhere to paper when dry.

In a recent number I had the pleasure of figuring a new species of *Dasya* from the shores of Jersey, and I have now to introduce, from the same locality, a *Cladophora*, discovered by my valued correspondent, Miss Turner, to whom I am indebted for many Jersey Algæ. Miss Turner informs me that the specimens were picked up on the beach after a heavy gale, in 1846; four only were found, and the plant has not since been noticed.

From one of these specimens, now n Herb. T. C. D., our figure has been taken.

Of the reference to M. Lenormand's *Œgagropila simplex* (seemingly a manuscript name) I am quite certain, a specimen communicated to me by that gentleman agreeing in all respects with Miss Turner's plant; but possibly the reference to the Mediterranean *Conf. simplex*, J. Ag., may be incorrect. And yet I have little hesitation in uniting our plant with that species. They agree in every respect except in the length of the articulations, which, in the Mediterranean plant, are shorter than in ours; and this slight discrepancy seems scarcely sufficient to separate plants so closely allied, by so many remarkable features.

Though not one of the handsomest, this is one of the most curious species of the genus. Outwardly it nearly resembles *C. Brownii*, but the form and proportion of the articulations are very different.

Fig. 1. Cladophora repens; tuft:—*of the natural size.* 2. Portions of three filaments from the same. 3. An articulation from one of the filaments:—*magnified.*

Plate CCXXXVII.

STILOPHORA LYNGBYÆI, *J. Ag.*

Gen. Char. *Root* a small, naked disc. *Frond* filiform, solid or tubular, branched. *Fructification*, convex, wart-like sori scattered over the surface, composed of obovate spores nestling among moniliform, vertical filaments. Stilophora (*J. Ag.*)—from στιλη, a *point* or *dot*, and φορεω, to *bear*; in allusion to the dot-like fructification.

Stilophora *Lyngbyæi*; frond tubular, at length distended, much branched, the branches dichotomous, spreading, with wide, rounded axils, much attenuated toward the apices; ramuli scattered, forked, capillary; sori subdistant, disposed in transverse lines.

Stilophora Lyngbyæi, *J. Ag. Symb.* vol. i. p. 6. *Sp. Alg.* vol. i. p. 84. *Endl.* 3rd *Suppl.* p. 26.

Scytosiphon paradoxus, *Fl. Dan.* t. 1595. f. 2.

Spermatochnus paradoxus, *Kütz. Phyc. Gen.* p. 335.

Chordaria paradoxa, *Lyngb. Hyd. Dan.* p. 53. t. 14.

Striaria Grevilleana, *Pollexf. MS.*

Sporochnus rhizodes β paradoxa, *Ag. Sp. Alg.* vol. i. p. 157. *Grev. Alg. Brit.* p. 43. *Hook. Br. Fl.* vol. ii. p. 275. *Harv. Man.* p. 27.

Hab. In land-locked bays, and estuaries, on a muddy and sandy bottom, in 4–10 fathom water. Annual. Summer. Several places on the shores of Scotland and Ireland, abundantly.

Geogr. Distr. Baltic Sea. Atlantic Coasts of Europe. Mediterranean Sea.

Descr. *Root*, a small disc. *Fronds* from two to four or six feet in length, from one to two lines in diameter at their widest part, but tapering to a capillary fineness towards the apices, usually tufted, and sometimes covering the ground in continuous patches that spread over several square yards. *Stem* very much branched in a dichotomous manner, becoming irregular by the occasional suppression of one of the arms of the fork; the divisions widely spreading, with very broad, rounded axils; the forks distant below, gradually nearer towards the apex. The lower part of the stem becomes, in age, much distended, with a wide cavity and thin walls, the whole of the central cellular substance dying out; in younger parts it is more solid. *Warts* of fructification more distant than in *S. rhizodes*, and placed in transverse, slightly spiral bands, containing obovate *spores* attached to club-shaped paranemata. *Colour* a pale, testaceous brown, olive toward the tips, and becoming greener in drying, especially after the specimen has been steeped in fresh water. *Substance* when recent crisp, and very brittle; soon becoming flaccid and somewhat tough, giving out mucus. It closely adheres to paper.

Hitherto this plant has appeared in British works as a variety of *S. rhizodes*, figured at Plate LXX, and notwithstanding its different appearance, when *typical* specimens of each are under examination, it is not without hesitation that I admit the present to be specifically distinct. Those who are acquainted with the difference in aspect assumed by marine plants, according to the depth of water at which they grow, will best understand my doubts; remembering that the typical *S. rhizodes* grows within tide-marks, and *S. Lyngbyæi* at a considerable depth, beyond the reach of the tide. And the differences between the two are precisely of the nature of those caused by deep water. If we regard *size*, we must remember that *Asperococcus Turneri* in tide pools is seldom more than six inches long; and that when growing with our *S. Lyngbyæi*, which it frequently accompanies, it has fronds three or four feet in length and proportionably broad. So also *Gracilaria confervoides*, which grows to six or seven feet in length in deep water. The *distention* of the frond in *Stilophora* and the attenuation of the branches likewise increase with depth. On the whole, therefore, the characters typical of our *S. Lyngbyæi* become more strongly marked as the depth of water increases, and appear to me greatly to depend on locality. It is for this reason that I am inclined to question its right to be considered a species, distinct from *S. rhizodes*.

Fig. 1. STILOPHORA LYNGBYÆI;—part of a frond, *the natural size*. 2. Segment of a branch. 3. Cross section of the same. 4. Section of a wart. 5. Spore and paranemata, from the same;—*all magnified*.

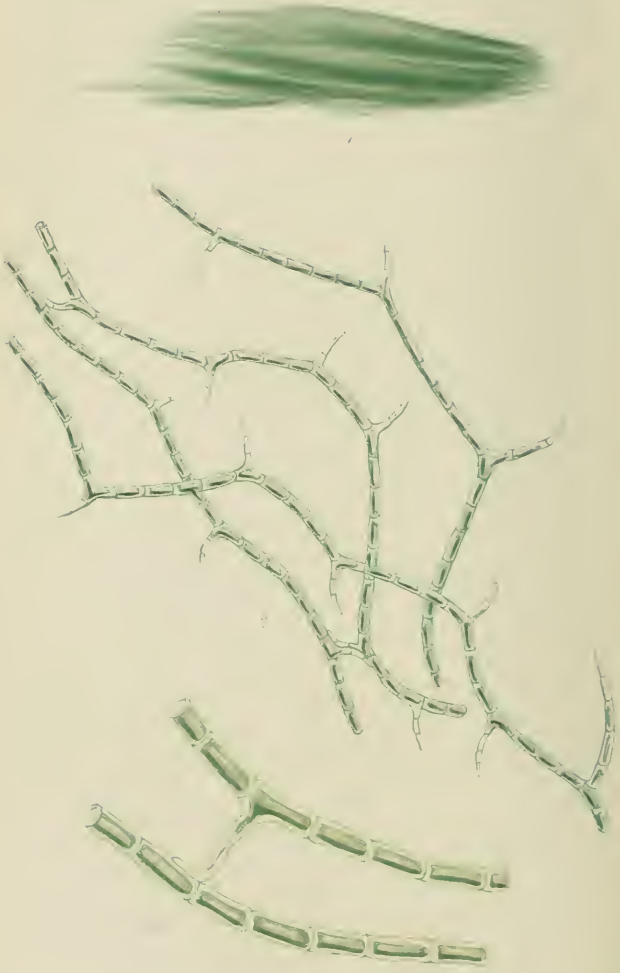


Plate CCXXXVIII.

RHIZOCLONIUM* RIPARIUM, *Kütz.*

Gen. Char. *Filaments* green, jointed, uniform, decumbent, simple or spuriously branched; branches short and root-like. *Fruit*, granules contained in the cells. Rhizoclonium (*Kütz.*),—from ῥίζοω, to *root*, and κλὼν, a *branch*.

Rhizoclonium *riparium*; filaments long, slender, decumbent, pale-green, forming wide strata, flaccid, entangled, angularly bent, furnished at the angles with short, root-like processes (which sometimes, but rarely, lengthen into very patent branches, and often attach themselves to neighbouring filaments.)

Rhizoclonium obtusangulum, *Kütz. Phyc. Gen.* p. 261. (*and probably R. Jurgensii and R. littoreum, ib.*)

Conferva riparia, *Roth Cat. Bot.* vol. iii. p. 216. *Eng. Bot.* t. 2100. *Dillw. Conf.* p. 111. *Sup.* t. *E. Ag. Syst.* p. 106. *Harv. in Hook. Br. Fl.* vol. ii. p. 359. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 140.

Conferva obtusangula, *Lyngb. Hyd. Dan.* p. 159. t. 55.

Conferva perreptans, *Carm. Harv. in Hook. Br. Fl.* vol. ii. p. 352.

Conferva tortuosa, *Wyatt, Alg. Danm.* no. 190. (*not of Dillw.*)

Zygnema littoreum, *Lyngb. Hyd. Dan.* t. 59. (?)

Hab. On sand-covered rocks, near high-water mark. Annual. Summer. Not common. Bantry Bay, *Miss Hutchins*. Sunderland, *Mr. W. Backhouse*. Yarmouth, *Mr. Dillwyn*. Torquay, &c., *Mrs. Griffiths*. Appin, *Capt. Carmichael*.

Geogr. Distr. Shores of Northern Europe.

Descr. *Filaments* prostrate, forming pale green strata, sometimes spreading in patches some square feet in area, slender, lying close together, and frequently matted inextricably. The threads are angularly bent, at intervals, and from each angle issues a short, root-like tapering ramulus, usually consisting of two or three cells, standing at right, or very obtuse angles with the main filament. This rarely lengthens into a proper branch: more generally it preserves the root-like character, and attaches itself to a neighbouring filament, and sometimes two such rootlets uniting together, bind the filaments still more closely together. I have not observed the roots inosculating with the attached filament, as the connecting tubes of *Zygnema* do. *Articulations* about twice as long as broad, full of a pale-green endochrome. *Substance* flaccid, not very closely adhering to paper.

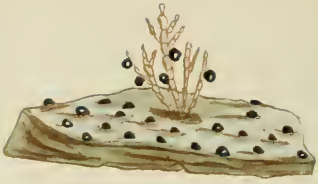
This curious little plant was first noticed as British by the

* Misprinted *Rhizogonium* in the systematic index to the 1st volume.

late Miss Hutchins of Bantry, but notwithstanding the figures given by Dillwyn, and in English Botany, and its very distinct characters, it has been much misunderstood. The specimens published by Mrs. Wyatt, under the name *Conferva tortuosa*, belong, in the copies of her valuable work which I have examined and, I suspect, in all the others, to our *R. riparium*. It is a more slender plant than *C. tortuosa*, of a paler colour, and, above all, distinguished by the root-like fibres which issue at intervals, from the articulations; and the presence of which has induced Kützing to place it in a separate genus.

I am not certain whether all the synonyms quoted above belong to this, or to several closely allied species. According to Prof. Kützing there are three or four distinct plants confounded under the *Conferva riparia* of authors, a point to determine which I have not sufficient data at hand. As regards the specimen now figured, it is at least certain that ours is the plant of Dillwyn, our figure having been prepared from one of the original specimens collected by Miss Hutchins.

Fig. 1. Rhizoclonium riparium; stratum,—*of the natural size*. 2. Filaments from the same; *magnified*. 3. A portion:—*more highly magnified*.



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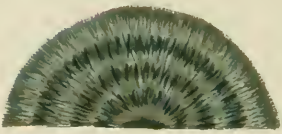

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Plate CCXXXIX.

RIVULARIA ATRA, *Roth*.

Gen. Char. *Frond* globose or lobed, fleshy, firm, composed of continuous radiating filaments, annulated within, each springing from a spherical globule. Rivularia (*Roth*),—so named by Roth, in allusion to the fluviatile habit of some of the first-discovered species.

Rivularia *atra*; fronds minute, scattered, globose, or hemispherical, firm, smooth, glossy black-green; filaments dark green, densely packed.

Rivularia atra, *Roth, Cat. Bot.* vol. iii. p. 340. *Ag. Syn.* p. 130. *Ag. Syst.* p. 24. *E. Bot.* t. 1798. *Harv. in Hook. Br. Fl.* vol. ii. p. 392. *Harv. in Mack. Fl. Hib.* part 3. p. 235. *Harv. Man.* p. 152.

Euactis atra, *Kütz. Phyc. Gen.* p. 241.

Linckia atra, *Lyngb. Hyd. Dan.* p. 195. t. 65.

Linckia hemispherica, *Schum. Enum.* vol. ii. p. 114.

Tremella hemispherica, *Linn. Syst. Nat.* vol. ii. p. 714. *Huds. Fl. Ang.* p. 565. *Lightf.* p. 900. *With.* vol. iv. p. 81.

Chætophora atra, *Ag. Disp.* p. 43.

Hab. On rocks and stones, and on Corallines and other Algæ, between tide marks. Perennial? At all seasons. Very abundant.

Geogr. Distr. Shores of Europe.

Descr. *Fronds* one or two lines in diameter, hemispherical when attached to flat surfaces, globose when growing on filiform Algæ, very hard, of an exceedingly firm, compact substance, and dark colour. *Filaments* subulate, attenuated, connected together in branching, subdichotomous series, filled with dark-green endochrome, which is annularly divided in the upper part, and coheres in oblong masses in the lower. Each filament springs from a transparent globule (or connecting cell).

A very common plant on all rocky shores, growing either on the rocks, or on the smaller Algæ, especially on *Cladophora rupestris* and *Corallina officinalis*. It forms small, hard wart-like balls or hemispheres, rarely as large as the seed of Sweet-Pea (*Lathyrus odoratus*), and sometimes completely covers the plant to which it attaches itself.

Carmichael describes an allied species, *R. applanata*, said to differ from *R. atra* in being flatter and thinner in substance, and growing in similar localities. This I have never seen.

Fig. 1. RIVULARIA ATRA:—*of the natural size.* 2. Vertical section of a frond. 3. Some of the filaments:—*magnified.* 4. A filament separated and *highly magnified.*

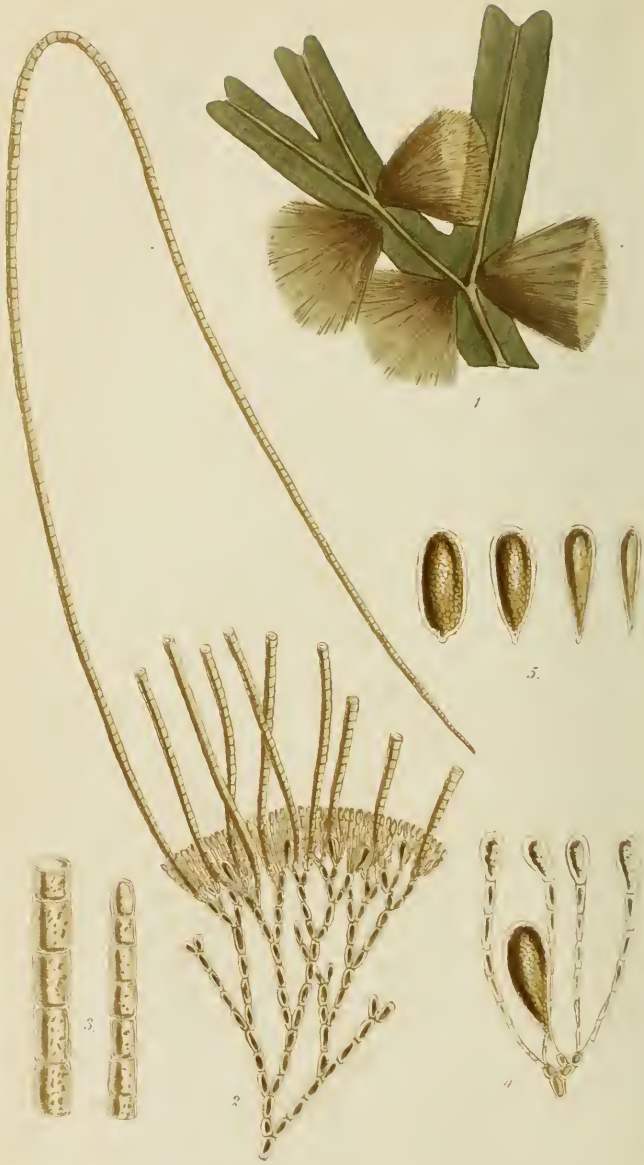


PLATE CCXL.

ELACHISTEA FUCICOLA, *Fries*.

GEN. CHAR. *Frond* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical branching fibres closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the base of the filaments, concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), from ελαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *fucicola*; tufts pencilled; filaments elongate, flaccid, membranaceous, attenuated upwards; articulations once or twice as long as broad; tubercular mass spherical.

ELACHISTEA fucicola, *Fries. Fl. Scan.* p. 317. *Aresch. Pug.* t. viii. f. 6–7. *J. Ag. Sp. Alg.* vol. i. p. 12.

MYRIONEMA fucicolum, *Endl.* 3rd. *Suppl.* p. 23.

PHYCOPHILA fucorum, and P. Agardhii, *Kütz. Phyc. Gen.* p. 330.

CONFERVA fucicola, *Velley, Pl. mar.* No. 4. *Dillw. Conf.* t. 66. *Lyngb. Hyd. Dan.* t. 50. *Ag. Syst.* p. 103. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part. 3. p. 227. *Harv. Man.* p. 131. *Wyatt, Alg. Danm*, no. 192.

CONFERVA ferruginea, *Ag. Syst.* p. 103.

HAB. Parasitical on *Fucus serratus* and *F. vesiculosus*. Annual. Summer and Autumn. Common.

GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* forming brush-like tufts, an inch in length, rising from a hemispherical, cartilaginous tubercle, which gradually increases in size as the plant advances in growth. This tubercle is composed of numerous dichotomous, articulated, vertical filaments, issuing from a common point, beneath the surface of the *Fucus* on which the parasite grows, and radiating in all directions. After several forkings the tips of the branches terminate in a cluster of linear club-shaped fibres or paranemata, three or four of which spring from each apex, and among these, which constitute the *periphery* of the tubercle, are attached both the *spores*, and the long *filaments* which form the brush-like tuft. *Filaments* an inch long, scarcely tapered at the base, much attenuated to the apex; the articulations once and a half to twice as long as broad. *Spores* at first club-shaped, then pyriform, and at length ellipsoidal. *Colour* olive-green, becoming brown or foxy.

This is the largest species, the longest known, and the com-

monest of the genus *Elachistea*. It infests *Fucus vesiculosus* and *F. serratus* almost wherever these plants grow, and may be found nearly at every season. At its first appearance it forms a minute pencil of greenish filaments rising from a scarcely perceptible tubercle. As it grows larger, the colour changes to brown, and the tubercle increases much in size, and at length becomes a button, attached by a central point. It then falls away and the plant perishes. The growth of other *Elachisteæ* is very similar.

