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Richard Spruce Esq., F.B.S.

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XXXV.—*The Musci and Hepaticæ of Teesdale.* By RICHARD SPRUCE, Esq., F.B.S.

[Concluded from p. 203.]

41. *Ceratodon purpureus*, Brid. (Didymodon, H. and T.) Frequent.

42. *Cinclidotus fontinaloides*, Beauv. In the Tees.

43. *Climacium dendroides*, W. and M. (*Hypnum dendroides*, Dillen.; Linn.; H. and T. Leskea, Hedw.) Common.

44. *Dicranum Dillenii*, Tayl. MSS. (*D. scoparium* α. vulgaris, Musc. Brit.) Heaths and rocks; fruiting abundantly in Holwick Wood.

45. — *flavescens*, Sm. Sides of streams, frequent.

46. — *flexuosum*, Hedw. Heaths and moist rocks.

47. — *fulvellum*, Sm. On stones near springs, between the base of Cronkley Scarr and the river: fruit very scarce.

48. — *fuscescens*, Turn. Musc. Hibern. p. 60; Engl. Bot. t. 1490. *D. Sphagni*, Wahl. (*D. scoparium* γ. Hook. in Engl. Flora.)

On basaltic rocks below the High Force, Holwick Scarr and other places, but existing in the greatest abundance and perfection on Cronkley Scarr.

Dr. Taylor has well distinguished between *D. scoparium*, Hedw., and *D. Dillenii*, and I do not hesitate to assert that the *D. fuscescens* of Turner is equally distinct from both. In Teesdale, where *D. Dillenii* and *fuscescens* grow together on the same rocks, the difference in habit is so striking, that I am surprised any one should ever have thought of uniting them. The latter I would separate from the former by the following characters:—

Tufts more dense, darker-coloured, deep green above, fuscous below. *Leaves* secund or subsecund, slightly twisted in drying, lanceolate, tapering into a very long and slender acumination; *nerve much thicker*, in the upper half usually exceeding the breadth of the pagina on each side, which is not the case at all in *D. Dillenii**; *reticulation far smaller, punctate* in the upper portion of the leaf (the cellules being nearly equal in length and breadth), which is never the case in *D. Dillenii* (where the length of the cellules always much exceeds their breadth). The *perichætal leaves* have broad sheathing bases (usually extending a very little above the *vaginula*), but are widely spreading upwards; whereas in *D. Dillenii* the inner perichætal leaves are remarkably convolute, broadly elliptical, with linear squarrose apiculi†, and the sheath which they form is above twice the length of the vagi-

* In *D. Dillenii* the nerve has 3—5 dorsal ribs, the middle one of which is serrated near the summit and sometimes expanded into a lamina; but in *D. fuscescens* the nerve has only one rib at the back, which is serrated and extends a very little way below the summit of the leaf.

† The stem-leaves of *Hypnum piliferum* are very similar in form.

nula. Capsule ovato-cylindrical, subcernuous; lid curved, subulate from a conical base. In *D. Dillenii* the capsule is cylindrical, nearly erect, with a subulate straight lid. Seeds deep olive, slightly larger than the brownish seeds of *D. Dillenii*. Teeth of the peristome shorter, deep red (almost black), opaque, cloven less than half way: in *D. Dillenii* tapering to a longer point, red at the base and tips but orange-yellow in the middle, cloven more than half way, often trifid.

I did not once observe the true *D. scoparium* in Teesdale. Its differences from *D. Dillenii* may be thus briefly stated:—Stems of far larger size and growing in looser tufts, mostly ascending from a decumbent base. Leaves more distant, of extraordinary length, uniformly falcato-secund, in the slender nerve and elongated cellules agreeing with *D. Dillenii*. The perichætium is still more remarkable than that of *D. Dillenii*, and frequently encloses several pedicels, which I have never seen to be the case in *D. fuscescens*. Capsules arcuate, substrumose.

49. *Dicranum glaucum*, Hedw. Heaths and rocks.

50. — *heteromallum*, Hedw. Heaths and banks.

51. — *squarrosum*, Hedw. Sides of streams; always barren.

52. — *strumiferum*, Ehrh. On fallen rocks (basaltic) at the base of Holwick Scarr. The capsules appeared to have ripened prematurely (owing, probably, to the dryness of the season) and were for the most part imperfectly formed.

53. — *varium*, Hedw. Common.

