

Daltonia splachnoides in Irish conifer plantations – another epiphyte on the move

Daltonia splachnoides (Sm.) Hook. & Taylor is the only member of its genus in Europe, and one of just four European members of the Daltoniaceae (Hill *et al.*, 2006).

It is a very distinctive species when fruiting because of its small, ovoid, dark brown capsules covered by flared, pale calyptrae with fringed margins, but it is tiny and easy to overlook, even with sporophytes. Non-fruiting colonies are composed of small tufts of slightly branched shoots, with straight, acuminate, bordered leaves, and are difficult to spot among other mosses. It has a hyperoceanic distribution (Hill & Preston, 1998) and is currently known in Europe from Ireland, Scotland, Madeira and the Azores. Further afield it has been reported from Bioko, Kenya, Uganda, China, The Philippines, Thailand, Vietnam, Australia, New Zealand, many West Indian islands, south and central America, and western North America (Piers Majestyk, pers. comm.).

Daltonia splachnoides is an ‘inexplicably’ rare species of humid western regions of Britain and Ireland. The BBS 2009 summer meeting in south-west Ireland gave **Sam Bosanquet** and colleagues a chance to search for this tiny but fascinating moss. As he explains, many new colonies were found, allowing new insights into its ecology. Where will it turn up next?

Until very recently, *D. splachnoides* has been considered a very rare and elusive moss in Scotland and Ireland. The Atlas (Birks, in Hill *et al.*, 1994) presented records from 13 Irish hectads (10×10 km squares) and 7 Scottish hectads, almost all of them in the far west. The most easterly Irish outlier, Seahan Mountain in Co. Dublin near the north end of the Wicklow Mountains, is the type locality, where T. Taylor collected material in the early 19th century (Smith, 1813). Birks described *D. splachnoides* as growing in ‘a range of habitats’, including flushed rocks in woodland streams, rotting logs overhanging streams, and tree roots and trunks near waterfalls. Streams and humidity appear to be the main link in these habitats, and Gordon Rothero (pers. comm.) suggests that *Daltonia* likes to be splashed regularly. The absence of this species from countless apparently suitable sites was emphasized by Birks who suggested that it was perhaps near the edge of its ecological range. Birks also mentioned records from the roots of ash trees that would become covered with robust pleurocarpous mosses within a few years, perhaps indicating a fugitive lifestyle involving colonization and then local loss (a metapopulation strategy similar to that of other pioneer epiphytes and many invertebrates).

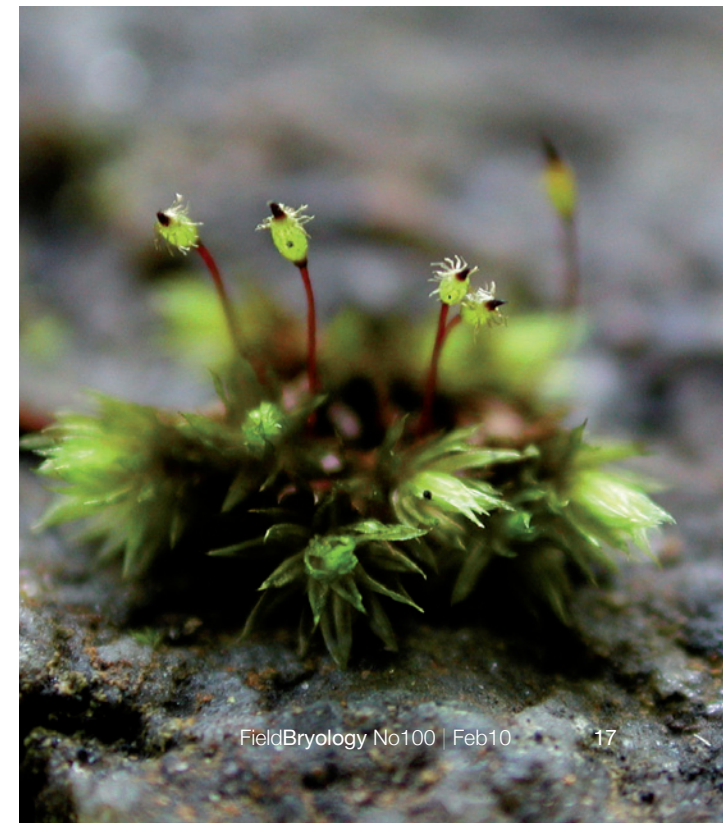
The 1998 *Census Catalogue* (Blockeel & Long, 1998) reports records from eight Irish vice-counties and three in Scotland. This had climbed to 13 and four, respectively, by the next *Census Catalogue* (Hill *et al.*, 2008). Most new records in the intervening years came from hillsides and ravines – the same sort of habitats where *D. splachnoides* had been found for decades. Two records suggested that something different was happening: one from Co. Limerick in a ‘stream valley at edge of forestry, slopes of Kockanimpaha’, R2236, made in 1994 by E. Wiltshire and M.V. O’Brien (Blockeel, 1995) and one ‘on S side