By J. Agardh this genus is placed in *Ectocarpeæ*, but, in my opinion, incorrectly. The structure of the tubercle, in which the spores are lodged, is precisely that of the *Chordarieæ*, and did this tubercle constitute the whole plant, no doubt Professor Agardh would associate the genus with the latter family, for the whole structure of this part is analogous to that of *Leathesia*, and the nature and position of the *spores* the same. But then there are the long pencilled filaments composing the largest part of the frond; and these are very unlike anything found elsewhere in *Chordarieæ*, while they closely resemble the threads of an *Ectocarpus* in structure. Taking these filaments for *the frond*, Agardh would be correct in referring the genus to *Ectocarpeæ*. But, to my mind, the *tubercle*, as it contains the fructification, must be regarded as the most essential part of the structure; the *filaments* as an accessory part; and therefore I am of opinion that the genus is best placed in *Chordarieæ*.

Fig. 1. Tufts of ELACHISTEA FUCICOLA, growing on *Fucus vesiculosus*;—*the natural size*. 2. Part of a branching filament of the tubercle, with its paranemata, and excurrent filaments, one of which is bent back, the others cut off. 3. Portions of one of the excurrent filaments. 4. Paranemata and spore. 5. Spores in various stages of advancement;—*all magnified*.

R.B. & R.imp

Plate CCXLI.

LAMINARIA BULBOSA, *Lamour.*

Gen. Char. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. Laminaria (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

Laminaria *bulbosa*; stem flat, with a waved margin, once twisted at the base, rising from a roundish, hollow, warted tuber; frond oblong, deeply cleft into many linear segments.

Laminaria bulbosa, *Lamour. Ess.* p. 22. *Ag. Syn.* p. 18. *Lyngb. Hyd. Dan.* p. 21. *Hook. Fl. Scot.* part 2. p. 99. *Ag. Syst.* p. 271. *Ag. Sp. Alg.* vol. i. p. 114. *Grev. Alg. Brit.* p. 29. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 24. *Wyatt, Alg. Danm.* no. 4.

Laminaria Belvisii, *Ag. Sp. Alg.* vol. i. p. 115. *Ag. Syst.* p. 271.

Saccorhiza bulbosa, *De la Pyl. Fl. Ter. Newv.* p. 23. *J. Ag. Sp. Alg.* vol. i. p. 137.

Haligenia bulbosa, *Dne. Ess.* p. 50. *Endl. 3rd. Suppl.* p. 27.

Phycocastanum bulbosum, *Kütz. Phyc. Gen.* p. 346.

Fucus bulbosus, *Huds. Fl. Angl.* p. 579. *Linn. Trans.* vol. iii. p. 153. *Turn. Syn.* p. 212. *Esper, Ic.* t. 123. *E. Bot.* t. 1760. *Turn. Hist.* t. 161.

Fucus polyschides, *Lightf. Fl. Scot.* p. 936. *With.* vol. iv. p. 97. *Stack. Ner. Brit.* t. 4.

Fucus palmatus, *Gmel.* t. 30.

Ulva bulbosa, *DC. Fl. Fr.* vol. ii. p. 16.

Hab. On rocks at low-water mark, and to the depth of 10–15 fathoms. Perennial. Autumn. Abundant on the British shores.

Geogr. Distr. Shores of Europe from Norway to Spain. Ferroe Islands. Coast of Guinea, *Pal. de Beauvois.*

Descr. *Root*, in the young state of the plant, composed of several clasping fibres, gradually perishing as the frond increases in size, and its place supplied by a hollow tuber which originates at a higher point on the stem. *Stem* at first slender and filiform, half a line in diameter and an inch in height, with a small dilatation like a collar a little above its middle; gradually becoming broader and quite flat, till, in large specimens, it is four or five feet long, and two or three inches wide, with the margin very much waved and curled. In these full-grown specimens, the *collar*-like swelling becomes dilated into a hollow tuber, from four inches to a foot in diameter, rough with wart-like or cylindrical fibrous projections. The portion of the stem below the tuber is either absorbed or perishes, and roots issue from the lower surface of the tuber to supply the place of the original holdfast: thus a new base is provided for the frond. *Frond* in young specimens membranaceous, oblong, or ovate, undivided; when full-grown coriaceous,

thick, from three to six feet in length, oblong, cloven into innumerable narrow, ribbon-like segments. *Spores* abundantly formed in the wavy margin of the stem, but not confined to this portion of the frond. They originate in the cells immediately beneath the surface, and are closely packed together, vertically, in large cloud-like sori; they are at first linear-clavate, at length elliptical; their perispore drawn out at base into a slender stipe. *Colour* a clear, brown olive; greenish when young. *Substance* more tender than in *L. digitata.*

This is the largest British species of the *Laminarieæ*, its frond in some instances forming, when spread out on the ground, a circle twelve feet in diameter. Its common name is *Furbelows*, and its aspect must be familiar to most visitors of the sea-shore.

In modern systems it is generally separated from *Laminaria*, and no less than three generic names have recently been proposed for it, of which *Saccorhiza*, having the priority in publication, has been adopted by Prof. J. Agardh in his recent work. *L. bulbosa* differs somewhat, in habit, from other *Laminariæ*, and may perhaps be allowed to form a separate generic group; but the chief diagnostic character insisted on by the upholders of the change is not valid. It is asserted that the spores are confined to the frill of the stem. It is quite true that here they are most abundant; but they also occur in effused patches on the lamina, as in other *Laminarieæ*.

I am indebted to my friend John Nuttall, Esq., of Titoor, for the specimen here figured, which is singularly characteristic of the full-grown plant, and yet of so small a size as to come easily into a quarto plate.

Fig. 1. LAMINARIA BULBOSA; a small, but fully formed specimen:—*of the natural size.* 2. Section, with spores, *in situ*:—*magnified.* 3. Spores, of various ages:—*highly magnified.*

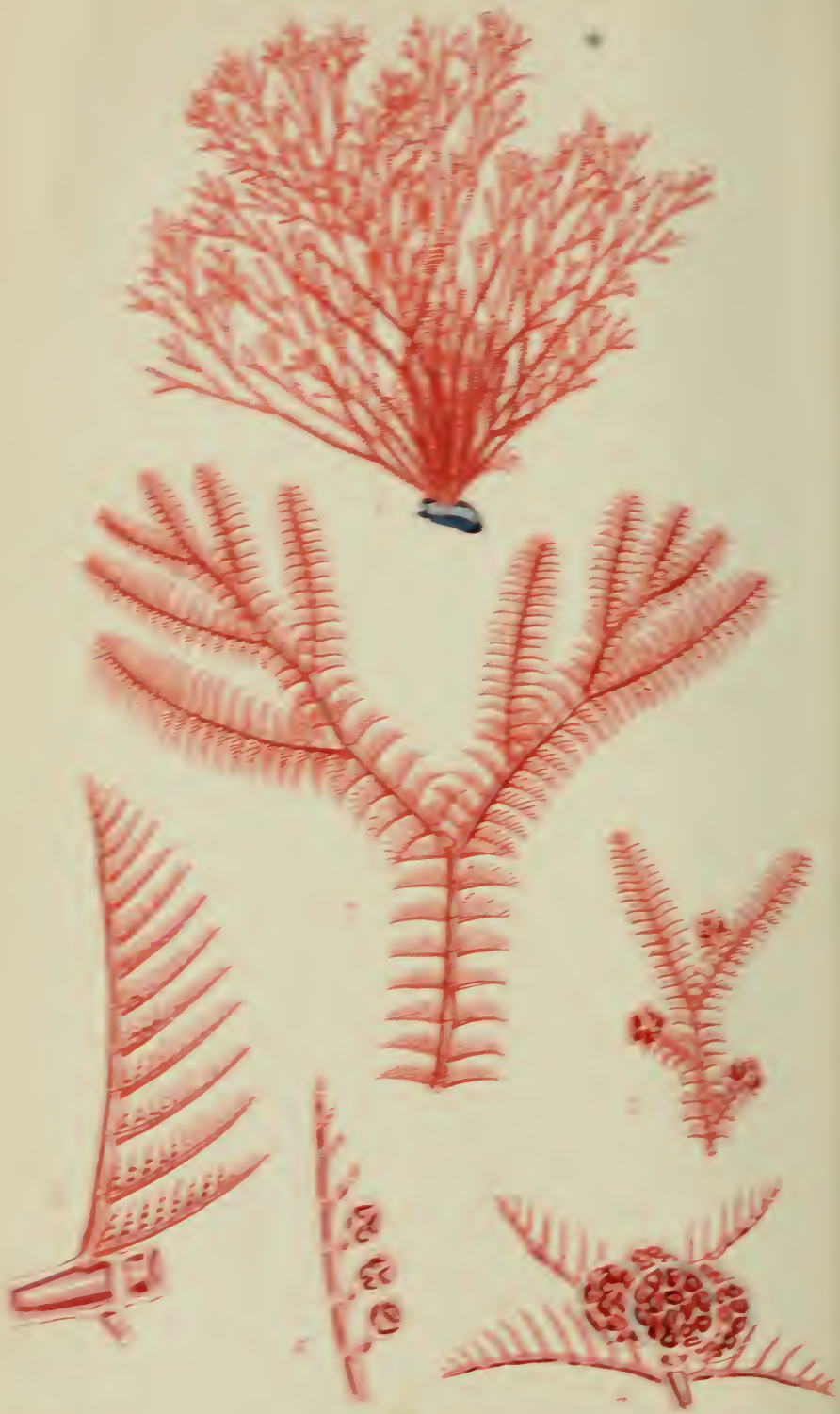


Plate CCXLII.

CALLITHAMNION PLUMULA, *Lyngb.*

Gen. Char. *Frond* rosy or brownish red, filamentous, stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous, angular spores. Callithamnion (*Lyngb.*),—from καλος, *beautiful*, and θαμνον, a *little shrub*.

Callithamnion *Plumula*; stems distichously branched, subdichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin.

Callithamnion Plumula, *Lyngb. Hyd. Dan.* p. 127. *Ag. Sp. Alg.* vol. ii. p. 159. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Harv. in Mack. Fl. Hib.* part 3, p. 213. *Harv. Man.* p. 104. *Wyatt, Alg. Danm.* no. 188. *Endl. 3rd Suppl.* p. 34. *Hook. fil. Fl. Antarct.* vol. ii. p. 489. *J. Ag. Alg. Medit.* p. 71. *Kütz, Phyc. Gen.* p. 372.

Ceramium Plumula, *Ag. Syn.* p. 62. *Ag. Syst.* p. 142.

Conferva Plumula, *Ellis, Phil. Trans.* p. 57. t. 18. *Dillw.* t. 50.

Conferva Turneri, *Sm. E. Bot.* t. 1637 (*not* 2339).

Hab. On rocks and Algæ, near low-water mark, and in 4–15 fathoms water. Annual. Summer. Not uncommon, from Orkney to Cornwall.

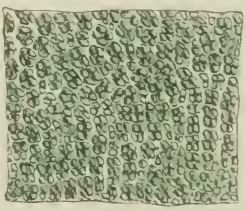
Geogr. Distr. Atlantic shores of Europe and North America. Mediterranean Sea. Cape Horn, *Dr. Hooker*. Tasmania, *Gunn*.

Descr. *Root*, a small disc. *Fronds* densely tufted, from two to six inches in length, capillary, flaccid, distichously branched, the branches alternate or subdichotomous, repeatedly divided. The stems are articulated to the base, and every articulation, of the main stems as well as of the branches and their divisions, bears a pair of opposite, minute ramuli or *plumules*, inserted a short way below the apex of the articulation, and very much more slender than the part from which they spring. In luxuriant specimens *four* plumules instead of two, are frequently found. These plumules are from half a line to a line in length, spreading horizontally or somewhat reflexed, and pectinated, or bi-tripectinated along their upper faces; the ramuli of the combs standing at an angle of 45° with the rachis. Every articulation of the rachis bears its ramulus, with great regularity. The *tetraspores* are borne on the tips of the ultimate ramuli; they are therefore pedicellate. The *favellæ* are densely clustered, and terminate the main branches, which are there always shortened. The *colour* is a fine carmine, sometimes brownish; and is well preserved in drying. The substance is soft and tender, and the plant closely adheres to paper.

A very charming plant, though a common one; common, not merely on the shores of Europe, but dispersed far and wide through the ocean, north and south of the Line. Dr. Hooker gathered it at Cape Horn, and Mr. Gunn has sent it from Van Dieman's Land. I have examined specimens from these distant habitats, and compared them with those from our own shore, and can detect no specific distinctions. The characters of the species are indeed strongly marked, and once seen, cannot be forgotten. Would that others of this beautiful genus were equally constant! It would save botanists a world of trouble and uncertainty. Here every articulation, without exception, through the whole plant, bears its pair of comb-like branchlets. Under the microscope, therefore, *Cal. Plumula* cannot well be mistaken. But, notwithstanding this perfect regularity of branching, specimens differ much in luxuriance, and consequently in outer aspect; and we might enumerate *two* varieties, in one of which the combs are twice as long as in the other, and more delicate.

Cal. simile of the Antarctic Flora, a native of Kerguelen's Land, is an instance of a closely allied, and yet perfectly distinct species, and shows in a very forcible manner how similar two things in nature may be, without being the same; how closely she can draw her lines without touching at any point!

Fig. 1. CALLITHAMNION PLUMULA:—*of the natural size.* 2. Portion of a frond. 3. Portion of another specimen, with *favellæ.* 4. *Favellæ,* with surrounding plumules. 5. Plumule, bearing *tetraspores* on its ultimate ramuli. 6. Penultimate ramulus from the same, with tetraspores:—*all more or less highly magnified.*



2.

Plate CCXLIII.

ULVA LACTUCA, *Linn.*

Gen. Char. *Frond* membranaceous, green, expanded, plane, (in some cases saccate when young,) composed of irregular cellules. *Fructification; granules,* often arranged in fours, scattered over the whole frond. Ulva (*L.*),—supposed to be from Ul, *water* in Celtic.

Ulva *lactuca;* "frond at first obovate, saccate, inflated, at length cleft down to the base; the segments plane, unequal, laciniated, semi-transparent." *Grev.*

Ulva lactuca, *Linn. Sp. Pl.* p. 1632. *Lightf. Fl. Scot.* p. 970. in part. *Ag. Sp. Alg.* vol. i. p. 409. *Ag. Syst.* p. 189. *Lyngb. Hyd. Dan.* p. 30. in part. *Grev. Crypt. Scot.* t. 313. *Grev. Alg. Brit.* p. 172. *Hook. Br. Fl.* vol. ii. p. 311. *Harv. Man.* p. 170.

Hab. On rocks, stones, shells, and the smaller algæ between tide-marks. Annual. May and June. Generally distributed round the British coasts, but less common than *U. latissima.*

Geogr. Distr. Shores of Europe.

Descr. *Fronds* tufted, from two to six inches high, at first forming an obovate bag, closed at the summit, but soon bursting, and split quite to the base into two or more segments which are often irregularly lobed or divided, the margin sometimes entire, but oftener jagged. *Substance* very thin and delicate, semi-transparent, closely adhering to paper in drying. *Colour,* a peculiarly beautiful light yellowish green. The surface glossy when dry. Under the microscope the frond is seen to consist of closely packed, quaternate cells, lying in a transparent membrane.

To Dr. Greville belongs the merit, as far as British naturalists are concerned, of having first clearly pointed out the characters by which this delicate plant may be distinguished from the more common *U. latissima,* and therefore I have thought it best to preserve the diagnosis given by that author in his Algæ Britannicæ. The characters are most obvious in an early stage of growth, when the present plant forms an obovate sac, not very unlike a greatly distended *Enteromorpha;* while *U. latissima* is at all periods of its growth a flat membrane. Other characters are found in the substance and colour. *U. lactuca* is of a brighter and yellower green, and more glossy when dry; and its substance

is greatly more thin and delicate than that of *U. latissima*. The form of both plants is too variable to find a place among the distinctive characters. *U. latissima* is found at all seasons and on every shore; but *U. lactuca* is seldom seen except in spring or early summer.

Fig. 1. Ulva lactuca, young and old plant:—*the natural size.* 2. Small portion of the membrane:—*magnified.*

Plate CCXLIV.

DUDRESNAIA COCCINEA, *Bonnem.*

Gen. Char. *Frond* cylindrical, gelatinous, elastic; *axis* composed of a lax net-work of anastomosing filaments, coated with a stratum of closely combined, longitudinal fibres; the *periphery* of horizontal, dichotomous, moniliform filaments. *Fructification*, of two kinds, on different individuals; 1, globular masses of *spores* (*favellidia*) attached to the filaments of the periphery. 2, external zoned *tetraspores*, borne on the filaments of the periphery, generally terminating a ramulus. Dudresnaia (*Bonnem.*),—in honour of *M. Dudresnay*.

Dudresnaia *coccinea*; frond rosy red, tender and gelatinous, much and irregularly branched; branches alternate, flexuous, moniliform, attenuated upwards; ramuli more or less numerous.

Dudresnaia coccinea, *Bonnem. in Journ. Phys.* vol. xciv. p. 180. *Crouan, Nouv. Ann. Sc. Nat.* vol. iii. p. 98. t. 2. f. 3–4. *J. Ag. Alg. Medit.* p. 84. *Endl. 3rd Suppl.* p. 37.

Mesogloia coccinea, *Ag. Syst.* p. 51. *Hook. Br. Fl.* vol. ii. p. 386. *Wyatt, Alg. Damn.* no. 148. *Harv. in Mack. Fl. Hib.* part 3, p. 186. *Harv. Man.* p. 48.

Rivularia verticillata, *E. Bot.* t. 2466.

Hab. On rocks &c., near low-water mark; or, more generally, in 4–10 fathom water. Annual. Summer. Very rare. Brighton, *Mr. Borrer*. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore*. Falmouth, *Miss Warren*. Jersey, *Miss White* and *Miss Turner*. Bantry Bay, *Miss Hutchins*.

Geogr. Distr. Atlantic coasts of France.

Descr. *Root*, a very small, conical disc. *Fronds* from six to ten inches high, much branched and bushy: sometimes with a single stem closely set with lateral branches, sometimes divided near the base into several stems. *Stem* or its divisions, set with alternate, patent branches, the lowest of which are longest, the upper gradually shorter. These bear a second and a third, and in luxuriant specimens a fourth series of smaller branches and ramuli; each series being more and more slender, and the last about as thick as bristles. In some specimens the branches and ramuli are very dense, in others they are distant and bare. In the young frond the axis is a simple, articulated filament giving off at its joints whorls of dichotomous, moniliform ramuli; but as it advances in age the central filament or axis divides into several, or others grow round it, and the whorls are much more densely set. Thus in young plants the branches appear moniliform like those of a *Batrachospermum*; but in old plants they are cylindrical. *Favellidia* large, lodged at the base of dense, much divided ramuli. *Tetraspores* transversely four-

parted, oblong, terminating the branches of the horizontal ramuli. *Colour*, a brilliant crimson, given out in fresh water. *Substance* gelatinous. The frond adhering closely to paper in drying.