54. *Didymodon Bruntoni*, Arn. On basaltic rocks near the High Force, Cronkley Scarr, &c. The habit of this moss is very similar to that of *Weissia cirrhata*, along with which it grows; but the capsules of the latter were quite empty and dead, while those of the former were only beginning to shed their opercula.

55. — *capillaceus*, Schrad. Frequent, and in fine state, especially on moist basaltic rocks near Winch Bridge.

56. *Encalypta ciliata*, Hedw. On limestone rocks at the White Force, below High Force and in Ettersgill beck.

57. — *streptocarpa*, Hedw. Limestone rocks and walls, but barren.

58. *Fissidens adiantoides*, Hedw. (*Dicranum, Musc. Brit.*) Hagg Syke.

59. — *bryoides*, Hedw. Banks, chiefly in the lower grounds.

60. — *taxifolius*, Hedw. Clayey and sandy banks.

61. *Fontinalis antipyretica*, L. In the Tees and its tributary streams.

62. *Funaria hygrometrica*, Hedw. Frequent.

63. *Grimmia apocarpa*, Hedw. Rocks and walls. In sandy spots overflowed by the Tees, the var. *rivularis* grows with closely tufted erect stems and leaves of extraordinary breadth.

64. — *pulvinata*, Sm. On walls, &c.

65. — *spiralis*, H. and T. Basaltic rocks at Caldron Snout and Falcon Clints, where it fructifies very sparingly.

66. *Grimmia torta*, Hornsch. Not unfrequent, either on the limestone or basalt, but occurring chiefly on loose stones in the more elevated situations, as at the base of White Force and Falcon Clints. Always barren.

67. — *trichophylla*, Grev. Abundant on walls between Barnard Castle and Middleton, and on rocks in Upper Teesdale.

68. *Gymnostomum curvirostrum*, Hedw. On rocks near streams; chiefly on the limestone, but not confined to it.

69. — *Donianum*, Smith. On limestone rocks (below the basalt) on the Yorkshire side of the High Force, where it was discovered by Mr. R. B. Bowman. This minute moss grows in very small quantity, and its locality is exceedingly difficult of access, except when the river is low. Since observing it in this station I have gathered it in considerable quantity in Mowthorpe Dale near Castle Howard, where it grows in the crevices and on the under side of calcareous rocks, in company with *Hypnum tenellum* and *crassinervium*.

70. — *nimbosum*, Tayl. MSS. (*Zygodon Mougeotii*, B. and S.?) Rocks at the High Force, White Force and Cronkley Scarr.

71. — *rupestre*, Schwægr. Frequent on moist rocks; often growing in company with *G. curvirostrum*.

72. *Hedwigia cæstiva*, Hook. On moist basaltic rocks below the High Force, as well as in other similar situations. When the immense tufts which this moss usually forms are separated vertically, they often appear beautifully zoned, which I suppose is caused by the annual elongation of the stems.

73. *Hookeria lucens*, Sm. On the west side of Mickel Fell.

74. *Hymenostomum microstomum*, R. Br. (*Gymnostomum microstomum*, Hedw.; *H. and T.*) Upon a wall, topped with earth, below the High Force plantation.

75. *Hypnum aduncum*, L. Bogs. In fruit on Cronkley Fell.

76. — *alopecurum*, L. Moist rocky situations.

77. — *catenulatum*, Schwægr. On stones in Holwick Wood.

78. — *commutatum*, Hedw. Abundant and in a fertile state on wet rocks.

79. — *confervoides*, Bridel? "Repens, ramis teretibus capillaceis, foliis erectis lato-lanceolatis enerviis, integerrimis; capsula suberecta, operculo obtuso."—*Schw. Suppl.* t. 142; *Drummond's Musci Americani*, No. 190.

Growing intermixed with *Jung. trichophylla* on basaltic rocks in a shaded situation by the Tees' side below Winch Bridge. I observed only a single patch, destitute of capsules, but possessing *perichætia*.

Stems sparingly branched, not subpinnate as in *H. catenulatum* (its nearest congener). Branches nearly erect, of a beautiful pale green above, in their lower part with a slight tinge of pink. Leaves nerveless, slightly denticulate, more widely arcuated (though far smaller in size), narrower, and tapering more upwards than those of *H. catenulatum*, yet not extending to so long a point as in *H. serpens*; they are equally patent, too, in

the dry as in the moist state. *Perichætal leaves* deeply but unequally serrated.

This interesting moss bears so strong a resemblance to *H. serpens*, that, had I not been struck by its peculiar colour and remarkably neat appearance, I might have passed it over for that species. The characters above stated will suffice to show those who have studied *H. serpens* that *H. confervoides* is widely different from it in several essential particulars.