of trunk of *Picea sitchensis* 10 m above ground level in 32 year old stand, 320 m alt., Meentiny near Rockchapel on slopes of Knockacummer, R24501357, 2003, Cooté L., det. Kelly’ (Rothero, 2007).

Conifer plantation records

The Meentiny record provoked much discussion in the BBS. Using a doubled-rope and climbing spurs to survey epiphyte communities in conifer plantations, LC had found it growing 11.3 m up a standing spruce tree. Perhaps *D. splachnoides* was present widely, but out of reach in our conifer plantations. Might bryologists need to be sampling bryophytes from high up trees? *Colura calyptrifolia* was provoking more bryologists to record in humid conifer stands

▽ *D. splachnoides* displaying its unmistakable fringed calyptrae. R. V. Lansdown (left) & Neil Lockhart (below)





Daltonia splachnoides on the move

Daltonia to exploit what is a relatively recent arrival in habitat terms. The forest cover of Ireland in early postglacial times did include an important coniferous component, with extensive tracts dominated by *Pinus sylvestris*, especially in western regions, although 20th century plantations have a dense canopy of spruce which creates a darker and more humid forest microclimate than that found under *Pinus sylvestris*. A major *Pinus* decline began around 4,000 years ago and the species is generally believed to have died out sometime in the 1st millennium A.D. (Roche *et al.*, 2009). The overall deforestation of the Irish landscape began with Neolithic clearances; Rackham (1995, 2005) has estimated that by 1650 A.D. the total

(Bosanquet, 2004; Averis, 2007), but there was no sign of *Daltonia* in the Welsh forests where *Colura* had become so frequent. LC had also found a population 6.5 km north of Meentinnny at Tooreenmacauliffe (R256199) at 12.2 m up a spruce in August 2003, and Bastian Egeter had found *D. splachnoides* on a decaying spruce log in the Meentinnny plantation in the same month, but these records were not known to most BBS members at the time.

As preparation for the 2009 summer meeting in Co. Cork and Co. Kerry, SDSB and CDP spent 5 days in south-west Ireland visiting potentially suitable areas for exploration by the BBS in June and July. They found three new colonies of *Daltonia*: one in a typical humid stream gully in the Pass of Keimaneigh (W103639; v.-c. H3) and two on *Salix* in situations where *Colura* would now be expected (and was indeed present) (left-hand photo above). SDSB then located two populations further east in East Cork (v.-c. H3) on the way to the summer meeting, and four more in the same areas as those reported by LC and B. Egeter, including one on conifer stumps (right-hand photo above) and one on *Salix* in a moorland mire several hundred metres from any conifers. DGL also searched specifically for *Daltonia* on the North Kerry part of the BBS meeting and found it by a conifer plantation in

the upper reaches of the Cordal stream, as well as in a more traditional site on the north side of the Slieve Mish mountains. These new records are summarized in Table 1.

