▷Fig. 1: *Ulota calvescens* in Calderdale, May 2013, showing well-developed capsules on long setae, with sparsely hairy calyptras. J. Turner

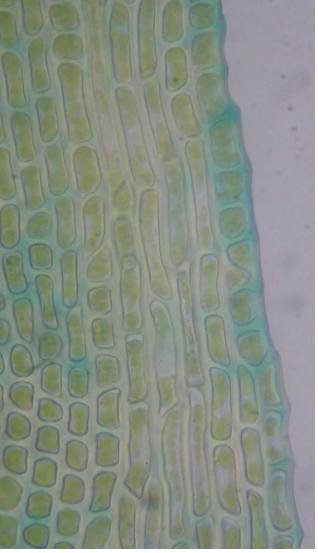
Tales of the unexpected, no. 2: *Ulota calvescens* in the southern Pennines

Tom Blockeel and **Johnny Turner** discuss the totally unexpected discovery of this classic oceanic moss in the South Pennines

Ostensibly, *Ulota calvescens* is a classic oceanic moss. Ratcliffe (1968) places it in the 'Widespread Atlantic' group of bryophytes in his detailed ecological account of Atlantic species. The first edition of the Atlas of British and Irish Bryophytes (Hill, Preston & Smith, 1994) shows a distribution centred on the Hebrides and the adjacent west coast of Scotland, with isolated localities in south-west Scotland and North Wales. In Ireland at that time it was almost confined to the west. In continental Europe *U. calvescens* is known from Brittany, where it was first found in 1993 (Bates & Hodgetts, 1995), and in the western part of the Iberian Peninsula, with its southernmost locality in the Algarve region of Portugal (Dixon, 1912). It occurs in all three archipelagos of Northern Macaronesia (Azores, Madeira and the Canary Islands), but is unknown elsewhere. In BRYOATT (Hill *et al.*, 2007) it is designated as a 'Southern Temperate-Oceanic' species.

Recently there have been indications of an expansion of its range eastwards in Britain and Ireland. During meetings and mapping expeditions for the new edition of the Atlas, it was found to be frequent in parts of west and south-central Ireland, with isolated occurrences in the north and south-east. In Britain there have been scattered records from south-west Scotland, south Wales and Cornwall. However most of the English and Welsh occurrences have consisted of few or solitary tufts, tending to reinforce the impression of a strongly oceanic species with rare and perhaps transitory occurrences to the east and south of its core range.

It was a revelation, therefore, for us to discover in the spring of 2013 that *U. calvescens* is widespread and at least locally frequent in the South Pennines, from Derbyshire northwards to Wharfedale in Yorkshire (and presumably beyond). Its presence was first suspected when one of us (JT) was scrutinising epiphytes in and around Hebden Bridge in South-west Yorkshire, where epiphytic bryophytes have shown a remarkable recovery since the dark days of severe SO_2 pollution. Some tufts of *Ulota* were distinctive in having a long seta with capsules maturing early in the season, and having less conspicously hairly calyptras than adjacent *U. bruchii* and *U. crispa*. During a meeting of



△Fig. 3 left: The vitta of elongate cells inside the leaf margin of *Ulota calvescens* in the lower half of the leaf (lightly stained with methylene blue), from Beacon Fell, Lancashire, June 2013. T.L. Blockeel. △Fig. 2 right: *Ulota calvescens* at Heptonstall, Calderdale, in May 2013, showing old and new season's capsules. Note the sparsely hairy calyptras of the young capsules and the relatively wide mouths of the old ones. J. Turner

the Yorkshire Naturalists Union at Cromwell Bottom near Brighouse on 18 May the two of us noted a tuft of the same plant on a sallow in wet woodland that has developed on a former fly-ash tip. TLB subsequently confirmed from microscopic examination that these specimens belonged to *U. calvescens*. Within a few weeks we had found it in Cheshire, Derbyshire, Lancashire and Mid-west Yorshire, and JT found it to be farily frequent around Hebden Bridge and the adjacent Calder Valley. Remarkably it extends to the eastern watershed of the Pennine range on Big Moor near Sheffield.

Identification

The older floras stressed the almost hairless calyptra as an important diagnostic character for *U. calvescens*, but this is misleading and may have led to the species being under-recorded even in its core areas. Dixon (1912) noted that his plants from the Algarve had calyptras that were 'rather more pilose than usual', and Størmer (1959) reported that some material that he had seen from the Canary Islands had strongly hairy calyptras. More recently Holyoak (2002) made similar observations on specimens from Ireland. In Pennine material we have found the calyptras to range from sparsely to moderately hairy, but only rarely approaching the bristling calyptras of typical *U. bruchii* and *U. crispa*; they are often dark-tipped. In the field *U. calvescens* is most easily recognised in spring. The capsules mature earlier than those of *U. bruchii* and *U. crispa,* and are held on a relatively long seta (Figure 1). The capsules of the Pennine plants were already expanded in May, when those of the other two species were still emergent. This allowed potential tufts of *U. calvescens* to be spotted with relative ease at that time of the year. The tufts are usually compact and neat, and the leaves very strongly curled when dry. Later in the year, *U. calvescens* is more difficult to spot because the setae of *U. bruchii* may be as long as those of *U. calvescens*. When old and dry the mouth of the urn is somewhat flared, as in *U. crispa*, and in combination with the long seta this may help in locating potential specimens when old capsules are present (Fig. 2).