80. *Hypnum crassinervium*, Tayl., Wils. On limestone rocks by the Tees, near the foot of the High Force.

81. — *cupressiforme*, L. Everywhere.

82. — *curvatum*, Sw. Trees and rocks.

83. — *cuspidatum*, L. Common.

84. — *denticulatum*, L. Frequent in moist shady situations.

85. — *filicinum*, L. Common, but rarely fructifying.

86. — *fluitans*, L. In Hell Cleft.

87. — *incurvatum*, Schrad. On stones at the base of the High Force, on the Durham side of the Tees; growing with *Orthotrichum rupestre*. I had nearly passed this over for *H. serpens*, which it certainly much resembles, especially in the form of its capsules. It is also not unlike *H. populeum*, with which species it grew intermixed.

88. — *loreum*, L. Frequent.

89. — *lutescens*, Huds. Limestone rocks in Ettersgill beck and Hell Cleft.

90. — *molluscum*, Hedw. Frequent.

91. — *multiflorum*, Tayl. On trees in Egglestone Wood and Balderdale. A *Hypnum*, which for the present I must consider a var. of this, grows in the fissures of limestone rocks in Hell Cleft, at the High Force, and other places; it is remarkable for the reddish hue of its foliage, in consequence of which I at first mistook it for *Leskea rufescens*. The leaves are longer and narrower than in the usual state of *H. multiflorum*, and when dry are striated.

92. — *myosuroides*, Hedw. Common in rocky situations.

93. — *palustre*, L. Wet rocks and on stones in streams, fructifying copiously.

94. — *plumosum*, L. On rocks in and near streams.

95. — *polymorphum*, Hedw. By the Tees below Winch Bridge; barren.

96. — *populeum*, Hedw. Walls and rocks.

97. — *prælongum*, Linn. }

98. — *proliferum*, L. } Everywhere common.

99. — *purum*, L. }

100. — *rugulosum*, Web. This has been found by Mr. Ibbotson on the limestone above Falcon Clints; but as I only searched the base of those rocks, I did not observe it.

101. — *ruscifolium*, Neck. Streams, frequent.

102. — *rutabulum*, L. Everywhere.

103. — *Schreberi*, Willd. Heaths.

104. — *scorpioides*, L. Bogs.

105. *Hypnum sericeum*, L. Walls, trees and banks.
106. — *serpens*, L. Everywhere.
107. — *splendens*, Hedw. Heaths and rocks.
108. — *squarrosum*, L. Common.
109. — *stellatum*, Schreb. Bogs, frequent. Var. β . *minus*, on a wall near Lonton, in fruit.
110. — *striatum*, Schreb. Banks.
111. — *triquetrum*, L. Frequent.
112. — *uncinatum*, Hedw. Abundant on stones and about the roots of trees, with fruit in excellent condition.
113. — *undulatum*, L. Shady places, not common.
114. — *velutinum*, L. Common.
115. *Leskea complanata*, Hedw. (*Hypnum complanatum*, *Musc. Brit.*) Frequent.
116. — *pulchella*, Hedw. Frequent among rocks in shaded situations. In Teesdale this elegant moss is almost constantly associated with *Bryum crudum*.
117. — *trichomanoides*, Hedw. About the roots of trees; not common.
118. *Leucodon sciurioides*, Schwægr. Trees between Barnard Castle and the High Force inn.
119. *Meesia uliginosa*, Hedw. (*Bryum trichodes*, L.; *H. and T.*) Very sparingly on moist basaltic rocks at Winch Bridge.
120. *Mnium hornum*, Hedw. (*Bryum*, *Musc. Brit.*) Frequent.
121. — *marginatum* (*Mn. serratum*, *Brid.*; *Bryum marginatum*, *Dicks.*; *H. and T.*). In rocky situations.
122. — *punctatum*, Hedw. Near streams.
123. — *rostratum*, Schwægr. Rocks in Ettersgill beck, in fruit. Below Winch Bridge.
124. — *undulatum*, Hedw. (*Bryum ligulatum*, *Schreb.*; *H. and T.*) Frequent.
125. *Neckera crispa*, Hedw. Common on rocks.
126. — *pumila*, Hedw. On trees in Holwick Wood.
127. *Orthotrichum affine*, Schrad. Trees and walls.
128. — *anomalum*, Hedw. Frequent on limestone rocks and walls. The capsules had passed the season of maturity, and were therefore in an unfit state for observing the *cilia*; but by attentively watching this moss on a wall near Castle-Howard during the last three summers, I have satisfied myself that *well-developed capsules* usually possess an inner peristome. I have arrived at the same conclusion respecting *O. cupulatum*; but in the latter the *cilia* are 16, in the former only 8.
129. — *crispum*, Hedw. On trees, with *O. Drummondii*.
130. — *cupulatum*, Hoffm. In the same localities as *O. anomalum*.
131. — *diaphanum*, Schrad. Trees and walls, between Barnard Castle and Middleton.
132. — *Drummondii*, Hook. This beautiful species is more abundant in Upper Teesdale than any other of the genus, and may be met with everywhere on shrubs and young trees. I observed it in the