Metzgeria consanguinea, *Hypnum jutlandicum* and *Ulota crispa* s.l. were recorded as associates on *Picea* trunks by LC, along with the lichens *Hypotrachyna revoluta* and *Parmelia sulcata*, and copious green algae. SDSB noted *D. splachnoides* growing with *M. consanguinea*, *M. violacea*, *Orthotrichum pulchellum*, *U. bruchii* and *U. phyllantha* on *Salix* by streams through conifers, and with *Isothecium myosuroides*, *U. phyllantha* and *Zygodon conoideus* on a roadside sycamore. *Kindbergia praelonga*, *Plagiothecium undulatum* and *Lophocolea bidentata* were associates of the colonies on conifer stumps and a spruce log.

Discussion

The sudden increase in records of *D. splachnoides* from conifer plantations in Ireland is thought to result from two factors. The first is an awareness of the bryological interest of this habitat, in part because of the ecological studies of the Bioforest team (Iremonger *et al.*, 2007), and in part because of the parallel discovery of frequent *C. calyptrifolia* in British plantations. The second is a probable genuine increase in

△ Two habitats where *D. splachnoides* has been found in Ireland. Left. On *Salix* in a habitat typical of where one might find *C. calyptrifolia*. Above. On a conifer stump. Sam Bosanquet

Table 1. Recent records of *D. splachnoides* from conifer plantations and other non-traditional habitats in south-west Ireland

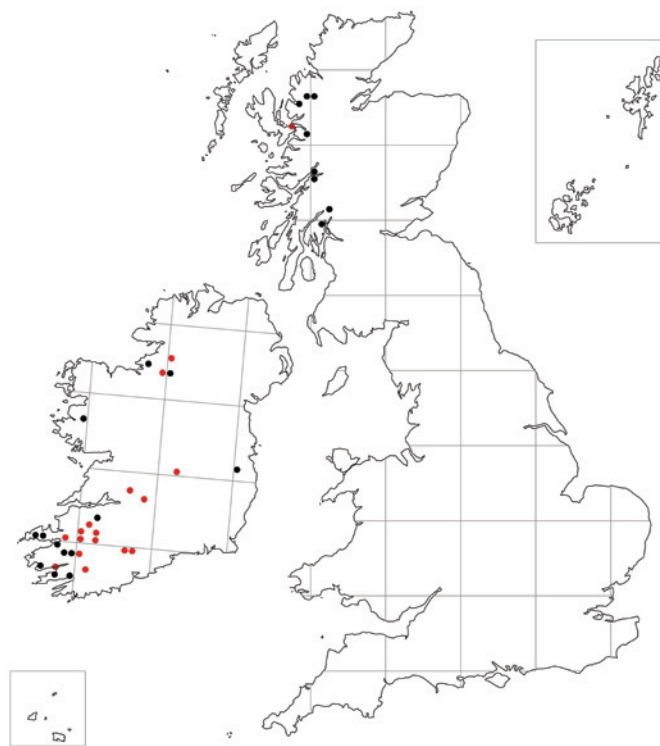
Recorders: BE, Bastian Egeter; CP, Chris Preston; DL, David Long; LC, Linda Coote; SB, Sam Bosanquet.