Microscopically, *U. calvescens* is easily identified by its leaf cells. In *U. bruchii* and *U. crispa*, the cells across much of the leaf base are linear and thick-walled, but there is a differentiated marginal band of hyaline cells in which the cross-walls are more strongly thickened than the longitudinal walls (in the manner of many *Grimmia* species). The hyaline band is usually quite broad, often 8 cells or more wide. The cells above the base grade into shortly rectangular cells, becoming

uniformly (if somewhat irregularly) isodiametric in the upper lamina. *U. calvescens* differs in having a band ('vitta') of elongate cells that ascends the margin of the leaves above the basal part. This band lies inside the margin, being separated from the edge of the leaf by 1-2 rows of short cells (Figure 3). It varies in length, even on opposite sides of the same leaf and on leaves from the same stem, sometimes reaching to mid-leaf, but often shorter. Though occasionally very short, it is always present and is a reliable diagnostic character. The marginal band of hyaline cells at the base tends to be narrower than in the other two species, often only 2-4 cells wide. However it varies considerably and is not a reliable character for identification. On each side of the leaf base of *U. calvescens* there is often a longitudinal fold or furrow in the lamina, but the two folds are sometimes indistinct and they too are less useful as a diagnostic character.

Habitat and Distribution

In its Pennine localities, *U. calvescens* favours sheltered but well-illuminated sites. Typical habitats are stream valleys, groups of sallows in marshy or boggy ground, and light or scrubby woodland. It tends not to occur in closed woodland, except along tracks or by clearings. One of the Derbyshire sites is by a tree-lined disused railway; one of the host trees there was in a small marshy hollow at the edge of the old track. The site near Brighouse is in woodland that has developed on an old fly-ash tip, where there are water-filled hollows during winter. At Fernilee Reservoir in the Goyt Valley solitary tufts occur on trees on the margin of the reservoir. Most other sites are sheltered but not all of them are close to water.

The most common host tree is sallow (*Salix* spp.), but it has also been recorded frequently on ash and sycamore, occasionally on oak and rowan, and once on planted hornbeam. At many sites only single or a few tufts were observed, but at others it occurred in greater quantity.

Our initial searches, mostly in May and June 2013, confirmed the presence of *U. calvescens* in 14 hectads (10km squares) of the national grid, but it may prove to be widespread throughout north-west England. The southernmost sites are in the Upper Dove Valley SK06, the Sett Valley near Hayfield SK08, the Etherow Valley near Charlesworth SJ99 (all VC 57), the Goyt Valley at Fernilee Reservoir SK07 (VC 57 & 58), and Big Moor near Sheffield SK27 (VC 57). In Calderdale, it is known from many sites from Todmorden to Hebden Bridge and Heptonstall SD92, eastwards to Rishworth SE01, Mytholmroyd SE02, Ogden SE03 and Cromwell Bottom SE12 (all VC 63). Northwards it is recorded from Lancashire at Spring Wood, Whalley SD83 (VC 59), Beacon Fell SD54 (VC 60), and in NW Yorkshire from Bolton Abbey Woods SE05 and Grass Wood SD96, both in Wharfedale (VC 64).

Discussion

The occurrence of *Ulota calvescens* in the southern and western Pennines has an obvious parallel in *Colura calyptrifolia*, another oceanic bryophyte that has recently colonised this region as an epiphyte. However even from our preliminary observations *U. calvescens* extends significantly further east beyond the zone in which *Colura* is currently known. The South Pennines were formerly subject to severe SO_2 pollution, and up to the 1980s only the most acid-tolerant bryophytes could be found on trees. It is almost certain that neither *Colura* nor *U. calvescens* were present near the Lancashire and Yorkshire conurbations at that time. The amelioration of SO_2 pollution has therefore been a pre-condition for the establishment of these epiphytes. What

it is not possible to know on present evidence is whether their recent spread represents a recolonisation or a genuine expansion of range.

The western Pennines support only a few strongly oceanic bryophytes at the present time. The deep sheltered valley of the Hebden Water north of Hebden Bridge retains small isolated populations of *Jubula hutchinsiae* and *Lepidozia cupressina*, and there are scattered sites for *Saccogyna viticulosa*. *Plagiochila spinulosa* occurred formerly but appears to be extinct. It is possible that other oceanic species occurred in the pre-industrial era but disappeared before they could be recorded. *Ulota calvescens* and *Colura calyptrifolia* could have been among them. On the other hand these species are known to have extended their range elsewhere in Britain into areas that were not subject to severe atmospheric pollution (notably in parts of Wales), and other factors may be relevant. Climate change is one of them, and the cycle of wet summers since 2007 may have aided the spread of the two species. However it is notable that tufts of *U. calvescens* were showing no signs of stress in 2013 after a relatively cold winter and unusually dry, late spring. Its presence in southern Portugal suggests some tolerance of periods of drought. A population of *Colura* on the other hand was showing clear signs of stress in the Goyt Valley in June 2013, most of the shoots being bleached. It may be at the limits of its tolerance there.

While SO_2 pollution has declined, nutrient deposition has increased. This is a complex subject and there is much that we do not yet know. Nutrients in their different forms may have a fertilising or an acidifying effect, and it is known that increased nitrogen (N) levels can have a harmful effect on some bryophytes. On the other hand the spectacular displays of species such as *Metzgeria violacea*, which may paint whole tree trunks yellow-green in favourable sites in the South Pennines, suggest that nutrient input may be beneficial for some species.

It is easy to understand how *U. calvescens* has been overlooked in recent years, a classic case of not seeing what is not expected, and its frequently hairy calyptras have helped to conceal its presence. It is much less easy to explain how a moss thought to have a strongly oceanic distribution is now turning up in the middle of England. It will be interesting to learn the true extent of its distribution over the coming years.

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