greatest plenty and luxuriance on junipers near the High Force, and on birches by the side of Blea beck and on Cronkley Fell.

The existence of an *annulus* at the mouth of the capsule in the genus *Orthotrichum* appears to have escaped the notice of every writer on the subject of bryology: even Bruch and Schimper, whose investigations have been so minute and elaborate, have failed to detect it. To Mr. Wilson is due the credit of first observing this organ in the capsules of *O. cupulatum*, sent to him by myself from the neighbourhood of York, in May 1842. At that time we thought it might be peculiar to the species, but I have since ascertained its presence in nearly every British species of the genus; and I may mention *O. Drummondii* and *crispum* as mosses in which it may be easily detected. In all cases it is best seen by bending the teeth of the peristome inwards and cutting them away, or by carefully taking out the inner membrane of the capsule, of which the peristome forms the continuation.

The *annulus* of *O. Drummondii* is very narrow, closely appressed to the teeth of the peristome, of which it partakes the hue, so that unless they be first removed, it is almost certain to be overlooked. It is divided into processes, of which *two* subtend each tooth, so that the whole number of processes is thirty-two: they are obtuse, sometimes perforated, and of very fragile texture.

133. *Orthotrichum leiocarpum*, B. and S. (*O. striatum*, Hedw.; *H. and T.*) Frequent on trees.

Bruch and Schimper assign the following very adequate reason for changing the name of this species: "Comme c'est la seule espèce du genre *Orthotric* qui ait une capsule dépourvue de raies, nous l'appelons *O. leiocarpum* (à fruit lisse) en rejetant la dénomination '*striatum*,' qu'on avait conservé jusqu'ici."

134. *O. Lyellii*, H. and T. On trees in many places, but barren.

135. — *pulchellum*, Sm. On trees near streams; frequent. In Hell Cleft I found a large var. growing on a stone, with a longer capsule and paler outer peristome than ordinary.

136. — *rivulare*, Turn. On stones in the Balder; rare. The leaves of specimens gathered in this locality are remarkably denticulated at the apex; but this peculiarity exists also, though in a less degree, in specimens from Dr. Greville, gathered in Glen Dochart.

137. — *rupestre*, Schleich. (*O. rupicola*, Funk.; *H. and T.*) On fallen rocks and stones at the base of the High Force.

138. — *stramineum*, Hornsch. "Monoicum, subpulvinatum; caule ramoso; foliis patulis, siccitate laxè imbricatis, lanceolatis, costato-carinatis, margine reflexis; capsula pyriformi-oblonga, late striata, e lutescente fusca; calyptra campanulata, subpilosa; dentibus 8 bigeminatis, ciliis 8 æqualibus vel 16 alternis brevioribus."—*Bryol. Eur.*

O. stramineum, Hornsch. *ined. Brid. Bryol. Univ. i. p. 789.*

On an ash-tree near the bridge across the Lune, between Mickleton and Lonton; very scarce.

From *O. affine*, growing on the same tree, this differs as follows. *Leaves* usually of a deeper green. *Vaginula* clothed with remarkably long hairs, which often reach half-way up the capsule; but naked in *O. affine*. *Capsule* much shorter and wider, with a shorter neck, thick-skinned, the areolation wider, especially near the mouth, the 8 striæ with which it is marked far broader. *Calyptra* straw-coloured, more convex, concealing two-thirds of the capsule (in *O. affine* only half). *Operculum* shorter. *Cilia* consisting of fewer cellules. *Seeds* green; in *O. affine* pale brown.

My specimens uniformly show 16 cilia, but Bruch and Schimper remark: "Le nombre des cils du péristome intérieur varie de 8 à 16, et on trouve souvent des échantillons où cette variation a lieu sur le même individu."