One of the rarest of the British Algæ, scarcely known except on the southern shores of England, and there only in a few stations, and nowhere in great abundance. Perhaps one cause of its comparative rarity is its place of growth. Being a deep-water species it is rarely found except when cast ashore after a gale, or when sought by dredging. In the former case the specimens are frequently very flaccid, and faded in colour. I am not aware of its having been found in Ireland except, many years ago, by Miss Hutchins.

There is considerable difference in structure and also in appearance between young and old plants. In the former the axis is a simple, jointed filament, not very unlike that of a *Griffithsia*, whorled at short intervals with beaded fibres. But as the plant increases in age, the axis becomes more compound until it consists of a bundle of closely packed filaments; and then the branches become thicker and more cylindrical. *Favellidia* are commonly produced in abundance. *Tetraspores* are much more rare.

Fig. 1. DUDRESNAIA COCCINEA:—*of the natural size.* 2. Portion of a young branch, with tetraspores. 2. Ramulus from the same. 4. Tetraspores and portion of ramulus. 5. Portion of branch with favellæ. 6. Favella and ramuli from the same:—*all magnified.*

Plate CCXLV.

ENTEROMORPHA RAMULOSA, *Hook.*

Gen. Char. *Frond* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification;* granules, commonly in fours, contained in the cellules of the frond. Enteromorpha (*Link*),—from ἔντερον, an *entrail*, and μορφή, *form* or *appearance*.

Enteromorpha *ramulosa;* frond subcompressed, highly reticulated, irregularly divided; the main divisions long, densely set with lateral branches; branches curved, curled or twisted, everywhere clothed with short, spine-like ramuli.

Enteromorpha ramulosa, *Hook. Br. Fl.* vol. ii. p. 315. *Harv. Man.* p. 175. *Wyatt, Alg. Damn.* no. 208.

Enteromorpha clathrata, γ. uncinata, *Grev. Alg. Brit.* p. 181.

Ulva ramulosa, *E. Bot.* t. 2137.

Ulva uncinata, *Mohr. Cat. Alg.* fide *Ag.*

Hab. Rocks and stones, between tide-marks. Annual. Spring.

Geogr. Distr. Shores of Europe.

Descr. *Fronds* from six inches to one or two feet in length, densely tufted, and often woven together into an inextricable mat, irregularly branched. Main stems frequently undivided or but slightly divided, furnished throughout with densely set, short, horizontal branches of very unequal length, some of them being not half an inch and others two or three inches long. These branches bear an abundance of short, spine-like, simple or slightly branched, scattered, setaceous or capillary ramuli, very much more slender than the part from which they spring. The stem and branches all taper to a fine point. The colour is an intense grass-green, of much brilliancy, and well preserved in drying. The substance membranaceous, rather harsh to the touch from the abundance of short spreading ramuli that cover the branches. In drying the frond adheres, but not very closely, to paper.

A common *form* of *Enteromorpha*, but scarcely more than a form. Under Plate XLIII. of our first volume I have stated that I regard *E. ramulosa* as merely one of the varieties of *E. clathrata*, and that both the plants so called have so much in common with *E. erecta* and others of the genus, that it is doubtful whether all are not merely varieties of one Protean species. To this opinion I still adhere. Nevertheless, as the extreme

states described by botanists are outwardly dissimilar, I have determined to figure them all.

The present variety is distinguished by its squarrose habit, full green colour, and rather harsh feel. When young and untangled, as in our figure, it is not unsightly; but in age it often forms an inextricable fleecy mass, spreading widely over the surface of the ground, and forming a comfortable cover for a variety of small crustacea and shell-fish; but in this state it is not to be recommended to the seeker of specimens for the Herbarium.

Fig. 1. ENTEROMORPHA RAMULOSA:—*of the natural size.* 2. Portion of the stem with small branches and ramuli. 3. Fragment of the surface of the frond. 4. Part of tranverse section:—*magnified.*


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Plate CCXLVI.

BANGIA (?) ELEGANS, *Chauv.*

Gen. Char. *Frond* filiform, tubular, composed (*in the typical species*) of numerous radiating cellules, disposed in transverse rows and enclosed within a hyaline, continuous sheath. *Spores* purple or green, formed within each of the cells of the frond. Bangia (*Lyngb.*),—in honour of *H. Bang*, a Danish Botanist, and friend of Lyngbye.

Bangia? *elegans;* filaments minute, dichotomously branched, with very patent axils; branches containing a single row of simple or binate, purple granular cells.

Bangia elegans, *Chauv. Mem. Soc. Linn. Norm.* vol. vi. p. 13. *Alg. Norm. Fasc.* vii. no. 159. *Recherches*, p. 33.

Hab. Parasitical on the smaller algæ. Very rare. Dredged in Strangford Lough at Portaferry, adhering to *Gracilaria confervoides, Wm. Thompson, Esq.* (1838.)

Geogr. Descr. Coast of Normandy.

Distr. Forming minute tufts, 1–2 lines long, resembling, to the naked eye, the tufts of *Callithamnion Daviesii* in colour and size. *Filaments* dichotomously branched, several times forked, the branches cylindrical, curved, spreading, with very wide axils, obtuse at the tips. The younger parts of the filament contain a string of closely-set lenticular granules or cells, arranged like those of a *Lyngbya*. In the older parts the cells are less regularly placed and are more distant, of a broadly spindle-like form with a division in the centre, as if composed of two conical or sugar-loaf bodies. These are probably the ripe *spores*, which escape on the bursting of the tubular filament. The colour of the spores is a purplish lake, becoming greenish in decay.

The only British specimen of this curious and beautiful little plant that I have seen, was dredged several years ago by my friend Mr. Thompson, of Belfast, who communicated it to me, and allowed me to retain a portion, from which the figure here given has been prepared. This I have compared with an authentic specimen of Chauvin's plant, received from M. Lenormand, and find them to agree in all essential particulars. The chief difference is in colour, the Irish specimen having lost its original purple and acquired a greenish shade; no uncommon effect of decay.

The genus *Bangia* has long been a receptacle for heterogeneous species, and though partially reformed by M. Chauvin in the excellent memoir above quoted, it can hardly be said that in making the present plant a species of *Bangia* he has more than indicated its near affinities. For though doubtless *allied* to *Bangia*, its structure is more simple than in the genuine members of the genus, and it stands nearer perhaps to *Sphæroplea* of Agardh. It might, however, be more properly regarded as the type of a new genus characterized by the binate spores.

Fig. 1. Tufts of BANGIA ELEGANS, growing on GRACILARIA CONFERVOIDES :—*the natural size.* 2. A frond, *magnified.* 3. A young apex. 4. A portion of the older part of the frond :—*highly magnified.*

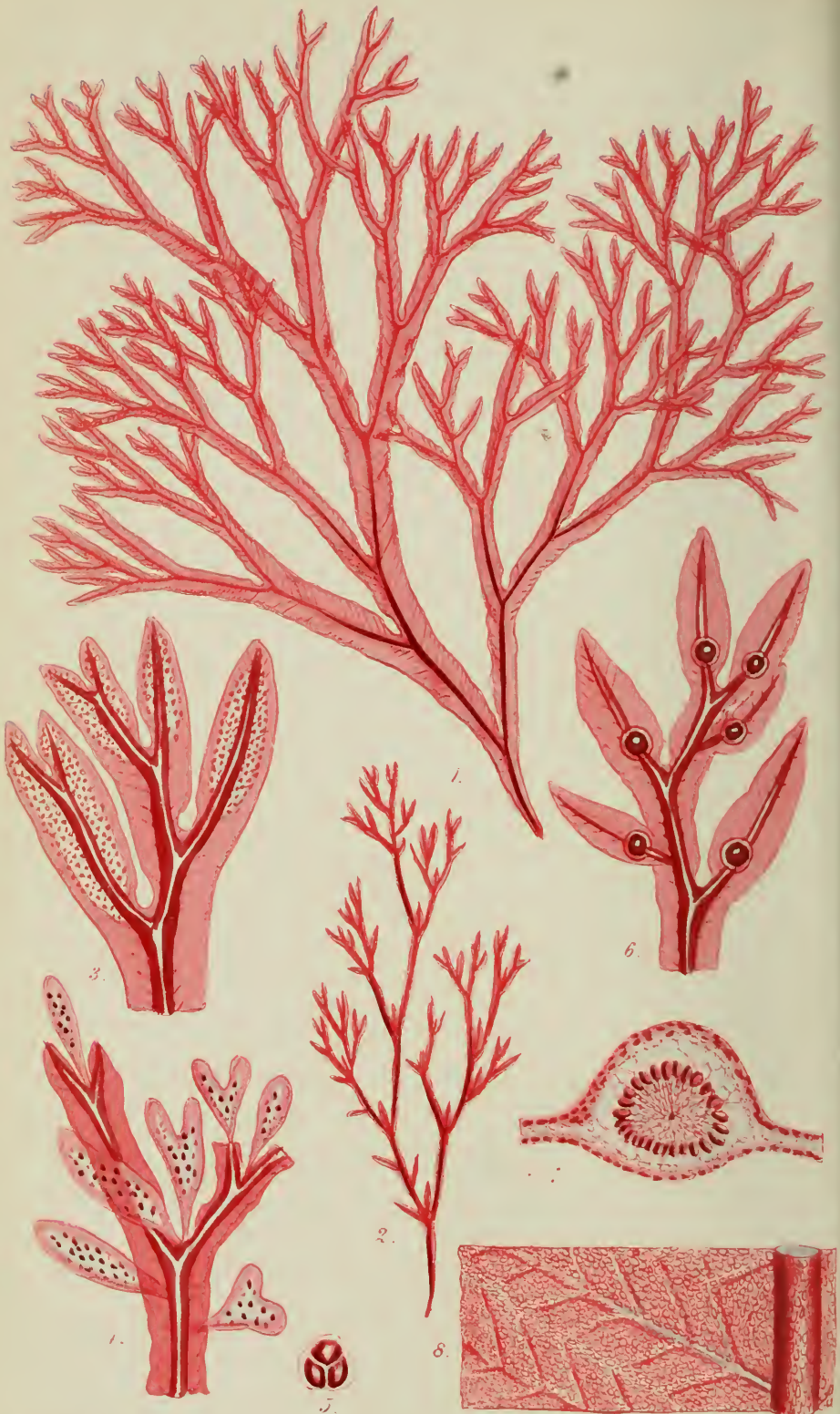
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Plate CCXLVII.

DELESSERIA ALATA, *Lamour.*

Gen. Char. *Frond* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular tuft of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. Delesseria (*Lamour.*),—in honour of Baron B. Delessert, a distinguished botanist and patron of Botany.

Delesseria *alata*; stem dichotomous, much branched, winged throughout with a narrow, membranous lamina which is pennate-nerved; tubercles rising from the midrib; tetraspores in sori occupying the apices of the frond, or in proliferous leaflets.

Delesseria alata, *Lamour. Ess.* p. 124. *Lyngb. Hyd. Dan.* p. 8. t. 2. *Ag. Sp. Alg.* vol. i. 178. *Ag. Syst.* p. 250. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 293. *Grev. Alg. Brit.* p. 73. *Hook. Brit. Fl.* vol. ii. p. 285. *Wyatt. Alg. Damn.* No. 14. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* p. 55.

Wormskioldia alata, *Spreng. Syst. Veg.* vol. iv. p. 293.

Hypoglossum alatum, *Kütz. Phyc. Gen.* p. 445.

Fucus alatus, *Huds. Fl. Ang.* p. 578. *Gmel. Hist.* p. 187. t. 25. f. 1. *Linn. Mant.* p. 135. *Syst. Nat.* p. 718. *Lightf. Fl. Scot.* p. 951. *Fl. Dan.* t. 352. *Stack. Ner. Brit.* t. 13. *Esper. Ic. Fuc.* vol. i. p. 20. t. 3. *Turn. Syn.* p. 144. *Turn. Hist.* t. 160. *E. Bot.* t. 1837.

Hab. On rocks and the larger Algæ, between tide-marks and in 4–10 fathoms water. All round the British Coasts.

Geogr. Distr. Atlantic shores of Europe and North America.

Descr. *Root*, a small disc. *Frond*, 4–8 inches high, 1–4 lines in breadth, very much branched in a more or less regularly dichotomous manner; the main divisions being frequently alternate, or almost pinnately disposed, the minor ones regularly and repeatedly forked. *Branches* gradually narrower to the tips, consisting of a strong percurrent midrib or stem bordered with a flat, wing-like lamina, which follows all the divisions, but is usually broader at one side of the rib than at the other, especially toward the axils, where there is a deep, rounded sinus. This is most obvious on broad varieties. Every part of the membrane is furnished with opposite, patent veinlets connecting the midrib with the margin of the lamina, and themselves connected by pellucid striæ. Normally the frond is perfectly distichous, all the branches extending in one plane; but old specimens are very frequently beset with crowded, irregularly inserted branchlets, issuing from all parts of the midrib proliferously; such plants are excessively bushy. *Tubercles*

immersed in the midrib, towards the tips of the branches, very convex. *Tetraspores* either contained in terminal sori, disposed at each side of the rib; or else in proper leaflets, irregularly grouped about the apices. *Colour*, in well grown specimens, a clear, deep crimson, varying to dark full red, and sometimes brownish. *Substance* membranaceous, adhering to paper. The cells of the frond are small and close, for the genus.

One of our commonest species; and though not without beauty, yet one of the least attractive of the genus to which it belongs. When well grown, with a broad wing to the stems, as in the specimen selected for our upper figure, its claims to the possession of considerable beauty and grace will readily be admitted, but in average specimens the wing-like margin is much more narrow and is very liable to injury; the colour darker and more dingy; and the ramification less regularly dichotomous. Sometimes, from proliferous growth, the whole upper part of the frond is thick and bushy.

Under Pl. LXXXIII. of the first volume will be found a statement of my views respecting the claims of *D. angustissima* to specific rank,—claims, which I did not then admit, and which I am not now disposed to do. That supposed species I can only regard as a very narrow and aberrant form of the present plant, having either no membrane developed, or a very imperfect one. Were it true that no membrane was ever found in *D. angustissima*, then we should have an *absolute* character on which to found a species. But such is not the case, for I have specimens in which the commencement of membrane is evident on some of the branches, while other parts, equally perfect, are destitute of membrane. I consider *D. angustissima* therefore to be an extreme variety of *D. alata*, analogous to the narrow states of such plants as *Chondrus crispus*.

Fig. 1. DELESSERIA ALATA; A broad variety. 2. Narrow variety:—*both the nat. size.* 3. Apex of branch with tetraspores. 4. Apex with the same, contained in proper leaflets. 5. A tetraspore. 6. Apex with tubercles. 7. Section of a tubercle. 8. Portion of the lamina and midrib:—*magnified.*

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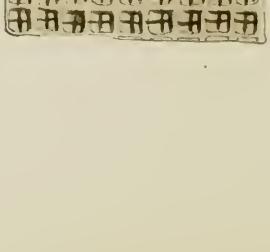


2.

Plate CCXLVIII.

PUNCTARIA TENUISSIMA, *Grev.*

Gen. Char. *Frond* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent spores, intermixed with club-shaped filaments. Punctaria (*Grev.*),—from *punctum*, a *dot;* the fruit being in dots, scattered over the surface.

Punctaria *tenuissima;* frond sublinear, very thin, transparent. *Grev.*

Punctaria tenuissima, *Grev. Alg. Brit.* p. 54. *Hook. Fl.* vol. ii. p. 279. *Harv. Man.* p. 34.

Punctaria undulata, *J. Ag. Spec.* vol. i. p. 72.

Ulva plantaginifolia, *Lyngb.* p. 31. t. 6. *(fide J. Ag.)*

Diplostromium plantagineum, *Kg. Phyc. Gen.* p. 298.

Hab. Parasitical on *Zostera marina, Chorda filum,* &c. near low-water mark. Annual. Summer. Bute, *Dr. Greville.* Appin, *Captain Carmichael.* Near Dublin, *W.H.H.;* probably common.

Geogr. Distr. Atlantic Shores of Northern Europe, Baltic Sea. North West Coast of France. North America.

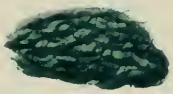
Descr. *Fronds,* 2–8 inches long, 1–3 lines wide, very densely tufted, covering the plant on which they grow with innumerable slender wavy ribbons, tapering to the base and apex, but linear for the greater part of their length, sometimes ending bluntly; the margin waved or curled, and either entire, or remotely and irregularly toothed. *Colour,* a very pale shade of brownish olive, or horn-colour, sometimes hyaline. *Substance* exceedingly thin and delicate, adhering to paper. *Structure* beautifully areolated. *Fruit* unknown.

Two species of *Punctaria* have already appeared in this work, and the one now figured completes the representation of the British kinds. The present species has never been found in a state of fruit, and hence some botanists (among others my valued friend Mrs. Griffiths) regard it as the young of some other species; perhaps of *P. latifolia,* with which its substance more nearly agrees, than with that of *P. plantaginea.* But its great difference in form seems to forbid such an opinion being hastily adopted, particularly as young *P. latifolia* may be found of much smaller

size and with a broader and more ovate frond. I rather think that this ignorance of the fruit arises from imperfect observation. The plant does not seem to be found all round the coast, and where it has been observed has been in places only occasionally and hastily visited by botanists; and though I have myself gathered it in my immediate neighbourhood, I must plead guilty to having neglected to watch its growth from the commencement to disappearance. Capt. Carmichael, a very close observer, was persuaded of its distinct character; and I have specimens from North America and the Baltic closely resembling those from our own shores.

According to the younger Agardh the synonyme *Zonaria tenuissima*, Ag., quoted by Greville belongs rather to *Laminaria fascia;* for which reason the Swedish Algologist has substituted the name *undulata* for that here adopted.

Fig. 1. PUNCTARIA TENUISSIMA; growing on *Chorda filum*:—*natural size.*
2. Small portion of the membrane:—*magnified.*



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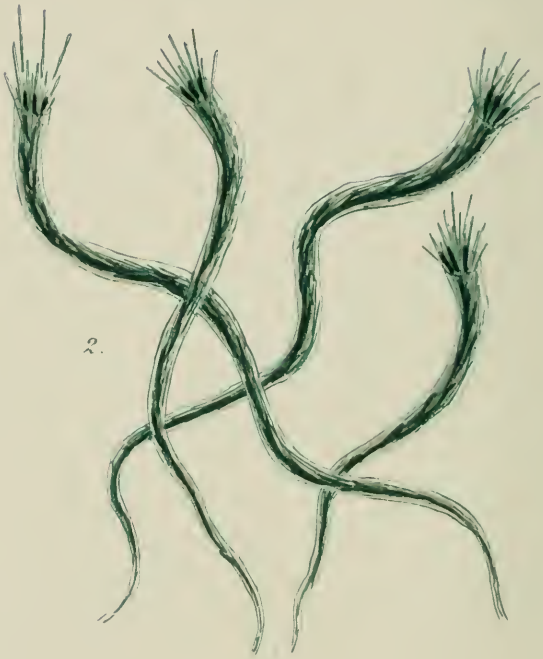

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Plate CCXLIX.

