



# *Sphagnum fuscum* and *Sphagnum beothuk* in Britain and Ireland

**Mark Hill** reports on two closely related sphagna

In a recent paper, Kyrkjeide *et al.* (2015) recognized a ‘dark morph’ of *Sphagnum fuscum*, which they identified as *Sphagnum beothuk*, previously described from Newfoundland. In their paper, the authors presented detailed distribution maps for Norway, but had looked at only a few specimens from Britain and one from Ireland (which was *S. fuscum* and was not mentioned in the paper). In March 2016, Neil Lockhart and Caitríona Douglas found *Sphagnum beothuk* new to Ireland. They sent the specimen to the

Norwegian sphagnum expert Kjell Flatberg, who confirmed its identity (Lockhart & Douglas, 2017). Here I present more detail of the British and Irish distributions, based on specimens that have been checked mainly by me and a few by Flatberg.

## Identification

I relied mainly on the branch-leaf pore character, shown clearly by Kyrkjeide *et al.* in their Figure 3. This is not an easy character, as the leaf has to be stained in order to observe it. Either crystal violet



<Fig. 1 (opposite page). *Sphagnum fuscum* with *Betula nana* at 600 m in Dundreggan Forest. G.P. Rothero.

△Fig. 2. (above). *Sphagnum beothuk* on Fiddandarry Bog at 150m. N. Lockhart

or methylene blue is suitable. Without stain, you cannot tell whether a pore is a real one (a 'perfect' pore, missing its membrane) or a 'pseudopore' (an imperforate membrane surrounded by a thickened ring). There are plenty of pseudopores towards the apex of branch leaves of *Sphagnum beothuk* but there are very few pores; the few pores that do exist are almost all at the bottom (proximal) end of the cells. The best way to observe the pores is to look at the dorsal (outer) surface of the leaves. The leaves often have to be turned over individually as they tend to lie belly-up if floated in a droplet.

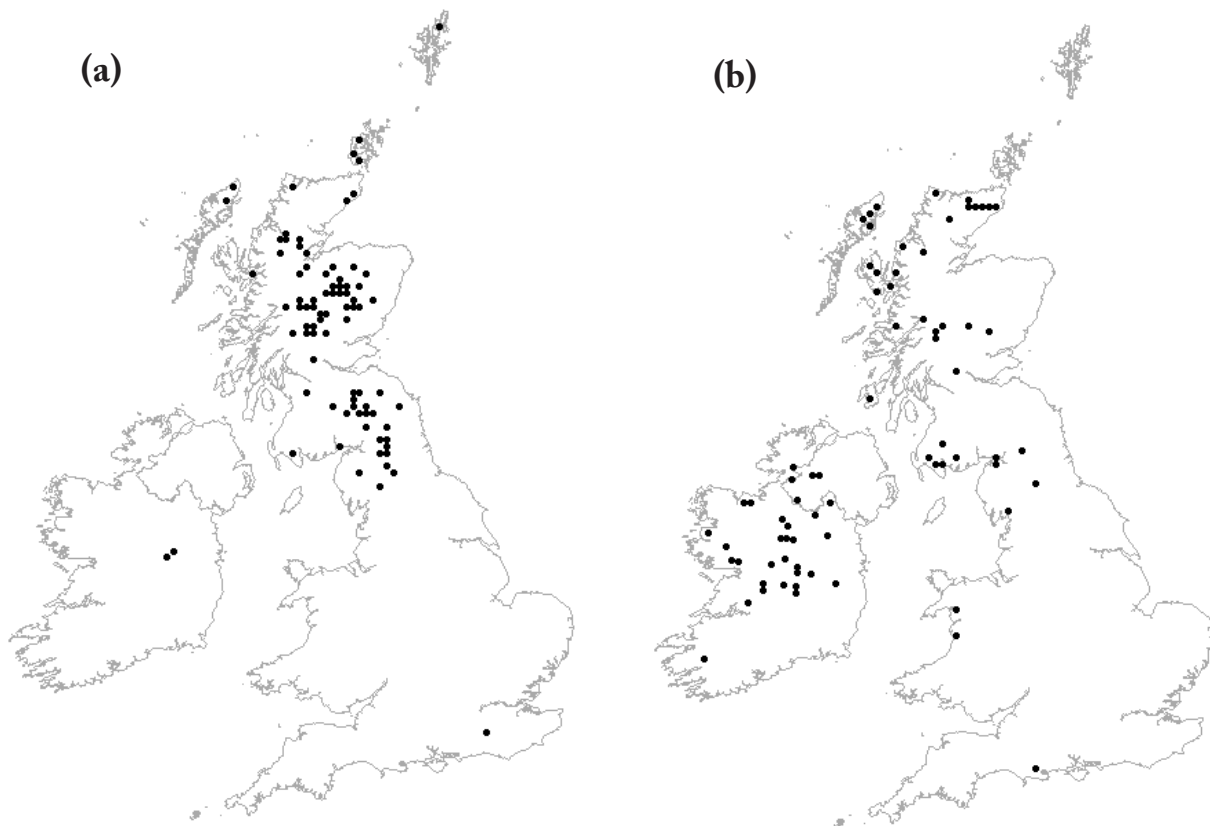
The other main character is the shape of the stem leaves, mostly parallel-sided in *S. fuscum*, mostly narrowed towards the apex in *S. beothuk*. Additional characters are the colour - paler like mushroom soup in *S. fuscum*, brighter and