Location	Grid ref.	Alt. (m)	V.-c.	Habitat	Year	Recorder
Valley north of Barnageehy	Q810092	275	H2	<i>Salix</i> by stream on hillside	2009	DL
Cordal Stream, near Castleisland	R077079	230	H2	<i>Salix</i> in ditch on edge of conifer plantation	2009	DL
North-east of Leamydoody	R067127	250	H2	<i>Salix</i> arching over ditch on edge of conifer plantation (photo above left)	2009	CP
North-west of Knockatee	R075117	310	H2	Small <i>Salix</i> in open on side of disused shale quarry	2009	SB
Glengort, Abbeyfeale	R192217	285	H8	Bark of dead wood in plantation	2007	LC
Glenamucklagh	R218083	305	H4	<i>Salix</i> by stream in plantation	2009	SB
Taurbeg north-east	R236117	330	H4	<i>Salix</i> clump in moorland mire	2009	SB
Gloun Dine Bridge	R238104	290	H4	<i>Acer pseudoplatanus</i> by road	2009	SB
Gloun Dine Bridge	R238104	290	H4	<i>Ulex</i> scrub on edge of plantation	2009	SB
Meentinnny	R245135	320	H4	<i>Picea</i> trunk, 11.3 m above ground	2003	LC
Meentinnny	R245135	320	H4	<i>Picea</i> log	2003	BE
Tooreenmacauliffe	R256199	385	H4	<i>Picea</i> trunk, 12.2 m above ground	2003	LC
Cummery Connell	R263166	315	H4	<i>Picea</i> stumps in humid plantation	2009	SB
Pass of Keimaneigh	W103639	180	H3	<i>Salix</i> by stream in humid valley	2009	SB
Toorgarriff	W691921	240	H5	<i>Salix</i> on edge of plantation	2009	SB
Gortroche Forest	W714957	205	H5	<i>Salix</i> by stream in plantation	2009	SB

woodland cover had shrunk to only ca 2.1–3% of the island. Conifer plantations do not appear in the landscape until the 18th century A.D. (Roche *et al.*, 2009). Extensive coniferization of the Irish uplands did not occur until the second half of the 20th century, and it may be that only in recent decades have such plantations become sufficiently mature and humid to provide substantial areas of habitat for *Colura*, *Daltonia* and other species. Like *Colura*, *D. splachnoides* produces abundant propagules – sporophytes and, in some populations, dense clusters of narrowly ellipsoid, 72–108 × 17–20 µm, 5- to 6-celled, hyaline-walled gemmae in the leaf axils (Holyoak & Lockhart, 2009; DGL pers. obs.) – and colonizes sparsely vegetated bark and rock in humid situations. John Birks described *Daltonia* as ‘*inexplicably rare*’ in 1974. It may then have been limited by the absence of the right habitat in much of its potential range, rather than any inadequacy of its colonizing ability. Conifer plantations have perhaps provided a suitable niche into which it has been able to expand eastwards.

The areas of Counties Cork, Kerry and Limerick where *Daltonia* has been found in plantations are upland, hilly country with numerous streams and large areas of conifer woodland, such as the Glanaruddery and Mulla-ghareirk Mountains. Targeted searches of *Salix* bushes and *Picea* trunks in five plantations in the south-eastern two-thirds of West Cork (v.-c.

H3) by SDSB during the BBS summer meeting produced regular *C. calyptriifolia* and *M. consanguinea*, but no *D. splachnoides*. The prevailing winds in Ireland are from the south-west, so there may be less chance of dispersal of spores into plantations in southern West Cork from the native woodland refugia of *Daltonia* than is the case for plantations further north-east in Co. Cork. Furthermore, southern v.-c. H3 is a more exposed and generally lower altitude area than the parts of Co. Cork and Co. Kerry in which *Daltonia* is now quite frequent, and so may be less suitable for this species. CDP also failed to find *Daltonia* in plantations in lowland North Kerry which have been colonized by *Colura*. These two factors have implications for



△ Distribution of *D. splachnoides*. Black dots indicate pre-2000 records; red dots are newly discovered sites since 2000.

the potential for *Daltonia* to spread to southern Britain, which is not downwind of south-west Ireland, and where few if any conifer plantations reach the year-round humidity levels found in West Cork and Kerry. *D. splachnoides* has always been thought to be rarer in Scotland than Ireland, so colonization of northern Britain would start from a lower baseline than in Ireland. Nevertheless, there seems a reasonable chance that close scrutiny of *Salix* bushes or *Picea* trunks in humid spruce plantations in the western Highlands could produce new colonies of *Daltonia*, and a slim chance that it might spread east from its current south-easternmost point in Ireland (in the Slieve Bloom Mountains, Laois; v.-c. H14) to reach south-east Ireland, or even Wales or Cornwall.

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