O. pallens, Bruch, which I have found near York, agrees with *O. stramineum* in the number of cilia, but differs in its obtuse upper leaves and their wider areolation, smooth vaginula, smaller calyptra and elongated capsule.

139. *Phascum alternifolium*, Schwagr. On a turf-capped wall below the High Force plantation.

I cannot satisfy myself that this is specifically distinct from *Ph. subulatum*, Hedw. The character which appears to be chiefly relied on for their separation in the 'Bryol. Europ.' is founded on the male inflorescence; the *antheridia* in the former being enclosed in *gemmæ* dispersed along the stem, and in the latter *free* in the axils of the perichætal leaves. I must trust to future observation to decide whether or not this difference is to be accounted specific.

140. *Physcomitrium ericetorum*, De Notaris. (Gymnost. fasciculare, H. and T.) Caldron Snout.

141. *Polytrichum aloides*, Hedw. Frequent.

142. — *alpinum*, L. Abundant in heathy situations.

143. — *commune*, L. Heaths.

144. — *gracile*, Menzies. Near Lower Cronkley.

145. — *juniperinum*, Willd. Heaths.

146. — *nanum*, Hedw. In several places.

147. — *piliferum*, Schreb. On the moor between the High Force inn and Cronkley Bridge.

148. — *undulatum*, Hedw. Common.

149. — *urnigerum*, L. Near the High Force inn.

150. *Pottia truncata*, B. and S. (Gymnostomum truncatulum, Musc. Brit.) In cultivated ground.

151. *Pterogonium gracile*, Sw. Falcon Clints; barren.

152. *Splachnum mnioides*, L. fil. On fallen rocks at the base of Holwick Scarr; between Cronkley Scarr and the Tees; Meldon Hill, on the Westmoreland side of Maize beck.

153. *Tetraphis pellucida*, Hedw. Hagg Syke; Hell Cleft, &c.
 154. *Tetradontium Brownianum*, Schwægr. (*Tetraphis Browniana*, Grev.; *H. and T.*) On the underside of stones near Caldron Snout.
 155. *Trichostomum flexicaule*, B. and S. (*Didymodon, Brid.*) Abundant, both on the limestone and basalt. This is a moss which I had concluded from previous observation to be confined exclusively to limestone and chalk formations; but it certainly does not refuse to grow on the basalt, in Teesdale.
 156. — *rigidulum*, Smith. (*Didymodon rigidulum, Hedw.; H. and T.*) Near streams.

The five following species are not included in *Trichostomum*, as limited by Bruch and Schimper.

157. *Tr. aciculare*, Beauv. Abundant.
 158. — *fasciculare*, Schrad. Frequent on rocks and stones.
 159. — *heterostichum*, Hedw. Rocks and walls.
 160. — *lanuginosum*, Hedw. Abundant. Among the mountains the rocks and stones are frequently quite hoary with this moss.
 161. — *microcarpum*, Hedw. Falcon Clints; scarce.
 162. *Weissia acuta*, Hedw. Plentiful on basaltic rocks by the Tees at Winch Bridge and other places.
 163. — *cirrhata*, Hedw. On Holwick and Cronkley Scarrs.
 164. — *controversa*, Hedw. Banks.
 165. — *curvirostra*, H. and T. On walls and rocks, as well as in moist sandy situations.
 166. *Zygodon lapponicus*, B. and S. (*Gymnostomum lapponicum, Hedw.; H. and T.*) Fissures of basaltic rocks at Caldron Snout; in fruit.
 167. — *viridissimus*, Brid. (*Gymnostomum viridissimum, H. and T.*) On trees between Barnard Castle and Middleton; on rocks in Balderdale.

Hepaticæ.

1. *Fegatella conica*, Tayl. Near streams.
 2. *Jungermannia albicans*, L. Everywhere.
 3. — *asplenoides*, L. Frequent in the low grounds; scarcely ascending to the subalpine regions.
 4. — *Bantriensis*, Hook. MSS. Caule erecto vel adscendente, subramoso; foliis ovato-rotundatis, obtuse emarginatis, perichætalibus conformibus; stipulis parvulis, lanceolato-subulatis, integerrimis, basi 1-2 dentatis, bifidis, vel laciniatis; fructu terminali, calycibus subcylindricis, ore angustiori tubulato ciliato.
*J. Bantriensis, Hook. MSS. olim**. *J. bidentata*, var. *Brit. Jung. Synops.* p. 16. *Suppl.* tab. 3.