MICROCOLEUS ANGUIFORMIS, *Harv.*

Gen. Char. *Filaments* minute, rigid, straight, transversely striate, bundled, and enclosed within membranaceous, simple or branching sheaths, from whose apices they oscillate. Microcoleus (*Desmaz.*),— from μικρος, *small*, and κολεος, a *sheath*.

Microcoleus *anguiformis;* sheaths snake-like, simple, decumbent, tapering much to the extremity; filaments slender, with distant striæ.

Microcoleus anguiformis, *Harv. MSS. Hass. Fr. Water Alg.* p. 261. t. 70. fig. 1.

Hab. Pools of brackish water, near the shore, at Dolgelly, *Mr. Ralfs.*

Geogr. Distr. Coast of Wales.

Descr. This minute plant forms a dense stratum of a dark green colour on the surface of the mud. The sheaths are grouped together without order, decumbent, much entangled, and variously twisted into many snake-like folds, broad at the extremity from which the filaments oscillate, and tapering much towards the other end. The inclosed filaments are short, slender, and straight, with distant striæ. The colour is a dull blackish green, without gloss when dry.

A minute but curious Alga, allied in many points to *Oscillatoria*, from which genus *Microcoleus* chiefly differs in possessing frond-like sheaths, containing threads bundled together. At first these sheaths appear scarcely more compound than a single filament, but as the plant advances, the sheath widens and is found full of a multitude of filaments. These oscillate, like those of an *Oscillatoria*, either from the wide mouth of the sheath, or from any accidental rupture which may happen in its side.

I am indebted to Mr. Ralfs for the only specimens I have seen of this plant, and am not aware of any habitat for it, save the one above recorded. It ought to occur in similar places, on

other parts of the coast, but unless closely looked after may easily escape detection.

Fig. 1. Portion of the stratum :—*natural size.* 2. Sheaths, or fronds. 3. Apex of a sheath, with protruding filaments :—*both magnified.*

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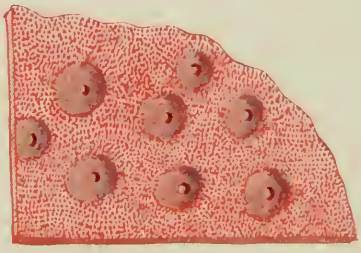

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Plate CCL.

HILDENBRANDTIA RUBRA, *Meneg.*

Gen. Char. *Frond* cartilagineo-membranaceous, (*not stony,*) crustaceous, suborbicular, adhering by its lower surface; composed of very slender, closely packed, vertical filaments. *Conceptacles* immersed in the frond, orbicular, depressed, pierced by a hole and containing tetraspores and paraphyses at the base of the cavity. Hildenbrandtia (*Nardo*),—in honour of . . . . . ?

Hildenbrandtia *rubra*, Meneg.

Hildenbrandtia rubra, *Meneg. Mem. Riun. Nat. Padov.* 1841, p. 10. *Endl. 3rd Suppl.* p. 26. (*excl. Syn. Berk.*) *Kütz. Phyc. Gen.* p. 384. t. 78. f. V.

Hildenbrandtia Nardi, *Zanard. Alg. Adr.* p. 135.

Rhododermis Drummondii, *Harv. in Ann. Nat. Hist.* vol. xiv. p. 27. pl. 2.

Hab.. On smooth stones and pebbles, between tide-marks, as well as in deep water. At all seasons? Common on the shores of the British Islands.

Geogr. Distr. Atlantic and Mediterranean shores of Europe.

Descr. *Frond* forming a thin, crustaceous expansion from half an inch to two inches or more in diameter, at first orbicular, and spreading in concentrically marked patches, but gradually sinuated and its surface irregularly corrugated as it advances in age; closely adhering by the whole of its under surface to the rock or stone on which it grows. A small portion viewed vertically with the microscope shows innumerable dot-like cells, imbedded in a clear, firm, gelatine: and thin slices, viewed laterally, prove the crust to be formed of very densely set, and closely cohering, slender filaments, composed of minute cells. When in fruit the surface is pitted with disc-like depressions, pierced in the centre by a hole which communicates with a chamber or immersed conceptacle hollowed out of the frond, and containing a few oblong, zoned tetraspores, among a number of paraphyses or abortive filaments. The part of the frond forming the walls of the conceptacle is of a much paler colour than the rest. *Colour* varies, according to locality, from a clear blood-red to a dark red brown. *Substance* coriaceo-membranaceous, very firm.

Common all round the coast, on stones and rocks within tide-marks, and also often dredged from deeper water. It forms a thin skin-like film, so closely applied to the surface of the body on which it grows that it is impossible to remove a specimen

without laceration. Its colours are sometimes much brighter than at others, especially (as observed by Dr. Drummond) in places where it is exposed to the dripping of fresh water.

The affinity of this obscure plant is rather doubtful, and I am by no means satisfied with the position which I have now assigned to it, next the *Nullipores*. It differs from those vegetables in wanting the lime which forms so remarkable a portion of their solid contents; but its cellular structure is not very unlike that of a *Nullipore*, and there is a near resemblance in the fructification. The cells composing the frond in the *Nullipores* or *Melobesiæ*, are longer and narrower than those of the *Hildenbrandtia*, but arranged in an order nearly similar.

Kützing (Phyc. Gen. p. 384) makes three species; *H. sanguinea*, *H. rosea*, and *H. Nardi*, which to judge by the author's diagnoses, differ from each other merely in colour;—the first being "*ferrugineo-sanguinea*," the second "*coccineo-rosea*," and the third "*lutescenti-fusca, siccitate nigrescens.*" This last may possibly be our *Ralfsia*.

I am not acquainted with the writings of the botanist to whom this genus is dedicated.

Fig. 1. HILDENBRANDTIA RUBRA, on a stone:—*natural size*. 2. Portion of the froud, with disc-like depressions. 3. Section of the same, cut through a conceptacle. 4. Tetraspores:—*all magnified*.

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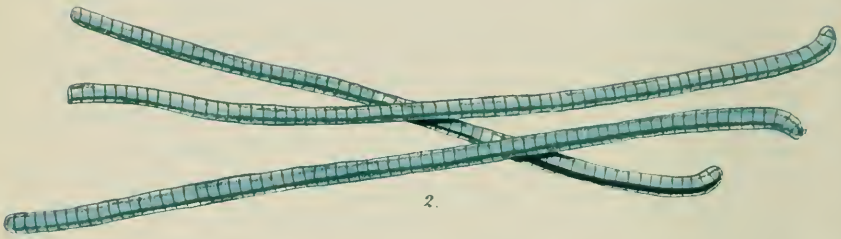

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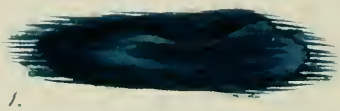

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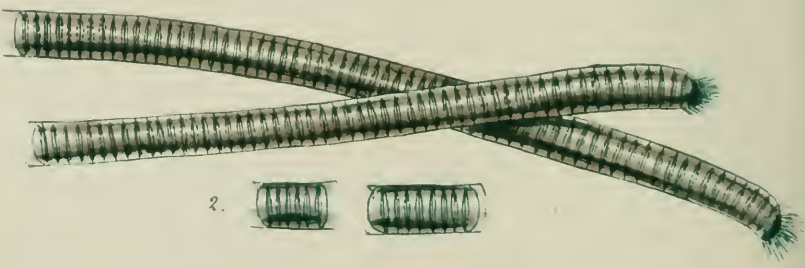

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Plate CCLI. *A.*

OSCILLATORIA NIGRO-VIRIDIS, *Thw. n. s.*

Gen. Char. *Filaments* lying in a mucous matrix, rigid, simple, vividly oscillating. *Tube* continuous. *Endochrome* annulated with more or less close, parallel, transverse striæ. *Oscillatoria* (Vaucher),—from the motion observed in the filaments.

Oscillatoria *nigro-viridis; stratum* of a very dark olive-green colour; *filaments* delicate, pale green, rigid, with obtuse, curved apices; *striæ* inconspicuous, distant about half a diameter of the filament; *endochrome* very slightly granulose.

Hab. In a brackish ditch at Shirehampton near Bristol. Aug. 1847, *G. H. K. Thwaites.*

Descr. *Stratum* thin, of a dark olive green, almost black colour, growing upon the mud and subsequently floating in large masses. *Filaments* of a pale dull green colour, with obtuse, distinctly curved, scarcely attenuated apices. *Striæ* not conspicuous, distant from each other about half a diameter of the filament. *Endochrome* scarcely granulose.

This species, which I have met with only once, bears some resemblance, as has been remarked to me by the Rev. M. J. Berkeley, to *Oscillaria uncinata*, of *Kützing*, but the latter is a smaller species than ours, and has the striæ of its filaments more distinctly marked. *Thw.*

Plate CCLI. *B.*

Oscillatoria *subuliformis; stratum* of an intense æruginous green colour; *filaments* bright green, subuliform; *striæ* inconspicuous, distant from one half to three quarters of a diameter of the filament; *endochrome* not evidently granulose.

Hab. In brackish ditches, at Shirehampton near Bristol, during the Summer and Autumn, not uncommon. *G. H. K. Thwaites.*

Descr. *Stratum* thin, growing upon the mud, subsequently floating, appearing black in the water, but when taken out, of a beautiful deep blue-green colour. *Filaments* very delicate, bright green, gradually attenuated towards the apices, which are subacute and much curved. *Striæ* inconspicuous, distant from each other about three-fourths of a diameter of the filament. *Endochrome* uniform, not visibly granulose.

This beautiful species, the filaments of which oscillate very vividly, is an extremely interesting object under the microscope. The curved ends of the filaments may then be seen to move in a spiral direction, showing that this is the real motion of the filaments, though they may appear to an inattentive observer to have merely a waving lateral movement. Without the sanction and kind assistance of Mr. Berkeley, I should scarcely have ventured to describe this and the foregoing species as new, but he has kindly compared them with authentic specimens in his own herbarium, and considers them hitherto undescribed. *Thw.*

Plate CCLI. *C.*

Oscillatoria *insignis; stratum* of a dark brown, almost black colour; *filaments* brown, of considerable diameter, their apices obtuse, slightly oblique, and ciliated. *Striæ* conspicuous, very close; *endochrome* distinctly granulose.

Hab. In a brackish ditch at Shirehampton near Bristol, in Nov. 1848. *G. H. K. Thwaites.*

Descr. *Stratum* thin, covering decaying vegetable matter at the bottom of the ditch in which it occured, with a dark brown coating, becoming somewhat greenish in drying. *Filaments* very large, rather brittle; their apices rounded, somewhat oblique and furnished with numerous delicate motionless cilia. *Endochrome* distinctly granulose; the granules being principally evident close to the striæ, which they render more conspicuous.

The cilia which terminate the filaments of this fine species, are not peculiar to it alone. Professor Kützing has figured in his "Phycologia Generalis" similar appendages to the filaments of *Oscillaria subfusca*, and has noted their occurrence in another species. Careful observation shews that these cilia have no proper motion of their own, and therefore can exercise no agency on the movements of the filaments; they appear to be mere appendages, or terminations of the membranous tube, and to perform no important function in the economy of the plant. *Thw.*

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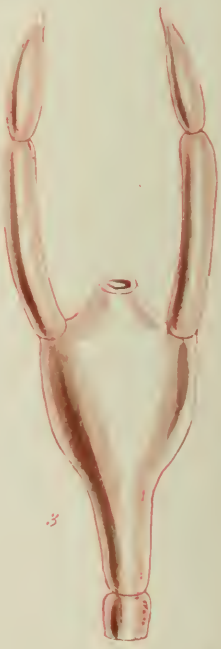

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Plate CCLII.

JANIA RUBENS, *Lamour.*

Gen. Char. *Frond* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification,* urn-shaped *ceramidia* formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores.* Jania,—(*Lamour*), from *Janira,* one of the *Nereides.*

Jania *rubens;* articulations of the principal branches and ramuli cylindrical, about four times as long as broad.

Jania rubens, *Lam. Cor. Flex.* p. 272. *Gray, Brit. Pl.* vol. i. p. 339. *Flem. Brit. An.* p. 514. *Johnst. Brit. Lith.* p. 224. *Dne. Ess.* p. 111. *Endl.* 3rd *Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

Corallina rubens, *Ellis and Soland. Zooph.* p. 123. *Turt. Brit. Faun.* p. 211. *Lam. An. s. Vert.* 2nd edit. vol. ii. p. 517.

Hab. Parasitical on the smaller Algæ, between tide-marks. Perennial. Summer. On all parts of the British Coast.

Geogr. Distr. Shores of Europe. South Africa.

Descr. *Fronds* from half an inch to an inch and a half in height, densely tufted, dichotomous, many times forked, fastigiate; branches either erect or spreading, gradually attenuated toward the apices. *Articulations* cylindrical in all parts of the frond, without prominent angles; those near the base very short, the upper ones gradually longer; those in the middle parts of the frond from four to five times longer than broad. *Apical* articulations either acute or obtuse, sometimes much attenuated, and sometimes nearly as robust as in other parts of the frond. *Ceramidia* subterminal, urnshaped, with long horns formed of from two to four articulations. When deprived of its lime by acid, the frond is distantly banded with dark, transverse striæ. *Colour* a pale red, with purplish shades when quite fresh.

The commonest species of the genus Jania and the most widely diffused, abounding along the shores of Europe and having been brought also from the Southern Ocean. I have specimens from South Africa which nearly accord with those from our own coasts. It probably occurs on the American shore in equal abundance.

From *J. corniculata* (tab. nost. CCXXXIV.) which it outwardly much resembles, *J. rubens* may, at once, be known by the

long, cylindrical lower articulations; and this much is generally sufficient to ascertain the species. But I observe, on some specimens, especially those from the South of England, an occasional prolongation of the upper angles of the articulation, showing a tendency to approach *J. corniculata*. Still, I have never seen a thoroughly intermediate specimen.

Several exotic species nearly resemble *J. rubens* in habit, differing chiefly in size and in the comparative length of the articulations.

Fig. 1. JANIA RUBENS, growing on *Cladostephus:—of the natural size.* 2. A branch. 3. Ceramidium. 4. The same, after maceration in acid. 5. Tetraspores. 6. An articulation, from which a transverse slice has been removed, showing the internal structure:—*all magnified.*

W.H.H. del et lith

Plate CCLIII.

DASYA COCCINEA, *Ag.*

Gen. Char. *Frond* filamentous; the stem and branches mostly opake, irregularly cellular (rarely pellucid and longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the ramuli jointed, single tubed. *Fructification* two fold, on distinct plants: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing tetraspores ranged in transverse bands. Dasya (*Ag.*),—from δασυς, *hairy*.

Dasya *coccinea;* stems elongate, robust, rough with hair-like fibres, distichously branched; branches bi-tri-pinnate; pinnulæ multifid, single-tubed, their articulations as long as broad.

Dasya coccinea, *Ag. Spec. Alg.* vol. ii. p. 119. *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Wyatt, Alg. Damn. No.* 41. *Harv. in Mack. Fl. Hib.* part 3. p. 209. *Harv. Man.* p. 97. *Endl. 3rd Suppl.* p. 44.

Asperocaulon coccineum, *Grev. Fl. Ed.* p. 309.

Ellisius coccineus, *Gray, Br. Pl.* vol. i. p. 334.

Trichothamnion coccineum, *Kütz. Phyc. Gen.* p. 415.

Hutchinsia coccinea, *Ag. Syn.* p. 26. *Hook. Fl. Scot.* part 2. p. 89. *Ag. Syst.* p. 147.

Callithamnion coccineum, *Lyngb. Hyd. Dan.* p. 124.

Conferva coccinea, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 36. *E. Bot.* t. 1055.

Conferva plumosa, *Ellis, Phil. Trans.* vol. lvii. p. 425. t. 18. f. *c. C. d. D. Lightf. Fl. Scot.* p. 996.

Ceramium hirsutum, *Roth, Cat. Bot.* vol. ii. p. 169. t. 4.

Var. β. *squarrosa;* branches destitute of hair-like fibres, sparingly and often irregularly branched; ramuli squarrose.

Ceramium patens, *Grev. Crypt. Scot.* t. 261.

Hab. On rocks and Algæ near low-water mark; β. dredged in deep-water. Annual. Summer. Common.

Geogr. Distr. Atlantic shores of Europe, from Norway to Spain.

Descr. *Root*, a conical disc. *Stem*, six to eight inches long or more, mostly undivided, as thick as small cord at the base, gradually attenuated, opake, and clothed with short, shaggy hairs, pretty regularly tri-pinnate pinnæ long, spreading, lanceolate closely pinnulated; the ultimate pinnulæ forked or multifid, or cloven to the base into numerous simple, single-tubed ramuli. *Articulations* visible in the smaller branches only, many tubed, and very short, interrupted by transverse bands of small, irregular cells. A trans-

verse section of the stem exhibits nine radiating siphons disposed round a small cavity, and surrounded by a band of small cells, of thickness varying according to the age of the part from which the section is made. Articulations of the ramuli very short. *Ceramidia* ovate, with thick walls. *Stichidia* oblong, suddenly mucronate, nearly sessile. *Colour*, a fine deep crimson, becoming brighter after immersion in fresh-water. β. is much smaller and more squarrose in its branching, sometimes nearly bare of ramuli.

A well-known plant, common along the coasts of Europe, and a great favourite with collectors of Sea-weeds for ornamental purposes.

I have mentioned but one variety, as worthy of note; but this variety puts on so many forms that it might be split into two or three. In Dr. Greville's figure (Crypt. Scot. t. 261,) the species appears in its most depauperated state, so different in aspect from the normal condition, that without an inspection of connecting links, it would be difficult to suppose the two forms belonged to one species. But by dredging in sandy bays and among *Nullipores* a complete series of forms, connecting the most luxuriant with the most lank, may be collected. Those from deep-water are generally very irregularly branched, and seldom produce fruit. Specimens having *stichidia* are always more slender and delicate than those that bear *ceramidia*.

Fig. 1. Dasya coccinea. 2. The var. β. *squarrosa*:—*both of the natural size.* 3. *Ceramidium* with accompanying ramuli. 4. Section of ceramidium. 5. Stichidium, with ramuli. 6. A tetraspore. 7. Section of lower part of the stem. 8. Section of a branch:—*all magnified.*


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Plate CCLIV.

CALOTHRIX CONFERVICOLA, *Ag.*

Gen. Char. *Filaments* destitute of mucous layer, erect, tufted, or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular sporidia. Calothrix (*Ag.*),—from καλος, *beautiful*, and θριξ, *a hair*.

Calothrix *confervicola;* filaments short, glaucous, opake, filiform, blunt, rigid, straight or slightly curved, tufted.

Calothrix confervicola, *Ag. Syst.* p. 70. *Harv. in Hook. Br. Fl.* vol. ii. p. 367. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 156. *Wyatt, Alg. Damn. No.* 229.

Leibleinia confervicola, *Endl. Gen. No.* 57. 3*rd Suppl.* p. 21.