darker (snuff-coloured) in *S. beothuk*. The capitula of *S. fuscum* are less convex, while those of *S. beothuk* are more likely to be pompoms. Braithwaite (1880) must surely have been thinking of *S. beothuk* when he wrote 'Nothing can exceed the beauty of a great bed of it, when freshly moistened by a shower, resembling, as it does, a surface of snuff-coloured velvet'.

The additional characters are rather variable, and when I open a packet I am still often unsure which species I am looking at, even after examining 262 specimens. Therefore I have relied heavily on branch-leaf pores and the shape of the stem leaves.

## Results

Because *Sphagnum fuscum* sensu lato is so easy to identify in the field, few bryologists have



△Fig. 3. Distribution of (a) *Sphagnum fuscum* and (b) *Sphagnum beothuk* in Britain and Ireland. All confirmed records are shown, not distinguished by date. The maps were prepared by the Biological Records Centre.

taken the trouble to collect more than one or two specimens, except for the purpose of vice-county recording. The exceptions are Tristan ap Rheinallt (10), Rod Corner (17), Ursula Duncan (10), David Long (28), John O'Reilly (9), Sandy Payne (10) and Derek Ratcliffe (16). I have relied heavily on two British national herbaria: Royal Botanic Garden Edinburgh (E; 128 specimens) and National Museum of Wales including British Bryological Society (NMW and BBSUK; 57 specimens). I have not attempted to chase up records in Irish herbaria. The Irish distributions are therefore rather thin.

In general, *S. fuscum* is found at higher altitudes in mainland Scotland, while *S. beothuk* is lowland and oceanic, extending along the western seaboard of Britain north to the Flow Country of Caithness and Sutherland. All but

three Irish specimens (one a duplicate) were *S. beothuk*. The mean altitude for specimens of *S. fuscum* was 510 m, while that for *S. beothuk* was 140 m. At several sites, both species have been collected: Butterburn Flow (VC 70), Flanders Moss (VC 87), Dun Moss (VC 89), Kensary (VC 109) and Pentland Road (VC 110). There seems to be no distinction in habitat between them at low altitudes, so they could well grow intermixed, as they sometimes do in Norway (Kyrkjeeide *et al.*, 2015).

Both species have been found fruiting in Britain. Derek Ratcliffe found fruiting *S. fuscum* near Dava (VC 95); Ursula Duncan found it fruiting on the Cairnwell (VC 92); and John O'Reilly found it on Drowning Flow (VC 67). Jean Paton found fruiting *S. beothuk* near Loch Sguod (VC 105); and Sandy Payne found it

fruiting near Forsinard (VC 108 and VC 109). There are no fruiting records from Ireland.