On sandy deposits by the Tees and its tributary streams; in the

* I should have scrupled to retain Hooker's specific name, had it not been already published by Lindenberg and Nees in the 'Species Hepathicarum' (as I am informed by Dr. Taylor); although these authors appear to have been unacquainted with the plant, and to have presumed on its being distinct merely from Hooker's brief account of it.

greatest abundance below Winch Bridge. Sides of springs on the summit of Cronkley Fell.

Var. *β. minor*, foliis minutis, e basi latiori, subdistantibus. By the Tees near Winch Bridge and the High Force.

Var. *γ. muscicola*, surculis prostratis, foliis angustioribus subhorizontalibus. Creeping over mosses on moist rocks below the High Force.

This I believe to be the plant alluded to by Hooker in his monograph under *J. stipulacea* (*J. scutata*, W. and M.), in these terms: "A new species (*J. Bantriensis*, MSS.), which has lately been discovered by Miss Hutchins, and which has, like the present, emarginate leaves: but it differs in its much greater dimensions, in the less concave, obtusely and slightly emarginate leaves, in the small stipules, and in the situation of the calyx, rising quite leafless at the base from the upper side of the stem, as that of *J. pusilla* does." And it is very probable that the plant mentioned afterwards on the same page as having been found in Scotland by Mr. Lyell, and possessing considerable affinity with *J. stipulacea*, but differing in its twice or thrice larger leaves and their obtuse segments, is specifically the same. There is yet another supposed species mentioned in the same work (under *J. bidentata*), communicated also from Bantry by Miss Hutchins, and "distinguished from *J. bidentata* in having the leaves cut into three more frequently than into two segments; and in either case they are very distinctly, but irregularly toothed," which I am inclined to unite with the other two. If this opinion be correct, Hooker's remarks plainly indicate a very polymorphous species. Of these three plants, the two latter are never afterwards alluded to in the 'Brit. Jung.,' but *J. Bantriensis* is finally disposed of at page 16 of the Synopsis as a variety of *J. bidentata*, and a figure of the calyx and upper portion of the stem is given in the third supplementary plate. That my plant is the *J. bidentata* var. *Bantriensis* of Hooker has been assured to me by Dr. Taylor, who has kindly compared it with an original specimen from the late Miss Hutchins; and having had excellent opportunities in Teesdale for studying it in its various forms, I am bound to declare that it is truly distinct from both *J. bidentata* and *scutata*, as the following diagnosis will amply demonstrate:—

Plants forming dense tufts or patches; in habit much resembling *J. cordifolia*.

Stems mostly erect, flexuose, simple or sparingly and dichotomously branched, with suberect branches; yet sometimes exhibiting a laxer and procumbent mode of growth, with divaricating branches; always, however, distinct from the entangled and much-branched stems of *J. bidentata*. They vary almost indefinitely in size, but in the normal form equal *J. bidentata* and far surpass *J. scutata*.

Leaves secund, far rounder in outline and attached to the stem by a narrower base than those of *J. bidentata* (which are nearly horizontal in insertion and direction), gradually increasing in size from the base to the summit of the stem, the terminal ones (on the larger stems) three times the size of the lowest; all emarginate or (more rarely) tridentate, with obtuse, acute or apiculate segments; the lower with a lunulate sinus and entire margins; the upper subacutely and often irregularly emarginate, angular or toothed at the margins. The areolation a little wider than in *J. bidentata*. The colour varies from yellowish green to deep olive, but is never whitish, as we most frequently see it in *J. bidentata*. The leaves of the branches and innovations are narrower, more deeply and acutely cloven than the rest; and on the procumbent stems they are seldom secund, but merely incurved or even horizontally patent.

Stipules minute, seldom broader than the stem, exceedingly polymorphous, yet usually lanceolato-subulate, with one or more lateral teeth, sometimes quite entire, more rarely bifid or lacinate, often subfalcate but never *twisted*. Occasionally they appear to be quite rudimentary, and are not seldom altogether wanting, especially in the lower half of the stem. In nearly all these particulars they offer a perfect contrast to the *unusually large* and ovato-acuminate stipules of *J. scutata*.

Inflorescence dioicous. The *male plants* grow in separate tufts; the stems are anthriferous in their upper half, and the *perigonal leaves* are acutely divided at the summit into three *incurved* unequal teeth, the lowest tooth being the smallest; each leaf encloses 1—4 anthers, most frequently the latter number. But in *J. bidentata* the perigonal leaves are *recurved* in their upper half, and have an involute lobe at the base which contains the anthers. I have not seen perigonia of *J. scutata*, nor were they known to Hooker.