Leibleinia purpurea, chalybea et æruginea? *Kütz. Phyc. Gen.* p. 221.

Oscillatoria confervicola, *Ag. Syn.* p. 110. *Lyngb. Hyd. Dan.* p. 94.

Conferva confervicola, *Dillw. Conf.* t. 8. *Roth, Cat. Bot.* vol. iii. p. 193. *Fl. Dan.* t. 1484. f. 1. *E. Bot.* t. 2576.

Hab. On small Algæ, between tide-marks; very common. Annual. Summer and autumn.

Geogr. Distr. Shores of Europe and North America.

Descr. *Filaments* densely tufted, somewhat stellate, a line or two in length, filiform, slightly tapering upwards, straight or slightly curved, not twisted, rigid, free or slightly connected together by the edges towards the base, unbranched or sometimes throwing out from the centre of the filament a fascicle of short ramuli, seemingly a proliferous evolution of the endochrome. Now and then, but rarely, roundish bodies, resembling conceptacles (represented at fig. 3) are found attached to the sides of the filaments: their exact nature is not determined. *Endochrome* very dense, of a dark green-colour, reflecting glaucous tints from the surface, closely annulated.

Very abundant on the smaller algæ towards the end of summer, especially on *Ceramium rubrum*, whose fronds are sometimes completely hidden beneath the dense, dark-green pile, formed by this parasite. Such specimens have somewhat the habit of a *Cladostephus*, so densely and equally covered are they. Under water they reflect glaucous tints.

I have ventured to figure globular bodies, which I never saw

but once, though I have repeatedly sought for them. They were originally noticed many years ago by Sir W. J. Hooker, and figured from his drawing, in one of the supplementary plates of Dillwyn's *Conferv*æ, and on the faith of that figure the plant has been erected into a genus by Bory,—a measure sanctioned by Endlicher,—and placed in the neighbourhood of *Ectocarpus*. Whatever the nature of these bodies may be, I think that this little plant can scarcely be removed from its congeners without violence; and certainly am unwilling to admit a relationship to *Ectocarpus*. The spore-like bodies may be of the nature of buds, or excrescences, and may possibly be afterwards changed into the tufted ramuli, which are frequently found, as it were, bursting from the sides of the filament.

Fig. 1. Calothrix confervicola, growing on *Ceramium rubrum*:—*the natural size*. 2. Portion of a fascicle. 3. A proliferous filament; and portion of filament with supposed spores. 4. More highly magnified segment of filament:—*magnified*.

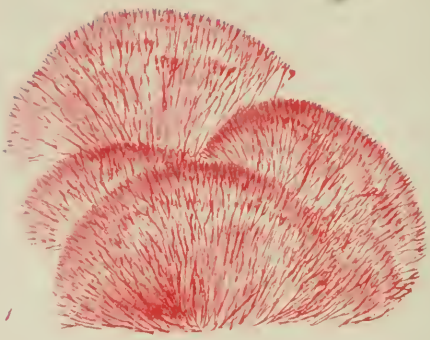

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Plate CCLV.

CERAMIUM FASTIGIATUM, *Harv.*

Gen. Char. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles (favellæ)* having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. Ceramium (*Roth*),—from κεραμος, a *pitcher*; but the fruit is *not* pitcher-shaped.

Ceramium *fastigiatum*; frond capillary, of equal diameter throughout, flaccid, dichotomous, level-topped; the axils acute; articulations pellucid, those of the middle of the stem from four to six times longer than broad, the upper gradually shorter, and coloured; dissepiments coated with coloured cells; favellæ small, subterminal, subtended by three or four involucral ramuli.

Ceramium fastigiatum, *Harv. in Hook. Lond. Journ. Bot.* vol. i. p. 303. *Wyatt, Alg. Danm.* no. 86. *Harv. Man.* 1st ed. p. 99.

Gongroceras fastigiatum, *Kg. in Linn.* xv. p. 736. *Phyc. Gen.*

Hab. On rocks, &c., near low-water mark; rare. Annual. Autumn and winter. Torquay, *Mrs. Griffiths.* Mt. Batten, Plymouth, *Rev. W. S. Hore.* Frith of Forth, *Dr. Greville.*

Geogr. Distr. Mediterranean Sea, *Kützing.* East coast of North America.

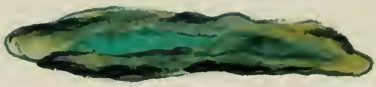
Descr. *Filaments* 4–5 inches high, as thick as human hair, densely tufted, of equal diameter throughout, fastigiate, many times dichotomous, regularly forking from the base to the apex, mostly bare of lateral branchlets, but sometimes having a few, short, simple or forked ramuli. The lower axils distant, and somewhat spreading; the upper close together and narrow, acute. *Apices* generally emarginate, the points straight, or slightly curved, somewhat hooked, but not rolled inwards. Lower *articulations* from three to six times as long as broad, pellucid and colourless, furnished occasionally with a few scattered granules; upper articulations gradually shorter, the pellucid spaces suffused with pale, watery endochrome; the uppermost very short and strongly coloured. *Favellæ* of small size, sessile near the apex of the frond, having a few short, involucral ramuli. *Tetraspores* I have not seen. *Substance* tender, and flaccid, closely adhering to paper. *Colour*, in the tuft, a dark purple, fading in the herbarium to brick-dust colour; in the filament, a clear purplish lake.

This is one of the rarest and most beautiful of the British species of *Ceramium*. It is nearly related to *C. nodosum*, particularly in ramification, and in the diameter of its filaments; but

the substance is much more soft and tender than in that species, and the colour much brighter. The upper joints, moreover, in the present species are suffused with a beautiful carmine, and the axils are far less patent. The tufts are perfectly fastigiate, forming regular circular fans when displayed on paper.

The merit of having first correctly distinguished the present plant is due to Mrs. Griffiths, who has for many years studied the species of the puzzling genus *Ceramium* with great care, and who is, therefore, more competent than most botanists to judge of the proper limits of the species. Whether this plant be the *Conferva fastigiata* of Roth (Cat. Bot., vol. ii. p. 224), I am unable to decide, having never seen an authentic specimen of that author's naming, but I suspect that half-a-dozen *Ceramia* which are now regarded as species, have been at different times referred to Roth's synonym. Our present plant is by no means confined to one locality. The specimens from the several stations above noted, are all of the same character, and I have also had the pleasure of receiving from my liberal correspondents, Professor Bailey of New York, and Mr. Olney of Rhode Island, U. S., North American specimens in all respects similar to our British ones.

Fig. 1. Tuft of CERAMIUM FASTIGIATUM :—*of the natural size.* 2. Portion of a filament :—*magnified.* 3. Apex of the same, with favella. 4. Articulation from the lower part of the same :—*both highly magnified.*



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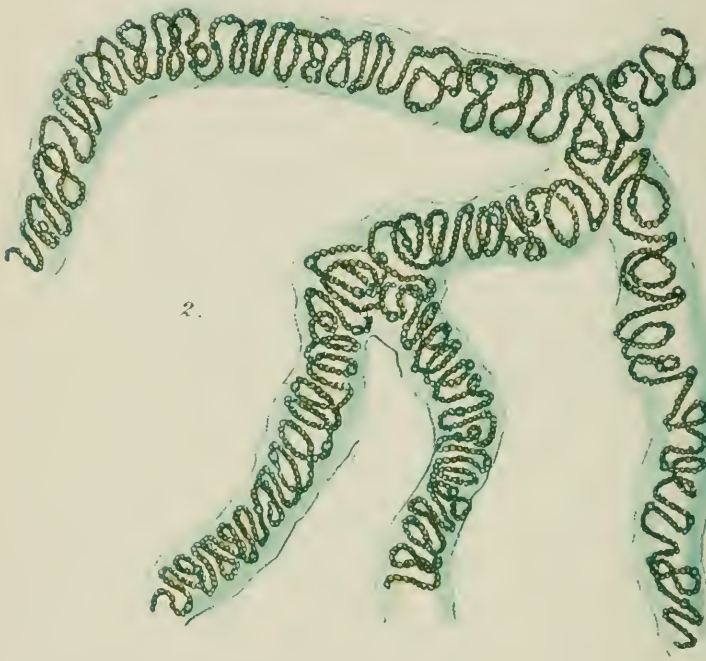

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Plate CCLVI.

MONORMIA INTRICATA, *Berk.*

Gen. Char. *Frond* gelatinous, branched; the branches containing a spiral moniliform filament, composed of spherical, coloured cells, interrupted here and there by a cell of a different kind, and of larger size. *Spores* formed from the ordinary cells. Monormia (*Berk.*),—from μονος, *one*, and ορμος, a *necklace*.

Monormia *intricata*.

Monormia intricata, *Berk. Gl. Brit. Alg.* p. 46. t. 18. *Harv. Man.* ed. 1. p. 185. *Hass. Brit. Fresh Water Algæ*, p. 285. pl. 75. f. 11.

Hab. At Gravesend, in the ditches of the marsh to the south of the Frindsbury canal, in great abundance, in June, 1832, *Rev. M. J. Berkeley*. Ditch (brackish) near Lighthouse, Shirehampton, Bristol, *Mr. G. H. K. Thwaites*.

Geogr. Distr. Not noticed out of England?

Descr. "Forming small, roundish, gelatinous masses floating amongst different species of *Lemna* in fresh water, but probably within the influence of the tide; and also amongst *Enteromorpha intestinalis*, and even within its frond, in brackish water. The plant is at first of an olive yellow, gradually assuming a greener tint, and when dried, of a deep verdigris. Very gelatinous, delicately branched; the branches very flaccid. Under a high magnifier the whole plant is evidently composed of gelatine, in the centre of which runs a single moniliform filament following the ramifications, and in its progress curling to and fro repeatedly across the thread; the joints being nearly globular. The specimens from the interior of *Enteromorpha intestinalis* are paler, and have often longer joints amongst the globular ones."—*Berk.* In young specimens the moniliform thread is found composed of a string of spherical, olive-green cells, of equal size, here and there interrupted by a larger, subquadrate cell, much paler than the rest. As it advances in age the cells, nearest the quadrate cell enlarge, become ellipsoid, and filled with a dense endochrome; in fact, converted into spores. The process of change into spores goes on at each side of the quadrate cell (which remains unchanged), until the whole of the filament is turned into a string of spores. If these simply organized plants have sexes, the functions of the male probably reside in these quadrate cells.

This curious plant has but a slender claim for admission into this work, being commonly a fresh-water production; but the specimens here figured having been obtained from the same salt-water ditches which have already supplied us—through the kindness of Mr. Thwaites,—with several interesting subjects, I have thought that there could be no objection to giving a figure of a

plant interesting by its structure and beauty, and so closely allied to the *Sphærozygæ*, which have already appeared. *Monormia* seems to differ from *Sphærozyga* chiefly in possessing a gelatinous branching matrix, so loose in structure that it can hardly be called a frond, surrounding the spirally-twisted filament. This filament is of indefinite length, having many connecting cells: the filaments of the *Sphærozygæ*, on the contrary, are generally short, with seldom more than one or two connecting cells. The fructification in both appears formed on the same type.

Fig. 1. Stratum of MONORMIA INTRICATA as it appears to the eye. 2. Part of a branching frond:—*magnified.* 3. Portion of the filament from the same:—*very highly magnified.*


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Plate CCLVII.

ECTOCARPUS FENESTRATUS, *Berk.*

Gen. Char. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. Ectocarpus (*Lyngb.*),—from εκτος, καρπος, *external fruit*.

Ectocarpus *fenestratus;* pale green, very slender, forming small tufts; filaments not much branched; branches distant, alternate, furnished with a few long and simple, alternate ramuli; articulations of the branches twice or thrice as long as broad, pellucid; silicules stalked, scattered, at first clavate, then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark brown.

Ectocarpus fenestratus, *Berk. in Herb. Griff. MSS. Harv. Man. Ed.* 2. p. 58.

Hab. Salcombe, *Mrs. Wyatt.* Annual. May.

Descr. *Filaments* forming small tufts, very slender, one or two inches high, not very much branched; the branches lying apart and somewhat feathery, alternate, repeatedly divided, all the divisions erect, the ultimate ramuli prolonged and straight. *Articulations* variable (as in all the genus), usually in the middle part of the stems twice or thrice as long as broad, full of a pale olive, translucent endochrome, with a very few grains dispersed through it; in the upper part gradually shorter. *Silicules* pedicellate, at first club-shaped and narrow, afterwards becoming elliptic-oblong, or somewhat fusiform, but always very blunt at each end. When fully ripened they are dark coloured, marked with closely set, transverse and longitudinal striæ, which mark the surface with small, square reticulations, like a mosaic pavement, or the lattice of a window; an appearance alluded to in the specific name. *Colour*, pale greenish olive. *Substance* flaccid, closely adhering to paper.

The characters by which this plant is distinguished from others of the genus—namely, simplicity in branching and the peculiar form of the silicule,—appear sufficiently well marked; and we may therefore hope that we have here the foundation of a good species which will be detected in other localities, and in greater abundance than has yet been the case. At present I have only seen a single small specimen, or rather half a specimen, for the tuft that I owe to the kindness of Mrs. Griffiths

is cut in two :—and Mrs. Wyatt has only met with it once. This is, however, not to be wondered at, if we consider the extremely local nature of many species of *Ectocarpus*, and that Salcombe, the habitat of our novelty, is a considerable distance from the discoverer's ordinary abode. In appearance *E. fenestratus* is not unlike many specimens of *E. siliculosus*, but the form of the silicule is very different; and in this character there is a much nearer approach to *E. tomentosus*, a species, which in all other respects, is widely different from *E. fenestratus*.

Fig. 1. ECTOCARPUS FENESTRATUS; a tuft :—*the natural size.* 2. Portion of a filament :—*magnified.* 3. Small part of the same, with two ripe silicules. 4. Apex, with two young silicules :—*both highly magnified.*

W H H del et lith

R B & R imp

Plate CCLVIII.

ECTOCARPUS LONGIFRUCTUS, *Harv.*

Gen. Char. *Filaments* capillary, jointed, olivaceous or brown, flaccid, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. Ectocarpus (*Lyngb.*),—from εκτος, καρπος, *external fruit.*

Ectocarpus *longifructus*; tufts large, branching, the divisions feathery; filaments robust, excessively branched, branches mostly opposite, the lesser ones set with short, spine-like, opposite or rarely alternate ramuli; articulations as long as broad; silicules very long, linear-lanceolate, attenuate, densely striate transversely, terminating the principal branches and ramuli.

Ectocarpus longifructus, *Harv. Man. Ed.* 2. p. 61.

Hab. Parasitical on Algæ between tide-marks. Skaill, Orkney, *Mrs. Moffatt.*

Descr. *Tufts* six or eight inches long, much branched and feathery. *Filaments* robust, not much entangled, excessively divided, the branches and ramuli very generally opposite, sometimes alternate, spreading at wide angles. The smaller branches are furnished with numerous, opposite or alternate, short, spine-like ramuli, and mostly end in the very long silicules which are so striking a feature in this plant. These silicules are very much longer than the branchlet that bears them, and taper from the base to the apex, which is very acute or acuminate: they are closely netted with longitudinal and transverse lines. *Articulations* of the stem and branches about as long as broad, or a little longer. *Colour*, a greenish olive. It closely adheres to paper in drying.

I here figure an *Ectocarpus* from Orkney nearly related to *E. litoralis*, rather than to *E. siliculosus*, and differing chiefly in the greater luxuriance of the frond, and the different form of the fructification. The fructification of our present plant, however, must be regarded more as an exaggeration of that of *E. litoralis* than as essentially different. In *E. litoralis* the apices of the branches grow out beyond the portion converted into fructification, and the latter therefore appears as if it were immersed in

the branch; here when the ramuli are fertile the whole of the upper portion of the ramulus becomes the fruit. Such a character, if constant, would very well serve for a specific diagnosis, but its constancy has yet to be tested. Our *E. longifructus* rests at present upon a solitary specimen preserved in the herbarium of the Rev. J. H. Pollexfen, of Clapham, to whom I am indebted for my knowledge of this plant, and who has allowed me to abstract one of the lateral branches of his specimen. Persons visiting Orkney would do well to look carefully after the *Ectocarpi*, among which many more forms may yet be noticed. The characters of these plants cannot always be detected by the naked eye, nor are they easily recognisable except when in fructification. I am fully sensible that it is unsafe to propose new species from an inspection of individual specimens, but there are cases in which this course may safely be taken; and it will be remembered that *Ectocarpus Hincksiæ* is an instance of a species founded, like the present, on a solitary specimen picked up by a lady, but which, in a short time, was ascertained to exist on many distant shores, and which is now well established. I hope the present experiment may be equally successful.

Fig. 1. Ectocarpus longifructus:—*the natural size.* 2. A branch:—*magnified.* 3. Silicules from the same:—*highly magnified.*

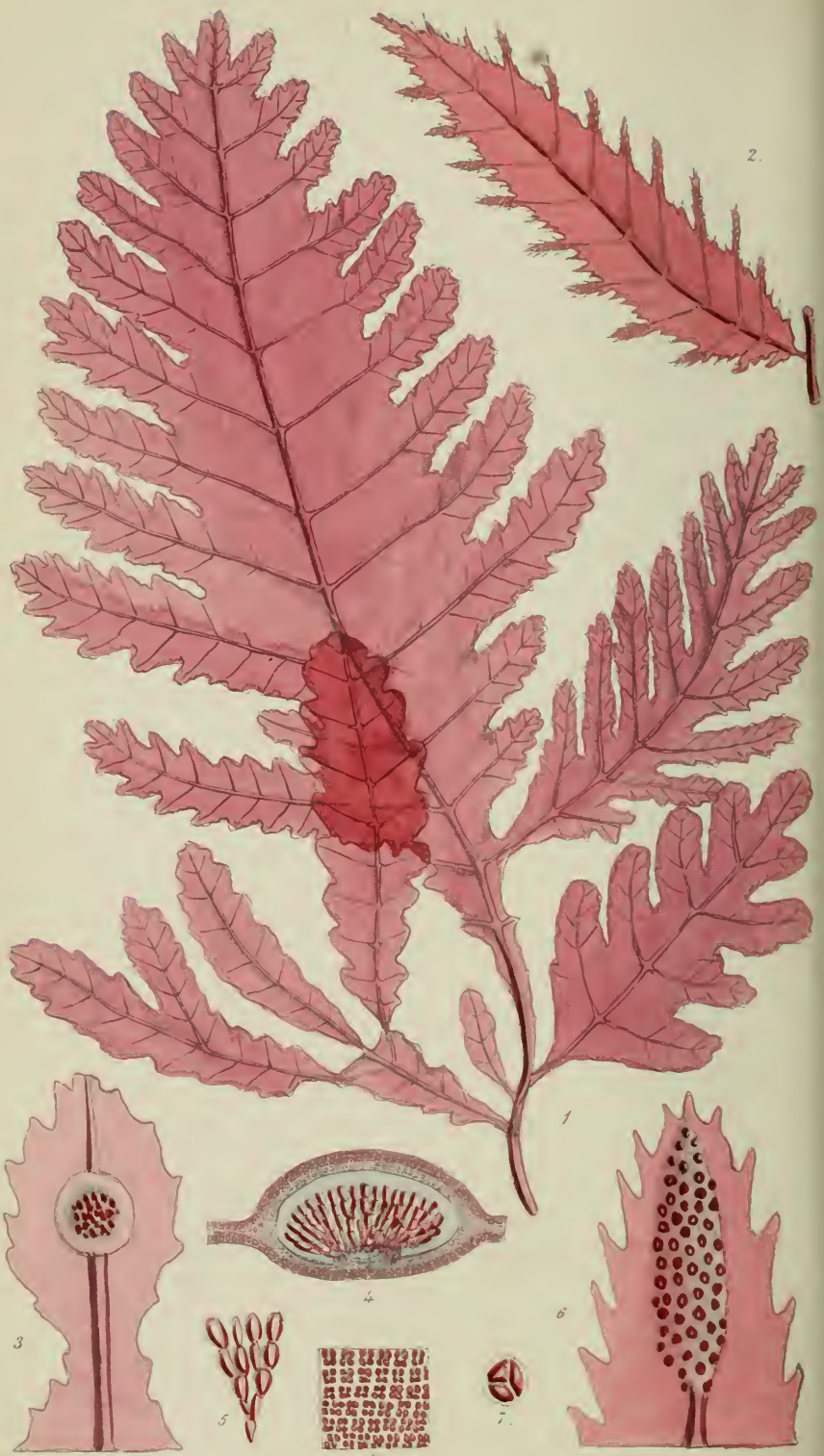
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Plate CCLIX.