Vice-county distributions, based on checked specimens are as follows. I have followed the convention used in the current *Census Catalogue* (Hill *et al.* 2008) that where there is no record from a vice-county later than 1959, the vice-county number is bracketed. Fuller details of the specimens examined are given in the Appendix.

*Sphagnum fuscum* s.str. (13), (65), (66), 67-70, 72, 74, 76-81, 83, 87-90, 92-98, 104, (105), 106, 108-112. H18, (22).

*Sphagnum beothuk* 9, 46, 48, 66, (69), (70), 73, 74, 87-89, 97, 98, 102, 104, 105, 107-110. H2, 9, 10, 14-18, (19), (23), 24, 25, (27), 28-30, (32), 33, 34, 36.

## Discussion

The two localities of *S. fuscum* from central Ireland are from lowland bogs, not, as one would expect, from upland blanket bogs. Specimens of *S. fuscum* from Rossan Bog, Co. Meath, were distributed by the BBS. The two that I have seen (BBSUK and E) are typical *S. fuscum*. The occurrence of *S. fuscum* in southern England is also remarkable, and could have been transient like that of *S. riparium* (Jones, 1986).

Another surprising specimen was *Sphagnum beothuk* collected in 2005 by Margaret Bradshaw from Tinkler's Bog in Upper Teesdale at 495 m. Not only is the locality higher than the altitude of all other records of the species, but earlier specimens from Upper Teesdale collected between 1898 and 1901 were all *S. fuscum*. Because the specimen was exceptional, I examined several stems in detail. All lacked pores in the upper part of the branch leaves and had stem leaves narrowing upwards to the apex. Reluctantly, I identified her specimen as *S. beothuk*. Then John

O'Reilly sent another specimen from exactly the same locality, collected in 2007, which was also *beothuk*. In coastal Norway *S. beothuk* extends north beyond the Arctic Circle (Kyrkjeide *et al.*, 2015) so the climate of Upper Teesdale may not be unsuitable for it.

In general, those specimens that had small pores at the apex of the branch leaves also had parallel-sided stem leaves and vice-versa. However, one of H.N. Dixon's specimens from the side of Ben Lawers above Meiller, collected in 1893 (BBSUK, accession number C.2001.019.2393) lacked small pores in the upper leaf, but had parallel-sided stem leaves. His other collection, with identical information on the packet (BBSUK, accession number C.2001.019.2395) had small pores and was typical *S. fuscum*. I have identified both specimens as *S. fuscum*.

Although most specimens could be identified unequivocally by the combination of branch-leaf pores and shape of the stem leaves, a few specimens were difficult and could be interpreted as intermediates. According to Shaw & Cox (2005) plants that appear to be genetic admixtures are not uncommon in Section *Acutifolia*, and 'genetic data suggest that *S. fuscum*, *S. rubellum*, and *S. warnstorfi* might be especially promiscuous'. It would be surprising therefore if there were not some introgression between *Sphagnum beothuk* and *S. fuscum* where their ranges overlap. A specimen from Challockglass Moss (VC 74) collected by Rod Corner in 1976 is pale and with small branch-leaf pores, but its stem leaves are mostly narrowed upwards. Another specimen from the same site, collected by J. Waddell and M. Webber in 2002 is pale and flat-topped, but has both the branch-leaf pores and stem-leaf shape of *S. beothuk*. I identified the 1976 specimen as *fuscum* and the 2002 specimen as *beothuk* but these decisions are somewhat arbitrary. A more difficult decision relates to

specimens from Glen Derry (VC 92), collected by Michael Proctor in 1951 and distributed by the BBS. The specimen in BBSUK is *S. fuscum* as would be expected from eastern Scotland. The specimen in E lacks small pores in the upper leaf, and has variable stem leaves, some parallel-sided but mostly narrowed upwards. The flat part of Glen Derry, from which it probably came, is at about 500 m elevation, higher than any known locality for typical *Sphagnum beothuk*. It seems unwise to record it as *beothuk*, and this is the only specimen to which I have not given a name.