Female flower terminal, destitute of any *proper* perichætium. The *calyces* which contain only pistilla are pyriform* (as represented in 'Brit. Jung.' Suppl. t. 3), but when fully grown and fruit-bearing nearly cylindrical, depressed at the summit and terminating in a narrow tubular ciliated mouth, which is from one-fifth to one-sixth the length of the calyx: after the emission of

* An extensive examination of *barren calyces* will bring to light a great variety of forms, but this I attribute to the imperfect state of development they often exhibit; I have even seen them wide-mouthed and almost campanulate, when they plainly betray their origin to be derived from the union of leaves in all respects similar to those of the stem, for the bi- or tridentate apices of the latter are distinctly visible. I have observed similar circumstances in other *Jungermannia*, especially *J. ventricosa* and *obtusifolia*, and the former of these perhaps owes its rank of a species to its having been first observed with barren calyces *only*; at least I search in vain for any permanent character to distinguish it from *J. excisa*.

the capsule, laciniated. They are entirely destitute of plicæ or furrows, the transverse section being always circular. The cellules of the tubular mouth are remarkable for being more elongated than the rest, and the terminal ones, which constitute the cilia, are longest of all; whereas in *J. bidentata*, however much the calyx may be laciniated and toothed, *the terminal cellules are always the smallest*. [The fructification of *J. scutata* offers excellent marks of distinction from *J. Bantriensis*: it is *lateral*, with a *perichatium* consisting of 2—6 leaves, entire or variously cut at the extremity, and *far smaller than the stem leaves*; and the calyx is obovate with a trigonous denticulated mouth.]

Calyptra obovate, much narrower than the calyx and *perfectly free*; but in *J. scutata* it is of equal width with the calyx, and *adheres to its sides*.

Peduncle incrassated, thicker than that of *J. bidentata*. *Capsule* smaller, more nearly spherical, its valves of a deep purplish brown hue, but in *J. bidentata* of a light brown. *Seeds* slightly smaller, and spiral filaments much shorter than those of *J. bidentata*.

In *var. β* the stems are many times smaller than in the normal form (though intermediate states occur) and of a loosely cellular texture. Leaves broader than long, from a wide base, usually with a shallow triangular emargination; the areolation slightly wider than in the normal form. Stipules so minute as to be detected with great difficulty.

Var. γ, which is also of humble size, has almost exactly the habit of *J. excisa*, and might be mistaken for it if the stipules were not observed. The stems are prostrate, subramose, opaque. Leaves almost horizontal, proportionally longer and subquadrate, with a closer areolation. Stipules more uniform, yet occasionally bifid. I found *gemmae* on this variety alone: the leaves which bear them are closely imbricated at the extremity of a shoot, of delicate texture, remarkably laciniated and crose, reddish as well as the *gemmae* themselves, which are almost spherical in shape. The stipules which accompany the gemmiferous leaves are of unusual size, being scarcely smaller than the leaves themselves.

All the states of this species are remarkable when growing, or if moistened after having been dried, for their strong and rather agreeable scent; very different from that of *J. bidentata*, but not unlike that of *J. hyalina*. Dr. Taylor likens it to “recently cut cedar-wood with a dash of sweet-briar.”

Although *J. bidentata* and *scutata* are the nearest allies of *J. Bantriensis*, yet there are other species which approach closely to it, amongst which are *J. barbata*, Schreb., *J. Lyoni*, Tayl., and *J. saxicola*, Schrad.; but as the differences are obvious enough to

any one acquainted with these species, it is needless to enter into an exposition of them.

I ought to add that Mr. Wilson has favoured me with specimens of what I consider to be a state of *J. Bantriensis*, gathered by Mr. Ralfs near Dolgelley, in September last. It differs from the normal form only in its laxer habit, more distant and sub-patent leaves.

5. *Jungermannia barbata*, Schreb. Frequent, especially near the High Force; usually intermixed with mosses.

6. — *bicuspidata*, L. Everywhere.

7. — *bidentata*, L. Common; but not ascending the mountains.