DELESSERIA SINUOSA, *Lamour.*

Gen. Char. *Frond* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. Delesseria (*Lamour.*),—in honour of *Baron B. Delessert*, a distinguished botanist and patron of Botany.

Delesseria *sinuosa*; stem elongated, branched, beset with oblong or obovate, deeply-sinuated or pinnatifid, toothed, transversely-ribbed leaves.

Delesseria sinuosa, *Lamour. Ess.* p. 124. *Lyng. Hydrop. Dan.* p. 7. t. 2. *Ag. Sp. Alg.* vol. i. p. 174. *Ag. Syst.* p. 248. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 292. *Grev. Alg. Brit.* p. 73. *Hook. Br. Fl.* vol. ii. p. 285. *Wyatt, Alg. Damn.* no. 62. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* ed. 1. p. 55. *Endl. 3rd Suppl.* p. 53.

Wormskioldia sinuosa, *Spreng. Syst. Veg.* vol. iv. p. 331.

Fucus sinuosus, *Good. and Wood. in Linn. Trans.* vol. iii. *Eng. Bot.* t. 822. *Turn. Syn.* p. 1. *Turn. Hist.* t. 35.

Fucus crenatus, *Gm. Hist. Fuc.* p. 184. t. 24. f. 4. *Linn. Syst. Gm.* p. 1388.

Fucus rubens, *Huds. Fl. Ang.* p. 573. *Lightf. Fl. Scot.* p. 943. *Stack. Ner. Brit.* p. 18. t. 7.

Fucus roseus, *Fl. Dan.* t. 652.

Fucus Palmetta, varietas, *Esper, Ic. Fuc.* vol. i. p. 84. t. 42.

Hab. Parasitical on the stems of *Laminaria digitata*; also attached to various substances in deep water. Perennial. Summer and autumn. Common on the British shores.

Geogr. Distr. Atlantic shores of Europe and North America.

Descr. *Root* a small disc. The frond originates in an oblong or obovate, deeply sinuated, or pinnatifid leaf, four to six inches in length, and from one to four inches in breadth, furnished with a strong, percurrent midrib, pinnated with secondary, opposite nerves, one of which runs to the apex of each lacinia of the frond. As the growth of the plant proceeds, the laciniæ become deeper and deeper, and at length the cutting between each reaches the mid-rib; and at the same time the margins of each lacinia become first toothed and then incised, while lesser opposite nervelets are given off to the marginal teeth by their primary nerve. At this stage the midrib of of the first-formed leaf has become a stem pinnated with a great number of leaves, of similar form and structure to what the first leaf had been; and at a further period various irregularities of branching, some caused by laceration, some by proliferous growth, take place, till there results a much branched stem, well clothed with pinnatifid leaves. The margin is sometimes slightly toothed, and sometimes cut into very slender processes, or cilia; and not uncommonly, when the plant vegetates at a depth of 6–10 fathoms,

every lacinia is drawn out at the apex into tendrils, and the depauperated lamina very much cut into narrow, jagged processes. *Tubercles* solitary, either seated on the nerves of the leaf, or borne on little leaflets rising from the nerve, depressed, containing a tuft of beaded filaments, finally resolved into spores. *Tetraspores* in oblong or linear marginal sori, formed at the apices of the lateral nerves, often confined to the slender, marginal processes. *Colour*, a beautiful purplish crimson or lake. In drying, the frond adheres to paper.

Next to *D. sanguinea* (Tab. CLI.) this, when well grown, and of large size, is one of the handsomest of the genus. Our plate represents the frond in rather a young state, a specimen having been chosen for figuring which exhibits the changes that take place in form during the growth of the frond. At first the plant consists of a simple, penninerved leaf sinuated at the margins. The sinuosities gradually deepen into lateral lobes; and these lobes, as is shown in the lower part of the figure, deepen into branches, or new fronds, at first sinuous, then lobed and at length divided like the fronds from which they grow. Thus, eventually, a much branched and leafy frond results from the original leaf, by regular growth and subdivision of the margin. When any vigorous part is wounded, an irregular, proliferous growth likewise takes place, new leaflets springing from any part of the midrib. Sometimes the margin is much laciniated.

D. sinuosa is abundant throughout the Northern Atlantic. In the Southern Ocean it is represented by *D. quercifolia* and *D. Lyallii*, two very beautiful species which resemble it closely in form and mode of growth, but which are essentially different.

Fig. 1. A young and vigorous frond of DELESSERIA SINUOSA. 2. Leaf from an old frond, of the cut variety, with sori of tetraspores in the marginal lobes:—*both of the natural size.* 3. Marginal lobe with tubercle. 4. Section of the tubercle. 5. Strings of spores, from the same. 6. Marginal lobe, with sorus, formed out of the apex of the nerve. 7. Tetraspore. 8. Portion of the surface:—*all magnified.*

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Plate CCLX.

ELACHISTEA FLACCIDA, *Aresch.*

Gen. Char. *Frond* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification,* pear-shaped spores attached to the bases of the filaments concealed in the tubercles, and frequently accompanied by paranemata. Elachistea (*Fries*), — from ἐλαχιστα, the *least*; from the small size of these plants.

Elachistea *flaccida*; tufts pencilled: filaments elongate, flaccid, membranaceous, much attenuated to the base; the lower articulations half as long as broad, the upper of equal length and breadth; tubercle hemispherical.

Elachistea flaccida, *Aresch.—J. Ag. Gen. et Sp. Alg.* vol. i. p. 12. *Harv. Man.* ed. 2. p. 50. *Fr. Fl. Scan.* p. 317. *Eng. Bot.* t. 2912.

Elachistea breviarticulata, *Aresch. in Linn.* vol. xvi. p. 234. t. 8. f. 5.

Phycophila flaccida, *Kütz. Phyc. Gen.* p. 330.

Myrionema breviarticulatum, *Endl. 3rd Suppl.* p. 23.

Conferva flaccida, *Dillw.* t. G. *Harv. in Hook. Br. Fl.* vol. ii. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 227. *Harv. Man.* ed. 1. p. 132. *Wyatt, Alg. Damn.* no. 292.

Conferva obtusa, *Ag. Syst.* p. 101.

Conferva breviarticulata, *Suhr, in Flora* 1831, p. 32. t. 4. f. 36, *x, y, z.*

Hab. Parasitical on *Cystoseira fibrosa,* common. Annual. Summer and autumn.

Geogr. Distr. Atlantic coasts of France and England.

Descr. *Tubercle* small, one to three lines in diameter, hemispherical, very firm, composed of moniliform, dichotomous fibres densely compacted together, and not easily separable. From the tips of the fibres composing the tubercle spring the filaments, which are half an inch long, or something more, tapering extremely at the base, then rapidly widening to the middle, from which they taper very gradually to the upper extremity. *Articulations* in the lower and middle parts of the filament not quite half as long as broad, in the upper part as long as, or rather longer than, their breadth; the apex obtuse. Between the filaments spring numerous linear clavate paranemata, tapering to the base, and gradually swelling upwards; these have oval articulations, about thrice as long as broad. *Spores* lodged among the paranemeta, obovate, on slender, short pedicels, dark olive. *Substance* flaccid and soft, readily adhering to paper in drying. *Colour* a pale greenish olive, sometimes yellowish or foxy.

A very common parasite on *Cystoseira fibrosa*, whose branches are rarely found free from the olive-coloured soft pencils of this little plant. In size and appearance to the naked eye there is much resemblance to *Elachistea fucicola* (Tab. CCXL.), except that the colour is generally greener, and the length of the tufts rather less; but under the microscope these species are very readily known from one another. *E. flaccida* is remarkable for the shortness of its articulations, in proportion to their breadth throughout the lower and middle portions of the filaments, and for the gradually increasing length of the cells towards the apices. The filaments, also, taper exceedingly at the base; and the tubercle from which they originate is of very much smaller size than in *E. fucicola*.

Fig. 1. Tufts of ELACHISTEA FLACCIDA growing on *Cystoseira fibrosa*. 2. Vertical section of part of a frond, showing a portion of the tubercle, with paranemata and spores, and part of two filaments. 3. Apex of a filament. 4. Spore, with its paranemata:—*all magnified.*

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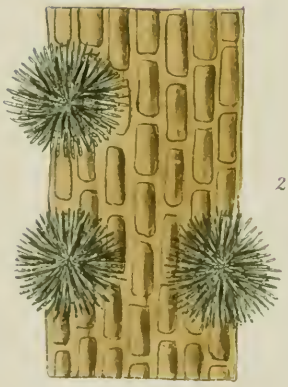

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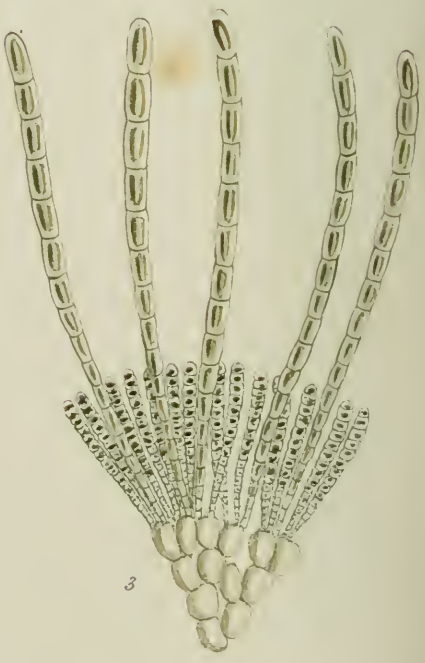

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Plate CCLXI.

ELACHISTEA STELLULATA, *Griff.*

Gen. Char. *Frond* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the bases of the filaments concealed in the tubercle, and frequently accompanied by paranemata. Elachistea (*Fries*), — from ἐλαχιστα, the *least*; from the small size of these plants.

Elachistea *stellulata*; tufts very minute, stellate; tubercle composed of large cells; filaments short, tapering to the base, linear club-shaped, obtuse; articulations about twice as long as broad, uniform; paranemata with short articulations.

Elachistea stellulata, *Griff. MSS. Aresch. Pug. in Linn.* vol. xvii. p. 261. tab. 9. f. 4. *Harv. Man.* ed. 2. p. 51.

Myrionema stellulatum, *J. Ag. et Gen. Sp. Alg.* vol. i. p. 49.

Conferva stellulata, *Harv. Man.* ed. 1. p. 132.

Hab. Parasitical on *Dictyota dichotoma*. Annual. Summer. Torquay, *Mrs. Griffiths*.

Geogr. Distr. Not observed out of England.

Descr. *Tufts* exceedingly minute, scarcely half a line in diameter, appearing like dark brown specks, dotting over the surface of the *Dictyota*, and under the microscope resembling miniature *echini*. *Tubercle* well developed, composed of dichotomous strings of large, colourless cells. From the terminal cell of each string the filaments and paranemata arise. *Filaments* a quarter of a line in length, linear-clavate, gradually tapering from the obtuse apex to the base the articulations of nearly uniform size, all being from once and a half to twice as long as broad, constricted at the joints. Each articulation contains a bag of rather dark coloured endochrome. *Paranemata* very numerous, springing with the filaments, and about one-third as long, with very short articulations, club-shaped. *Spores* unknown to me. They are figured by Dr. Areschoug as obovate-oblong.

This minute and microscopically beautiful little plant was discovered some years ago by Mrs. Griffiths on the old fronds of *Dictyota dichotoma*, and first described in the first edition of the Manual of British Algæ. I have not seen any other specimens than those originally collected by Mrs. Griffiths, who met with the parasite infesting several specimens of the *Dictyota*; nor am I aware that any other observer has noticed it in Britain, or that

it has been detected elsewhere. The Alga on which it grows is so very widely scattered that our *Elachistea* ought, probably, to have a place in many distant floras, but its minute size has hitherto been its protection. It looks so much like the fructification of the *Dictyota*, when carelessly examined with the naked eye, or with a lens of small power, that it may often be passed over as such; and I was once disposed to think that it might be merely a diseased proliferous state of that fructification. This opinion I have long abandoned, and recognised this production as a parasite, and true member of the genus *Elachistea*. In this latter point, however, I am at issue with my friend Professor J. Agardh, who places *E. stellulata* in the genus *Myrionema*. As far as size and outward characters go, such a position seems natural, but it will be found on closer inspection, that the filaments here are of two kinds, exactly as in *Elachistea*, and that they spring not from decumbent, adnate filaments, as in *Myrionema*, but from erect, radiating ones, compacted into a little tubercle.

Fig. 1. Part of a frond of *Dictyota dichotoma*, infested with the Elachistea:—*of the natural size.* 2. Some of the tufts on a portion of the membrane:—*magnified.* 3. Vertical section of a part of tuft, most of the filaments removed:—*highly magnified.*


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Plate CCLXII.

CALLITHAMNION BYSSOIDEUM, *Arn.*

Gen. Char. *Frond* rosy, or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branches, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. Callithamnion (*Lyngb.*),—from καλλος, *beauty*, and θαμνιον, a *little shrub*.

Callithamnion *byssoideum*; stems exceedingly slender, flaccid, and byssoid, much divided; branches lanceolate in outline, virgate, set with numerous long, slender, flexuous, pinnate or subbipinnate plumules; articulations of the branches eight times, of the ramuli four times as long as broad; tetraspores, one or two, sessile on the pinnules, elliptical; favellæ binate, subterminal.

Callithamnion byssoideum, *Arn. MSS. Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Wyatt, Alg. Damn.* no. 185. *Harv. Man.* ed. 1. p. 107.

Hab. On several Algæ, in tide-pools near low-water mark; on *Codium tomentosum*, especially. Annual. Summer. Whitsand Bay, *Dr. Jacob.* Devonshire, *Mrs. Griffiths.* Salcombe, *Mrs. Wyatt.* Plymouth, *Rev. W. Hore and Dr. Cocks.* Portaferry, Strangford Lough, *Mr. W. Thompson.* Dublin Bay, and Cork Harbour, *W. H. H.* Not an uncommon species.

Geogr. Distr. Not noticed out of Britain.

Descr. *Filaments* extremely slender, as fine as cobwebs, densely tufted, from two to four inches long, excessively branched in a decompound-pinnate manner, all the divisions alternate and distichous. The whole frond, when displayed on paper, has an ovate or pyramidal outline, the lowermost branches being longer than the upper ones; each individual branch is narrow-lanceolate, when taken in connection with the plumules with which it is clothed. These plumules are slender, and flexuous, simply or doubly pinnated, laxly set, with few and distant pinnules; the latter very long, and destitute of ramuli or lateral processes. *Articulations* of the stem and branches of great length, 6–8 times longer than broad, destitute of internal veins, except in the lower part of the stem; articulations of the ramuli at least four times as long as broad, but often more. *Tetraspores* elliptical, sessile, rather large, borne on the sides of the pinnules, towards the base, one or two, rarely more, on each pinnule. *Favellæ* binate, generally terminating truncated branches. *Colour*, a fine rosy lake, with a slightly purple or sometimes brown hue. *Substance* exceedingly tender and gelatinous, closely adhering to paper in drying.

This species was first collected, it would seem, by Dr. Jacob at Whitsand bay, and first recognised as new by Professor Walker Arnott, from whom I first received specimens under this name,—a name adopted in the British Flora, and now generally recognised. *E. byssoideum* is one of the softest and most gelatinous of the genus, having exceedingly slender fronds, growing in dense tufts. To the naked eye it frequently bears much resemblance to *C. corymbosum*, so much that it sometimes requires a microscope to determine to which species the specimen under examination may belong. The ultimate branching, and the position of the tetraspores will then afford an easily seen character, by which the two plants may be distinguished. There is a much closer affinity, indeed, between *C. byssoideum* and *C. roseum*, than between the former and *C. corymbosum*. From *C. roseum* our plant is chiefly known by its much greater delicacy and softer substance, and its adhering much more closely to paper, and being more glossy when dry.

Fig. 1. CALLITHAMNION BYSSOIDEUM; a tuft:—*of the natural size.* 2. Part of branch, with bipinnate plumule. 3. Pinnules, bearing tetraspores from the same. 4. Part of a branch with favellæ. 5. A favella. 6. Articulations from the lower part of the stem:—*all more or less highly magnified.*

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W.H.H. del. et lith. R.B. & R. imp.

Plate CCLXIII.

ENTEROMORPHA HOPKIRKII, *M'Calla.*

Gen. Char. *Frond* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification;* granules, commonly in fours, contained in the cellules of the frond. Enteromorpha (*Linn.*),—from εντερον, an *entrail,* and μορφη, *form* or *appearance.*

Enteromorpha *Hopkirkii*; frond excessively slender and byssoid, flaccid, very much branched; branches feathery, decompound, erect, attenuated, set with minute, subulate ramuli; cellules large, hyaline, each cell containing one or two minute grains of endochrome; the ramuli composed of a single series of such cellules.

Enteromorpha Hopkirkii, *M'Calla, Alg. Hib. ined. Harv. in Phyc. Brit.* vol. i. pl. XV. *Harv. Man.* ed. 2. p. .

Hab. Dredged in 4–10 fathoms water. Annual. Summer and autumn. Goodrington, Torbay, *Mrs. Griffiths* (1838). Carrickfergus, *Mr. M'Calla* (1845).

Geogr. Distr. ——?