Phytogeographically, *Sphagnum beothuk* is similar to *S. austinii*, with which it often grows. *Sphagnum austinii* is classified by Hill & Preston (1998) as Hyperoceanic Temperate. However, *S. beothuk* is not known to occur in the broadleaf forest zone (often called the nemoral zone) of Europe except in Ireland and Britain. It is perhaps best classified as Oceanic Boreo-temperate. *S. fuscum* is Circumpolar Boreo-arctic Montane.

#### Acknowledgements

I thank Kjell Flatberg (Trondheim) for helpful advice and initial checking of specimens. Neil Lockhart sent Irish specimens and first alerted me to the presence of *Sphagnum beothuk* in Ireland. I am grateful to David Long for facilitating the loan of specimens from E and to Lesley Scott for sending them. I thank Katherine Slade for sending me all the specimens in BBSUK and NMW.

Christine Bartram allowed me to borrow specimens from CGE. I thank all bryologists who sent me specimens to check, especially Tristan ap Rheinallt, Rod Corner, John O'Reilly and Sandy Payne.

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## Appendix

Records to support vice-county distributions are given here. Each is the most recent record for its vice-county. Except for three specimens seen only by Kjell Flatberg and one identified by M.O. Kyrkjeeide, all have been checked by me. Accession numbers are not listed here, but are available in the full dataset deposited with the Biological Records Centre. Grid references are truncated to at most six figures, but are listed up to ten figures in the full dataset, which includes earlier records from the vice-county where these exist. Where the herbarium is not stated, the specimen was in a private collection when checked for this revision.

**Collectors of specimens:**

*T. ap Rheinallt*, *P.M. Benoit*, *E. Bignal*, *H.J.B. Birks*, *T.H. Blackstock*, *B.S. Brookes*, *D.F. Chamberlain*, *T.G. Charman*, *R.W.M. Corner*, *A.C. Crundwell*, *D.H. Dalby*, *C. Douglas*, *M. Eakin*, *B. Edwards*, *F. Fernandez*, *K.I. Flatberg*, *C. Forster Brown*, *M.D. Furness*, *H. Grogan*, *N.G. Hodgetts*, *R. Holme*, *E.C. Horrell*, *D.A. Jones*, *A.L.K. King*, *E.M. Kungu*, *K.O. Kyrkjeide*, *M.O. Kyrkjeide*, *N. Lockhart*, *D.G. Long*, *A. Moen*, *S.V. O'Leary*, *J. O'Reilly*, *J.A. Paton*, *A.G. Payne*, *C.D. Pigott*, *R.D. Porley*, *M.C.F. Proctor*, *D.A. Ratcliffe*, *G.P. Rothero*, *A.J.E. Smith*, *D.M. Synnott*, *A. Upton*, *C.H. Waddell*, *J. Waddell*, *E.C. Wallace*, *K.J. Watson*.

***Sphagnum fuscum*. 13:** bog, St Leonard's Forest, near House, TQ23, 1954, Wallace (NMW); **65:** Cronkley Fell, NY82, 1901, Jones & Horrell (NMW); **66:** blanket bog, above Falcon Clints, NY8228, 1958, Pigott (E); **67:** 230 m alt., Muckle Moss, NY798669, 2014, O'Reilly & Furness; **68:** open peaty slope, 775 m alt., N slope of Cheviot, near summit, NT907209, 1984, Long (E); **69:** in M18 blanket bog, 580 m alt., Moor House, NY755324, 2008, O'Reilly; **70:** 540 m alt., by R Tees, N of Moor House, NY753341, 2015, O'Reilly; **72:** blanket bog, 600 m alt., between Midlaw Linn and Loch Skene, NT168160, 1983, Corner; **74:** intermediate mire, 80 m alt., Challoghglass Moss, NX300559, 1976, Corner; **76:** blanket bog, Flow Moss, NS555467, 2003, Watson (BBSUK); **77:** raised bog, below Fall Hill, NE of Crawford, NS959219, 2005, Kungu & Chamberlain (BBSUK); **78:** blanket bog, 620 m alt., Blackhope Scar, Moorfoots, NT316477, 1982, Corner; **79:** blanket bog, 700 m alt., Hundleshope Heights, NT244330, 2008, J. Waddell (E); **80:** valley mire amongst *Betula* with sphagnum carpet, 235 m alt., Adderstonlee Moss, nr Hawick, NT533118, 2005, Corner