8. — *byssacea*, Roth. In several localities. Few *Jungermanniæ* are more various in their hues than this little species: in Hell Cleft it gives to the large patches of *Barbula tortuosa* which it infests the appearance of being strewn with soot; near Maize beck it imparts a pinkish tinge to *Dicranum glaucum* and other palustrous mosses; growing on the earth near the High Force, its colour is a deep green. In the last-named locality the stems exhibit stipules, which are very minute, ovate and entire towards the base of the stems, but bifid in the upper part. Stipulaceous varieties of *J. byssacea* are not unfrequent near York, and might be mistaken for *J. Francisci*, Hook., which is however a perfectly distinct species.

9. — *ciliaris*, L. Very sparingly on Cronkley Fell. This usually alpine species flourishes in abundance on all our moors in the Vale of York, where its constant companion is *Cetraria Islandica*.

10. — *concinata*, Lightf. On rocks south-east from Cronkley Bridge, and more abundantly at the base of Holwick Scarr.

11. — *cordifolia*, Hook. In streams on the west side of Mickel Fell; on wet rocks near the Tees, in various places.

12. — *Dicksoni*, Hook. Cronkley Scarr and rocks south-east of Cronkley Bridge, but very scarce.

13. — *dilatata*, L. On trees.

14. — *echinata*, Tayl. MSS. On limestone rocks in Hell Cleft, Ettersgill beck, and on the Yorkshire side of the High Force. I have seen *J. hamatifolia*, Hook., its near congener, in precisely similar situations on slate and old-red-sandstone rocks in the south-west of Ireland.

15. — *emarginata*, Ehrh. Abundant in moist rocky situations, especially near streams.

16. — *epiphylla*, L. Near streams.

17. — *excisa*, Dicks. In many places.

18. — *furcata*, Linn. Rocks and trees.

19. — *incisa*, Schrad. Near Maize beck.

20. — *inflata*, Huds. In heathy places.

21. — *luxifolia*, Hook. At the base of the High Force; very scarce.

22. — *Lyellii*, Hook. I found a single plant by the Tees near Winch Bridge.

23. — *Lyoni*, Tayl. MSS. Cronkley Fell and Holwick Wood.

24. *Jungermannia multifida*, L. On moist rocks among mosses; fructifying in several places.
 25. — *nemorosa*, L. In a great variety of situations.
Var. β . *purpurascens*, in Hell Cleft.
Var. γ . *recurvifolia*, on rocks near streams.
 26. — *pinguis*, L. In bogs and near streams.
 27. — *platyphylla*, L. Rocks.
 28. — *polyanthos*, L. On stones in the bed of the Balder.
 29. — *pubescens*, Schrank. Frequent on rocks (chiefly limestone) near the Tees and its tributaries. I found *perigonia* in abundance, but no *calyces*, though I searched most minutely.
 30. — *reptans*, L. Cronkley Scarr; very sparingly.
 31. — *riparia*, Tayl. MSS. Sides of streams; not common.
 32. — *scalaris*, Schrad. Frequent in moist situations.
 33. — *serpyllifolia*, Dicks. Near the High Force, Hell Cleft and other places, yet nowhere abundant.
 34. — *setacea*, Web. Heathy situations near Maize beck and Cronkley Scarr.
 35. — *spinulosa*, Dicks. Near the High Force and Caldron Snout, but rather rare.
 36. — *Tamarisci*, L. On rocks and about the roots of trees.
 37. — *Taylori*, Hook. Cronkley Scarr and the west side of Mickel Fell.
 38. — *Trichomanis*, Dicks. Frequent.
 39. — *trichophylla*, L. Abundant in moist situations.
 40. — *undulata*, L. Maize beck. Dr. Taylor's opinion that this is only a variety of *J. nemorosa* ('Flora Hibernica,' part ii. p. 61) is, I fear, too well founded.
 41. *Marchantia androgyna*, L. Exceedingly abundant on rocks by the Tees, Ettersgill beck, and other streams.
- Collegiate School, York, Nov. 15, 1843.

XXXVI.—On the Fossil Vegetables of the Sandstone of Ayrshire.
By J. SHEDDEN PATRICK, F.R.S.E., F.R.S.S.A. &c.*

[With a Plate.]

HAVING observed, in visiting the Museum of the Royal Society, that, although it contained many fossils of interest, especially a very beautiful and complete series from England, presented by the Earl of Cathcart, those of Ayrshire appeared to be altogether wanting, I was induced to take advantage of a few months' residence in the district of Cuninghame in that county, during the summer of 1843, to make a small collection of some of the principal fossils of the locality for the purpose of presentation to the Society's museum.

The fossil vegetables which constitute the collection were ob-

- Read before the Royal Society of Edinburgh, Jan. 2nd, 1844.