Descr. *Fronds* six to twelve inches long or more, of exceedingly fineness and delicacy, the main stems being scarcely the diameter of human hair, the branches and ramuli very much more slender; excessively branched and feathery, the branches erect, straight, alternate, or rarely opposite, tapering to a fine point, repeatedly decompound, the ultimate divisions set with minute, awl-shaped ramuli. The structure of the frond is peculiarly lax. The cells in the branches are of large size, about three or four visible in the breadth of the branch, hyaline, containing generally a single small grain of grass-green endochrome or *chlorophyll.* The ultimate ramuli consist of a single series or string of such cells, or, in other words, are articulated. There is much less difference between the diameter of the larger and smaller branches in this species than in most others of the genus. *Colour* a pale yellowish green, becoming paler in drying. *Substance* exceedingly flaccid and tender, most closely adhering to paper in drying.

I am not prepared to defend the *characters* of all the species of the genus *Enteromorpha*; but among our British kinds the present one is remarkable for having some points easily recognisable, and for being a plant of much delicacy and beauty. It rivals in the tenuity of its fronds, and in their bushy branching, the most delicate of the *Cladophoræ,* having, to the naked eye, an aspect not very unlike that of *C. Rudolphiana,* and being more slender than *C. gracilis.* Under the microscope it is known by the very

large size of its nearly empty cells, in the centre of which a small spherical grain of emerald-green endochrome is found. The ramuli are so slender that they consist of a single row of such cells, and thus have something the character of the threads of a *Conferva*.

My first knowledge of this species was from specimens dredged in 1838 by Mrs. Griffiths in Torbay. They remained in my Herbarium unnamed until the plant was again found, in 1845, by the late Mr. M'Calla, who bestowed the name as a tribute of grateful respect to Mr. Thomas Hopkirk, author of "Flora Glottiana," from whom he had received kindness whilst resident in the neighbourhood of Belfast. In now adopting Mr. M'Calla's specific name I wish to record the regret I feel, in common with all naturalists acquainted with his merits, that death should so soon have closed a career which opened with much promise of future fame. The readers of the Phycologia must be well acquainted with the name of Mr. William M'Calla, in connection with the habitats of many of our rarest Algæ. It is therefore almost superfluous to say that he was well acquainted with the species, and had a most acute eye to detect a minute species, and a most accurate judgment to discriminate one varying form from another. But though Algæ were the natural objects in which, of late, he chiefly delighted, he had a very extensive knowledge of marine zoology, and has made large additions to the Irish Faunæ. Born in very humble circumstances, imperfectly educated, and always with narrow means, he had to struggle through life with many hindrances to progress. That he overcame many of those hindrances is a proof of his talents and energy; that he did not overcome all may well be forgotten by those who have not had to struggle with any, and yet feel disposed to criticise the short-comings of others. Mr. M'Calla fell a victim to Cholera, in May 1849, aged about 35.

Fig. 1. Enteromorpha Hopkirkii:—*of the natural size.* 2. Portion of a branch:—*magnified.* 3. Small fragment of the same, with its subulati ramuli:—*very highly magnified.*

W H H. del et lith.

R.B. & R. imp

Plate CCLXIV.

RHODOMELA SUBFUSCA, *Ag.*

Gen. Char. *Frond* filiform, solid, much branched, inarticulate, reticulated; the axis composed of concentric layers of oblong, hyaline cells; the periphery of several rows of minute, irregular, coloured cellules. *Fructification*, 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in swollen ramuli, or contained in proper pod-like receptacles (*stichidia*) in a single or double row. Rhodomela (*Ag.*),—from ῥοδεος, *red*, and μελας, *black*; because the species usually become darker in drying.

Rhodomela *subfusca*; frond filiform, much branched; the branches irregularly divided, clothed with pinnated branchlets, and subulate, simple scattered or fasciculate ramuli; pinnules subulate; tetraspores contained either in the somewhat swollen ultimate ramuli (in summer), or in proper branching stichidia (produced in winter).

Rhodomela subfusca. *Ag. Sp. Alg.* vol. i. p. 378. *Ag. Syst.* p. 199. *Spreng. Syst. Veg.* vol. iv. p. 343. *Grev. Alg. Brit.* p. 193. *Hook. Br. Fl.* vol. ii. p. 294. *Wyatt, Alg. Damn.* no. 111. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* ed. 2. p. 79. *Endl. 3rd Suppl.* p. 47.

Lophura cymosa, *Kütz. Phyc. Gen.* p. 435.

Gigartina subfusca, *Lamour. Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 47. t. 10. *Grev. Fl. Edin.* p. 289.

Sphærococcus subfuscus, *Hook. Fl. Scot.* part 2. p. 104.

Fucus subfuscus, *Woodw. in Linn. Trans.* vol. i. p. 131. t. 12. *Good. and Woodw. Linn. Trans.* vol. iii. p. 212. *Turn. Syn. Fuc.* p. 350. *Turn. Hist.* t. 10. *E. Bot.* t. 1164. *Esper, Ic. Fuc.* vol. ii. p. 11. t. 117.

Fucus confervoides, *Huds. Fl. Ang.* p. 591.

Fucus variabilis, *Good. and Woodw. Linn. Trans.* vol. iii. p. 220.

Fucus setaceus, *Wulf. Crypt. Aquat.* no. 40.

Hab. On rocks and shells, in pools between tide marks; sometimes on the larger Algæ. Biennial or perennial. Spring and summer. Generally dispersed round the coast.

Geogr. Distr. Atlantic shores of Europe and North America.

Descr. *Root* a small thin disc. *Fronds* generally tufted, from three to twelve inches in length, varying greatly in diameter, sometimes not thicker than hogs' bristle, sometimes twice or four times as thick, tapering upwards, cylindrical, much branched. *Branches* long and virgate, sometimes undivided, sometimes forked, mostly alternate, imperfectly distichous, or spirally placed, well furnished, in summer, with alternate lateral secondary branches. These secondary branches are sometimes long, and repeatedly pinnate, sometimes short and simply pinnate; sometimes they are absent altogether, and their place supplied by numerous, scattered or clustered, awl-shaped, simple ramuli. These ramuli are rarely absent on the lower parts of the branches

and stem. In winter all the secondary branches fall off, leaving merely the main branches, to which the stumps of the fallen ramuli adhere, and give them a singularly uncouth aspect. In spring the frond pushes out a new series of more slender and decompound ramuli than it had borne the first season. The whole frond is perfectly opake, without any appearance of articulation. *Capsules* ovate, sessile, or on very short peduncles, borne on the pinnules in summer. *Tetraspores* produced both in summer and winter; in summer immersed in the apices of the pinnules, which are then slightly distorted; in winter contained in special receptacles, or *stichidia*, which spring from the sides of the main branches. These stichidia are raised on slender peduncles, forked, and tufted. *Colour* a brownish red, becoming very dark in drying. *Substance* cartilaginous, very rigid in the branches, more flaccid in the ramuli, long resisting the action of fresh water.

This plant is so different in appearance when collected in summer and in winter that it may well be taken by the young botanist for two. The summer specimens are well clothed with slender, multifid and soft ramuli, which lengthen as the season advances, and drop off before winter, leaving bare stems rough with broken stumps.

The *tetraspores* are found either in summer or in winter. At the former season they are simply immersed in the terminal ramuli; at the latter they will be found lodged in small branching *stichidia* scattered irregularly along the sides of the branches.

Except in its much more bushy and branching habit and paler colour, there is a very close resemblance between this species and *R. lycopodioides* (Tab. L.)

Fig. 1. RHODOMELA SUBFUSCA:—*of the natural size.* 2. Pinnated (summer) branchlet with tetraspores in the pinnules. 3. Tufted stichidia (winter) with tetraspores. 4. A tetraspore. 5. Branchlet with capsules. 6. A capsule or ceramidium. 7. Transverse section of the stem:—*all more or less highly magnified.*


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Plate CCLXV.

CYSTOSEIRA ERICOIDES, *Ag.*

Gen. Char. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores* and tufted *autheridia*. Cystoseira (*Ag.*),—from κυστις, a *bladder*, and σειρα, a *chain*; because the air vessels are often arranged in strings.

Cystoseira *ericoides*; stem thick, woody, short, cylindrical, beset with numerous, slender, filiform branches, variously divided, and densely clothed with small, spine-like, awl-shaped ramuli; air-vessels small, solitary beneath the apices of the branches; receptacles cylindrical, armed with awl-shaped processes.

Cystoseira ericoides, *Ag. Sp. Alg.* vol. i. p. 52. *Ag. Syst.* p. 281. *Spreng. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 4. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. in Mack. Fl. Hib.* part 3. p. 167. *Harv. Man.* p. 18. *Endl. 3rd Suppl.* p. 30. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 221.

Halerica ericoides, *Kütz. Phyc.* p. 354.

Fucus ericoides, *Sp. pl.* p. 1631. *Good. and Wood. in Linn. Trans.* vol. iii. p. 130. *E. Bot.* t. 1968. *Turn. Hist.* t. 191.

Fucus tamariscifolius, *Huds. Fl. Ang.* p. 576. *Stack. Ner. Brit.* p. 44. t. 11. *Turn. Syn. Fuc.* p. 88. (*excl. syn. Gmel.*)

Fucus selaginoides, *Esper, Ic. Fuc.* vol. i. p. 69. t. 31. (*excl. syn. Gmel.*) *Good. and Wood. Linn. Trans.* vol. iii. p. 132. *Turn. Syn.* p. 85.

Hab. On marine rocks, near low-water mark and in tide-pools. Perennial. Summer and autumn. Frequent on the shores of the south of England and south and west of Ireland. Yarmouth Reach, *Mr. Turner*. Port Rush, Antrim, *Mrs. Ovens*.

Geogr. Distr. On the Atlantic shores of Europe and the north of Africa.

Descr. *Root* a large conical or flattened disc. *Frond* generally solitary, twelve to eighteen inches in length, rising with a cylindrical stem nearly half an inch in diameter. This stem is four to six inches long, and either simple or forked, or having four or five main divisions, which support numerous slender, crowded, bitripinnated branches. *Branches* as thin as whip-cord, decompound, all the divisions alternate and distichous, densely set with short, spine-like ramuli or leaves, each of which has a gland-like pore on its back, near the base. *Air vessels* few and small, oblong, placed usually in the terminal branchlets just below the base of the receptacle. *Receptacles* formed in the apices of all the branches, oblong, cylindrical, becoming nodose, always armed with spine-like ramuli, similar to those that clothe the branches. *Spores* obovate, with wide borders. When growing, under water, the frond reflects beautiful prismatic colours, which are lost when it is lifted into the air:—the colour is then a yellowish olive. On being dried the frond turns black, and shrinks considerably. *Substance* tough and leathery.

This is one of the most beautiful of the British species of *Cystoseira*, especially when seen growing under water. It then appears clothed with the richest tints of blue and green, more like those phosphorescent gleams that flash from the lower marine animals than any vegetable colours. As each twig waves to and fro in the water the hues vary, and sometimes, when the light falls partially on a branch, some portions seem covered with sky-blue flowers, while others remain dark. All these beautiful tints perish when the plant is removed from the water. The specific name *ericoides*, or heath-like, alludes both to the brilliant colouring and the shrubby character of the frond, which is covered with small ramuli resembling the leaves of a heath.

C. ericoides is common on the southern shores of our islands, and becomes gradually less frequent towards the north. It has been once found on the coast of Ayrshire by the Rev. D. Landsborough.

Fig. 1. CYSTOSEIRA ERICOIDES:—*of the natural size.* 2. Receptacle and vesicle, both formed in the apex of a branch. 3. Section of a conceptacle, showing the spores and antheridia. 4. A spore:—*all more or less magnified.*

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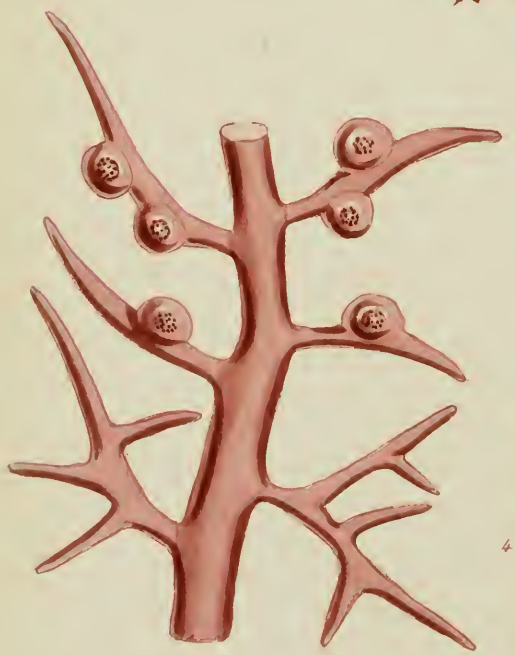

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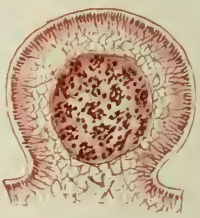

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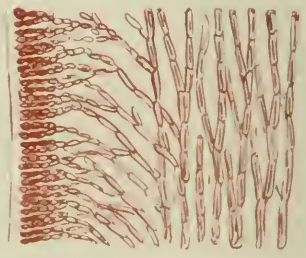

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Plate CCLXVI.

GIGARTINA TEEDII, *Lamour.*

Gen. Char. *Frond* cartilaginous, either filiform compressed or flat, irregularly divided, purplish-red; the axis or central substance composed of branching anastomosing longitudinal fibres; the periphery of dichotomous filaments, laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles,* containing, on a central placenta, dense clusters of *spores,* scattered among the filaments of the periphery. Gigartina (*Lamour.*),—from γιγαρτον, a *grape stone,* which the tubercles resemble.

Gigartina *Teedii*; frond cartilagineo-membranaceous, flaccid, flat, linear, acuminate, repeatedly pinnate; the pinnæ opposite or alternate, horizontally patent, distichous, set with horizontal, spine-like ramuli; coccidia globose, on the ramuli, sessile.

Gigartina Teedii, *Lamour. Ess.* p. 49. t. 4. f. 11. *Hook. Br. Fl.* vol. ii. p. 301. *Wyatt, Alg. Damn.* no. 27. *Harv. Man.* ed. 1. p. 76. *Endl. 3rd Suppl.* p. 42.

Chondracanthus Teedii, *Kütz. Phyc.* p. 399.

Rhodomenia Teedii, *Grev. Alg. Brit.* p. 96.

Sphærococcus Teedii, *Ag. Sp. Alg.* vol. i. p. 277. *Ag. Syst. Alg.* p. 225. *Grev. Crypt. Fl.* t. 356.

Fucus Teedii, *Roth, Cat. Bot.* vol. iii. p. 108. t. 4. *Turn. Hist. Fuc.* t. 208.

Hab. On rocks, at the extreme limit of low water. Perennial. Very rare. Elberry Cove, Torbay, *Mrs. Griffiths* (1811).

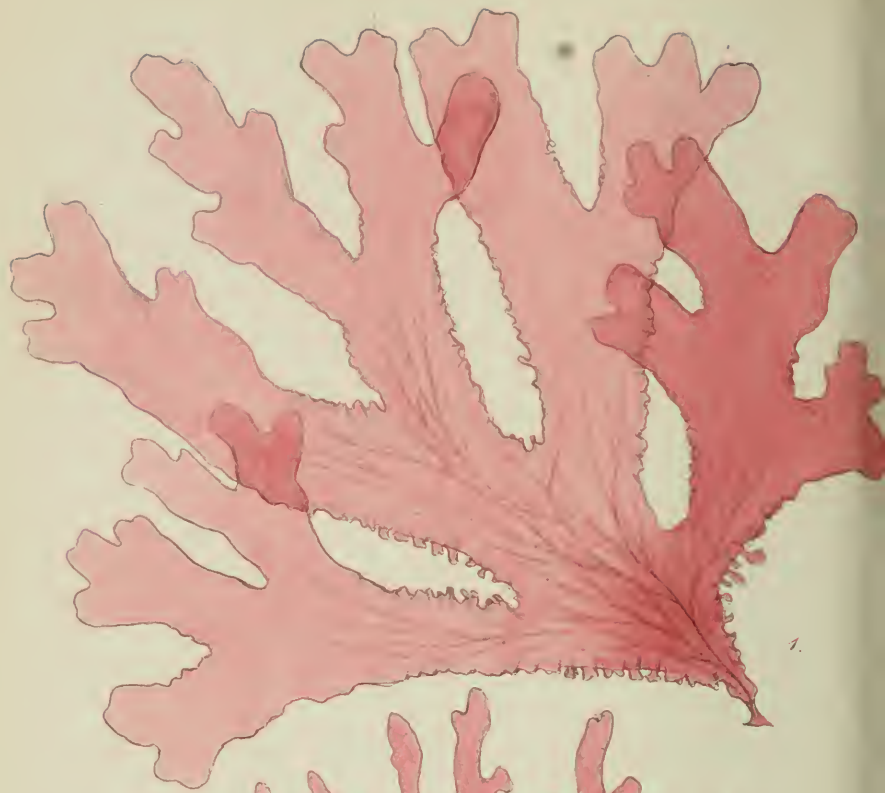
Geogr. Distr. Atlantic coasts of France, Spain, and Portugal. Abundant in the Mediterranean.

Descr. *Root* a flattened disc. *Fronds* numerous from the same base, densely tufted, from three to six inches long, distichous, excessively branched in a more or less regularly pinnate manner, all the divisions horizontally patent. The main stems are from one to two, or, in very luxuriant specimens, three or four lines in breadth in the middle, and taper towards both ends, being attenuated upwards into a long slender point. They are either simple or forked, or irregularly cloven, flexuous, and closely beset with lateral branches which are simply, doubly, or trebly pinnate, and always beset with short, spine-like, horizontally patent ramuli. Different specimens vary much in the amount of branching, and in the breadth of the frond. *Fructification* has not been found in this country. The favellidia are enclosed in tubercles as large as poppy seed, plentifully scattered over the sides of the ramuli, and partially immersed in them. *Colour,* when quite recent, a dull brownish red; but in fresh water and in decay the frond assumes various tints of red and yellow, and finally becomes verdigris green. *Substance* between cartilaginous and membranaceous, soft and flexible, becoming rather horny when dry. In drying the frond shrinks considerably, and scarcely adheres to paper.

This is one of the rarest and most interesting of the British Sea-weeds. It was first found in England by Mrs. Griffiths, in the year 1811, on a small rock in Elberry Cove, growing in scattered tufts on spots left bare at the extreme limit of low water, of spring tides; and on this rock it continues to grow, and may generally be found in greater or less perfection every summer. In warm summers the plants are larger, more branching, and with broader membranes, and the tufts more numerous. Fructification has never been observed in this locality, and perhaps this is the cause why the plant appears never to have extended itself. On the opposite coast of Normandy, and southwards along the French coast, it is much more abundant, annually producing fruit; and in the Mediterranean *G. Teedii* is a very common plant. With us it seems to have reached nearly its extreme northern limit.

This plant is closely allied to *G. Chamiseoi*, of Peru, and *G. Chauvini*, of extra-tropical South America, from some varieties of which it is not always easy to separate it. In Britain it may be confounded with some states of *Gelidium corneum;* but the substance is much softer, and the structure, as seen in thin slices placed under a microscope, extremely different.