& Long (E); **81:** extensive raised mire, 207 m alt., Dogden Moss near Greenlaw, NT684495, 2013, Long (E); **83:** hummock in blanket bog, 630 m alt., Blackhope Scar, NT316478, 2008, Holme & J. Waddell (E); **87:** 20 m alt., Flanders Moss, NS6297, 1979, Bignal (BBSUK); **88:** blanket bog, 800 m alt., summit of Meall nam Fuaran, Glen Almond, NN8236, 1993, Corner; **89:** raised bog, 350 m alt., Dun Moss, near Blairgowrie, NO167557, 1980, Payne; **90:** by runnel on gentle N-facing hillside, 850 m alt., above the Dounalt, Glen Doll, NO236756, 2002, Long (E); **92:** open flushed *Calluna* slope, 405 m alt., Morrone Birkwood, Braemar, NO134906, 2003, Long (E); **93:** 590 m alt., Buck of Cabrach, NJ415232, 1992, Corner (BBSUK); **94:** grassy flats by stream, 1085 m alt., Allt Coire Domhain, SE of Cairn Lochan, NH993024, 2007, Long & Rothero (E); **95:** hummocks on small raised bog, 405 m alt., Braes of Abernethy, NJ072155, 1986, Long & Paton (E); **96:** mire, nr Loch Battan, Wester Clunes, NH543391, 2006, Payne; **97:** damp peaty slope, 825 m alt., N side of Bealach Breabag, Ben Alder, NN507703, 1987, Long (E); **98:** peaty streamside, 760 m alt., Coire an Dothaidh, Bridge of Orchy, NN3239, 1978, Crundwell & Long (E); **104:** bog hummock, Isle of Skye, S of Kyleakin, NG72, 1987, Flatberg (TRH); **105:** bog, 700 m alt., by Loch a'Mhadaidh below Sgurr Mor, NH201724, 1960, Smith (NMW); **106:** blanket peat in open montane valley, 580 m alt., near Loch Coireag nam Mang, Moruisg, NH11955064, 2013, Long (E); **108:** wet area of flow, Strath Dionard, nr Gualinn, Kyle of Durness, NC35, 1963, Ratcliffe (E); **109:** blanket bog, Kensary, S of Watten, ND24, 1974, Crundwell (E); **110:** in pool complex in blanket mire, 109 m alt., Allt Loch nan Geadh, Pentland Road, Lewis, NB32713613, 2016, ap Rheinallt; **111:** Fara, Orkney, ND329952, 2012, Upton;

**112:** extensive sloping mire, 100 m alt., NW of Loch Basta, Yell, HU504952, 2000, Payne (E); **H18:** raised bog, 90 m alt., Raheenmore Bog, N43, 2014, Moen, det. Flatberg (TRH); **H22:** Rossan Bog, half mile SE of Kinnegad, N54, 1956, King (BBSUK).

*Sphagnum beothuk*. **9:** hummocks in valley mire, 25 m alt., Lower Hyde Bog, nr Bere Regis, SY872922, 2006, Edwards (BBSUK); **46:** raised mire, Cors Fochno, SN6391, 1987, Blackstock; **48:** hummocks in acid bogland, 200 m alt., near Trawsfynydd, SH63, 1978, Benoit (BBSUK); **66:** Widdybank Fell, NY818290, 2007, O'Reilly; **69:** Witherslack, SD4284, 1884, C.H. Waddell (E); **70:** raised bog, 10 m alt., Glasson Moss, NY2360, 1959, Paton (E); **73:** bog, 250 m alt., Corranoch Bog, the Silver Flowe, NX473830, 1966, Birks (E); **74:** 10 m alt., Borrow Moss, Wigtown, NX4357, 1977, Corner; **87:** raised bog, Flanders Moss, NS69, 1979, Chamberlain (E); **88:** wet base-rich flushes, 195 m alt., near Milton of Invervack, Blair Atholl, NN8364, 1981, Chamberlain & Long (E); **89:** raised bog, 380 m alt., Dun Moss, NO15, 1967, Brookes (E); **97:** open raised bog, 130 m alt., W of Leanachan, Leanachan Forest, NN1978, 1986, Long (E); **98:** 298 m alt., by A82 N of Lochan na h-Achlaise, NN3148, 2011, Kyrkjeeide & Kyrkjeeide, det. M.O. Kyrkjeeide (TRH); **102:** Islay, Duich Moss, NR3355, 1998, O'Leary; **104:** valley mire, 50 m alt., Portree, above Sluggans, NG460452, 2016, Hodgetts; **105:** hummocks on raised bog, 15 m alt., near Loch Sguod, NW of Poolewe, NG812879, 1986, Long (E); **107:** blanket bog, 225 m alt., by Loch Gaineamhach, Lairg to Tongue road, NC513259, 2006, Chamberlain & Kungu (E); **108:** blanket bog, 190 m alt., W of Lochan nan Clach Geala, NC926494, 2015, Charman; **109:** blanket bog, 100 m alt., Shielton Peatlands, Flow Country, ND195477, 2002, Porley;

**110:** hummock at edge of bog pool in blanket mire, 111 m alt., Loch nan Stearnag, Pentland Road, Lewis, NB324366, 2016, ap Rheinallt; **H02:** bog, Cores bog, W side of Mangerton Mountain, V98, 1983, Synnott (BBSUK); **H09:** hummock on bog, near Kilkishen, R5175, 1979, Lockhart; **H10:** bog, Carrig, SW of Birr, N00, 1965, King (BBSUK); **H14:** hummocks in raised bog, 110 m alt., Caher Bog, S2691, 2009, Hodgetts (BBSUK); **H15:** raised bog, nr Woodford, M70, 1962, Smith (BBSUK); **H16:** robust hummock in degraded bog, 13 m alt., Pollagh, Moycullen, M201377, 2016, Eakin; **H17:** large raised bog, Addergoole North, River Suck, near Ballinasloe, M83, 1968, Birks (E); **H18:** raised bog, 60 m alt., Woodfield Bog, near Clara, N23, 1990, Long (E); **H19:** bog, Mouds Bog, near Newbridge, N81, 1956, King (BBSUK); **H23:** Derries Bog, N04, 1952, King (BBSUK); **H24:** Cloontirm Bog, nr Longford, N17, 1966, King (BBSUK); **H25:** hummocks on raised bog, 53 m alt., Derreenasoo Bog, G9309, 2016, Eakin & Fernandez, det. Lockhart; **H27:** tussock on blanket bog, near Lough Namucka, Louisburgh, L8275, 1951, Dalby (BBSUK); **H28:** ombrotrophic blanket bog, 152 m alt., Fiddandarry Bog, Ox Mountains, G392224, 2016, Douglas & Lockhart, conf. Flatberg; **H29:** hummock on raised bog, South Cashel, N085900, 1986, Douglas & Grogan (BBSUK); **H30:** hummocks on raised bog, 55 m alt., Drummany Bog, H4017, 2016, Eakin & Fernandez, det. Lockhart; **H32:** Scottstown, Red Bogs, H63, 1900, C.H. Waddell (CGE); **H33:** undisturbed blanket bog, Pettigoe Plateau, H035644, 2011, Forster Brown (NMW); **H34:** large hummock in blanket bog, 150 m alt., Croaghonagh Bog, H053885, 2008, Hodgetts (BBSUK); **H36:** hummocks in raised bog, 70 m alt., Tully, NW of Omagh, H417758, 2016, Long.