Fig. 1. GIGARTINA TEEDII:—*of the natural size.* 2. Part of a fertile frond (from a foreign specimen) with tubercles in the ramuli. 3. Section of a tubercle. 4. Longitudinal section of the frond:—*all magnified in a greater or less degree.*



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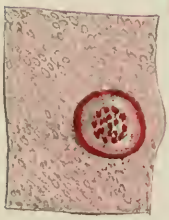

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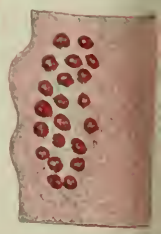

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W.H.H. del et lith.

R.B. & R. imp.

Plate CCLXVII.

NITOPHYLLUM LACERATUM, *Grev.*

Gen. Char. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores* grouped into definite *sori*, or spots variously scattered over the frond. Nitophyllum (*Grev.*), corruptly formed from *nitor*, *brilliancy*, and φύλλον, a *leaf*.

Nitophyllum *laceratum*; frond sessile or shortly stipitate, much branched dichotomously, traversed by numerous branching and anastomosing nerves; segments linear, variously cleft and lobed, waved at the margin, obtuse; spots of tetraspores oblong, either marginal or borne on distinct, leafy processes of the margin.

Nitophyllum laceratum, *Grev. Alg. Brit.* p. 83. *Hook. Brit. Fl.* vol. ii. p. 288. *Wyatt, Alg. Danm.* No. 107. *Harv. in Mack. Fl. Hib.* part 3. *Harv. Man. Ed.* 1. p. 59.

Cryptopleura lacerata, *Kütz. Phyc. Gen.* t. 68. vol. iii. p. 444. *Sp. Alg.* p. 870.

Aglaiophyllum laceratum, *Mont. Fl. Canar.* p. 150. *Endl. 3rd Suppl.* p. 52.

Delesseria lacerata, *Ag. Sp. Alg.* vol. i. p. 184. *Ag. Syst.* p. 251. *Grev. Fl. Edin.* p. 293.

Wormskioldia lacera, *Spreng. Syst. Veg.* vol. iv. p. 332.

Chondrus laceratus, *Lyngb. Hyd. Dan.* p. 18.

Fucus laceratus, *Gmel. Hist.* p. 179. t. 21. f. 4. *Good and Woodw. Linn. Trans.* vol. iii. p. 155. *Stack. Ner. Brit.* p. 77. t. 13. *Turn. Syn.* p. 154. *Turn. Hist.* t. 68. *E. Bot.* t. 1067.

Fucus crispatus, *Huds. Fl. Alg.* p. 58. *Linn. Syst. Nat.* p. 1718. *Esper, Ic. Fuc.* vol. i. p. 130. t. 90.

Fucus endiviæfolius, *Lightf. Fl. Scot.* p. 948. t. 32.

Hab. On rocks and on the stems of *Laminaria digitata*, near low-water mark and at a greater depth. Annual. Summer. Common on the shores of the British Islands.

Geogr. Distr. Atlantic Coasts of Europe and North America.

Descr. *Root* a small disc, often throwing out creeping fibres. *Fronds* sessile, or with a very short, cartilaginous stem, much divided, four to six or eight inches in length, and as much in expansion, the laciniæ varying in breadth from a quarter of an inch to upwards of an inch. The division of the frond is usually dichotomous, with many irregularities; the laciniæ are linear, or somewhat cuneiform, lobed and dentate, and often curled at the margin, very obtuse, simple or repeatedly forked. The lower part of the membrane is always traversed by slender, branching and anastomosing, tolerably distinct veins, which in some specimens extend and ramify through the upper

part of the frond also: these are rarely indistinct, and are often very well defined. The axils are patent, the apices spreading widely. A variety is common in which the lateral smaller lobes of the frond hook backwards and coil round any neighbouring plant. *Coccidia* depressed, spheroidal, generally marginal or in marginal processes, containing, on a central placenta, numerous chained spores. *Spots* of tetraspores minute, oblong, confined to a line immediately within the margin, or else placed in little leafy processes which fringe the principal laciniæ of the frond. *Substance* delicately membranaceous, and very thin, but somewhat tough, elastic, and not adhering strongly to paper. *Colour* a purplish or brownish full red, reflecting glaucous tints when growing.

This is the most generally dispersed species of *Nitophyllum*, and the one most usually met with within tide marks. It frequently is found fringing the steep and shaded sides of deep rocky pools, when protected from the sun by overhanging *Fuci*; but its favourite place of growth seems to be on the stems of the larger oar-weeds. The frond varies much in breadth in different specimens, as may be seen by our figure, which, however, by no means represents the extreme forms. Some specimens are so broad and so little divided that they closely approach *N. Gmelini* in aspect, especially when dried; but the substance and colour of the two plants are essentially different, and when seen growing it is impossible to mistake one for the other. A very singular variety of *N. laceratum* is frequently seen between tidemarks, attaching itself by hooked lobes to neighbouring small algæ, and sometimes so intricately interwoven with their stems that it cannot be extricated without tearing. In this the frond is very narrow, of a brighter colour than usual, and almost every lobe converted into a strong recurved hook.

I have frequently observed spores to be developed within the substance of the placenta, as well as on its outer surface. Our figure (fig. 4) represents them in both positions, as seen in a vertical section of the conceptacle.

Fig. 1. NITOPHYLLUM LACERATUM; a broad variety. 2. A narrow variety, with marginal processes:—*both of the natural size.* 3. Small portion of the membrane with a marginal coccidium. 4. Section of the coccidium. 5. Marginal spot of tetraspores. 6. Marginal processes containing spots of tetraspores:—*all magnified.*


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Plate CCLXVIII.

CONFERVA BANGIOIDES, *Harv.*

Gen. Char. *Filaments* green, jointed, attached or floating, unbranched. *Fruit*, aggregated granules, or zoospores, contained in the articulations, having, at some period, a proper ciliary motion.—Conferva (*Plin.*), from *conferruminare*, to consolidate; because some of the species were used by the ancients in cases of fractured bones.

Conferva *bangioides*; filaments attached, elongated, very slender, soft and lubricous, wavy; articulations about twice as long as broad, containing, at maturity, a compact dark green mass; dissepiments broad, pellucid.

Conferva bangioides, *Harv. Man. Ed.* 1. p. 131. *Ed.* 2. p.

Hormotrichum bangioides, *Kütz. Sp. Alg.* p. 383.

Aplonema bangioides, *Hass. Fr. Alg.* p. 224.

Hab. On rocks, &c., near low-water mark. Breakwater at Plymouth, *Mr. Blatch*. Torquay, *Mrs. Griffiths*. Port Ballantrae, *Mr. Moore*. Ballycotton, *Miss Ball*.

Geogr. Distr. Not noticed out of Britain.

Descr. *Filaments* from three to six inches in length, capillary, densely tufted, or spreading in large patches, which are dark green and glossy to the eye. Each filament is of equal diameter throughout, but there is much difference between the relative diameters of filaments from the same tuft. The articulations are about twice as long as broad, slightly contracted at the dissepiments, and filled with a dense herbaceous green endochrome, leaving a pellucid border all round. In an advanced stage of growth the endochrome contracts and condenses into a dark-coloured, oblong *spore*, which remains in the centre of the articulation, until, on the breaking up of a plant, it is liberated. *Substance* lubricous, closely adhering to paper in drying.

The species here figured is, in many respects, similar to *C. Youngana*, but is a larger species. From most others it may be known by its very lubricous and glossy tufts and soft feel. Except in colour there is much outward resemblance to *Bangia fuscopurpurea*, though under the microscope no two plants need be more unlike. When the plant first makes its appearance the colouring substance nearly fills the cell, and is of a pale colour, but gradually it condenses into a small, subcylindrical and dark-coloured spore in the centre.

The first specimens I received of this plant were sent to me by Mrs. Griffiths, to whom belongs the merit of having determined its characters correctly. It has subsequently been found in two stations in Ireland, but must still be regarded as one of our rarer species.

Fig. 1. Tuft of CONFERVA BANGIOIDES :—*the natural size.* 2. Portions of filaments of different ages :—*highly magnified.*


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Plate CCLXIX.

CALLITHAMNION THUYOIDEUM, *Ag.*

Gen. Char. *Frond* rosy or brownish red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. Callithamnion (*Lyngb.*), from κάλλος, *beauty*, and θαμνίον, *a little shrub*.

Callithamnion *thuyoideum*; stem capillary, undivided, set with alternate, distichous, repeatedly pinnate branches, with a narrow lanceolate outline; branches furnished with bipinnate or tripinnate plumules; articulations of the branches 2–6 times, of the pinnules about twice as long as broad; tetraspores borne on the tips of the ultimate pinnules.

Callithamnion thuyoideum, *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. Man.* ed. 1. p. 111.

Callithamnion thuyoides, *Ag. Sp. Alg.* vol. ii. p. 172. *Endl. 3rd. Suppl.* p. 34. *Kütz. Sp. Alg.* p. 645.

Callithamnion tripinnatum, *Harv. in Hook. Br. Fl.* vol. ii. p. 346 (*not of* Agardh). *Wyatt, Alg. Danm.* no. 186.

Conferva thuyoides, *E. Bot.* t. 2205.

Hab. On rocks, near low-water mark, rare. Annual. Spring and Summer. Yarmouth, *Mr. Borrer*. Plymouth, *Mr. Icona*, &c. Pier, Torquay, *Mrs. Griffiths*. Falmouth, *Miss Warren*. Ilfracombe; and Bracelet Bay, Swansea, *Mr. Ralfs*. Wicklow, *W.H.H.* Portaferry, *Mr. W. Thompson*. Roundstone, *Mr. Mc.Calla*.

Geogr. Distr. British Islands, and Atlantic coast of France.

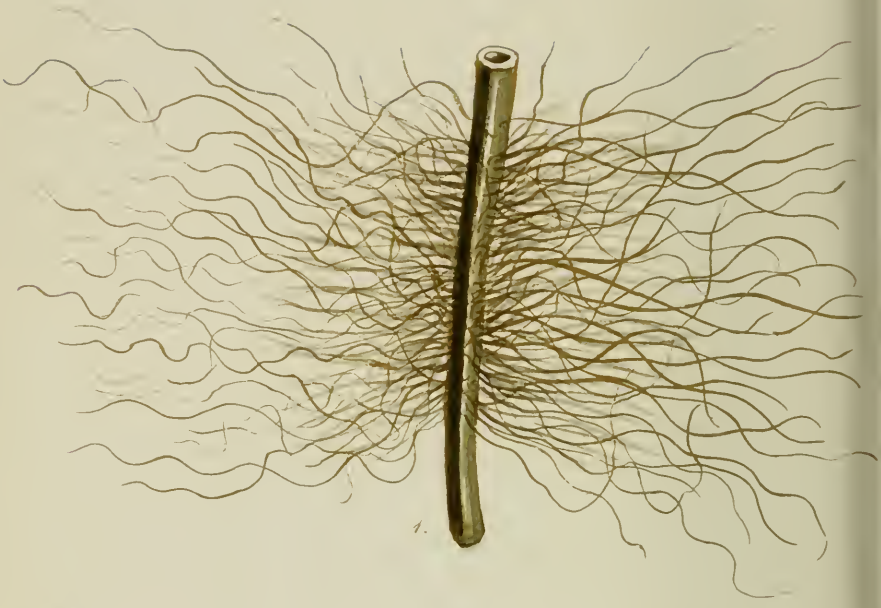
Descr. *Root* a minute disc. *Fronds* one to three inches long, densely tufted, perfectly distichous, with an ovate or flabellate outline. *Stem* mostly undivided, closely pinnated through its whole length with alternate, very patent branches, the lowest of which are longest, the rest gradually diminishing to the apex. These primary branches have a lanceolate outline, and are, with great regularity, pinnated with linear-lanceolate plumules, one rising from every articulation, and turned alternately to the right or left; the lowest plumules very short, the upper gradually longer and more compound, to the middle of the branch, thence gradually shortening towards its apex. *Plumules* bi- tripinnate, resembling the branches in miniature; the first plumule always given off from the upper side of the rachis. *Articulations* of the stem and branches very variable in length, commonly from four to six times as long as broad; but sometimes very short, with

swollen dissepiments :—those of the ramuli uniformly about twice as long as broad. *Favellæ* solitary or binate, bursting from the rachis of the plumules, variously lobed. *Tetraspores* minute, globose, terminal on the ultimate ramuli. *Colour* a rosy pink, or brownish red. *Substance* delicately membranaceous, soft and flaccid, most closely adhering to paper.

One of the most *concinnate* of the *Callithamnia*, elegant in all its minute parts, and strictly neat in its mode of growth. In essential character it closely approaches *C. gracillimum*, from which it is more to be distinguished by habit than by any very definite character. *C. gracillimum* is a larger and more tufted plant, more irregular in ramification, with longer and more indefinite plumules, varying much in the composition of its ramuli. Our present plant is rather robust, with an evident central stem and lateral branches, spreading with much regularity; each branch, as well as the plumules with which it is feathered, being of a narrow lanceolate outline. The plumules are very generally triply pinnate. *Favellæ* are much less commonly found on this species than tetraspores, and generally burst from the sides, and not the apex of a branchlet.

Though found in many places, *C. thuyoideum* must be ranked among the rarer forms of the genus.

Fig. 1. Callithamnion thuyoideum ; a frond :—*of the natural size.* 2. Two articulations from a branch, each bearing a plumule. 3. Pinna from the same, with tetraspores. 4. A tetraspore. 5. Abbreviated plumule bearing a favella :—*all more or less highly magnified.*



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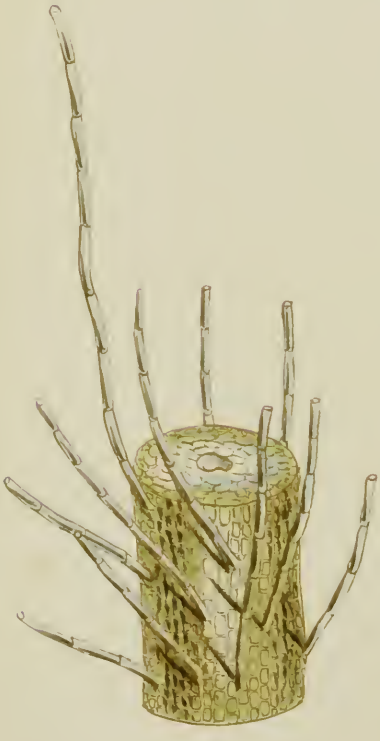

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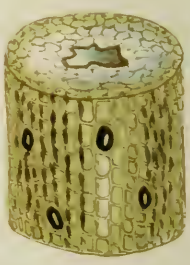

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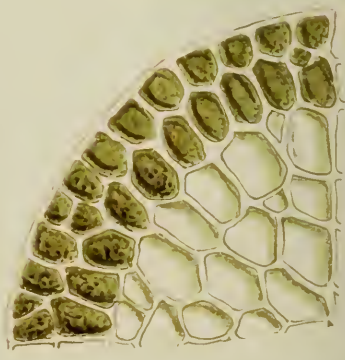

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W.H.H. del. et lith.

R.B.&R.

Plate CCLXX.

LITOSIPHON PUSILLUS, *Har.*

Gen. Char. *Frond* unbranched, cylindrical, cartilaginous, subsolid, at length tubular, composed of several rows of cells; the surface areolated. *Fructification*; solitary or aggregated naked spores, scattered irregularly over the surface of the frond. Litosiphon (*Harv.*), from λιτὸς, *slender* or *mean*, and σίφων, a *tube*.

Litosiphon *pusillus*; fronds tufted, thread-shaped, very long, equal in diameter throughout, reticulated, clothed with pellucid hairs; spores scattered.

Litosiphon pusillus, *Harv. Man. Ed.* vol. ii. p. 43.

Chlorosiphon pusillus, *Harv. in Phyc. Brit.* vol. i. p. 10. *Kütz. Sp. Alg.* p. 484.

Asperococcus pusillus, *Carm. in Hook. Br. Fl.* vol. ii. p. 277. *Wyatt, Alg. Danm.* no. 58. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man. Ed.* vol. i. p. 35. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 78.

Hab. Parasitical on Chorda filum. Annual. Summer. Common all round the coast.

Geogr. Distr. Shores of Europe.

Descr. *Fronds* very densely tufted, clothing the plant on which they grow in continuous series for the space of several feet, completely concealing the surface and spreading on all sides equally; from two to four inches long, as thick as hog's bristle, straight, or more commonly variously waved or twisted. When young the whole frond is beset with slender, byssoid, articulated fibres, like those found in *Myriotrichia*. These gradually wear away, and then the fronds become more twisted and less lubricous. In young plants the frond is nearly solid, composed of several strata of cells, the inner ones of which are large and empty, the outer gradually smaller, and those of the two or three external rows (constituting the periphery) filled with granulated endochrome. The central cells first perish, and the plant becomes tubular, but the tube does not seem to have regularly defined limits. The surface under the microscope appears reticulated with quadrate cells, which are disposed in longitudinal lines. Among these cells one is here and there larger and more prominent than the rest, containing a darker-coloured endochrome: these are supposed to be the spores, and no other fructification has yet been observed. *Substance* somewhat cartilaginous, but soft and lubricous, closely adhering to paper. *Colour* at first a greenish, afterwards a brownish olive.

The old fronds of *Chorda filum* are frequently infested, towards the close of summer, with the parasite here figured, which changes them into shaggy ropes, soft and slippery to the touch.

When placed in water the innumerable thread-like fronds of the *Litosiphon* stand out from the *Chorda*, and spread in all directions round it, like the hairs of a bottle-brush.

This plant was orginally noticed by Capt. Carmichael, who called it *Asperococcus pusillus*, a name by which it has been generally known to succeeding botanists; although all have admitted that its claim to be regarded as a species of *Asperococcus* was, to say the least, very doubtful. In the list of species appended to the first volume of this work I called it *Chlorosiphon*, supposing that it must be the plant called by Kützing *Chlorosiphon Shuttleworthianus*, a name given by that author to an Alga gathered by Mr. Shuttleworth, on the West Coast of Ireland. I made this reference after reading the description in Kützing's work, but a subsequent communication with that author showed me that I had committed an error, for a specimen of Mr. Shuttleworth's Alga kindly sent to me by Professor Kützing, proves to be that young state of *Chorda lomentaria*, to which Carmichael gave the name *Asperococcus castaneus*. In these circumstances it becomes necessary to bestow a new name on the present plant, and I have chosen one applicable in a double sense.

As a genus it seems to come nearest to *Dictyosiphon*, from which it obviously differs in having an unbranched frond. I am not at all satisfied respecting the nature of the so-called spores, but no other fructification has yet been discovered.

Fig. 1. LITOSIPHON PUSILLUS, growing on *Chorda filum*:—*of the natural size.* 2. Part of a young frond. 3. Part of an older frond, with spores. 5. Quarter of a transverse section of the frond:—*more or less highly magnified.*